DEVELOPMENT OF LEXICAL CATEGORIZATION IN PRESCHOOLERS

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A Dissertation Submitted in Part Fulfillment of
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CERTIFICATE

This is to certify that this dissertation entitled *"Development of lexical categorization in preschoolers"* is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech Language Pathology) of the student (Registration No.06SLP009). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysore

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CERTIFICATE

This is to certify that the dissertation entitled **"***Development of lexical categorization in preschoolers"* has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier in any other University for the award of any Diploma or Degree.

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DECLARATION

I declare that this dissertation entitled **"***Development of lexical categorization in preschoolers"* is the result of my own study and has not been submitted in any other university for the award of any diploma or degree.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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Gives you the lead in the journey,
Walks with you throughout,
Makes you open the doors of wisdom yourself!
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CHAPTER I

INTRODUCTION

Human beings explore the world around them because of their constant quest for knowledge. They organize behaviors into identifiable, organized schemas. Even children collect experiences through various mental schemas, assemble and organize the schemas into cognitive structures. They develop cognitive structures that represent organized information about all their experiences with sensation, movement, sound, location, people, object, speech among others.

Preschoolers are children of age 3- 5 yrs, who fall in the preoperational period of the Piagetian stages of cognitive development. Children in this period make headway in their language development. Vocabulary increases to around 900-1000 words at 3 yrs and 2100-2200 around 5yrs (Owens, 1996). As they learn new words they appreciate additional features associated with each word and try perceiving the significant relationship between lexical items. The process of object categorization - an aspect of cognitive organization also begins during the preschool period. This tendency marks the beginning of lexical categorization behavior during the preschool period.

Lexical categorization refers to *the process by which children make category membership inferences*. Such categorization is fundamental to human cognition, enabling communication and serving as the basis for the representation of objects and for predicting and explaining their behavior (Anglin, 1977; Markman, 1989). Changes in the

organization of mental representations occur with growing age and the exact nature and course of that requires more probing before reaching emphatic conclusions.

Children as young as 3.5 months (Eimas & Quinn, 1994), adults (Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976), and non-human animals (Freedman, Risenhuber, Poggio, & Miller, 2001) alike readily use perceptual similarity to determine the category to which something belongs. But when reasoning about an object, or explaining or predicting its behavior, perceptual appearance is not always criterial of category membership. For example, even though 'eels' look like snakes, in order to more accurately characterize their ancestry, behavior and physiological processes, experts categorize them as fish i.e. they considered the **non obvious properties** *(properties that are not perceptually revealed)* to determine category membership. Hence not only perceptual similarities, even non-obvious properties are crucial in categorization. (Jaswal, 2004).

Given sufficient experience, children as young as 30 months can form non-obvious categories by noting causal (Gopnik & Sobel, 2000) or functional (Kemler Nelson et al., 2000) regularities between objects. However, recognizing non-obvious similarities can be a slow and laborious process, often requiring experience that is difficult to obtain. Moreover, it requires every individual in every generation to have the experience for him or herself (Tomasello, 1999).

Hence, another reliable and efficient way to obtain non-obvious category information is through language (Gelman, Hollander, Star, & Heyman, 2000). When a trusted source uses an **unexpected category label** *(a category label that conflicts with the*

perceptual features of an object) for an object, it reflects a particular perspective that others have found useful when thinking and reasoning about that object in the past, and it can cause us to revise a classification immediately. For language to have this effect, however, listeners may have to give up a compelling, perceptually based classification in favor of a classification they do not immediately understand. Evidences on both of these theoretical view points are prevalent with controversies leading to unsettling argument.

The issues on the nature, process, influencing factors and developmental changes underlying the children's acquisition of category membership inference are questions of long standing debate. Differed opinions exist among the researchers on the development of lexical categorization in preschoolers. Also, similar lines of research in an Indian context are very scanty. Thus, the need for the study is justified.

The main objective of this research is to study the development of lexical categorization in preschoolers. An attempt to derive answers to the following questions is made

1) How are the lexical items organized in the mental lexicon by preschoolers?

2) What information is used in determining category membership of a lexical item?

3) How linguistic information is used by them in drawing inferences about the non-obvious category information of the lexical item and

4) Whether there exists any difference in lexical categorization across preschool years?

The present research engaged the preschoolers on a free word association task to comment on the organization of lexical entities in their mental lexicon. The same preschoolers were also engaged in a lexical categorization task. The task paradigm was so

designed that they were required to categorize by making inferences about the non obvious properties of perceptually misleading computer generated - hybrid stimuli. Here, the experimenter provided labels that conflict with the perceptual appearance of the hybrids to gain insights on how the linguistic information (label) influences lexical categorization and preschoolers' reasoning of non obvious characteristics of a lexical item.

CHAPTER II

REVIEW OF LITERATURE

Cognition, or mental activity, describes the acquisition, storage, transformation and use of knowledge. It involves a variety of mental processes like perception, memory, imagery, language, problem solving, reasoning and decision making that operate every time we acquire some information. (Matlin, 2003).

The conceptual knowledge obtained by the cognitive processing of information is fundamental to us. Our conceptual knowledge includes the both concrete things (cars, computers, etc) and abstract entities (truth, desire, etc). Without the ability to organize incoming information we would probably be at a total loss to use any other cognitive process. We divide the world into categories in order to make sense of our knowledge (Schwarz 1995).

A category refers to a class of objects that belong together. On other hand, concept refers to our mental representations of a category. (Smith, 1995). Categorization and conceptual organization as cognitive processes allow us to code the objects that surround us, combining a wide variety of similar objects into a single one word concept. This coding process greatly reduces the storage space, because many objects can all be stored with the same label. Our concepts also allow us to make inferences when we encounter new examples from a category.

a) Categorization as a cognitive skill

Piaget proposes three major cognitive principles – equilibrium, organization and adaptation – that are fundamental to the development of intelligence. With growing understanding of the world, the child organizes physical system and cognitive responses to better interact with the environment. These organized patterns are called schemata. The schemata are not static but continuously get modified in response to maturing physical and cognitive systems and experiences. As schemes evolve with new experiences, so will their cognitive structures, their organized understanding of changing environment (McLaughlin, 1952).

The concept of categorization is integral to the phenomenon of organization. The major spurt of categorization evolves during the second stage of Piagetian cognitive development - **preoperational stage.** The pre-operational stage extends from 2 to 7 years. Categorization at this stage is mainly guided by paired comparisons of entities. During this period children exhibit problem solving skills and begin the process of categorizing and sorting the world.

b) Categorization in lexical terms in preschoolers

The Piagetian pre-operational stage overlaps well with the preschool years. Preschoolers' semantic development is coupled with the developments in motor, social and cognitive abilities. Vocabulary increases from 900 – 1000 words at three years to 2200 words at five years of age. (Owens, 1996). This growth is not simple accumulation of new words in long term memory. Rather preschoolers actively accumulate semantic features that correspond to their growing perception of action, attributes, locations and agents and discover meaning of a word.

This derivation of meaning (concept) is closely linked to the phenomenon of categorization. The level of conceptualization is where experiences and objects are categorized, indicating that they are perceived as sharing some significant feature or relationship. All words have an underlying concept. For children and adults, using a word to label a new referent beyond the original one experienced for a word indicates that they perceive some similarity between them.

As preschoolers learn new words they also recognize additional features associated with each word and discover additional meanings for each word. They initially use words to represent broad categorizations and gradually refine word meanings. Thus they are better able to represent and organize the environment's reality. Hence vocabulary and language growth is pinned-up to growth in cognitive skill of categorization

c) Issues on nature of lexical organization

An issue of greater interest (in the domain of lexical categorization) is the way in which related words are organized in the internal structure of the mental lexicon and the changes in organization with age.

One of the telling behaviors in children of maturing semantic domain is their ability to relate/associate words to each other. The growing cognitive abilities allow them to efficiently organize and store all new found information. The internal structure of this organization and storage can be visualized as a web: A web of related words or concepts interconnecting individual words in a variety of ways called the *semantic network* (Pease

& Gleason, 1985). The organization of this network can be tapped indirectly using free association tasks.

Changes in organization of vocabulary occur at different age levels. An early change in child's word association (organization) has been described as a shift from thematic to taxonomic organization of responses (Locke, 1993).

- Taxonomies are categories of objects that share a common essence. Items in this share features that define them as a class. Objects in a given taxonomy are likely to be similar in perceptual features. (Medin & Ortony, 1989). *E.g. Wagon & bus; Wagon & daddy's car; Wagon & truck.*

- Themas are objects that are related by event schema. (Shank & Abelson, 1977). Relation that bind objects into themas include *spatial* (paper & desk), *causal* (student &pencil) and *functional* (paper & pencil). (Lin & Murphy, 2001).

Inhelder & Piaget (1964) observed that preschoolers sort objects into categories according to spatial (thematic) relation rather than perceptual (taxonomic) similarity. However by the age of 8 years and into adulthood taxonomic relations are preferred leading to a hypothesis that there is a thematic – taxonomic shift in conceptual development. The exact age of this shift is not quite clear. It may begin as early as toddler years and roughly between the ages of 5 and 8 years the system is hypothesized to undergo this shift.

However, Waxman and Namy (1997) examined 2 to 4 years of children on a forced choice task paradigm. Their data suggested that children showed no pervasive preference for either thematic or taxonomic relations. Instead the data suggested a more continuous developmental function with no frank shift from one conceptual mode of responding (thematic) to another (taxonomic).

d) Issues on process of lexical categorization

Research on process of lexical categorization has been vast. In general, there are two main approaches to lexical categorization.

1. Similarity based model
2. Theory based model

A similarity based approach proposes that children make category inferences on the basis of computation of similarity: the more features two objects share, the greater the similarity, and the more likely an inference will be drawn between them. Here label of an item is treated as one of its features, much like a visual feature.

The similarity based approach is appealing as it uses well – known mechanisms to predict and explain children's behavior. All that is needed is a mechanism capable of computing similarity of perceptual and label attributes across two objects.

Theory based model purports that children's lexical categories are constructed not merely on the basis of perceptual characteristics and regularities but on the basis of children's beliefs and assumptions about the world and the way language works. It

assumes that a label provides direct access to an object's kind, and hence allows appreciation of the non obvious properties it is likely to have.

Research in the area of process of lexical categorization is extensive. Samuelson & Smith, (1999) investigated a typical 2-year old children's productive vocabulary, and found that most category labels represent categories whose members cohere perceptually. It is also proposed that children's sensitivity to regularities between the appearance of objects and their labels results in shape bias, a generalization each child makes, that categories are organized by shape (Smith et al, 1999; 2002). The authors in general, suggest that children have extensive experience with *perceptually (similarity) based categories.*

The appearance of an object has been well – proved to be a reliable predictor of its category membership. Children as young as 3.5 months (Behl – Chadha, 1996), adults (Rosch et al, 1976), and non human animals (e.g., Bhatt, Wasserman, Reynolds, & Knauss, 1988; Freedman, Risenhuber, Poggio, & Miller, 2001) alike readily use perceptual similarity to determine the category to which something belongs.

However when appearance of an object and the label applied to it conflicted, (i.e. adults mentioned an unexpected label) children tended to make inferences based on the label mentioned. Gelman and her colleagues (Gelman 1988; Gelman & Coley, 1990; Gelman & Markman, 1986, 1987) have conducted several studies demonstrating that preschoolers are often willing to use an unexpected label applied to an object to make inference different from the one they would otherwise have made. Gelman (2003) has argued that children's willingness to make inferences on the basis of unexpected labels

indicates that they recognize that what something looks like is only a good; but not perfect cue as to what it is. (Bloom, 2000) On this account, children categories are theory based; they are constructed not merely on the basis of perceptual characteristics and regularities but on the basis of children's beliefs and assumptions about the world and the way language works. According to Gelman, children assume that a label provides direct access to an object's kind, and that an object's kind determines its nonobvious properties.

With the above review it is clear that the debate on whether lexical categorization in children is theory based or similarity based is longstanding with studies supporting or refuting either of the two approaches of lexical categorization.

e) Factors influencing lexical categorization

The influence of labeling in lexical categorization shows differences across preschool years. Even here different views are prevalent over the developmental differences seen in influence of labeling towards lexical categorization.

(a) Children can learn categories and label them from testimony, in addition to learning from observation. Between 12 and 24 months, children begin to recognize many atypical exemplars as members of familiar categories (Meints, Plunkett, & Harris, 1999), presumably because they have heard people use familiar category labels when referring to them (Adams & Bullock, 1986). For example, children learn that penguins are birds. Penguins do not look much like typical birds, and most children don't spend much time with penguins to observe and detect by themselves the reasons why penguins are birds.

(b) Nazzi & Gopnik (2001) are of the opinion that labels applied to objects have profound influence on the categories that children form. In addition to leading children to form an entirely new category, a label can have an even more powerful effect of re-classifying an object from one known category to another known category. (Gelman et al, 1990; Sloutsky & Fisher, 2004)

In Gelman and Markman (1986) study, for example, 4 yr olds were shown a picture of a squirrel and told “this squirrel eats bugs.” They were shown a picture of rabbit and told “This rabbit eats grass”. Finally they were shown a picture of a squirrel that looked much like a rabbit and were asked “See this squirrel. What does it eat?” Even though perceptual similarity is normally a good cue to category membership children tended to respond on the basis of label inferring that rabbit like squirrel would eat bugs like other squirrels.

To test predictions that inductive generalization is driven by the overall similarity, Sloutsky & Fisher, (2001) systematically varied the similarity of each of the selected test stimuli to a target by morphing pairs of animals into each other. From these morphed sequences, they selected multiple triads with different similarity ratios. These similarity ratios (Sr) were estimated in separate experiments, in which participants were asked to select the test animal that looked more like the target animal.

The results of the study concluded that the older children are assumed to be more influenced by labels than younger children. Sloutsky et al (2001) found that when 4- to 5yr old heard two objects with same label they were influenced both by shared labels and

by the number of shared common features. In contrast, 11 year old always took inferences based on label rather than perceptual features.

Jaswal (2004) presented results that are not in support of the above. In his study, a speaker asked preschoolers to make inferences about objects that were sometimes referred to with unexpected labels. The preschoolers saw color pictures of objects from two familiar categories, heard them labeled, and watched the researcher demonstrate a different activity with each (e.g., a dog ate bones, and a cat drank from a bowl of milk). After this training event, they saw pictures of hybrid objects, designed to look more like one object than the other. Sometimes these hybrids were referred to twice with an unexpected category label (e.g., a dog-like animal was referred to as a cat), and sometimes they were referred to neutrally (e.g., as ‘‘this one’’). Children were asked to use the pictures to act out the activity in which each engaged.The results showed that 4-year-olds were more reluctant than 3-year-olds to accept that, for example, a cat-like animal was a dog just on the basis of hearing it called a dog. i.e. 4 yr olds resorted to perceptually based inferences for categorization, whereas 3 yr old were more open to adult labels.

NEED

Thus the review of literature shows that issues in lexical categorization are topics of unsettling debate. More research to gain clearer insights into this domain of lexical categorization is called for. The implications of this study would have a significant bearing on the theoretical understanding of development of lexical categorization in preschoolers. Further, the need for such a study is also warranted in the Indian context.

AIM

The following objectives are included

- ✓ To understand the nature of lexical organization in preschoolers

  Research Question 1:

  How are the lexical items organized in the mental lexicon (taxonomic Vs thematic) of preschoolers?

- ✓ To understand the process of lexical categorization in preschoolers

  Research Question 2:

  Is the lexical categorization similarity based or theory based?

- ✓ To understand the influence of labeling in lexical categorization

  Research Question 3:

  Does labeling an object influence preschoolers in deciding category membership?

- ✓ To see, the development of lexical categorization across preschool years.

  Research Question 4:

  Does the nature and the process of lexical categorization vary among/ across preschoolers of 3-5 year age group?

CHAPTER III

METHOD

A.SUBJECTS

Thirty preschoolers of age 2.6-3.5 years (Group I), 3.6-4.5 years (Group II), and 4.6-5.5years (Group III) with 10 in each age group, studying in English medium in schools of Mysore participated in the proposed study. Equal number of boys and girls were included in each age group. Based on an informal screening, children with significant history of speech, language and other sensory problems were excluded from the study.

B.STIMULI

Twenty pictures from familiar categories were grouped into ten pairs based on similarity in shape and size. (Table 1)

Table 1

Paired pictures

Egg	Tender coconut
Wheel	Orange slice
Fork	Paint brush
Ice-cream cone	Microphone
Tree	Umbrella
Spoon	Key
Aeroplane	Pencil
Lock	Bag
Horse	Cow
Dog	Cat

Three types of stimuli were selected for the study.

1. Realistic, color digital images of prototypical exemplar of each pair were obtained referred to as *the standard objects.*

2. One additional typical exemplar of each category was created, primarily by manipulating color of each standard object. This was referred to as the *typical test objects*.

3. Additionally *two hybrid objects* were computer-generated by using one of the standards as base and adding additional features of the other standard image of that pair. For each set, one hybrid was designed to look more like a member of one category and the other hybrid was designed to look more like a member of other category. For example, in the cat-dog set, the hybrid had perceptual features of both cat and dog, but one was designed to look more like a cat and other was designed to look more like a dog.

E.g. of cat – dog continuum shown below (original pictures will be colored ones with width and height of 4-5") (See, Appendix B for other stimuli-pairs continuum)

Standard Cat	typical cat	hybrid cat	hybrid dog	typical dog	standard dog
					
Label:					
Cat	Cat	Dog	Cat	Dog	Dog
Label:					
Cat	This one	This one	This one	This one	Dog

Pilot study was conducted on five preschoolers using these stimuli. It served the following purposes of

1. Checking appropriateness of the prepared stimuli and
2. Practice administration (for the investigator) during actual testing

C.DESIGN

Each child was introduced to three conditions as follows

1. Free/ word association
2. No labeling
3. Conflicting labeling

Time gap of two weeks was given between each of the conditions. The order of presentation was kept the same as mentioned for all the thirty children.

D.PROCEDURE

1. Nature of lexical organization

Experiment 1

Free association condition

Each child was seated comfortably and tested individually. The experimenter explained the task to the child with an example (given below).

The clinician showed the picture of a cake and said,

> *"When you hear a word it makes you think of another word. For E.g. When I see this picture of cake, I think of words like birthday party, its sweet and creamy, candles, and so on. Can you tell me what all words come to your mind on seeing this cake?"*

Once the child understood the task, the test items (standard objects) were presented to the child, one at a time.

2.Process of Lexical categorization

Conflicting labeling Vs No label condition

Children were tested individually in a small room in their school. They were seated at a small table, with the experimenter sitting opposite. Each session began with a warm-up trial to familiarize them to the task. On one easel, the experimenter displayed a photo of a bed and explained that a doll slept in the bed. As the explanation was given, the experimenter demonstrated by putting the doll picture next to the bed. On the other easel (displayed simultaneously), the experimenter showed a photo of a fish and demonstrated and explained aloud that fish lives in water.

Table 2

Stimuli set and associated background and activity

	Stimulus set	**Activity/ background**
Warm up	Doll	Sleeps on the bed
	Fish	Lives in water
Test stimuli		
1	Egg	Goes with hen
	Tender coconut	Goes with the coconut tree
2	Wheel	Goes with cycle
	Orange Slice	Goes with orange fruit
3	Spoon	Goes with bowl with fruits
	Key	Goes with lock
4	Mic	Goes with picture of a girl singing
	Ice-cream	Goes with a picture of girl having ice-cream
5	Tree	Goes with leaf
	Umbrella	Goes with rain
6	Fork	Goes with vessels (spoon, plate & cup)
	Paint brush	Goes with color palette
7	Lock	Goes with key bunch
	Bag	Goes with picture of lady carrying bag
8	Pencil	Goes with notebooks
	Aeroplane	Goes in the sky
9	Cow	Gives milk
	Horse	Pulls cart
10	Cat	Drinks milk
	Dog	Eats bones

Children were then shown additional dolls and keys in alternating order and were asked where each went, until they succeeded in putting a doll with the bed and a fish with the water consecutively. Correct selections would be praised and incorrect selections, corrected.

Test trials were similar to the warm – up trial. For example, the experimenter showed a photo of a bowl of milk and explained that a cat drank the milk, and then would show a photo of dog bones and explained that a dog ate bones.

To reduce memory load, following the demonstration, each standard exemplar remained on easel next to its appropriate background photograph.

Children were then shown three test objects, one at a time and they were asked to show the activity or function associated with each. Two of the test objects were the additional typical exemplars from that set, and the third was one of the two hybrids from that set. One hybrid per set was shown to half of the children, and the other hybrid from that set was shown to the other half (e.g. half of the children saw the cat-like hybrid animal and half saw the dog-like one).

Children were presented with ten such trial blocks, corresponding to the ten pairs of objects in Table 1.

Experiment 2

No labeling condition

On the ten no-label trial blocks, the experimenter used the phrase "this one" to introduce each object, including the hybrid. (E.g. "Look at this one! Can you show me what this one does?"). Regardless of their selection, children were given a neutral feedback ("Okay!").

Experiment 3

Conflicting Labeling condition

On the ten label trial blocks, the researcher used a category label to introduce each of the test objects. Labels would be provided twice: "This is a X/ Look at this X. Can you show me what this X does?" The typical test exemplars were always called by labels that matched their appearance. By contrast, the hybrids were referred to by labels that were the opposite of their appearance (i.e., the cat-like hybrid was referred to as "this dog"). The children would not receive the same ten hybrid stimuli of Experiment.2; but received the other ten hybrid picture (of each stimuli set) that was not shown in Experiment 2.

E.RESPONSE CODING

The responses for the free association task (Experiment 1) were recorded using Sony digital tape recorder. The responses were then written verbatim and transcribed using IPA. The response data was transcribed and coded by four independent judges. Four different kinds of relation as defined by Borghi & Caramelli (2003) were utilized for coding purpose.

A. *Taxonomic relation* (kind of, is a): superordinate, subordinate and coordinate relations: e.g., 'bird–animal,' 'bird–parrot,' 'sparrow–parrot.' The production of taxonomic relations does not imply that children master class inclusion. There is evidence that pre-school children know the subset/superset relation without being aware of both the asymmetry relation and the branching structure which characterize class inclusion that will be developed later (Greene, 1994).

B. ***Thematic relations*** that include: (a) spatial relation (where?): the location of the referent of the given concept-noun, as in 'physician — hospital'; (b) temporal relation (when?): the temporal context, as in 'bird — spring'; (c) action relation (who?, what?): the actions which the referent of the given noun take part in, the agent, the recipient of an action, the same action, and, finally, its outcome, as in 'sparrow—fly'; (d) function relation (what for?): the function of the referent of the given concept-noun, as in 'chair — to sit on'; (e) event relation: the description of a complex situation in which the referent of the given noun is involved, as in 'chair — in his castle, a king makes use of the throne and, then, he puts it into his grave for 10 years.'

C. ***Attributive relations*** that include: (a) partonomic relation (part of): the production of a part of an object, as in 'bird — beak,' or of a whole of which the given noun is a part, as in 'bird — flock'; (b) property relation (what is it like?): the perceptual or evaluative properties of the referent of the given noun, as in 'chair—brown'; 'physician—expert'; (c) matter relation (made from): the material which the referent of the given noun is made from, as in 'chair—wood' (Chaffin & Herrmann, 1988; Chaffin, Herrman, &Winston, 1988).

D. ***Evaluative relations*** that include: (a) ego involvement relation: when the child refers to his/her own direct experience of the referent of the given concept noun as in 'I sawit often,' or to his/her own affective reaction to it as in 'I hate it'; (b) juxtaposition relation: stereotyped associations between the given and the produced noun, or idiomatic expressions as in 'bird — airplane.'

***E. Others*:** The relations which could not be included in the previous categories were named 'other.'

For reliability, three independent judges coded a randomly selected 10 % of the response data. Agreement between the judges was very high with the alpha co-efficient equalling 0.9463.

For the No label condition (Experiment 2) and conflicting labeling condition (Experiment 3), coding of children's response involved noting which of the two possible activities/ functions was selected for each test object. The data of both the conditions was further compared and coded as

1. **"One"** – for the presence of influence of labeling in determining category membership. For e.g when the child inferred that "a cat like animal would drink milk" in Experiment 2 and changed his/her inference as "a cat like animal would eat bones" under the influence of investigator's labeling in Experiment 3. This indicates presence of label-based inference for the specified stimuli

2. **"Zero"** – for the absence of influence of labeling in determining category membership. For e.g. when the child inferred that "a cat like animal would drink milk" in Experiment 2 and did not change his/her initial inference under the influence of investigator's labeling. This indicates presence of perceptually based inference.

CHAPTER IV

RESULTS AND DISCUSSION

This chapter focuses on the statistical analyses and interpretation of responses obtained on both the tasks on the nature of lexical organization and the process of lexical categorization. For the sake of convenience, the result section is divided into different levels with sub-levels as outlined below:

A. Nature Of Lexical Organization

a. Analyses of percentage relevant category Vs other category

b. Analyses of major categories of relevant responses

c. Analyses of minor categories of relevant responses

d. General discussion on lexical organization

B. Process of Lexical Categorization

a. Appropriateness of stimuli

b. Influence of labeling on lexical categorization

A. Nature Of Lexical Organization

a) Analyses of relevant category Vs other category

The responses of taxonomic, thematic, attributive and evaluative categories were grouped under one head of the 'relevant' category. The responses of 'other' category was retained the same. The raw scores of relevant and other categories were converted into percentage scores. The statistical analyses of these two categories are elaborated in this section.

Stage 1

The percentage responses of word association task across 'relevant' and 'other' types were initially analyzed using Mixed ANOVA (repeated measure ANOVA with age as independent factor), to analyze the difference between the response types and across the age groups. Table 3 shows the mean and standard deviation of both 'relevant' and 'other' types across age groups. The mean scores of 'relevant' responses increase with age and that of 'other' responses decreases. However standard deviation for 'other' types is large. The average percentage scores are depicted in Fig: 1.

Table 3

Mean and SD of percentage relevant and

Percentage other responses across age groups

	Age Groups	**Mean (max = 100)**	**SD**	**N**
Others	4-5 - 5.5 yrs	4.3870	6.4272	10
	3.5 - 4.5 yrs	14.1820	13.1285	10
	2.5 - 3.5 yrs	14.0650	13.9061	10
	Total	10.8780	12.1705	30
Relevant	4-5 - 5.5 yrs	95.6130	6.4272	10
	3.5 - 4.5 yrs	85.8180	13.1285	10
	2.5 - 3.5 yrs	85.9350	13.9061	10
	Total	89.1220	12.1705	30

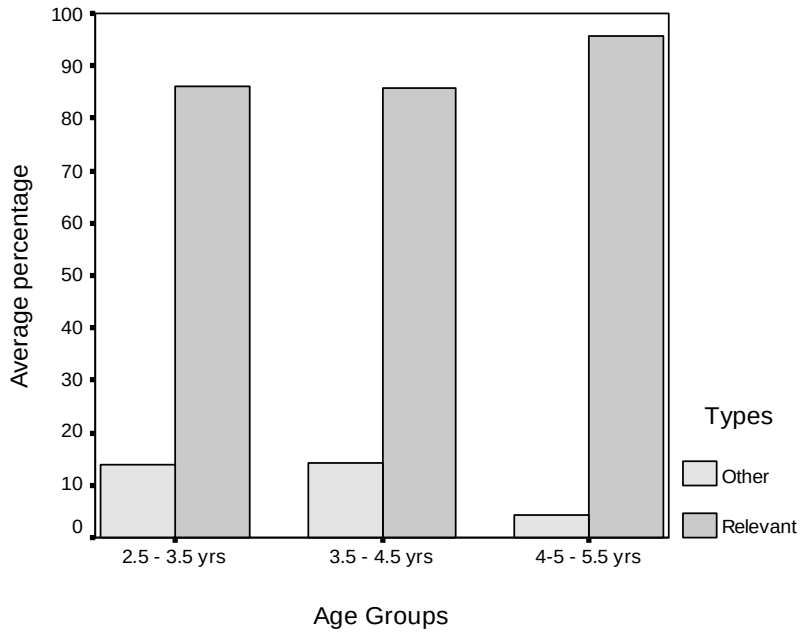

*Fig 1***:** Average percentage relevant and percentage other across age groups

The Mixed ANOVA revealed that the difference between 'relevant' and 'other' types was significant [$F(1,27) = 338.409$, $p < 0.001$]. However, there was no significant interaction between age and response types [$F(2,27) = 2.329$, $p > 0.05$]. Also, there was no significant difference across age groups [$F(2,27) = 1.907$, $p > 0.05$]

Stage 2

Further, one way analysis of variance (one-way ANOVA) was carried out to check if there is a significant difference across age groups for within each type of 'relevant' response. However, no significant difference between age groups within 'relevant' type [$F(2,27) = 2.329$, $p > 0.05$] and within 'other' type [$F(2,27) = 2.329$, $p > 0.05$] was revealed.

Stage 3

However, paired t- test comparisons showed significant difference between relevant and other within each age group at 0.001 level of significance. The results of t-test are given in Table 4.

Table 4

Paired comparison between relevant and other types within the age groups

Age Groups (yrs)	**t(9)**
2.5 – 3.5	**8.172*** **
3.5 – 4.5	**8.628*** **
4.5 – 5.5	**22.442*** **

*** Significant at 0.001 level

In summary,

The preschoolers produced significantly greater number of relevant responses for word association task in all the age groups.

Though not statistically significant, there was increment in relevant responses and subsequent decrease in no-response and irrelevant responses at 4.5-5.5 years.

Growth of vocabulary is at its zenith during the preschool years. It has also been estimated that preschoolers will learn nine words per day, accumulating a receptive

vocabulary of as many as 14000 words by 6 years of age (Carey, 1978). The significant number of 'relevant' responses point to the fact that the children are equipped with good number of conceptual relations in the preschool years.

b. Analyses of major categories of relevant responses

As mentioned above, 'relevant' responses consist of four major categories – taxonomic, thematic, attributive and evaluative. The raw scores of the four categories were converted into percentage scores.

Stage 1

The 'relevant' responses of word association task across taxonomic, thematic, attributive and evaluative categories were initially analyzed using Mixed ANOVA (repeated measure ANOVA with age as independent factor), to analyze the difference between the major categories and across the age groups. Table 5 shows the mean and standard deviation of the major categories scores across the age groups. The total mean scores are highest for thematic type followed by taxonomic, attributive and evaluative types. The taxonomic scores decrease with age and the thematic increases. The standard deviation of the attributive and the evaluative scores are high. The average percentage scores are depicted in Fig: 2

Table 5

Mean and SD of percentage taxonomic, thematic, attributive and evaluative categories across age groups

	Age Groups	Mean (max=100)	SD	N
2.5 – 5.5 yrs	Taxonomic	22.1530	16.3822	30
	Thematic	57.7590	20.1146	
	Attributive	12.6380	19.5269	
	Evaluative	7.4500	7.4698	
3.5 - 4.5 yrs	Taxonomic	23.3300	11.8283	30
	Thematic	62.8440	25.3556	
	Attributive	10.5370	18.2347	
	Evaluative	3.2890	4.7073	
4.5 – 5.5 yrs	Taxonomic	4.4260	3.7430	30
	Thematic	87.4460	7.2049	
	Attributive	2.1530	3.8518	
	Evaluative	5.9750	7.3500	

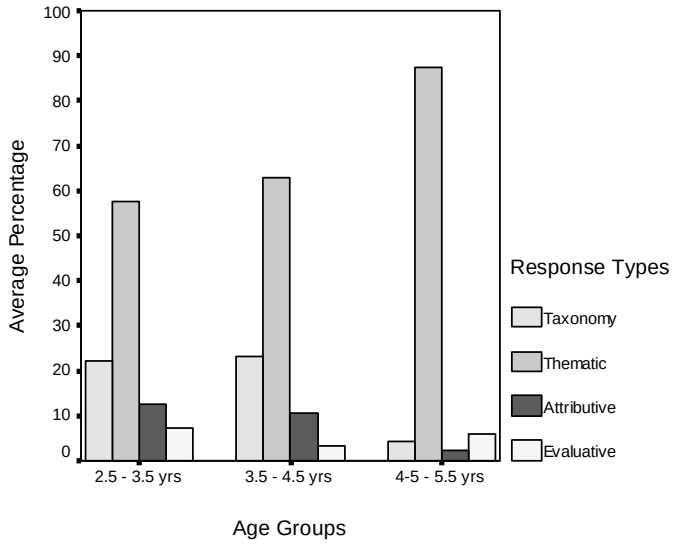

Fig 2: Average percentage of taxonomic, thematic, attributive & evaluative responses across age groups

The Mixed ANOVA revealed that the difference between the four major categories was significant [$F(3,81) = 101.565$, $p<0.001$]. Also, there was significant

interaction between age and the major categories [$F(6,81) = 5.030$, $p<0.001$]. However, there was no significant difference across age groups [$F(2,27) = 0.000$, $p>0.01$].

Further, pair-wise comparisons of the four major categories using Bonferroni test showed significant difference between taxonomic-thematic, taxonomic-evaluative, thematic-attributive and thematic-evaluative pairs at 0.05 level of significance.

Stage 2

One way analysis of variance (one-way ANOVA) was carried out to check if there are differences across age groups for within each major categories. The results revealed significant difference between age groups within taxonomy [$F(2,27) = 7.968$, $p<0.05$] and within thematic[$F(2,27) = 6.878$, $p<0.05$] and no significant difference between age groups within attributive [$F(2,27) = 1.267$, $p>0.01$] and within evaluative [$F(2,27) = 1.012$, $p>0.01$].

Further post-hoc analysis of both taxonomic category and thematic category using Duncan's Test showed no significant difference in scores between age groups Group I and Group II. However, significant difference was noted between age Group I *Vs* Group III and Group II *Vs* Group III at ($p < 0.05$) level. Table 6 and Table 7 show the results of post hoc Duncan analysis, respectively.

Table 6

Comparison of taxonomic category across age

Age group	N	Subset for alpha =0.05	
		1	2
2.5-3.5	10		22.1530
3.5-4.5	10		23.3300
4.5-5.5	10	4.4260	
Sig.		1.000	.439

Table 7

Comparison of thematic category across age

Age group	N	Subset for alpha =0.05	
		1	2
2.5-3.5	10	57.7590	
3.5-4.5	10	62.8440	87.446
4.5-5.5	10		1.000
Sig.		0.5570	

Stage 3

Later, Mixed ANOVA (repeated measure ANOVA with age as independent factor) was carried out to analyze the difference between the major (taxonomic, thematic, attributive and evaluative) categories within each of the age group. Table 8, 9, 10 shows the mean and standard deviation of the major category percentage scores across the age

groups Group I, Group II and Group III. The mean scores are the highest for thematic responses across all the three age groups. However, the standard deviation for other three categories was large.

Table 8

Mean and SD of percentage taxonomic, thematic, attributive and evaluative categories scores in 4.5-5.5 years

Relevant categories	Mean (max = 100)	SD	N
Taxonomic	4.4260	3.7430	10
Thematic	87.4460	7.2049	10
Attributive	2.1530	3.8518	10
Evaluative	5.9750	7.3501	10

Table 9

Mean and SD of percentage taxonomic, thematic, attributive and evaluative categories scores in 3.5-4.5 years

Relevant categories	Mean (max=100)	SD	N
Taxonomic	23.3300	11.8283	10
Thematic	62.8440	25.3556	10
Attributive	10.5370	18.2347	10
Evaluative	3.2890	4.7073	10

Table 10

Mean and SD of percentage taxonomic, thematic, attributive and evaluative categories scores in 2.5-3.5 years

Relevant categories	Mean (max=100)	SD	N
Taxonomic	22.1530	16.3822	10
Thematic	57.7590	20.1146	10
Attributive	12.6380	19.5269	10
Evaluative	7.4500	7.4698	10

The Mixed ANOVA revealed that the difference between the four relevant categories was significant at all the three age groups i.e. [$F(3,27) = 13.892$, $p<0.001$] for Group I, [$F(3,27) = 18.598$, $p<0.001$] for Group II and [$F(3,27) = 386.311$, $p<0.001$] for Group III.

Further, pair-wise comparisons of the four major categories using Bonferroni test showed significant difference at ($p< 0.05$) level between

i. Taxonomic-thematic, thematic-attributive and thematic-evaluative for Group I.
ii. Taxonomic-thematic, taxonomic-evaluative, thematic-attributive and thematic-evaluative for Group II.
iii. Taxonomic-thematic, thematic-attributive and thematic-evaluative for Group III.

In summary,

Of all, the most striking fact is that the thematic category responses dominate over all the other categories in all the three age groups.

The taxonomic category responses ranks second, followed by attributive and evaluative in the age range from 2.5-4.5 years. But the ranking order changes with evaluative, taxonomic and attributive occupying second, third and fourth positions at 4.5-5.5 years. However these ranking differences were not significant except taxonomic-evaluative at 3.5-4.5 years.

Across the different age groups,

Firstly the percentage of taxonomic responses showed a significant reduction from 3.5-4.5 years to 4.5-5.5 years. The reduction is paralleled by significant increase in the percentage of thematic responses at the same age levels. i.e. a marked shift in the conceptual or lexical organization is noted in the crucial age after 4.5 years.

Secondly, there is reduction in the attributive categories though noted across age, were not significant. Thirdly, the evaluative responses showed slight reduction between 2.5 - 4.5 years. Though not significant, the evaluative responses did appear to increase in 4.5-5.5 years.

c. Analyses of minor categories of relevant responses

The four major categories of 'relevant' response above mentioned consisted of minor categories as follows:

i. Taxonomic relations – Superordinate, Subordinate and Coordinate

ii. Thematic relations – Action, Function, Spatial, Temporal and Event relation

iii. Attributive relations – Property, Partnomic and Evaluative

iv. Event Relations – Evaluative and Stereotypes

Prior analysis the raw scores of minor categories were converted into percentage scores.

Stage 1

The responses of word association task across the minor categories were initially analyzed using Mixed ANOVA (repeated measure ANOVA with age as independent factor), to analyze the difference between the minor categories across the age groups. Table 11 shows the mean and standard deviation of the minor categories scores across the age groups. The scores also reveal the presence of high standard deviation and the presence of zero scores as in temporal and matter relations.

Table 11

Mean and SD of percentage taxonomic, thematic, attributive and evaluative categories across age groups

	Age Groups	N	Mean	SD
TAX SUPER ORDINATE	2.5-3.5	10	21.0000	20.6559
	3.5-4.5	10	26.6120	18.6090
	4.5-5.5	7	21.4286	39.3398
TAX SUB ORDINATE	2.5-3.5	10	36.2500	35.4583
	3.5-4.5	10	21.4440	21.1515
	4.5-5.5	7	35.7143	47.5595
TAX CO ORDINATE	2.5-3.5	10	42.7500	37.7942
	3.5-4.5	10	51.9440	25.4255
	4.5-5.5	7	42.8571	44.9868
THE ACTION	2.5-3.5	10	24.3030	19.6861
	3.5-4.5	10	23.4560	19.4918
	4.5-5.5	10	30.8810	9.3837
THE FUNCTION	2.5-3.5	10	20.2050	11.6952
	3.5-4.5	10	26.0370	13.6256
	4.5-5.5	10	47.6120	14.7094
THE SPATIAL	2.5-3.5	10	10.9570	6.7371
	3.5-4.5	10	21.6280	29.5363
	4.5-5.5	10	4.2170	5.3850
THE TEMPORAL	2.5-3.5	10	.0000	.0000
	3.5-4.5	10	.0000	.0000
	4.5-5.5	10	.0000	.0000
THE EVENT RELATION	2.5-3.5	10	44.5350	22.5630
	3.5-4.5	10	28.8790	15.4469
	4.5-5.5	10	17.2900	10.5759
ATTR PROPERTY	2.5-3.5	7	84.1271	37.3269
	3.5-4.5	6	57.4083	49.3994
	4.5-5.5	3	66.6667	57.7350
ATTR PARTNOMIC	2.5-3.5	7	15.8729	37.3269
	3.5-4.5	6	42.5917	49.3994
	4.5-5.5	3	33.3333	57.7350
ATTR MATTER	2.5-3.5	7	.0000	.0000
	3.5-4.5	6	.0000	.0000
	4.5-5.5	3	.0000	.0000
EVAL META LINGUISTIC	2.5-3.5	6	75.5550	38.1039
	3.5-4.5	4	62.5000	47.8714
	4.5-5.5	6	80.0000	40.0000
EVAL STEREOTYPES	2.5-3.5	6	24.4450	38.1039
	3.5-4.5	4	37.5000	47.8714
	4.5-5.5	6	20.0000	40.0000

Stage 2

One way analysis of variance (one-way ANOVA) was performed to check if there are differences across age groups for within each type of minor categories. The results revealed significant difference between age groups only within thematic-function [$F(2,27) = 11.606$, $p<0.001$] and within thematic-event relation [$F(2,27) = 6.525$, $p<0.05$].

Further post-hoc analysis of thematic-function category using Duncan's Test showed no significant difference in scores between age Group I *Vs* Group II. However, significant difference was noted between age groups Group I *Vs* Group III and Group II *Vs* Group III at ($p < 0.05$) level. Table 12 shows the results of post hoc Duncan analysis.

Table 12

Comparison of

thematic-function category across age

. **Age group**	**N**	**Subset for alpha =0.05**	
		1	**2**
2.5-3.5	10	20.2050	
3.5-4.5	10	26.0370	
4.5-5.5	10		47.6120
Sig.		0.339	1.000

Also post-hoc analysis of both thematic-event relation categories using Duncan's Test showed no significant difference in scores between age groups Group II and Group III. However, significant difference was noted between age Group I *Vs* Group II and

Group I *Vs* Group III at ($p < 0.05$) level. Table 13 shows the results of post hoc Duncan analysis.

Table 13

Comparison of

thematic-event relation category across age

Age group	N	Subset for alpha =0.05	
		1	2
2.5-3.5	10		44.5350
3.5-4.5	10	28.8790	
4.5-5.5	10	17.2900	
Sig.		0.137	1.000

Stage 3

Mixed ANOVA (repeated measure ANOVA with age as independent factor) was carried out to analyze the difference between the minor categories within each of the age group. Let us consider the statistical analysis of each of the minor categories of taxonomic, thematic, attributive and evaluative one by one age-wise.

Group I (2.5-3.5 years)

The mean and standard deviations of the minor categories of taxonomic, thematic, attributive are provided in Table 14, 15 and 16 respectively.

Table 14

Mean and SD of percentage

taxonomic-minor categories scores in 2.5-3.5 years

	Mean (max=100)	SD	N
Superordinate	21.0000	20.6559	10
Subordinate	36.2500	35.4583	10
Coordinate	42.7500	37.7942	10

Table 15

Mean and SD of percentage

thematic-minor categories scores in 2.5-3.5 years

	Mean (max=100)	SD	N
Action	24.3030	19.6861	10
Function	20.2050	11.6952	10
Spatial	10.9570	6.7371	10
Temporal	.0000	.0000	10
Event relation	44.5350	22.5630	10

Table 16

Mean and SD of percentage

attributive-minor categories scores in 2.5-3.5 years

	Mean (max=100)	SD	N
Property	84.1271	37.3269	7
Partnomic	15.8729	37.3269	7
Matter	.0000	.0000	7

The Mixed ANOVA revealed that the difference between the taxonomic categories was not significant [$F(2,18) = 0.801$, $p>0.001$]. But there exists significant difference between the thematic categories [$F(4,36) = 10.218$, $p<0.001$] and attributive categories [$F(2,12) = 10.038$, $p<0.001$].

Hence pair-wise comparisons of the thematic categories using Bonferroni test was carried out which showed significant difference between action-temporal, function-temporal, spatial-temporal, spatial-event relation, temporal-evaluative pairs at 0.05 level of significance.

Similar, pair-wise comparisons of the attributive categories using Bonferroni test showed significant difference between property-matter pair at 0.05 level of significance.

The paired t- test comparisons showed no significant difference between evaluative at 0.001 level of significance. The result of t-test is given in Table 17.

Table 17

Paired comparison between metalinguistic and stereotypes at 2.5-3.5 years

Age Groups (yrs)	**t(5)**
Metalinguistic- Stereotypes	1.643

*** Significant at 0.001 level

Group II (3.5-4.5 years)

The mean and standard deviations of the minor categories of taxonomic, thematic, attributive are provided in Table 18, 19 and 20 respectively.

Table 18

Mean and SD of percentage

taxonomic-minor categories scores in 3.5-4.5 years

	Mean (max=100)	**SD**	**N**
Superordinate	26.6120	18.6090	10
Subordinate	21.4440	21.1515	10
Coordinate	51.9440	25.4255	10

Table 19

Mean and SD of percentage

thematic-minor categories scores in 3.5-4.5 years

	Mean (max=100)	**SD**	**N**
Action	23.4560	19.4918	10
Function	26.0370	13.6256	10
Spatial	21.6280	29.5363	10
Temporal	.0000	.0000	10
Event relation	28.8790	15.4469	10

Table 20

Mean and SD of percentage

attributive-minor categories scores in 3.5-4.5 years

	Mean (max=100)	**SD**	**N**
Property	57.4083	49.3994	7
Partnomic	42.5917	49.3994	7
Matter	.0000	.0000	7

The Mixed ANOVA revealed that the difference between the taxonomic categories was not significant [F(2,18) = 03.700, p>0.001] and attributive categories [F(2,12) = 2.184, p>0.001. But there exist significant difference between the thematic categories [F(4,36) = 3.160, p<0.05].

Hence, pair-wise comparisons of the thematic categories using Bonferroni test was carried out and results showed significant difference between action-temporal, function-temporal, temporal-event relation pairs at 0.05 level of significance.

The paired t- test comparisons showed no significant difference between evaluative at 0.001 level of significance. The result of t-test is given in Table 21.

Table 21

Paired comparison between

metalinguistic and stereotypes at 3.5-4.5 years

Age Groups (yrs)	**t(3)**
Metalinguistic- Stereotypes	0.522

*** Significant at 0.001 level

Group III (4.5-55 years)

The mean and standard deviations of the minor categories of taxonomic, thematic, attributive are provided in Table 22, 23 and 24 respectively.

Table 22

Mean and SD of percentage

taxonomic-minor categories scores in 4.5-5.5 years

	Mean (max=100)	**SD**	**N**
Superordinate	21.4286	39.3398	7
Subordinate	35.7143	47.5595	7
Coordinate	42.8571	44.9868	7

Table 23

Mean and SD of percentage

thematic-minor categories scores in 4.5-5.5 years

	Mean (max=100)	**SD**	**N**
Action	30.8810	9.3837	10
Function	47.6120	14.7094	10
Spatial	4.2170	5.3850	10
Temporal	.0000	.0000	10
Event relation	17.2900	10.5759	10

Table 24

Mean and SD of percentage

attributive-minor categories scores in 4.5-5.5 years

	Mean (max=100)	**SD**	**N**
Property	66.6667	57.7350	3
Partnomic	33.3333	57.7350	3
Matter	.0000	.0000	3

The Mixed ANOVA revealed that there exist no significant difference between the taxonomic categories [$F(2,12) = 0.286$, $p>0.001$]. and attributive categories [$F(2,4) = 1.000$, $p<0.001$]. But there exist significant difference between the thematic categories [$F(4,36) = 34.525$, $p<0.001$].

Hence, pair-wise comparisons of the thematic categories using Bonferroni test was carried out. The results showed significant difference between action-spatial, action-temporal, function-temporal, functional-spatial, function-evaluative, spatial-temporal, spatial-evaluative, temporal-evaluative pairs at 0.05 level of significance.

Additionally, paired t- test comparisons showed no significant difference between evaluative at 0.001 level of significance. The result of t-test is given in Table 25.

Table 25

Paired comparison between

metalinguistic and stereotypes at 2.5-3.5 years

Age Groups (yrs)	**t(5)**
Metalinguistic- Stereotypes	1.837

*** Significant at 0.001 level

The following figures give a general idea on distribution of minor categories' scores across the three age groups. Fig 3, 4, 5 and 6 show the average percentage scores of minor categories of taxonomic, thematic, attributive and evaluative types across the age groups respectively.

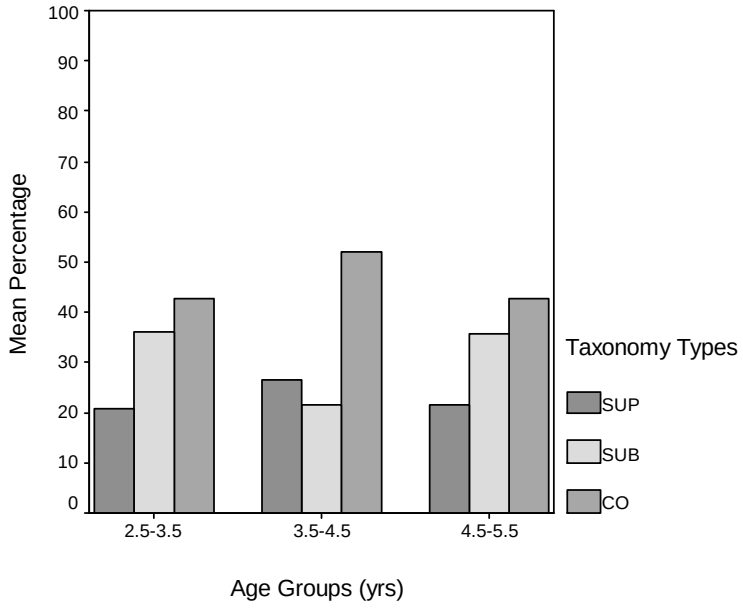

Fig 3: Average percentage of taxonomic categories – superordinate, subordinate and coordinate- across age groups

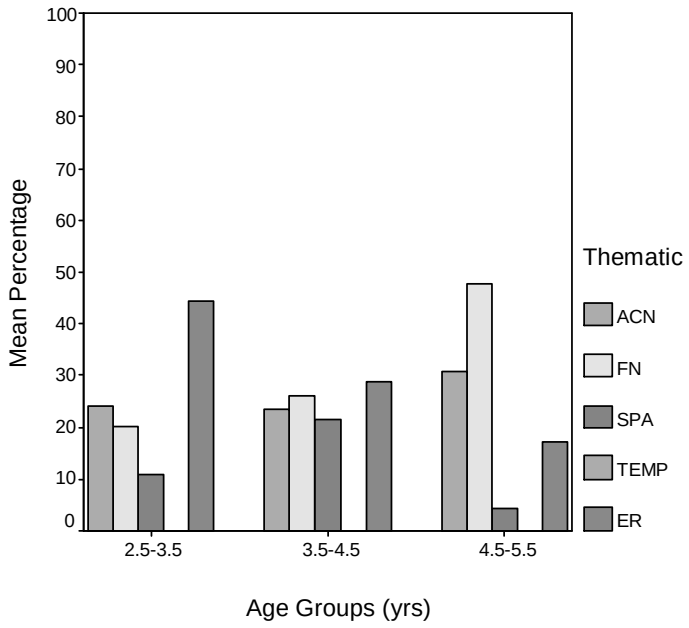

Fig 4: Average percentage of thematic categories –
Action, function, spatial, temporal and event relation - across age groups

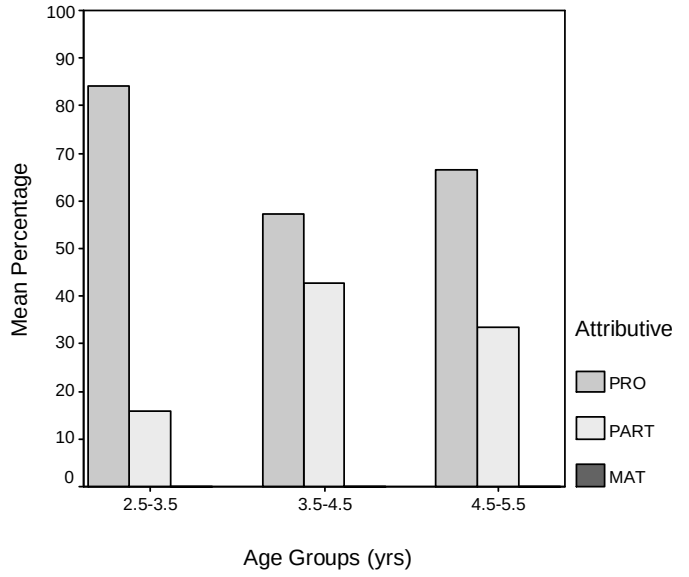

Fig 5: Average percentage of attributive categories –
property, partnomic and matter- across age groups

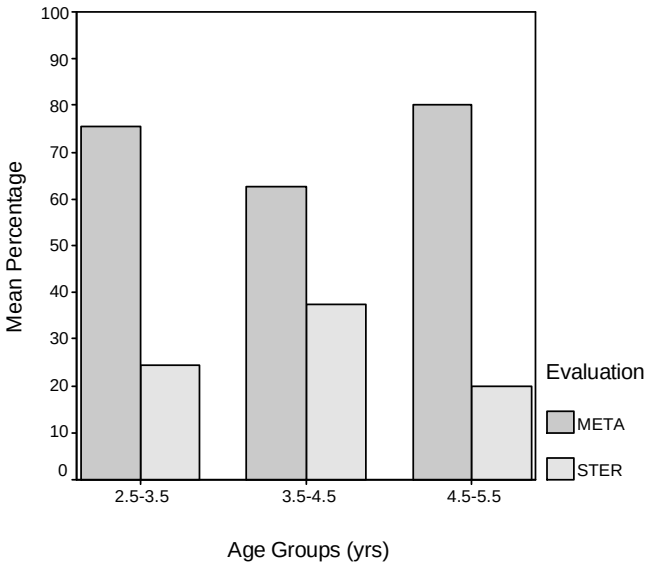

Fig 6: Average percentage of evaluative categories – Metalinguistic and stereotypes- across age groups

In summary,

Taxonomic categories

The coordinate categories appear in greatest numbers in all the age groups though not statistically significant. Each of the minor categories shows no significant difference with other taxonomic categories within all the age groups.

Thematic categories

The event relation responses decrease significantly with increase in age from 2.5 years to 5.5 years. In contrast the function responses, slowly increases from 2.5 years and shows marked increment at 4.5-5.5 years. The children exhibited no temporal responses in all the age groups.

The spatial and action categories didn't exhibit any significant trend across the preschool years. The action responses remained fairly constant and spatial responses was the least in 4.5-5.5 years.

Attributive categories

The property category appears in greatest numbers in all the age groups though significant only at 2.5 years. The matter relation didn't appear in all the age groups. Though not significant the partnomic relations increase after 2 years.

Evaluative

The evaluative responses appear in greatest number in all the age groups, though was not significant. Stereo typical responses remained fairly constant.

d. **General discussion on lexical organization**

Going by the research questions of the present study

1. How are the lexical items organized in the mental lexicon (taxonomic Vs thematic) of preschoolers?

The organization of the conceptual knowledge is a question of long standing controversies. The semantic concepts are not isolated units, but related to each other, as the activation of one activates many others (Chaffin, 1992, 1997; Collins & Loftus, 1975). Conceptual relations are the links that interconnect different concepts and, among the wide variety of conceptual relations, taxonomic and thematic relations play a key role (Barsalou, 1993; Markman,1989).

Concepts are taxonomically related when they are hierarchically organized from the more to the less inclusive levels or vice versa. When concepts are linked by cross-categorical relations, they are said to be thematically related as this kind of relation links different knowledge domains.

In order to understand the nature of lexical organization, the present study used word association task. A word association task can be used with success for studying the conceptual relations in children. (Nelson, 1986). The use of word association task is warranted due to its apparent advantages. The advantage of this verbal task lies in its less transparency to the child than more structured tasks, like the match-to-sample task. Thus, they better allow the surfacing of flexible and variable aspects of children's concepts. Also the task was less constraining as children were free to associate any kind of word or phrase to the target concept.

The results of our study indicated that the thematic responses out-numbered all other response types across all the three age groups. i.e. all through the preschool years children show a significant preference for thematically related responses and this statement is well in accordance with Inhelder & Piaget (1964). Additionally, many studies have shown the organization of concepts develops thematically before it develops taxonomically. (review, Obsborne & Calhoun, 1998). It has been shown that 20-month-old children group together objects that are included in the same routine (Fivush, 1987) and that pre-school children use more thematic than taxonomic relations in sorting tasks (Gelman & Bairgellon, 1983; Markman & Callanan, 1984). In consonance, our results are suggestive of similar thematic preference in preschoolers.

This thematic preference is accounted for by the way children deal with their environment as they build up concepts from everyday actions and events: i.e., from situations or themes (Mandler, 1992, 1998; Nelson, 1986). In accordance with this view, the preschoolers in the present study produced greater mean percentage scores for function, action and event-relation than that for temporal and spatial responses. However, significant difference was not established.

2. Does the nature of lexical organization vary among/ across preschoolers of 3-5 year age group?

A major finding in the field of conceptual development has been that there is a shift from thematic concepts to taxonomic concepts. i.e. children represent thematic relations early in development and by eight years of age into adulthood taxonomic relations are preferred. This shift in thematic concepts to taxonomic concepts *(shift hypothesis)* was first proposed by Vygotsky (1962) and by Inhelder and Piaget (1964), and it has been found, to varying degrees, in later research on children's concepts (e.g., Annett, 1959; Kagan, Moss, & Siegel, 1963; Olver & Hornsby, 1966; Markman, 1989). The thematic – taxonomic shift coincides with the first three years of formal reading and academic instruction. i.e. above 5 years of age..

Need to highlight here, that in the present study the results are indicative of certain shifts in the conceptual organization. The thematic responses markedly increased with subsequent reduction of taxonomic responses after the age of 4.5 years. Hence as per results, 4.5 years and after appears to be a crucial age for shifts in conceptual organization of the mental lexicon.

However, a strict shift from purely thematic to purely taxonomic cognitive restructuring cannot be expected as both taxonomic and thematic relations are represented in all the age groups. Also results showed that following thematic relations, the taxonomic responses rank second during 2.5- 4.5 years. i.e. preschoolers concepts are not rigidly thematically organized which is in support of Waxman & Namy (1997).

Research evidences show that even very young children show no preference for thematic relations. They seem to be aware that new words refer to single objects rather than to objects plus their thematic associates. E.g. They use word 'dog' to refer to a dog, not to a dog with a bone in its mouth. (Markman & Hutchinson, 1984; Waxman & Kosowsky, 1990). This might be the possible reason for occurrence of greater number of taxonomic relations at younger age groups (2.5 – 4.5 years) in the present study.

Nevertheless other evidences also suggest that the shift in conceptual organization may represent something less than a dramatic cognitive restructuring. Preschoolers demonstrate flexible categorization strategies, switching from thematic to taxonomic category when context mandates (Blaye & Bonthoux, 2001; Nguyen & Murphy, 2003).

Hence several weaker versions of this shift hypothesis have been put forward. Such weaker forms of hypothesis hold that both thematic and taxonomic relations structure concepts from an early age but the taxonomic structures are more fragile or more limited in type, respectively. With development, taxonomic structures become more robust (less susceptible to task demands) or more varied(less restricted to a particular taxonomic kind). The present study shows absence of rigid thematic-taxonomic shift at 5 years of age and so doesn't support the 'shift' hypothesis. It can be speculated that the

conceptual shift, if any, might occur during later developmental years. However the presence of taxonomic representations at all the early preschool years goes in support of a weaker version of shift hypothesis.

Also the early use of thematic relations helps children's later acquisition of more abstract, hierarchical relations such as those required by the taxonomic conceptual organization (Lucariello & Nelson, 1985; Lucariello, Kyratzis, & Nelson, 1992). Hashimoto, McGregor & Graham, 2007 studied conceptual organization in 5-, 8- and 10-years old and stated that with development, there is decrease of action and event relations and the increase of attributive relations in children's productions. They conclude that children's knowledge, which is initially grounded in their own or other people's direct action, becomes more directed to objects' details, and particularly to their perceptual properties. They opine that such changes may be the result of an increase in capacity for abstraction processes which helps older children detach objects from the events i.e. from the thematic bias and profit from contextual and general information.

However, much insight into this abstraction process could not be delineated from this study as no significant trend could be established with the responses of minor categories. Might be that the abstraction process is not well precipitated or established during the preschool years. Further research is required before arriving at conclusions.

B. Process of lexical categorization

a) Appropriateness of stimuli

An initial analysis was performed to check for the appropriateness of standard, typical and hybrid stimuli designed for this study. Thirty adults (15 males and 15 females)

in the age range of 18 to 23 years rated the stimuli for its appropriateness on a three point rating scale – *i) less than 25%, ii) 25 – 75%, iii) greater than 75%* - appropriate as the specified member.

The percentage of adults who categorized each of the stimuli as visually appearing greater than 75% as the specified member is mentioned below. The stimuli are presented in Appendix B. There are few instances of discrepancies observed in the perceptual judgements of adults with respect to certain hybrid stimuli.

In a similar study on category-induction, Jaswal, (2004), used stimuli that were rated for appropriateness by adults. He counterbalanced and assigned forty-eight preschoolers to labeling and no-labeling condition on a random basis to determine the influence of labelling in inferring category membership. The child's responses in both the condition were compared and coded based on the adult's perceptual judgements.

However, this present study used a time series design wherein all the preschoolers were exposed to both labeling and no-labeling conditions. Unlike Jaswal (2004), the child's responses were not coded based on adult perceptual judgements. The child's perceptually-based responses on the no-label condition (Experiment 2) served as baseline to decide upon the influence of labeling on the labeling condition (Experiment 3). This was done in order to control the effect of perceptual judgement by adults on the results of this study.

b. Influence of labelling on category induction task

For Experiment 2 and 3, Two – way analysis of variance (Two-way ANOVA) was performed to see the effect of i) age and ii) gender on the total number of times the subjects got influenced by labeling (label-based inferences). Table 26 shows the mean and standard deviation of label-based inferences across age and gender. The mean scores increase with age in both the male and female groups. However standard deviation is large.

Table 26

Mean and SD of

label-based inferences across age groups and gender

Gender	Age group	Mean (max =10)	SD
Male	4.5-5.5	6.80	4.09
	3.5-4.5	3.80	3.49
	2.5-3.5	1.60	1.82
	Total	4.07	3.75
Female	4.5-5.5	5.40	4.51
	3.5-4.5	6.00	2.45
	2.5-3.5	2.80	3.35
	Total	4.73	3.58
Total	4.5-5.5	6.10	4.12
	3.5-4.5	4.90	3.07
	2.5-3.5	2.20	2.62
	Total	4.40	3.62

Additional analyses of interaction effects were carried out by Two-way analyses of variance (Two-way ANOVA). Table 27 shows the effects of i) gender, ii) age and iii) interaction effects of gender and age on the total number of times the subjects got influenced by labeling. Results revealed no significant effect of gender on labeling influence scores. However age was shown to exert significant effect on labeling influence scores ($p < 0.05$). Also, there was no significance for the interaction effect of age and gender at significant level.

Table 27

Interaction of Gender and Age on label-based inferences

Source	Df	F	Sig.
Gender	1	0.287	.597
Age	2	3.435	**.049****
Gender * age	2	0.743	.486
Error	24		

**Significance at 0.05 level

Further post-hoc analysis using Duncan's Test showed no significant difference in the total number of times subject got influenced by labeling between age groups Group I and Group II and age groups Group II and Group III. However, significant difference was noted between age groups Group I and Group III at ($p < 0.05$) level. Table 28 shows the results of post hoc Duncan analysis. A fairly linear trend with increasing influence of labeling was observed from age groups Group I to Group III as depicted in Figure 7 and Figure 8.

Table 28

Interaction effects of age on label-based inferences

Age group	N	Subset for alpha = 0.05	
		1	2
2.5-3.5	10	2.20	
3.5-4.5	10	4.90	4.90
4.5-5.5	10		6.10
Sig.		**.089**	.439

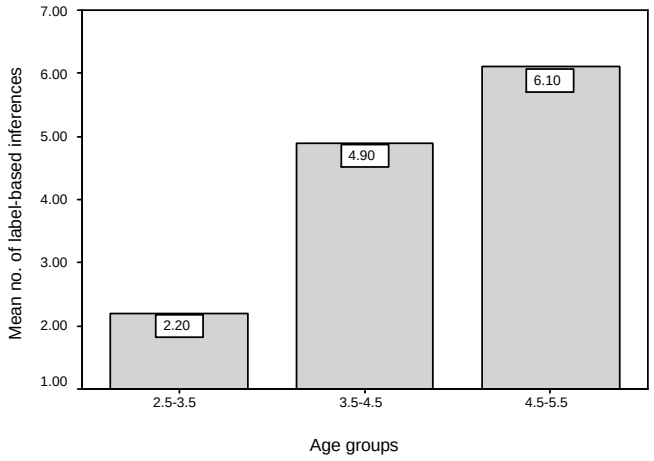

Fig 7: Average label-based inferences across age groups

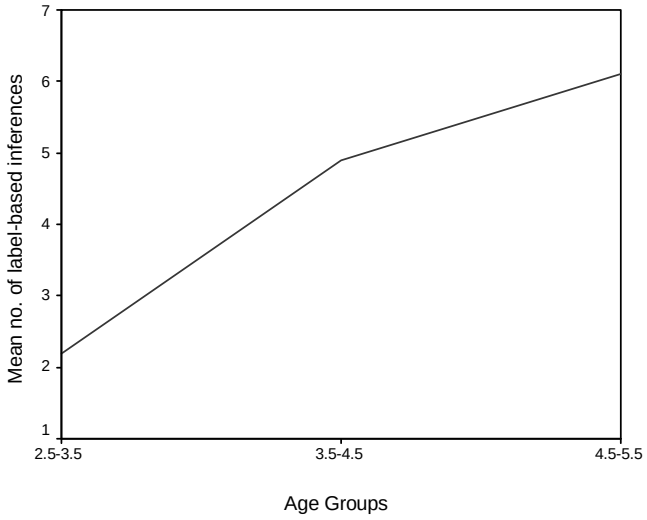

Fig 8: The label-based inferences across age groups

In summary,

First, the hybrid objects were perceptually compelling in the manner intended. For e.g. the preschoolers treated the cat-like object as a cat on the no-labeling condition. (*However the children might have differed in their personal perceptual judgement on deciding which of the two objects or animal the hybrid looked more like).* Hence on the labeling condition the hybrid stimuli should have been perceptually compelling when the

preschooler had to decide category membership under the additional influence of labeling.

Second, on hearing an object referred to with an unexpected label did influence the inferences that children made, though the extent of influence differed between children. Also in the labelling condition the stimulus should have been perceptually compelling while deciding category membership.

Thirdly, labelling seemed to have more of an influence on the 5-year olds than the 4-year-olds, with the 3-year olds having the least influence i.e. the 3-year olds made significantly larger number of perceptually based inferences than the 4- and 5- year old.

Further there is a linear progression of label-based inferences with increasing age i.e. from 3 years to 5 years. This indicates the presence of a change in the process of lexical categorization in preschoolers during the preschool years. There is a shift from the perceptually based inferences seen at 3 years to more label-based inferences at 5 years in determining the category membership.

3. Does labeling an object influence preschoolers in deciding category membership? Is the lexical categorization similarity based or theory based?

In this study, the 3-year olds based their category inferences more on perceptual-based decisions. In fact, these results are in agreement with findings from Eimas & Quinn (1994); Behl & Chadha (1996); Smith et al, 1992; 2002. The findings of present study cohere well with the predictions based on the similarity-based model (Sloutsky et al., 2001). This similarity based approach doesn't assume the existence of conceptual

knowledge at the beginning of development. Hence it doesn't assume that child's beliefs, assumptions or theories about the world aid in lexical categorization and induction. Rather, it attempts to explain the development of the conceptual knowledge from simpler processes operating on simpler components.

The central argument is that there are multiple correlations in the environment and that humans have perceptual and attentional mechanisms capable of extracting these regularities and establishing correspondences among correlated structures (Sloutsky, 2003). In nutshell, the similarity-based account suggests that inductive generalizations are driven by similarity that is determined by automatically detected perceptual correspondences.

But how do children know which correspondences are important, and for which categories?

It is suggested by McClelland & Rogers (in Press) that they do not have to know the importance of correspondences a priori, but that this knowledge could be a product of development and learning. He further argues that humans are endowed with powerful learning mechanisms that enable them to extract the importance of a particular match in a particular context. Some of these learning mechanisms are grounded in the ability to attend to and detect statistical regularities in the environment

One such learning mechanism is the **perceptual learning process** - *a process by which some features or stimulus dimensions become more distinct as a result of experience, whereas others become more equivalent*. It is likely that statistical characteristics of stimuli underlie perceptual learning, although details of this process are

not well understood. Perceptual learning has been shown to be an important mechanism for the development of categories during infancy: the perceptual system of infants can extract category-specific clusters of exemplars (Quinn, 1993; Quinn & Eimas, 2000).

Converging evidence coming from many other infancy research paradigms suggests that experience with multiple exemplars might direct the perceptual system towards extracting important category-specific regularities (Mareschal & Quinn, 2001). Experiments using the preferential looking paradigm consisted of familiarization and test phases. During the familiarization phase, 3- to 4-month-old infants were presented with pictures of either dogs or cats. During test trials, a novel member of a familiarized category was paired with a member of a novel category. As a result of familiarization, infants learned to differentiate between members of the familiar and novel categories.

In contrast to 3-year olds, the results of present study indicated that 5-year olds are more open to use labels as a basis of inferences. The older preschoolers gave up the compelling perceptual similarity in favour of linguistically provided non-obvious information. This is remarkable as it implies 5-year olds categories are not totally perceptually-based at their core and goes in agreement with the findings of Gelman (2003).

These findings cannot be explained based on the similarity based approach of category induction (Sloutsky, 2003). The theory-based approach (Gelman, 2003) is better suited to account for these data. According to this approach, children's categories reflect more than just regularities between cues in the environment; they also reflect children's beliefs and assumptions about the world. In other words a child believes that a label

provides direct access to an object's kind, and hence allows appreciation of the non obvious properties it is likely to have. How children decide which cues to pay attention to depends on what they already know and believe about the relevance of any given cue in a particular situation.

One traditional and powerful view of young children, articulated in detail by Piaget (1951) and others is that young children are externalists. More precisely, children are described as incapable of reasoning about a broad cluster of understandings. On this view, until roughly age 6 or 7 children are artificialistic, assuming that natural or mechanical events are caused by people rather than by intrinsic or internal mechanisms (Piaget. 1929). They are thought to have difficulty reasoning about what they cannot see, such as internal mechanisms of the human body (Carey, 1985; Gellert, 1962); dreams, thoughts, and other mental states (Piaget, 1929); or non-obvious concepts that conflict with surface perceptions (Bruner, Olver, & Greenfield, 1967). This child-as-externalist position suggests that a wide range of inabilities or conceptual confusions are interrelated and follow from the tendency to focus on the observable to the exclusion of other properties.

As mentioned above, the 5-year olds are more influenced by label which suggests that they attend to and can reason about the non-obvious information. This is in contrary with the traditional view i.e. even by the age of 5, children have a firm grasp and can reason about the concepts that are not readily evident at the superficial level. Similar contradicting findings also suggest that children attend to non-obvious aspects of things well before school age (Wellman & Gelman, 1988). For example, by 3 or 4 years of age children have a sensible understanding of the mind (Astington, Harris, & Olson, 1988; Wellman, 1990), of the appearance-reality distinction (Flavell, Flavell, & Green, 1983),

and of the importance of non-obvious properties for reasoning about categories (Gelman & Markman, 1986; Gelman & O'Reilly, 1988). It has further been suggested that such understandings may serve as a mechanism for cognitive growth.

c. Developmental differences in the process of categorization

4. Does the process of lexical categorization vary among/ across preschoolers of 3-5 year age group?

Jaswal (2004) concluded that four year olds are more reluctant than the three year old preschoolers to accept an unexpected label conflicting label used by an adult. However in our study with three years old were more reluctant to accept unexpected labels. And this result is in agreement with Sloutsky (2001). All these studies are suggestive of a conceptual shift in the process of categorization in preschoolers during developmental period. However varied opinions exist about the direction of this shift.

The results of the present study do indicate shift in the process of categorization. Accordingly, a similarity based approach of lexical categorization and induction can be thought of as being active in a 3 year old, with the number of perceptually-based inferences becoming fewer with age. There is significant reduction by 5 years of age with increasing label-based inferences in lexical categorization. The older preschoolers "disbelieve their eyes" in favour of others 'testimony'.

What can be the possible explanation for this conceptual shift in preschoolers?

In everyday life, it may not matter whether a whale is mammal or a fish. However, when adults want to make predictions about something or explain its behavior, knowing the category in which it belongs is very important. A willingness to accept the

classification an expert provides enables a learner to take advantage of that person's knowledge. Having a reliable source explain that whales are mammals allows us to infer that whales bear live young, breathe air, have warm blood, and so on—inferences that are quite different from those we would make if we classified whales as fish.

A willingness to accept testimony on matters of categorization seems related to an assumption adults make when communicating, which Putnam (1973) called the "division of linguistic labor." According to Putnam, adults routinely use terms without knowing the criteria for their use. For example, we readily use the word "gold" to refer to the precious metal, even though very few of us actually know how to distinguish real gold from fool's gold. Nonetheless, Putnam argued, we assume that there are criteria and that knowledge of the criteria for category membership is possessed by at least some members of our community.

Similarly, in the studies reported here 5 years olds were more willing to set aside a spontaneously generated classification in favour of a classification they could not have immediately understood — apparently accepting "on faith" that there was a reason why something that looked very much one category actually belongs to another category. They have something like a division of linguistic labor operating: They can accept and use what might be considered baffling category labels in order to make non-obvious inferences about animals.

Using language in this way

1. Allows them to stretch the boundaries of their own spontaneously generated, often perceptually based, categories, and to take advantage of

the richer and more conceptual frameworks that their cultures have evolved. This can be the plausible reason for the shift in the process of lexical categorization from a more atheoretical basis to a more theoretical conception.

2. Serves a more efficient means of gaining knowledge than first-hand observation
3. Sometimes serve as the only way to acquire knowledge about certain events.
4. Lead one individual to revise a belief or expectation that we generated from personal observation.

In a nutshell, the nature of lexical organization, as studied by the word association task, reveal that preschoolers give most preference to thematic conceptual relations. Above 4.5 years of age there is a significant shift in conceptual system with marked decrease in the taxonomic relations and subsequent increase in thematic relations.

The process of lexical organization, as studied by category-induction task, reveal that the 3-year olds uses perceptual-based information in determining category-membership, in support of similarity based approach. Whereas 5-year olds are more open to linguistic information in making category inferences, in support of theory-based approach.

CHAPTER V

SUMMARY AND CONCLUSIONS

Human beings explore the world around them and they assemble that information into cognitive structures that represent sensation, movement, sound, location, people, object, speech among others. Decades of extensive research has been directed towards explaining the nature and process of conceptual organization and categorization both in adults and in children. However this field of research is not free of controversies, with varied opinions and theories being put forth by different researchers.

The vocabulary growth of children is rapid during the preschool years of age 3 to 5 years. On learning new words, they appreciate additional features associated with each word and try to organize the lexical entities and conceptually relate each entity. Hence the preschool period appears the crucial age to investigate on the 'conceptual structuring'.

The main objective of this research is to study the development of lexical categorization in the preschoolers:

1) How are the lexical items organized in the mental lexicon by preschoolers?

2) What information is used in determining category membership of a lexical item?

3) How linguistic information is used by them in drawing inferences about the non-obvious category information of the lexical item and

4) Whether there exists any difference in lexical categorization across preschool years?

Thirty preschoolers of age 2.6-3.5 years (Group I), 3.6-4.5 years (Group II), and 4.6-5.5years (Group III) with 10 in each age group, studying in English medium in

schools of Mysore participated in the proposed study. Equal number of boys and girls were included in each age group. Children with significant history of speech, language and other sensory problems were excluded from the study

The present research engaged the preschoolers on a free word association task to comment on the organization of lexical entities in their mental lexicon. The same preschoolers were also engaged in a category – induction task to describe the lexical categorization behavior. The task paradigm was so designed that they were required to categorize by making inferences about the non obvious properties (*properties that are not perceptually revealed*) of perceptually misleading computer generated - hybrid stimuli. Here, the experimenter provided labels that conflict with the perceptual appearance of the hybrids to gain insights on how the linguistic information (label) influences lexical categorization and preschoolers' reasoning of non obvious characteristics of a lexical item.

The responses of the word association task was coded across five major categories along with its minor categories as i) taxonomic (subordinate, superordinate and coordinate), ii) thematic (action, function, spatial, temporal and event realtion), iii) attributive (property, partnomic and matter), iv) evaluative (metalinguistic and stereotypical) and v) others (irrelevant and no-responses). The responses of the category-induction task were coded for the presence of perceptually-based inferences and label-based inferences under the influence of conflicting labels.

The results on lexical organization (word association task) showed that the preschoolers exhibited preference for thematic relations throughout the preschool years. Further above 4.5 years of age there is significant increase in the percentage of thematic

responses with subsequent reduction in taxonomic responses. This is suggestive of a marked shift in the lexical organization of mental lexicon above 4.5 years.

Evidences from previous research purport the *shift hypothesis*. The shift hypothesis claims that there exists a shift from thematic to taxonomic preference and it occurs around 5 to 8 years of age. However, according to this study, this shift does not appear at 5 years of age. The preschoolers of all the three age groups produced quite a number of taxonomic relations, too. This shows that both taxonomic and thematic relations co-exist. Hence, the shift, if any cannot represent a rigid cognitive restructuring and in support of a weaker version of shift hypothesis.

With increase in capacity for abstraction process the children knowledge which is initially grounded in their own or other people's direct action, becomes more directed to objects' details, and particularly to their perceptual properties. This is reflected by the decrease of action and event relations and increase of attributive relations.

However, much insight into this abstraction process could not be delineated from this study as no significant trend could be established with the responses of minor categories. Might be that the abstraction process is not well precipitated or established during the preschool years. Inclusion of higher age groups might give possible insights into the development of abstraction

The results on the process of lexical categorization (category-induction task) show that labeling an item exerts influence on the preschoolers' decision of category membership on a category-induction task. The three year olds were least influenced by

labeling showing that they based their category inferences on perceptually-based information. This is in support of similarity based model that proposes that children make category inferences on the basis of computation of perceptual similarity.

In contrast, the five year olds were greatly influenced by labeling and made label-based category inferences on the category-induction task. The preschoolers of this age believe that a label (linguistic information) provides direct access to an object's kind, and hence allows appreciation of the non obvious properties it is likely to have. Hence in support of a theory based model.

Additionally by 4.5 years there is a significant shift in the process of lexical categorization from a perceptually-based categorization to a label-based approach of categorization. Such a shift is essential for a learner to take advantage of other person's knowledge which is a more efficient means of gaining knowledge than first-hand observation.

Implications

The current study has certain implications such as

1. Gaining fundamental knowledge on the nature, process and development of lexical categorization in preschoolers.
2. Revisiting the educational programs to teach concepts for normally developing preschoolers, to cross check whether they reflect the normal developmental process and so the child can take better advantage of such programs.

3. Serving as a baseline upon which the developmental trend of conceptual organization in a developmentally disabled child can be contrasted upon.
4. To put our remediation programs for lexical learning in developmentally disabled children into retrospection.

Limitations

The current study is not devoid of certain limitations.

1. The trends of the minor categories of word association task could have been better captured by increasing the number of subjects within each age group.
2. A number of factors are thought to influence the nature and process of conceptual organization behaviour in children. For e.g, the similarity ratio of the test stimuli and target, the weights of label, the kind of task paradigm, the type of instruction, etc. However the study has exploited only one such factor – the influence of labeling on lexical categorization.
3. The results of this study provide some support to few of the well-established theories on the conceptual organization. Still, more research is needed before gaining a fuller understanding of the conceptual knowledge.

Future directions

The research area of nature, process and development of lexical categorization has been extensive and decades old. However not much of a research has been undertaken in an Indian context. The present study is an initial step towards understanding of lexical categorization in preschoolers. And, what information is obtained from this study is just a piece of the massive puzzle. Further research on the influencing factors, cultural differences, schooling differences and developmental differences on conceptual

organization is required in order to gain a deeper understanding. Further, similar lines of research in an Indian context are highly warranted

REFERENCES

Adams, A. K., & Bullock, D. (1986). Apprenticeship in word use: Social convergence processes in learning categorically related nouns. In S. A. Kuczaj & M. D. Barrett (Eds.). *The development of meaning* (pp. 155-197). New York: Springer-Verlag.

Anglin, J. M. (1977). Word, object, and conceptual development. New York: Norton. In Jaswal, V. K., & Markman, E. M. (2002). Children's acceptance and use of unexpected category labels to draw non-obvious inferences. In W. Gray & C. Schunn (Eds.), *Proceedings of the twenty-fourth annual conference of the Cognitive Science Society* (pp. 500-505). Hillsdale, NJ: Erlbaum.

Annett, M. (1959). The classification of instances of four common class concepts by children and adults. *British Journal of Educational Psychology, 29,* 223-236.

Astington, J. W., Harris, P. L., & Olson, D. R. (1988). Developing theories of mind. New York: Cambridge University Press. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition, 38,* 213-244.

Behl-Chada, G. (1996). Basic-level and superordinate-like categorical representations in early infancy. *Cognition,* 60, 105 – 141.

Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22,* 577–609.

Bhatt, R. S., Wasserman, E. A., Reynolds, W. F., & Knauss, K. S. (1988). Conceptual behavior in pigeons: Categorization of both familiar and novel examples from four classes of natural and artificial kind stimuli. *Journal of Experimental Psychology: Animal Behavior Processes, 14,* 219 – 234.

Blaye, A., & Bonthoux, F. (2001). Thematic and taxonomic relations in preschoolers: The development of flexibility in categorization choices. *British Journal of Developmental Psychology, 19,* 395-412.

Bloom, P. (2000). How children learn the meanings of words. Cambridge, MA: MIT Press. In Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. *Child Development, 75,* 1871-1885.

Borghi, A. M., & Caramelli, N. (2003). Situation bounded conceptual organization in children: from action to spatial relations. *Cognitive Development, 18,* 49-60.

Bruner, J. S., Olver, R. R., & Greenfield, P. M. (1967). Studies in cognitive growth. New York: Wiley. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition, 38,* 213-244.

Carey, S. (1985). Conceptual change in childhood. Cambridge. MA: MIT Press. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition*, *38*, 213-244.

Carey, S. (1978). The child as word learner. In M. Halle, J. Bresnam, & G. Miller (Eds.), *Linguistic theory and psychological reality* (pp. 264–293). Cambridge, MA: MIT Press.

Chaffin, R., & Herrmann, D. J. (1988). The nature of semantic relations: A comparison of two approaches. In M. Evens (Ed.), *Relational models of the lexicon-representing knowledge in semantic networks* (pp. 249–294). Cambridge: Cambridge University Press.

Chaffin, R., Herrmann, J., & Winston, M. (1988). An empirical taxonomy of part–whole relations: Effect of part–whole relation type on relation identification. *Language and Cognitive Processes, 3(1),* 17–48.

Chaffin, R. (1992). The concept of a semantic relation. In E. Kittay & A. Lehrer (Eds.), *Frames, fields and contrasts: New essays in lexical and semantic organization* (pp. 253–288). Hillsdale, NJ: Erlbaum.

Chaffin, R. (1997). Associations to unfamiliar words: Learning the meanings of new words. *Memory and Cognition, 25(2),* 203–226.

Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. *Psychological Review, 82,* 407–428.

Eimas, P. D., & Quinn, P. C. (1994). Studies on the formation of perceptually based basic-level categories in young infants. *Child Development, 65,* 903 – 917.

Fivush, R. (1987). Scripts and categories: Interrelationships in development. In U. Neisser (Ed.), *Concepts and conceptual development: Ecological and intellectual factors in categorization* (pp. 234–254). Cambridge: Cambridge University Press.

Flavell, J. H., Flavell, E. R., & Green, F. L. (1983). Development of the appearance-reality distinction. *Cognitive Psychology, 15,* 95-120.

Freedman, D. J., Risenhuber, M., Poggio, T., & Miller, E. K. (2001). Categorical representation of visual stimuli in the primate prefrontal cortex. *Science, 291,* 312– 316.

Gellert, E. (1962). Children's conceptions of the content and functions of the human body. *Genetic Psychology Monographs, 65,* 291-411.

Gelman, R., & Bairgellon, R. (1983). A review of some Piagetian concepts. In J. H. Flavell & E. M. Markman (Eds.), *Handbook of child psychology: Cognitive development* (pp. 167–230). New York: Wiley.

Gelman, S. A., & Markman, E. M. (1986). Categories and induction in young children. *Cognition, 23,* 183-208.

Gelman, S. A., & Markman, E. M. (1987). Young children's inductions from natural kinds: The role of categories and appearances. *Child Development, 58,* 1532 – 1541.

Gelman, S. A. (1988). The development of induction within natural kind and artifact categories. *Cognitive Psychology, 20,* 65 – 95.

Gelman, S. A., & O'Reilly, A. W. (1988). Children's inductive inferences within superordinate categories role of language and category structure. *Child Development, 59,* 876-887.

Gelman, S. A., & Coley, J. D. (1990). The importance of knowing a dodo is a bird: Categories and inferences in 2-year-old children. *Developmental Psychology, 26,* 796–804.

Gelman, S. A., Hollander, M., Star, J., & Heyman, G. D. (2000). The role of language in the construction of kinds. *The Psychology of Learning and Motivation, 39,* 201-263.

Gelman, S. A. (2003). The essential child: Origins of essentialism in everyday thought. Oxford, England: Oxford University Press. In Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. C*hild Development, 75,* 1871-1885.

Gopnik, A., & Sobel, D. M. (2000). Detecting blickets: How young children use information about novel causal powers in categorization and induction. *Child Development, 71,* 1205-1222.

Greene, T. R. (1994). What Kindergartners know about class inclusion hierarchies. *Journal of Experimental Child Psychology, 57,* 72–88.

Inhelder, B., & Piaget, J. (1964). The early growth of logic in the child. New York: Newton. In Sloutsky, V. M. (2003). The role of similarity in the development of categorization. T*rends in Cognitive Science, 7(6),* 246-251.

Jaswal, V. K., & Markman, E. M. (2002). Children's acceptance and use of unexpected category labels to draw non-obvious inferences. In W. Gray & C. Schunn (Eds.), *Proceedings of the twenty-fourth annual conference of the Cognitive Science Society* (pp. 500-505). Hillsdale, NJ: Erlbaum.

Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. *Child Development, 75,* 1871-1885.

Kagan, J., Moss, H. A., & Siegel, I. E. (1963). Psychological significance of styles of conceptualization. *Monographs of the Society for Research in Child Development, 28 (2, Serial No. 86),* 73-112.

Kemler Nelson, D. G., Russel, R., Duke, N., & Jones, K. (2000). Two-year-olds will name artifacts by their functions. *Child Development, 71,* 1271-1288.

Lin, E. L., & Murphy, G. L. (2001). Thematic relations in adults' concepts. *Journal of Experimental Psychology: General, 130,* 3-28.

Lucariello, J., & Nelson, K. (1985). Slot-filler categories as memory organizers for young children. *Developmental Psychology, 21,* 272–282.

Lucariello, J., Kyratzis, A., & Nelson, K. (1992). Taxonomic knowledge: What kind and when? *Child Development, 63,* 978–998.

Mandler, J. M. (1992). How to build a baby: II. Conceptual primitives. *Psychological Review, 99,* 587–604.

Mareschal, D., & Quinn, P.C. (2001). Categorization in infancy. *Trends in Cognitive Science, 5,* 443–450.

Markman, E. M., & Callanan, M. A. (1984). An analysis of hierarchical classification. In R. J. Sternberg (Ed.), *Advances in the psychology of human intelligence* (pp. 325–365). Hillsdale, NJ: Erlbaum.

Markman, E. M., & Hutchinson, J. E. (1984). Children's sensitivity to constraints on word meaning: Taxonomic vs. thematic relations. *Cognitive Psychology, 16,* 1–27.

Markman, E. M. (1989). Categorization and naming in children: Problems of induction. Cambridge, MA: MIT Press. In Jaswal, V. K. (2004). Don't believe everything you hear: Preschoolers' sensitivity to speaker intent in category induction. *Child Development, 75,* 1871-1885.

Matlin, W. M. (2003). *Cognition* (5th ed.). Introduction. (pp. 2). United States of America: John Wiley & Sons, Inc.

McClelland, J.L. and Rogers, T.T. (in press) The parallel distributed processing approach to semantic cognition. *Nat. Rev. Neurosci. 0,* 000–000. In Sloutsky, V. M. (2003). The role of similarity in the development of categorization. *Trends in Cognitive Science, 7(6),* 246-251.

McLaughlin, S. (1952). *Introduction to language development.* (Ed.). Interactive bases of human communication. (pp. 96 - 99). San Diego, CA: Singular Thomson Learning.

Medin, D., & Ortony, A. (1989). Psychological essentialism. In S. Vosniadou & A. Ortony (Eds.), *Similarity and analogical reasoning* (pp. 179-195). New York: Cambridge University Press.

Meints, K., Plunkett, K., & Harris, P. L. (1999). When does an ostrich become a bird? The role of typicality in early word comprehension. *Developmental Psychology, 35,* 1072-1078.

Nguyen, S. P., & Murphy, G. L. (2003). An apple is more than just a fruit: Cross classification in children's concepts. *Child Development, 74,* 1783-1806.

Nazzi, T., & Gopnik, A. (2001). Linguistic and cognitive abilities in infancy: When does language become a tool for categorization? *Cognition, 80,* B11-B20.

Nelson, K. (1986). Event knowledge. Structure and function in development. Hillsdale, NJ: Erlbaum. . In Murphy, G. L. (2001). Causes of taxonomic sorting by adults: Atest of the thematic-to-taxonomic shift. *Psychometric Bulletin & Review*, 8(4), 834-839.

Obsborne, G. J., & Calhoun, D. O. (1998). Themes, taxons, and trial types in children's matching to sample: Methodological considerations. *Journal of Experimental Child Psychology, 68,* 35–50.

Olver, R.R., & Hornsby, J. R. (1966). On equivalence. In J. S. Bruner, R. R. Olver, P. M. Greenf ield, et al. (Eds.), *Studies in Cognitive growth* (pp. 68-85). New York: Wiley.

Owens, R. E. (1996). Language development: An Introduction (4th ed.). In McLaughlin, S. (1952). *Introduction to language development.* (Ed.). Pragmatic and semantic development in preschoolers. (pp. 292). San Diego, CA: Singular Thomson Learning.

Pease, D., & Berko Gleason, J. (1985). Gaining meaning: Semantic development. In J. Berko Gleason, (Ed.), *The development of language.* Columbus, OH: Merrill.

Piaget. J. (1929). The child's conception of the world. London: Routledge and Kegan Paul. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition, 38,* 213-244.

Piaget. J. (1951). Plays, dreams, and imitation in childhood. *New* York: Norton. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition, 38,* 213-244.

Putnam, H. (1973). Meaning and reference. *The Journal of Philosophy, 70,* 699–711.

Quinn, P.C. et al. (1993) Evidence for representations of perceptually similar natural categories by 3-month-old and 4-month-old infants. *Perception, 22,* 463–475.

Quinn, P.C., & Eimas, P.D. (2000) The emergence of category representations during infancy: are separate and conceptual processes required? *Journal of Cognitive. Development, 1,* 55–61.

Rosch, E., Mervis, C. B., Gray, W. D., Johnson, D. M., & Boyes- Braem, P. (1976). Basic objects in natural categories. *Cognitive Psychology, 8,* 382 – 439.

Samuelson, L. K., & Smith, L. B. (1999). Early noun vocabularies: Do ontology, category structure and syntax correspond? *Cognition, 73,* 1-33.

Shank, R. C., & Abelson, R. P. (1977). Scripts, goals and understanding. Hillsdale, NJ: Erlbaum. In Hashimoto, N., McGregor, K. K., & Graham, A. (2007). Conceptual organization at 6 and 8 years of age: Evidence from the semantic priming of

object decisions. *Journal of Speech, Language and Hearing Research, 50,* 161-176.

Sloutsky, V. M., Lo, Y., & Fisher, A. V. (2001). How much does a shared name make things similar: Linguistic labels, similarity, and the development of inductive inference. *Child Development, 72,* 1695 – 1709.

Sloutsky, V. M. (2003). The role of similarity in the development of categorization. *Trends in Cognitive Science, 7 (6),* 246-251.

Sloutsky, V. M., & Fisher, A. V. (2004). Induction and categorization in children: A similarity based model. *Journal of Experimentl Psychology: General, 133,* 166-188.

Smith, L. B. (1999). Children's noun learning: How general learning processes make specialized learning mechanisms. In B. MacWhinney (Ed.), The emergence of language (pp. 277 – 303). Mahwah, NJ: Erlbaum.

Smith, L. B., Jones, S. S., Landau, B., Gershkoff-Stowe, L., & Samuelson, L. (2002). Object name learning provides on the-job training for attention. *Psychological Science, 13,* 13–19.

Smith, E. E. (1995). Concepts and categorization. In E. E. Smith & D. N. Osherson (Eds.), *Thinking* (2nd ed., pp. 3-33). Cambridge, MA: MIT Press.

Schwarz, N. (1995). Social cognition: Information accessibility and use in social judgement. In E. E. Smith & D. N. Osherson (Eds.), *Thinking* (2nd ed., pp. 3-33). Cambridge, MA: MIT Press.

Tomasello, M. (1999). The cultural origins of human cognition. Cambridge, MA: Harvard UP. In Jaswal, V. K., & Markman, E. M. (2007). Looks aren't everything: 24-month-olds' willingness to accept unexpected labels. *Journal of Cognition and Development, 8,* 93-111.

Vygotsky, L. S. (1962). Thought and language, Cambridge, MA: MIT Press. In Murphy, G. L. (2001). Causes of taxonomic sorting by adults: Atest of the thematic-to-taxonomic shift. *Psychometric Bulletin & Review, 8(4),* 834-839.

Waxman, S. R.,&Kosowsky, T. D. (1990). Nouns mark category relations: Toddlers' and preschoolers' word-learning biases. *Child Development, 61,* 1461–1473.

Waxman, S. R., & Namy, L. L. (1997). Challenging the notion of thematic preference in young children. *Developmental Psychology, 33,* 555-567.

Wellman. H. M., & Gelman. S.A. (1988). Children's understanding of the nonobvious. In R.J. Sternberg (Ed.). *Advances in psychology of human intelligence* (Vol. 4, pp. 99-M). Hillsdale. NJ: Erlbaum.

Wellman. H.M. (1990). The child's theory of mind. Cambridge. MA: MIT Press. In Gelman, S. A., & Wellman, H. M. (1991). Insides and essences: Early understanding of the non-obvious. *Cognition*, *38*, 213-244.

APPENDIX A

GUIDELINES FOR SCORING WORD ASSOCIATION DATA:

Basic information:

1. **Thematic category**

This relates to associating words based on their relationship to a theme or context**.** Thematic organization is based on associations that relate words to some integrated context in which they are experienced as a whole. For eg. When asked to think of words that "go with" wagon a child exhibits thematic association like "sidewalk/ dirty/ my dollies/ our playhouse. The experience associated with playing with their wagon has provided the theme that pulls these words together into a cohesive collection.

2. **Taxonomic category:**

Concepts are taxonomically related when they are hierarchically organized from the more to the less inclusive levels or vice versa. The taxonomic organization is based on associations or classifications in which items share features that define them as a class. For wagon a child might say daddy's car/ a truck/ a bus.

a. **Superordinate categories**

A superordination relation links a concept to its hierarchically higher level concept. It is the highest conceptual level in hierarchical classification of meanings, which includes all of the subordinate categories in a given class. Superordinate categories are categories at less

inclusive levels. Superordinate relations have a vertical structure. By this definition, “chair” is a basic category, furniture is superordinate.

b. Subordinate categories

A subordination relation links a concept to its hierarchically lower level concept. Subordination category is a subgroup of objects defined by greater number of specific features than those defining the overall or superordinate category. Sub ordinate categories are categories at less inclusive levels. Even subordinate relations have a vertical structure. By this definition “chair” is a basic category, rocking chair is a subordinate.

c. Coordinate categories

A coordination relation links a concept to a concept of the same hierarchial level. Each listed coordinate term shares a hypernym* with this entry. Hypernym is a superordinate entry. Coordination relations have a horizontal structure. For example, man and woman are *coordinate terms* since they share human as hypernym.

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Examples of coding

Word association type		**Stimuli**	**Response**
Taxonomic	Super ordinate	Horse	Animal
		Orange	Fruits
	Sub ordinate	Key	Car key
		Ice-cream	Chocolate Ice-cream
	Co- ordinate	Key	Lock
		Dog	Cat
Thematic	Spatial	Horse	Park
		Pine tree	Christmas
	Temporal	Bird	Spring
	Action	Cat	/ha:lu kudijattɛ/ Drinks milk
		Coconut	/Tinnədu/ Eating

	Function	Fork	/nu:dɛls tinnəkkɛ/ To eat noodles
		Brush	/pɛint ma:dədu/ For painting
	Event relation	Bag	/amma ba:gu ha:kta:rɛ/ Mom carries bag
		Spoon	Cake “goes with” kind of thematic relation
		Umbrella	/malɛ: bəndrɛ itkotivi/ We hold umbrella when it rains
		Spoon	/tinsuta:rɛ/ Others feed with it
Attributive	Partonomic	Tree	Leaf
		Horse	Tail
	Property	Egg	Round
		Fork	/tʃutʃətɛ/ It pricks
	Matter	Pencil	Wood
Evaluative	Metalinguistic	Icecream	I don’t like it
		Egg	/mut ba:rdu/ Shouldn’t touch
		Bag	/ tʃɛna:gidɛ/ It’s nice.
	Stereotyped association	Wheel	National flag
		Wheel	Diwali Chakra Wheel kind fire work

APPENDIX B

The following photographs show the ten pairs of stimuli along with their standard items, typical items and hybrid items used in this study. The stimuli were rated for appropriateness by thirty adults. The percentage of adults who categorized the stimuli as visually- appearing to be greater than 75% as the specified member are mentioned below each of the stimulus.