COMPARISON OF LATE TALKERS WITH TYPICALLY DEVELOPING CHILDREN ON CONCEPT FORMATION AND LANGUAGE PERFORMANCE

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CERTIFICATE

This is to certify that this dissertation entitled **"Comparison of Late Talkers with Typically Developing Children on Concept Formation and Language Performance"** is a bonafide work submitted in part fulfillment of the degree of Master of Sciences (Speech-Language Pathology) of the student (Registration No. 12SLP022). 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.

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Dedicated to GOD Almighty

&

My Beloved PAPA…..

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Chapter I

Introduction

Language development is an important milestone in every child. The receptive language is followed by emergence of expressive abilities. It is important that language should be adequate for an effective communication. Language along with other skills such as cognitive, sensory and motor skills contribute majorly for holistic development of children. Language development forms its basis of acquisition of concepts.

Bourne and Colleagues (1986) defined ‘Concepts’ as the mental categories for objects, events, or ideas that have a common set of features. A concept can be defined by the significant features shared (Bruner, 1960). While learning a concept, it is reported that one will focus on the relevant features and ignore those that are irrelevant. Concepts are known as the furniture of minds. When a child forms a concept, the child knows more than the definition of a term. Example: For the word ‘river’- the child will know concepts like water, wet, flowing etc. This is a deep conceptual learning and not the superficial knowledge of a word. Thus, for something to be an example of a concept, it must contain all the critical characteristics (Bruner, 1960).

Further concepts can be thought as building blocks for more complex skills where children and adults learn the concepts from the similarities of their previous experiences through breaking the abstract meaning (Piaget, 1951; Quine, 1977; Gelman, 1990). 'Concepts' are known to be the mental tools that help one to think about a topic, they further impose meaning on an assembly of diverse facts and are thus essential to the task of categorizing, explaining, and understanding (Schaffer, 2007).

‘Conceptual knowledge’ is what a person knows about an idea or object (Smith, 2003; Yoshida & Smith, 2005). This knowledge further helps in the process of forming concepts. Hence, ‘Concept formation’ is a process by which a person learns to separate his experiences into general rules or classes (Hunt, 1962). The term *concept formation* or concept learning is used to refer to the development of the ability to respond to common features of categories of objects or events.

Concept formation has been a central issue of philosophy since ancient times (Ros, 1989) and it is usually assumed that, cognitive activities such as learning and remembering, reasoning, problem solving, language comprehension, decision making, presuppose the existence of a system of concepts in memory (Seel, 2012).

Concept formation is the ability to organize a variety of information to form thoughts and ideas. Conceptual organization may be contrasted with another type of classification behavior called discrimination learning. In discrimination learning, objects are classified on the basis of directly perceived properties such as physical size or shape (Riley, 1968). Concept formation is a sub – category of cognitive skills and involves certain themes.

1.1 Themes of Concept Development

Gelman and Susan (1998) examined the cognitive process of concept development in preschool children. They have provided four key themes. The first being concepts are like tools having powerful effect for children’s reasoning abilities. The second being the early concepts learnt by children need not be concrete or perceptual based and preschoolers may have the abstract reasoning skills. Third was that the concepts learnt are not uniform on individuals, tasks etc. The fourth one was that the concepts learnt by the children mirrors their emerging theories of the world. As children grow there is a progression in the process of formation of concepts (Gelman & Susan, 1998). This development can be explained under different stages.

1.2 Stages of Concept Formation

Singer and Revenson (1997) have stated that during 1920's Jean Piaget was extensively working in the area of cognitive development in children. When explaining on natural development, he dealt with the concepts of relationship involving logical operations which is important for child to perceive and organize the world. According to him, there are four stages in the development of cognition. They are as follows,

1. Sensory – Motor (Ages birth through two)
2. Preoperational (Ages two through seven)
3. Concrete Operations (Ages seven through eleven)
4. Formal Operations (Ages eleven through sixteen)

During the first stage of intellectual development (Sensory – Motor, Ages birth through two), children learn to acquire the concept of permanency of objects (where a doll exists even after its removal from the view). Through clinical observations, Swiss psychologist Jean Piaget initiated considerable study of how young children learn concepts that facilitate them to deal with their physical surroundings. Piaget stressed that infants first learn to differentiate themselves from the external environment. Followed by this, they form understandings of the physical world that allow further exploration of the world. Concept formation thus plays various roles during acquisition of these skills in children. One such skill is categorization and children in early infancy stages will start forming categories that are similar to those of adults. According to Gelman, before infants begin to speak they begin to form categories of speech sounds, faces, emotional expressions, colors, objects, animals, and mappings across modalities. Appropriate formation of concepts and categorization will help children to acquire vocabulary. This will further help in acquiring vocabulary. The vocabulary will be expanding with an increase of at least nine new words every day to their repertoire by the age of 18 months. It is believed that these new words encode concepts suggesting that concept acquisition begins during this stage (Carey, 1978; Gelman, 1996).

In the second stage (Preoperational, ages two through seven), the children will use language and internalization of actions. Symbolic function is present but ‘reversible operations’ and ‘conservation of quantity’ like size, and volume are absent showing the errors of conservation.

Children of two to five years of age will have the ability to grasp the concept of spatial localization of objects that are separated in space. Piaget characterized this period of learning as classifying objects only on the basis of perceptually attractive, concrete physical features. Children will learn the rules of formal logic where concept formation is a particular kind of logical information. Further in this stage, there will be a progress found in the formation of concepts. This progressive use of abstract concepts reflects both maturation and learning (Piaget, 1973; Singer & Revenson, 1997).

In this stage, children will be progressing in their categorization skills. In William James (1984) hypothesis of 'blooming, buzzing confusion' it is stated that if children are unable to perform categorization then their experiences might be filled with confusions with respect to objects, properties, sensations, and events extremely numerous to retain in their memory. Hence categorization helps children to develop concepts and vise versa (Gelman, 1988).

Categorization would have begun at 18 months but further progression will takes place in this stage. Another form of categorization known as lexical categorization will begin in this stage. Janani and Prema (2008) investigated development of lexical categorization in typically developing preschoolers of age ranging from two and a half years to five and a half years. It was found that on lexical organization (word association task), preschoolers exhibited thematic relations. On the process of lexical categorization (category – induction task) it was found that labeling an item exerts influence on the preschooler's judgment of category membership on a category – induction task. This supports the similarity based model that proposes children make category inferences on the basis of estimation of perceptual similarity.

Later by the age of six, many children display significant concept formation abilities. They originally have considerable linguistic competence and they use using such abstract qualification as present and past tense (Piaget, 1973; Singer & Revenson, 1997).

In the third stage (Concrete Operations), the conceptual operations of the child will contain the ability to perform concrete operations that belong to the logic of classes and relations. The fourth stage (Formal Operations) is where adult like logic evolves which can be marked by the ability to provide reasons by hypothesis, and this would be concerned with propositions or statements as well as objects (Piaget, 1973; Singer & Revenson, 1997).

It is reported that cognitive or conceptual development are the driving forces behind language development (Behrens, 1993). Further it is known that language guides concept formation and vice versa. If a language has no words for a concept, it is stated that, it is improbable that a speaker of that language will think of that concept. It is definitely known that linguistic and conceptual development converge crucially in the process of early word learning in children (Arunachalam & Waxman, 2010; Seel, 2012).

This is explained b y the 'levels of representations' ranging from more general cognitive abilities to more specific linguistic properties (Behrens, 1993). Figure 1.1 depicts the levels of representation.

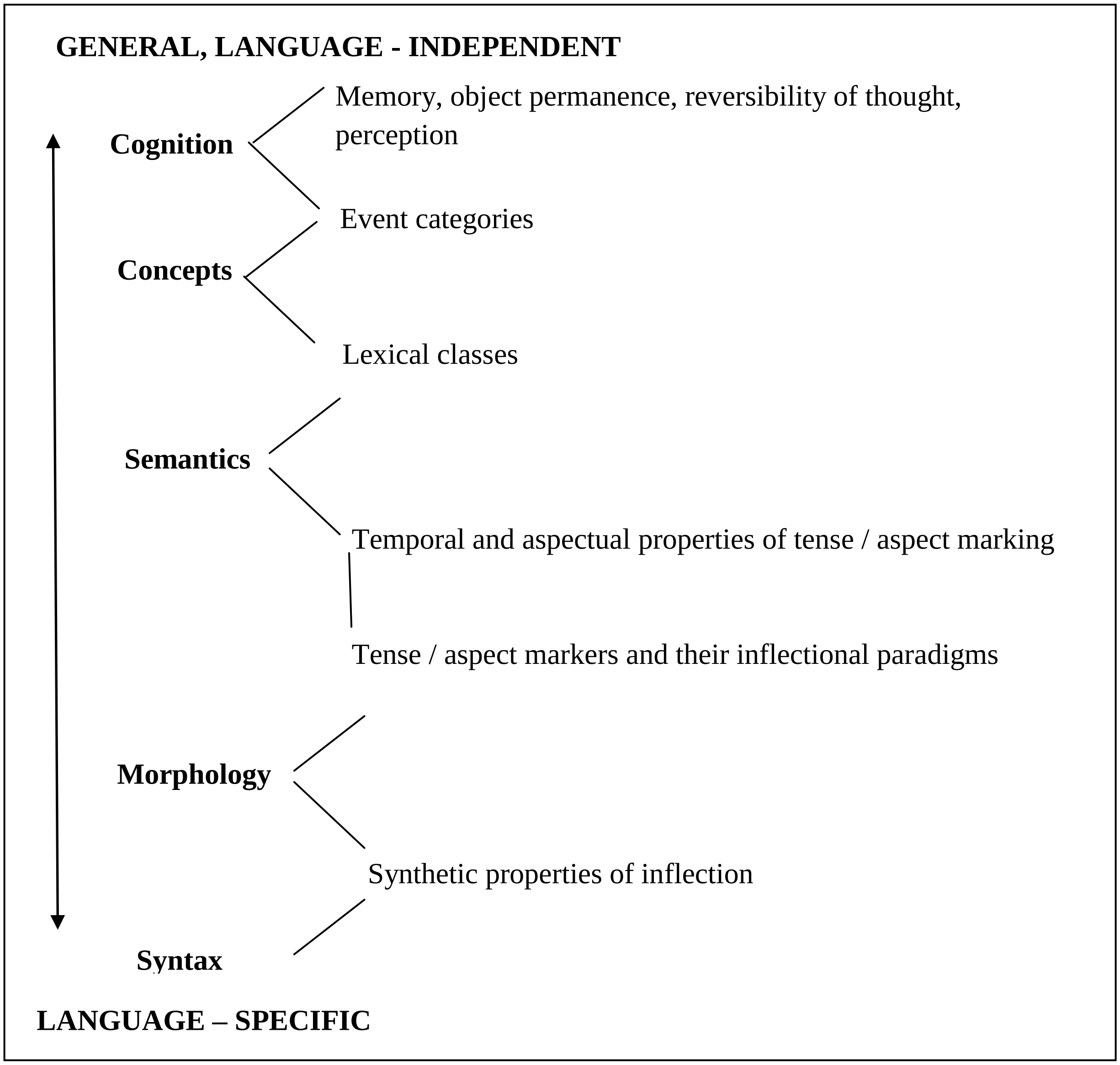

Figure 1.1 Levels of representation of cognition and language (Behrens, 1993)

According to the levels of representation, on the cognitive level, it is reported that children should have some language – independent temporal representations. For example, some memory of earlier events and some anticipations of future / upcoming events. It is reported that these representations are not linguistic notions. From the point of language acquisition, children need to find out which concepts are encoded by the semantic system of the language they are learning. For example, initially, they should learn to group / categorize their perceptions into event types and later will have to identify the lexical and morphological ways to encode them (Bowerman & Levinson, 2001).

Hence, each level can be thought of as a starting point in the acquisition of language. When going from language independent to language specific level, domains map to some extent neatly from one level to the next. It is reported that the language learners use such mappings taking the information of one domain and using it to attain the knowledge of another.

As concept development is strongly linked to language development, there is a need to determine the conceptual development of children with limited language skills so as to extend proper treatment plans. It is known that conceptualization may have its basis from the underlying essence of reality and it may be disturbed if the typical aspects of concepts are altered or removed. These disturbances may be exaggerated in clinical populations such as in children diagnosed as 'Late Talker' also (Yoshida & Smith, 2005).

A '*late-talker'* is defined as one who has a delay in language expression. It is believed that the children will eventually "catch up" without therapeutic intervention (Bernstein & Tigerman - Farber, 2002). Some toddlers with slow expressive vocabulary growth (i.e., late talkers) catch up to their typically developing peers in expressive language skills by the age of three or four years (Whitehurst & Fischel, 1994; Paul, 1996; Recorla & Lee, 2000; Rescorla, Mirak, & Singh, 2000).

It was recently suggested that the late talkers and children with Specific Language Impairment (SLI) are the same children at different ages (Rescorla, 2000, 2002; Rescorla & Roberts, 2002). Preschoolers with SLI, like children diagnosed as ‘Late talkers’, are identified by a process of exclusion. One of the hallmarks of preschool children with SLI is a morphosyntactic deficit-specifically, a deficit in verb morphology (Wexler & Cleave, 1995; Rice & Wexler, 1996; Bedore & Leonard, 1998).

Similarly, children diagnosed as ‘Late talkers’ identified at age two were reported to acquire fewer tense-marking morphemes compared to their language-matched typically developing peers (Paul & Alforde, 1993). It has been suggested that the term late talkers be used to describe children who are delayed in acquiring language and who are between the ages of two and four and that the term SLI be used to describe children who exhibit persisting language impairments at age of four or older (Rescorla & Lee, 2000).

1.3 Need for the Study

From the above studies it is understood that there is a relationship between conceptual development and language development. It is also known that there can be impaired conceptual acquisition in children having limited expressive abilities. There is scanty of information available on concept formation abilities in preschoolers in the age range of three – six years especially in the Indian context. The typically developing children in this age would be using a complex sentence structure (sentence having more than one clause). Comparatively children diagnosed as ‘Late Talker’ will be having limited expressive skills. Hence there is need to investigate whether concept formation abilities are involved in language performance especially in expressive skills in these children, which would help to rule out the presence of linguistic deficit during the critical period.

1.4 Aim of the Study

The present study aimed at 'comparing children diagnosed as 'Late talkers' with typically developing children on concept formation and language performance'.

1.5 Objectives of the Study

1. To investigate concept formation of animal membership in typically developing children (TDC).
2. To investigate concept formation of animal membership in children diagnosed as 'Late Talkers' (LT).
3. To compare the performances of children diagnosed as 'Late Talker' (LT) as against to typically developing children (TDC).
4. To investigate language performances with respect to vocabulary, receptive and expressive skills using KPVT and CLIP.
5. To correlate the linguistic performances of all the participants with that of concept formation tasks.

Chapter II

Review of the Literature

2.1 Concept Formation

Concepts are known to be the results of direct or indirect organization or structuring of experiences. The purpose of such structuring is to make things easier / simple. Hence, the description, interpretation, or memorization of the experiences is made possible. These experiences are organized into general rules or classes and this process is known as concept formation (Hunt, 1962). Concept formation is assumed to be the functional aspect of a larger, self – organizing system where, the system is able of sensing and recalling a part of experiences in the form of fragmentary images (Turner, 1962). According to Gelman (1988), concept formation prepares an adequate way of organizing experiences which in turn will help in learning. Learning takes place greatly from the social interactions. Concept formation mirrors the everyday experiences we have with the natural and social worlds. During the interaction with the world, subjective, personal, and cultural interpretations are given to them which create and define new concepts. This way of creating new and better concepts will improve the quality of lives (Vygotsky, 1934). There are few theories available in literature which explains the process of concept formation.

2.1.1 Theories on concept formation.

2.1.1.1 Prototype theory by Eleanor Rosch (1973).

Various theories have explained the process of concept formation. One such theory was ‘Prototype theory’ given by Eleanor Rosch (1973). Prototype view of concept learning describes that people abstract the central tendency i.e. prototype of the examples based on experiences and later use them as a basis for categorizing the objects. People categorize based on one or more central features of a given category obscurity / uncertainty of decreasingly typical examples. This implies that people do not categorize based on a list of things that correspond to a definition rather on a hierarchical inventory based on semantic similarity to the central example. For example, the mental representation of the category sports would be the things that match the category and these things would be unlimited as the process is continuous.

2.1.1.2 Ayn Rand's formulation.

Another theory was 'Ayn Rand's Formulation' (1990). According to this theory, differentiation is the first step of forming the concepts where it refers to isolate two or more things belonging together as units of the same class. Such type of isolating objects begins by noticing the degree of differences between them. From the point of perceptual level everything is different but some features might be more different than others. For example, the differences between a two tables are relatively lesser as compared to differences between a table and a chair. Here the objects which have lesser differences can be grouped as one class. Hence, Rand defines similarity as the relationship between two or more existents having same features but in different degree or measure. He says that similarity is the matter of measurement. He further says that difference between tables is a quantitative measure but difference between table and a chair can be a qualitative measure. Hence it can be distinguished that they are different groups. They can be called different in two aspects. One that they are physically different as chairs have a back and the second would be that they are functionally different as the purposes of both are different. Further, based on a broader level, they can be categorized as furniture.

The second step of forming concepts would be integration which is based on a process called measurement omission where the units are formed based on distinguishing features but omitting the measurements in particular. For example, when forming the concept of table the feature like a flat level surface and it supports etc are retained but the exact measurements are omitted.

Based on these two aspects, Rand defines concept formation as 'a mental integration of two or more units possessing the same distinguishing features with omission of particular measurements'. Concept formation is also a sub - domain of cognitive psychology. Along with social and natural world interaction, inbuilt cognitive capacity helps in expanding the depth of knowledge of concept formation.

2.2 Relationship Between Concept Formation and Cognition

Long (1982) determined the relation between cognitive structure and concept formation. For this, correlation co-efficient of cognitive structure and concept formation was measured. In order to find out the concept formation abilities Hanfmann's Block Test was used and for assessing cognitive structure Rokeach's Dogmatism Scale was administered on 34 participants. It was found that there was a significant relation for cognitive structure and concept formation. It is known that concept formation serves as necessary objective for cognitive tasks such as recognizing the objects, forming comparisons and reasoning, problem solving and expanding the knowledge. Reasoning and problem solving involves thinking / thought process. The conceptual thought will be enhanced by the simplified redescriptions. Concepts contain simplified redescriptions of the innate spatial information which in turn is related with the sensory and other bodily experiences. Hence cognition plays a role in the process of concept formation (Lin Lu & Dosher, 2006; Mandler, 2008).

A study reported that when children were asked to perform tasks for obscure / ambiguous stimuli they tend to provide many reasons for the same (Gelman, Collman, & Maccoby, 1986; Deak & Bauer, 1995). In another study, it is found that even preschool children can provide reasons beyond their capabilities. For example, three-year-old children may understand the concept of germs, their harmfulness and the caution for the same, although they have not yet learnt anything about viruses and bacteria's affecting the physiology of human being. They can provide reasons for these entities although they are beyond the capabilities of preschool age children. This is because even though preschool children have very little knowledge on these topics, they would have begun to understand that they exist and also the consequences of the same. These involve conceptualizations and these conceptualizations may vary depending on the domains or tasks. With respect to domains, children tend to use variety of information across the context depending on the task performed or the functions of the same (Kalish, 1996; Au & Romo, 1998). This specifies that concepts are involved in reasoning skills. The cognitive aspect of concept formation can be explained under the factors such as categorization, organization and schematic concept formation.

2.2.1 Categorization.

Another cognitive performance which is helpful in the process of learning for children is categorization. Several studies are done to examine the acquisition of conceptualization of complex concepts in children and the mental entities for such concepts helping in categorization. Children in early infancy stages will start forming categories that are similar to those of adults (Shultz 1982; Gelman 1990; Johnson 1990; Wellman 1990; Gelman, 1996).

In order to find whether infants of age seven - 11 months respond to the perceptual differences on conceptual categorization, four experiments were conducted by Gelman and Coley (1990). The results showed that in the first experiment nine - 11 month old infants could differentiate the global domains of animals and vehicles. But, within the category of animals sub categorization were not found. For example, the infants did not make out the differences between dog from fish or from rabbits. Within the category of vehicles, infants could differentiate car from airplanes and motor cycles. Experiment three revealed similar responses but were found to be weaker in the group of seven month old children. Experiment four showed infants were able to find the differences and similarities based on categorization. For example, they could find the category for a bird and aeroplane even though it had similar shapes (wings) and of same texture. As all the data showed that infant were able to differentiate categories but not on the subcategories, they concluded that infants may not respond to such perceptual differences as being conceptually relevant. When infants of 11 months old were shown action and allowed to repeat with same category member or different category member they could extend the conceptual properties. Children by the age of two to two and a half years will make interpretations on category membership despite inconsistencies. Three to four year children will have the capability to categorize objects on a variety of dimensions. One such dimension is perceptual characteristics like color, shape, pattern and face (Gelman & Coley, 1990; Mandler, 1993; Mandler & Donough, 1993; Alt & Plante, 2006).

The ability of children to perform categorization involves recognition which in turn works with the help of core cognition. Recognition is based on the mechanism of perceptual learning which seems to have processing of certain structure and hence affects categorization in a way that it strongly influences concept formation as well. In hypothesis of 'blooming, buzzing confusion' it is stated that if children are unable to perform categorization then their experiences might be filled with confusions with respect to objects, properties, sensations, and events extremely numerous to retain in their memory (William James, 1984; Diamond & Carey, 1986; Laren, Willis, & Graham, 2011).

Categorization also involves adequate way of organization. Organization can be defined as the structure discovered upon a set of things by a learner. This structure will facilitate retrieval of items from the memory. The progression observed in the memory organization of the preschoolers can be the result of developmental differences taking place in the structure of semantic memory and further the ease with which certain types of semantic relationships can be activated (Bjorklund, 1985).

Snyder, Bossomaier, and Mitchell (2004) reported that dominant neural strategy is involved in grouping 'object' which in turn helps in conceptual thought. Once the brain learns such significant or specific groupings, the "object" attributes will be inhibited from conscious awareness. Later an individual sees objects as a whole, not the parts. The details will be inhibited when the concept network is activated i.e. this inhibition is known to be dynamic and can be switched on and off.

Categorization which involves grouping is a known to be an essential step in the formation of concepts specially features like color may be related with particular function of brain sites. Cheadle and Zeki (2014) reported that when stimuli are grouped according to color and motion, separate subdivisions of parietal cortex, in and around the intraparietal sulcus are involved. They used concept based color and motion stimuli and further used functional magnetic resonance imaging (fMRI) to find out the locations. A strong concept-related activity in and around the intraparietal sulcus was found for color but not for motion. Concurrent retinotopic mapping experiments have shown that within the parietal cortex, concept-related activity increases within intraparietal sulcus areas. The study was also supported by Zeki and Stutters (2013).

2.2.2 Schematic concept formation.

Concepts can be classified based on schemas and hence known as Schematic concept formation (SCF). Evans (1967) describes SCF as the development of the ability to assign objects to their corresponding schema families on the basis of the information derived from perceiving the objects, without any other source of information as to the appropriate categorization, and without prior familiarization with the relevant schema.

Evans (1967) proposed a schematic concept formation (SCF) describing schema learning under environmental situations. There can be different situations where humans are confronted with instances of a variety of schema families mixed collectively. It was stated that humans build up a skill to allocate objects to their related schema families. This takes place based on the information derived from perceiving the things. This happens even without any other external resource of information concerning the suitable category and also with no earlier familiarization with the appropriate schema.

Hollier and Evans (1967) prepared a linguaform patterns which were sequences of syllables. To this, schema was introduced by a Marcov process which favored the occurrence of chosen pairs of syllables. Different pair of syllables produced different schema. An oddity task was used in order to test for SCF. The task was to find out the odd sequence in a set of three sequences, two of which had the same schema. All participants performed beyond chance and also improved with experience.

Edmonds (1974) trained children of age range six to 12 years for an oddity task of distinguishing patterns. He proposed that ability of distinguishing patterns will correspond to different schema. Schematic formation was found to take place prior to six years and will increase in its effectiveness in 11 or 12 years of age. The study also indicated that SCF task holds as a good measure of learning ability.

Shields, Gordon, and Evans (2013) studied the relationship between schematic concept formation (SCF) and intelligence in 60 adolescents. They performed a two – schema discrimination task. The intelligence quotients of subjects were in the range of 70 to 140 which was measured by the California Test of Mental Maturity (CTMM). There was a positive correlations found between Schematic concept formation and CTMM total. Further, no relationship was found for schematic concept formation and gender.

Hence, concept formation is related to cognition which in turn is required for cognitive activities such as learning, remembering, reasoning, problem solving, decision making and especially language development (Yoshida & Smith, 2005; Lin Lu & Dosher, 2006).

2.3 Relationship between Concept Formation and Language

Conceptual development is closely related to language development where conceptualization plays a role in language development. 'The Cognitive Hypothesis' highlights the role played by cognition as determinant of language development. 'The Cognition Hypothesis' for language development were given by Robinson (2001) and were motivated by Piaget's constructionist theory of development. According to Piaget, thought process precedes language development and also act as a prerequisite for language development. He proposed that cognitive development lays a base / foundation for language as children initiate to express the concepts which were developed prelinguistically. It is the schema which helps the child to attain language. It is hypothesized that 1) Children talk about concepts that have been developed previously, 2) structural complication of children's language does not go beyond their cognitive abilities. Robinson also stated that it is the cognitive abilities that offer meanings for expression at different levels of development.

Lucariello (1986) studied the developmental differences in object word learning and their usage. Usage of vocabularies under 50 words (beginners) and usage of vocabularies over 50 words (advanced) participated in the concept formation and word learning along with generalization experiment. Advanced group had the capability to learn more concepts and words with generalization compared to beginners. Words were mainly acquired for object concepts by both the groups. However beginners produced smaller amount of concepts showing a less extensive conceptual base support for word learning. This accounts for their lower levels of vocabulary acquisition. Beginners appear to form prototype/exemplar – based object concepts which leads to imperfect word extension and advanced group form featurally based object concepts leading to a broader extension.

According to Gelman (1990), before infants begin to speak they begin to form categories of speech sounds, faces, emotional expressions, colors, objects, animals, and mappings across modalities. Singleton (2012) observed that two - to three – year - old children were minimally able to generalize names to new exempler of a new category if they were differing from the original exemplar.

Gross, Buac, and Kaushanskaya (2014) studied the effects of conceptual scoring on the performance of simultaneous and sequential bilinguals using a standardized receptive and expressive vocabulary measures in both English and Spanish. 40 English speaking monolingual children, 39 simultaneous English – Spanish bilingual children and 19 sequential bilingual children in the age range of five to seven years participated in the study. On a single language measures in both modalities i.e., receptive and expressive, it was found that scores of bilinguals (both simultaneous and sequential) children were significantly below the monolingual children. This measure is helpful to rule out the vocabulary deficits predominantly in developing simultaneous bilinguals.

There are studies which oppose this aspect and state that it is language which plays a role in cognitive development. Slobin (1985) gave the ‘Semantic Predisposition Hypothesis’ which in turn served as evidence against ‘The Cognitive Hypothesis’. Slobin states that the semantic principles are offered to the child sooner than language learning and thus it help the decoding of form – function patterns of the particular language. He states that children go through a phase which can be determined by universal semantic distinctions before they acquire specific distinctions of the target language.

'Language Specificity Hypothesis' by Gopnik, Alison, Meltzoff, and Andrew (1986) states that the language itself might influence the achievement and development of conceptual and cognitive distinctions. They stress on the child's productive analysis of form – function patterns of target language. When children learn different languages, they do not encode the same spatial concepts but will acquire spatial distinctions that are relevant / applicable in their input language. Hence learning is more language specific. Hence this serves as evidence that language itself is responsible for conceptualizations (Bowerman1985; Choi & Bowerman 1991; Gopnik & Choi 1995).

Studies on prototypicality also emphasize that there is an influence of language in children to respond to exemplars. Southgate and Meints (2000) observed a developmental trend where a two-year-old children accepted an animal as a less frequent exemplar (Ostrich vs. Sparrow), only when the name of category (bird) was provided.

Dong (2006) did a linguistic study on concept formation as knowledge accumulation. He stated two roles played by language. Initially language serves as representations of ideas and concepts. It happens through the linguistic behaviors. During the design process these linguistic behaviors represent the structure of thought. Secondly, language also performs actions and creates states of affairs / events. The computational linguistic tools of latent semantic analysis and lexical chain analysis are applied to describe how design connects in concept formation as the accumulation of knowledge represented by lexicalized concepts. The accumulation is described as a data structure containing a set of associations between elemental lexicalized concepts. It was concluded that an analysis at a linguistic level can characterize concept formation.

Mayor and Plunkett (2010) states ‘Labels can impact the process of categorization’. It is also found that language; specifically object names and functions lead children to learn new categories.

Sapra (2011) states that the initial conceptual base becomes extended through subdivision sometimes aided by language and suggest new spatial analyses. According to concept attainment model, concept formation is attained in a step wise manner and not presented before to the children. This model supports the role played by language in the development of mental abilities.

These studies suggest that concept formation and language are so interwoven and it is difficult to establish the correct relationship. But it can be clearly known that both of them are interrelated. Hence it can be assumed that concept formation might be affected in language impaired children and language to be affected in cognitively impaired children. Hence it is known that when trying to measure the conceptual knowledge of children it is important to know the language issues especially in language impaired children. There are earlier studies performed to check the role played by concepts in language impaired children (Mayor & Plunkett, 2010; Sapra, 2011).

2.4 Concept Formation in Clinical Population

. Concept formation is reported to be affected in certain disorders like Mental retardation, Autism, Schizophrenia, ADHD etc (Walker & Bortner, 1975; Hong et al., 2010). There is literature available for the same. The following section briefs about the studies done on concept formation in clinical population.

2.4.1 Studies related to children with Psychiatric problems.

Kasanin, Jacob, and Hanfmann (1938) compared 60 patients with schizophrenia with 90 normals on a task of concept formation. The participants were instructed to classify the given blocks and were asked to provide reasons regarding the basis of classifying blocks. Results revealed that persons with schizophrenia could not perform well and further they could not form any novel classes too. Hence it was concluded that schizophrenics will have reduced capability to form new concepts.

Suzanne, Marion, and David (1944) studied the development of conceptual formation in children. Participants of this study were adults and children with psychiatric problems. Two concept formation tests were administered. Results indicated that they performed in three different levels and hence three levels of conceptual development were reported, namely concretistic, functional and conceptual. Two parts of test were compared with number, nature and difficulty of items. Children performed well in first part of the test. Hence they concluded that Concept formation (the realization of 'what things belong together') is involved in every intellectual function.

Feldman, Marvin, Drasgow, and James (1951) studied the concept formation in persons with schizophrenia and normal individuals. For this, they used visual – verbal test of concept formation consisting of 43 items. They found a difference in the performance of these two groups where persons with schizophrenia were unable to shift from one concept to another. Further they were unable to formulate abstract concepts to a greater extent. Hence they concluded that persons with schizophrenia had an impaired conceptual thinking.

Walker and Bortner (1975) studied the concept usage and categorizing behavior in children with schizophrenia. All children performed two sets of tasks where they were expected to match one object with one among the three choices. In the first task the choices were related by class, function or stimulus similarity. In the second task the choices were unrelated. Children with schizophrenia gave irrelevant responses. But there was an improvement found with increasing age. Children with schizophrenia did not improve even after the reduction in stimulus competition.

2.4.2 Studies related to children with Attention Deficit Hyperactivity Disorder (ADHD).

Hong et al., (2010) investigated the executive functions of lower grades (LG) and higher grades (HG) elementary school age children with Attention Deficit Hyperactivity Disorder (ADHD). 112 children with ADHD were divided into four groups (28 each) based on age (lower grade vs. higher grade) and Winsconsin Card Sorting Test (WCST) performance (lower vs. higher performance) were checked on completed categories. All participants were matched with respect to their age, gender, ADHD type and intelligence. Weshler Intelligence Scale for children and Computerized Neurocognitive Function Test were used. On comparisons made between executive functions scores in LG ADHD, It showed a statistically significant differences for 'backward digit span', 'verbal learning scores', 'memory scores', and Stroop Test Scores. But in HG ADHD, no difference was found. Even in *completed categories test* which involves concept formation, LG performed poor compared to HG children. They concluded that age is an important factor to be considered before measuring the executive functions.

Harrier and Deornellas (2010) studied on concept formation in children with ADHD. 93 children with ADHD and 85 typically developing children (TDC) in the age range of eight to 12 years participated in the study. Planning task from Woodcock Johnson – III tests of cognitive abilities, Weshler mazes task from Weshler intelligence scale for children – III were used to measure concept formation. There was an effect found on concept formation greatly i.e. ADHD's had poor scores. Further IQ also correlated well with concept formation.

2.4.3 Studies related to children with Autism.

It is reported that children with autism will have difficulty in integrating information and generalizing earlier learned concepts into new situations. These problems reflect impairment in category formation. During category learning, they lack the ability to abstract the representations and form categories by memorizing the respective rules (Klinger & Dawson, 2001). Further they did a study in children with Autism, Down syndrome, and normal children using a set of category learning tasks. These tasks required them to use a rule – based approach to solve. Later there was a second set of tasks in which there was no rule required to define the category membership. Results revealed that in rule based tasks, all were successful in using a rule to learn the category. In prototype tasks, only TDC were able to learn. Children with Autism and Down syndrome were unable to develop the prototypes for category learning. The results suggest that these children will have difficulty to categorize new information by forming prototypes.

Nancy, Jessica, and Gerald (2002) studied the concept identification and concept formation based on abstract reasoning in 90 children with autism and 107 normal children. Concept formation test and concept identification test were used. The results indicated a significant difference between both the groups on all abstract reasoning tasks. Stepwise discriminant function analyses revealed that both the tests correctly classified 78.4 % of cases.

Peterson (2005) investigated theory of mind (ToM) and concepts of human biology (eyes, heart, brain, lungs and mind) in 67 children grouped into 25 high functioning children with autism ranging from six-13 years and age-matched preschool children. Majority of the children with autism could understand the functional aspects of brain (84%) and mind (64%). They performed better than typically developing preschoolers where they understood inner aspects of physiology (heart, lungs) and aspects related to cognition (brain, mind). Their scores were high and matched the typically developing children.

2.4.4 Studies related to children with Mental Retardation (MR).

Belver, Herman, and Ronald (1959) studied on the concept formation and verbal mediation in children with mental retardation and normal children. They used an abstraction task where subjects were expected to discover the similarity among three words. Children with mental retardation and normal children of seven years were unable to perform the task whereas normal children of nine years were able to perform the task successfully.

Robert (1961) using a traditional sorting task compared normal and children with mental retardation on concept formation abilities. It was found that normal individuals had the ability to abstract objects to respective classes and children with mental retardation definitely had an impairment of concept formation.

2.4.5 Studies related to children with Specific Language Impairment (SLI).

McGregor, Newman, Reilly, and Capone (2002) found that naming errors were related with less encoded semantic information. McGregor et al., (2002) found that children with SLI made more naming errors than did unimpaired peers and had more words with weak semantic representations. The difficulties with encoding and depth of semantic knowledge noted in children with SLI reflect the less developed conceptual knowledge.

Concept development is strongly linked to language development (Yoshida & Smith, 2005). In children having limited expressive language abilities, it is quite challenging to quantify this. Alt and colleagues have found that children with SLI were not capable to identify many semantic features like color, pattern, shape, presence of eyes etc., as typically developing (TD) peers and they state that the problems might extend further than the initial stage of word learning (Alt & Plante, 2006).

Sheng and McGregor (2010) noticed a variety of abilities in lexical-semantic organization in seven-year-old children with SLI and recognized a subgroup having significant impairment in these skills and were related to word-finding deficits. McGregor, Rost, Guo, and Sheng (2010) found semantic deficits in school – age children with SLI where they were unable to use appropriate, semantically dictated word order and explain the meaning of novel compound words.

Alt, Meyers and Alt (2013) used a new technique for assessing conceptual development in children with SLI by comparing them with age adequate younger typically developing children (TDC). The participants were asked to rate how normal to weird the images were for the children with SLI, and younger age matched TDC. There was a significant difference found between the performances for all the groups. Results suggested that older children could perform better than the younger ones. When compared with children with SLI, younger typically developing children could perform better. They concluded that probing conceptual representations without the need for verbal response has the potential for exploring conceptual deficits in children with SLI.

2.4.6 Studies related to children diagnosed as Late Talkers (LT).

Late talkers are known to have poor vocabulary usage. These may reflect their poor semantic networks. Beckage, Smith, and Hells (2011) examined the structure of semantic network and vocabulary usage of typical children and 'Late talkers'. 39 typically developing children and 27 children diagnosed as 'Late talkers' in the age range of 15 – 36 months participated in the study. The list of vocabularies used by the participants was collected and later semantic network was derived. The networks were constructed by connecting the words according to the statistics of words used by normal children in environment. It consisted of 204 nouns, 51 verbs and 36 related to other parts of speech. For this purpose co – occurrence statistics were used. It consisted of nodes and links. Links represented the semantic relations of language of the child. Co – occurrence statistics served as index of semantic relatedness which measures the semantic, conceptual and syntactic relatedness objectively. Clustering coefficients were formed where there was a greater connectivity in TDC and LT having poor connectivity. Hence they concluded that LT's might be learning words from environment but loses few structures in language.

Chapter III

Method

The present study was aimed at comparing the concept formation in children diagnosed as 'Late Talkers' (LT) as against to typically developing children (TDC).

3.1 Participants

A total of 30 children in the age range of three to four years participated in the present study who were grouped into two groups. Group I consisted of ten children diagnosed as 'Late Talker' by a Speech Language Pathologist and group II consisted of 20 typically developing children (TDC) consisting of ten typically developing males (TDM) and ten typically developing females (TDF).

3.1.1 Participant selection criteria.

3.1.1.1 Criteria for the selection of participants in the group of typically developing children (TDC).

Typically developing children were selected from Preschools in Mysore city. These children did not have any history of reduced hearing, poor vision, poor intelligence, speech and language impairments, cognitive deficits, neurological deficits or physical anomalies. These children were native Kannada speakers. The age range of the children was three to four years.

3.1.1.2 Criteria for the selection of participants in the group of children diagnosed as. Late Talkers

Children diagnosed as ‘Late talkers’ were selected from the therapy clinic, from the Department of Clinical Services, All India Institute of Speech and Hearing (AIISH), Mysore. They did not have any history of reduced hearing, poor vision, poor intelligence, cognitive deficits, neurological deficits or physical anomalies except the delay in expressive language skills. They were diagnosed as ‘Late talker’ by Speech Language Pathologists. The age range of the children was three to four years. These children were native Kannada speakers.

3.2 Materials

The following materials were used for the present study,

1. Informed Consent form
2. Participant information sheet
3. Screening Picture Vocabulary Test in Kannada (KPVT; Sreedevi & Karanth, 1988)
4. Computerized Linguistic Protocol for Screening (CLIP; Anitha & Prema, 2004)
5. Stimuli for examining concept formation

3.2.1 Informed consent form.

An informed consent form was used to obtain consent for participation of children in the study. The consent was obtained from the parents/ guardians/ caretakers of the participants. For this purpose informed consent proposed by All India Institute of Speech and Hearing (AIISH) ethical guidelines for Bio – Behavioral Research (2009) was employed.

3.2.2 Participant information sheet.

The participant information sheet was prepared to obtain the details of the participants. The details included the demographic data, language usage details (Mother tongue, other languages known etc.), education background, presence of any illness, presence of deficits (reduced hearing, poor vision, poor intelligence, history / presence of any speech and language impairments, cognitive deficits, neurological deficits or physical anomalies.

3.2.3 Screening Picture Vocabulary Test in Kannada (KPVT; Sreedevi & Karanth, 1988).

To check the vocabulary usage of all the participants Screening Picture Vocabulary Test in Kannada (KPVT; Sreedevi & Karanth, 1988) was used. The test is used to check the vocabulary usage of children in the age range of three to six years where the test materials are set in the order of increasing complexity. There are 30 plates which include four pictures in each plate and the participants have to identify the picture named by the experimenter in each of the plates. Maximum score for children in the age range of three to four years is 20.

3.2.4 Computerized Linguistic Protocol for Screening (CLIP; Anitha & Prema, 2004).

In the present study, CLIP was used to assess the language age of children with respect to receptive and expressive skills under the domains of syntax and semantics. Computerized Linguistic Protocol for Screening was administered to mark out the developmental patterns on a range of linguistic aspects in the increasing order of complexity in both comprehension and expression skills in children. CLIP can be used for children in the age range of three to eight years. It is a helpful apparatus to identify children with language impairment. The maximum score for three to four years old population is 49 (comprehension) and 36 (expression). In the present study all the children were examined using CLIP.

3.2.5 Stimuli for examining concept formation.

A stimuli consisting of 90 items was developed using 12 standard reference pictures of animals to check the concept formation ability of the children. A detailed description of the stimuli is provided in the Phase I consisting of development of stimuli under the procedure of the study.

3.3 Procedure

The procedure involved in the present study was divided into two phases. Phase I involved the development of stimuli using Photoshop software (Master collection CS6) and Phase II included collection of data from ten children diagnosed as 'Late talker' and 20 typically developing children in the age range of three to four years.

3.3.1 Phase I: Stimuli development.

The stimuli were developed by using standard reference images of 12 animals. Further the variants of standard / referent images with respect to color, shape, pattern and face were prepared using Photoshop software (Master collection CS6). Hence there were 12 sets, each set consisting of one standard / referent and eight variant images. Among the 12 sets, ten sets were used as test stimuli and two sets were used for providing practice trials. The following sections provide the details of the same.

3.3.1.1 Reference images.

A total of 20 images of animals were collected. It was presented to ten typically developing children who were in the age range of three to four years. Children were instructed to name them. Based on their performance the top 12 images which were named by most of the children were chosen as stimuli. Hence a total of 12 animals familiar to preschool children were chosen to prepare the stimuli for the present study. This included the images of 12 domestic animals (cat, dog, cow, buffalo, elephant, sheep, monkey, donkey, pig, rabbit, horse, and camel) where, ten images served as test stimuli and two images (dog & cat) for familiarization of the task. Still images of the respective animals with the resolution of 1028 x 768 served as standard reference images. Table 3.1 depicts the list of 20 animals. Table 3.2 depicts the list of 12 animals in the order of mostly named by the children. These 12 images of animals were shown to children diagnosed as 'Late talkers' and they were able to name all the images.

Table 3.1

List of total 20 animals selected initially during the study

Sl. No.	List of animals
1	Dog
2	Cow
3	Cat
4	Goat
5	Elephant
6	Tiger
7	Rabbit
8	Cheetah
9	Giraffe
10	Pig
11	Monkey
12	Bear
13	Buffalo
14	Fox

15	sheep
16	Horse
17	Lion
18	Deer
19	Donkey
20	camel

Table 3.2

List of 12 animals which were mostly named by typically developing children

Sl. No	List of animals
1	Dog
2	Cat
3	Cow
4	Buffalo
5	Horse
6	Elephant
7	Sheep
8	Pig
9	Rabbit
10	Giraffe
11	Donkey
12	Camel

The standard / referent images used were obtained from internet sources (for example, Google images). The referent images had normal features of the animals. The images had good details about the animals and looked normal with respect to the size, shape, color, and pose. Care was taken to keep the clear features of the animal's faces. The view of the images looked in between the lateral view and frontal view to make the pose and features of the animal look clear. The images selected were cropped initially and then adjusted in such a way that it looked clear. Figure 3.1 depicts an example of the standard / referent image for stimulus 'cat'

Figure 3.1: Representation of the standard / referent image for the stimulus 'Cat'.

3.3.1.2 Preparation of variants of reference images.

The variation was done for the standard reference images only. The standard / referent images were taken and changes were made with respect to the color, pattern, shape and facial configuration using Photoshop software (Master collection CS6). The type of variations made was different for each animal. There were two types of variant stimuli. One was minimally variant / different from the referent image and the other one was maximally variant /different from the standard / referent image. For the minimum and maximum modification of the stimuli, a method used by Jaswal and Markman (2002), Janani and Prema (2004) and Alt, Meyers and Alt (2013) were adopted.

3.4.1.2.1 Color variation.

To change the color, a method used by Alt, Meyers and Alt (2013) was followed where the color of one or more body parts of the animal were changed in such a way that the color made the animal look absurd. For minimal difference, in the standard / referent image minor changes were made. For example, minimal variation in color: The gray color of the cat's skin was changed to light greenish color. The skin looked in green but still it can be accepted as cat. For maximal difference, major changes were made in the referent image. For example, maximal variation in color: The gray color of the cat's skin was changed to a multicolor where different body parts had different colors. Figure 3.2 is an example of minimum and maximum variant images with respect to color.

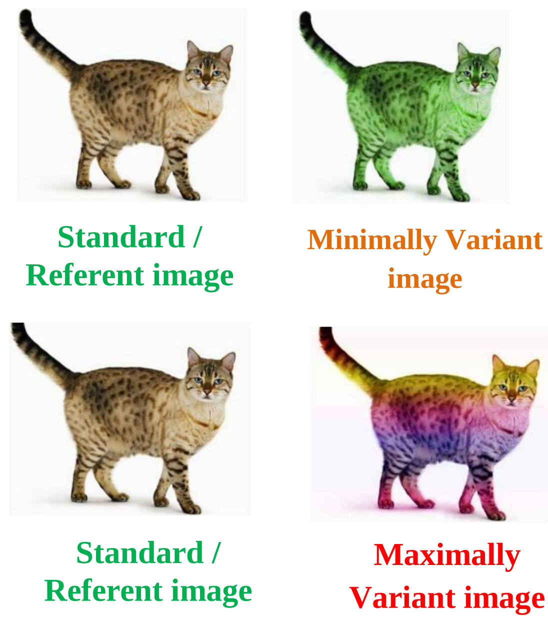

Figure 3.2: Representation of the standard / referent image for the stimulus 'Cat', the minimum color variant and maximum color variant.

3.3.1.2.2 Pattern variation.

To prepare the variants with respect to the pattern, a method used by Jaswal and Markman (2002) and Janani and Prema (2004) was followed where the features of animals such as skin, fur etc was changed. For example, the skin of cat was changed with the skin of tiger in such a way that it looked minimally different. The skin of cat was changed with the skin of a dog in such a way that it looked like maximally different. Figure 3.3 depicts an example of minimum and maximum variant images with respect to pattern.

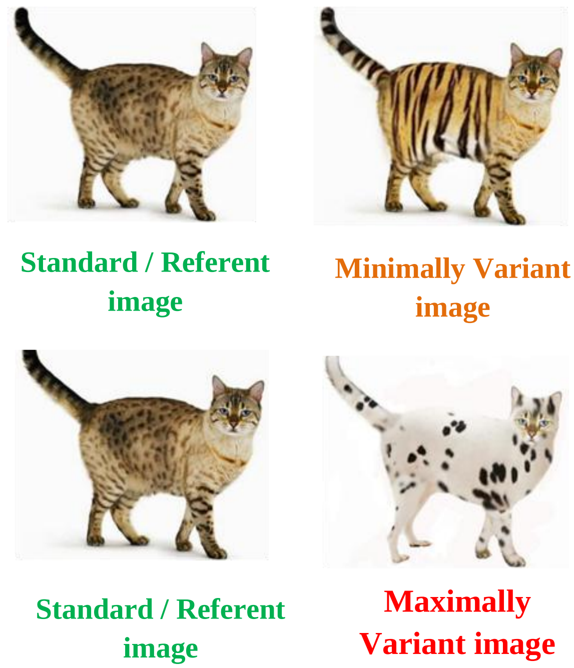

Figure 3.3: Representation of the standard / referent image of the stimulus ‘Cat’, the minimum pattern variant and maximum pattern variant.

3.3.1.2.3 Shape variation.

To change the shape, the method followed by Alt, Meyers and Alt (2013) was followed where; shape of the body of the animal was varied. For example, minimal change was made by changing the body shape of the animal by decreasing it. For maximal change, one leg was changed with the leg of monkey. Figure 3.4 depicts the standard / referent image of the stimulus ‘Cat’, representing the minimal and maximum variants with respect to shape.

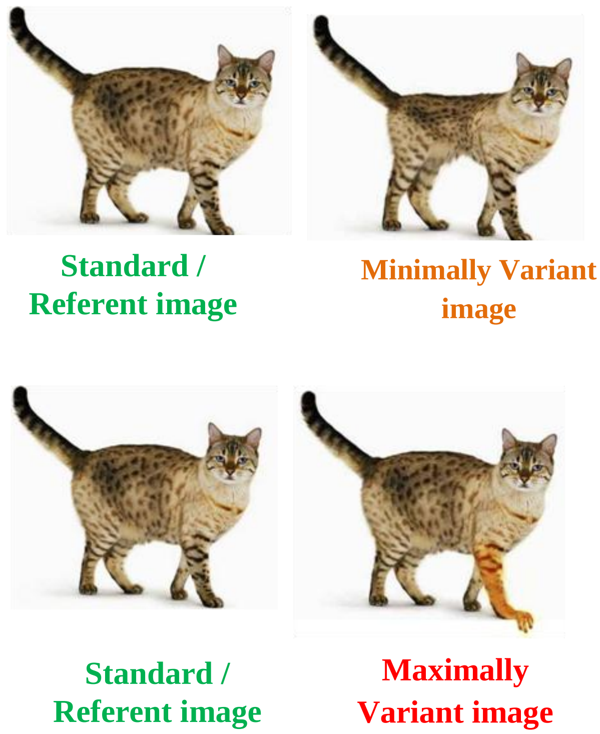

Figure 3.4: Representation of the standard / referent image of the stimulus ‘Cat’, the minimum shape variant and maximum shape variant.

3.3.1.2.4 Face variation.

To change the face, a method followed by Jaswal and Markman (2002) and Alt, Meyers and Alt (2013) was followed where changes with respect to the animal’s face was done. All changes made were interior to the outline of the standard / referent animal. For example, for minimal variation, the cat’s eyes were made three times bigger than the standard one. For maximal variation, the ears were made three times longer than the standard one. Figure 3.5 depicts the standard / referent image of the stimulus ‘Cat’, representing the minimum and maximum variant with respect to face.

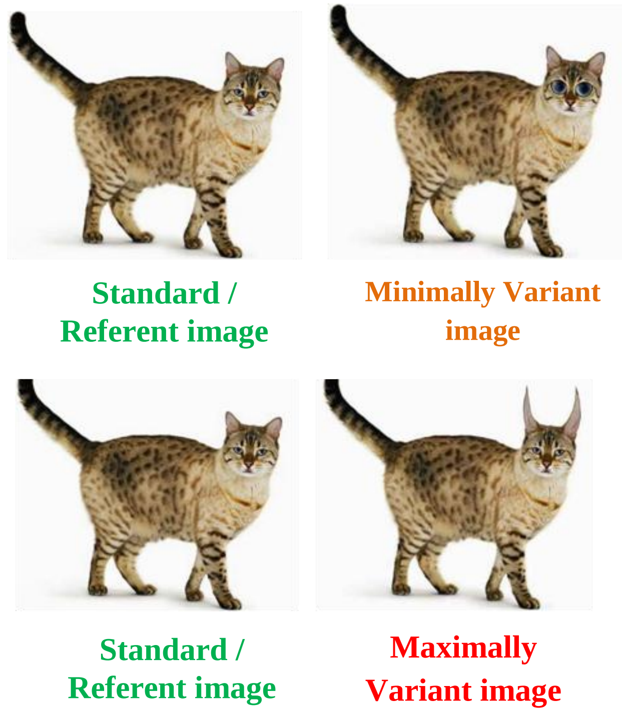

Figure 3.5: Representation of the standard / referent image of the stimulus 'Cat', the minimum face variant and maximum face variant

All these variations made the animals look different as they were the distortion of the standard / referent image. There was one referent image and eight variants for each image accounting nine stimuli for each animal. Totally 108 images [(1 standard + 8 variants) x 12 animals] were designed and considered for the study. The images were presented in random order. Each set consisted of one standard / reference image and its eight variants with respect to color, shape, pattern and face. Figure 3.6 depicts the stimulus set for 'dog' including one standard and the eight variant images.

Figure 3.6: Stimulus set for ‘dog’ including one standard / referent and the eight variant images.

3.3.2 Phase II: Content validation of the stimuli.

After the stimuli were prepared, the content validity of the stimuli was performed. Three Speech Language Pathologists participated in this process. They rated each picture using a five – point rating scale proposed by Mahoney, 2009. The Speech Language Pathologists were shown one standard and one variant image simultaneously in a random order where they had to validate it with respect to acceptability, agreement, and appropriateness of both reference and variant pictures. The Speech Language pathologists rated all 108 (90 test and 18 trial) stimuli used in the study. They were asked to rate whether minimum variants looked minimally different from the standard image and maximum variants looked maximally different from the standard image. The rating was done with respect to acceptability, agreement and appropriateness. When the Speech Language Pathologist rated the stimuli with the rating of three and below, the stimulus was subjected for modification based on the suggestion. Out of 180 stimuli, 47 of them were rated below three. Hence all the 47 stimuli were modified based on the suggestions provided by three Speech Language Pathologists. For example, the minimum color of horse was rated 'one' by the judges and hence the color was changed to purple and it provided a score of four on the second validation. Table 3.3 depicts the rating scale given by Mahoney (2009).

Table 3.3

Familiar rating scale (Mahoney, 2009)

Parameter	Ratings
Acceptability	0 – Not at all acceptable, 1- Not acceptable, 2- Slightly acceptable, 3-Moderately acceptable, 4-Very acceptable, 5-Completely acceptable.
Agreement	0-Completely disagree, 1- Disagree, 2- Somewhat disagree, 3-Neither agree nor disagree, 4-Somewhat agree, 5-Completely agree.
Appropriateness	0-Absolutely inappropriate, 1-Slightly inappropriate, 2- Neutral, 3-Slightly appropriate, 4-Appropriate, 5-Absolutely appropriate.

3.3.3 Phase III.

Phase III consists of two sections. Section I includes pre – data collection and Section II includes data collection. Figure 3.7 represents the procedure involved in the pre – data collection and data collection phase of the study.

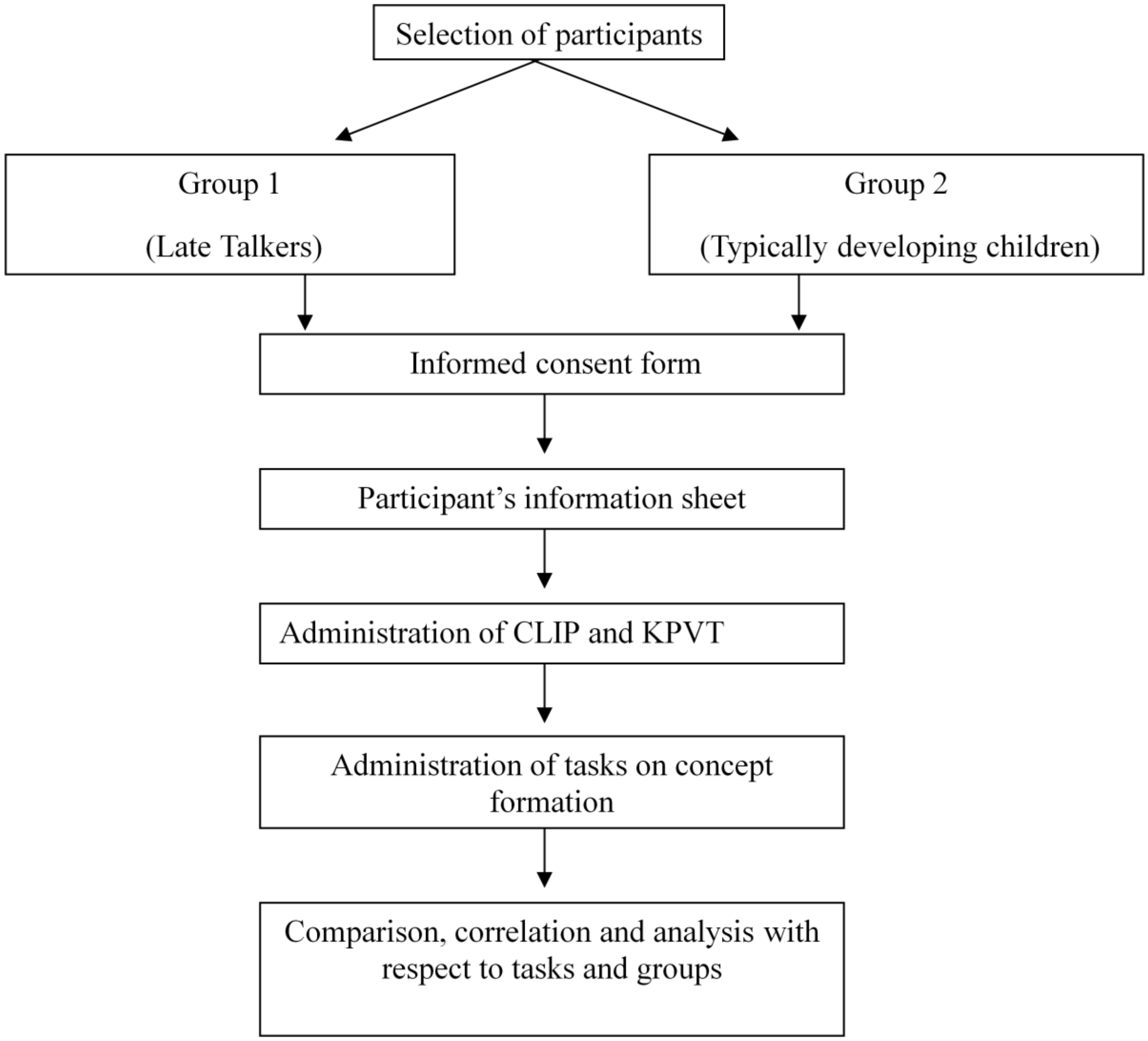

Figure 3.7: A flow chart representing the procedure involved in the pre – data and data collection phase of the study.

3.3.3.1 Pre – data collection.

3.3.3.1.1 Obtaining informed consent.

An informed consent form was used to obtain consent from all the participants [ten children diagnosed as 'Late talkers' (LT), ten typically developing males (TDM) and ten typically developing females (TDF) in the age range of three to four years]. The informed consent proposed by AIISH ethical committee for Bio-Behavioral research

(2009) was used. The consent was obtained from the parents / guardians / caretakers of the participants for permitting the children to participate in the present study. The consent form contained a brief description of the study, duration of the assessment, the confidential aspects of the results and identity of the children which were explained to the participants' parents / caregivers / guardians.

3.3.3.1.2 Obtaining general information about participants.

Once the informed consent was taken from all the participants, a participant information sheet was used to get the detailed information of the children who participated in the study. They acted as a pre-requisite for the present study. Initially the demographic data were collected which included the complete name, present age, date of birth, and the names of parents. Later information regarding the native language of the participants, other languages exposed to, languages spoken by the participants were gathered. Only children who had Kannada as their native language were chosen for the present study. Details regarding the education of the participants, the preschool in which the child is admitted, medium of instruction etc. Information regarding presence of any illness, presence of any deficits (reduced hearing, poor vision, poor intelligence, speech and language impairments, cognitive deficits, neurological deficits or physical anomalies) was gathered. This was done for both typically developing children (TDC) and children diagnosed as 'Late talker' (LT). It was made sure that the children diagnosed as 'Later talker' did not have any other anomalies expect a delay in the expressive language skills.

3.3.3.1.3 Administering CLIP.

In order to know the language age, both receptive and expressive skills were assessed in all the participants of the study using CLIP. The participants were shown picture plates which included tasks of pointing and verbally expressing the pictures. The children were expected to follow the instructions and perform the same respectively. Finally, the scores were obtained based on the normative values.

3.3.3.1.4 Administering KPVT.

In order to know the vocabulary usage of the participants, KPVT was used. It contained 30 stimulus plates and the children were instructed to point / identify the target picture among the four pictures in a plate.

The scores obtained by the participants in TDM group are in table 3.4. And the scores obtained by the participants in TDF group are in table 3.5. Further the scores obtained by the participants in LT group are in table 3.6.

Table 3.4

Scores obtained by TDM for CLIP and KPVT

Sl. No.	Participant	Age	Gender	Language	KPVT Scores	CLIP Scores
1	TDM_1	3.11	Male	Kannada	18	96
2	TDM_2	3.10	Male	Kannada	20	91
3	TDM_3	3.2	Male	Kannada	26	76
4	TDM_4	3.8	Male	Kannada	21	91
5	TDM_5	3.11	Male	Kannada	21	89
6	TDM_6	3.9	Male	Kannada	20	90
7	TDM_7	3.4	Male	Kannada	15	92
8	TDM_8	3.6	Male	Kannada	21	85
a9	TDM_9	3.3	Male	Kannada	22	96
10	TDM_{10}	3.9	Male	Kannada	11	90

Table 3.5

Scores obtained by TDF for CLIP and KPVT

Sl. No.	Participant	Age	Gender	Language	KPVT Scores	CLIP Scores
1	TDF_1	3.11	Female	Kannada	23	95
2	TDF_2	3.2	Female	Kannada	14	89
3	TDF_3	3.6	Female	Kannada	22	96

4	TDF_4	3.10	Female	Kannada	26	89
5	TDF_5	3.5	Female	Kannada	21	93
6	TDF_6	3.6	Female	Kannada	20	94
7	TDF_7	3.9	Female	Kannada	18	95
8	TDF_8	3.9	Female	Kannada	17	95
9	TDF_9	3.8	Female	Kannada	20	92
10	TDF_{10}	3.11	Female	Kannada	26	90

Table 3.6

Scores obtained by LT for CLIP and KPVT

Sl. No.	**Participant**	**Age**	**Gender**	**Language**	**KPVT Scores**	**CLIP Scores**
1	LT_1	3.11	Female	Kannada	11	48
2	LT_2	3.2	Male	Kannada	7	25
3	LT_3	3.5	Male	Kannada	8	38
4	LT_4	3.6	Male	Kannada	8	65
5	LT_5	3.6	Female	Kannada	7	32
6	LT_6	3.2	Male	Kannada	8	30
7	LT_7	3.11	Male	Kannada	9	39
8	LT_8	3.5	Female	Kannada	11	29
9	LT_9	3.4	Female	Kannada	10	31
10	LT_{10}	3.10	Male	Kannada	8	30

3.3.3.2 Data collection phase.

3.4.3.2.1 Administration of task of concept formation and scoring.

The stimuli were shown one at a time in a laptop. The participants were asked to perform three tasks such as ‘naming’ the animal, indicating ‘same / different’, and to ‘find out’ the differences observed between the standard and variant image. All the tasks were familiarized to the participants using two sets of stimuli (practice trial) before involving the participants for the actual tasks.

Task 1: Naming

In the naming task, the participants were expected to name the animals shown. The instructions provided for the children were, *“I will show you the picture of an animal* *and you should tell me the name of that animal".* Once the picture was shown, participant had to name them. When the participant named the picture correctly a score of '1' was provided and when the participant did not name the picture a score of '0' was given. The task involved a total score of ten. Only standard pictures were used during this task.

Task 2: Identifying the presence/absence of difference.

In this task, there were two pictures in a plate including a reference image and a variant image. The participants had to indicate whether the two pictures were same or different. When the participant said that it looked different then, a score of '1' was provided and when the participant said that it looked same, a score of '0' was given. The task involved a total of score 80. Instruction provided was, '*Tell me whether these two pictures of animals looks same or different'*. In order to check the redundancy, two same pictures were also shown in between the test stimuli.

Task 3: Pointing the difference

This task was administered simultaneously with task 2. Once the participants said that the animal looks different on comparison with the reference image, the participants were asked to point out the difference. Instructions provided was, *"Tell me what the difference is"*. Some responses of the children were pointing to the different part of the variant picture and most of the children expressed verbally the difference in the variant picture. Both pointing and verbal responses were accepted and were given a score of '1' and when it was not, a score of '0' was given. The task involved a total score of 80. The details of the tasks and the scores are as shown in the table 3.7.

Table 3.7

Details of scoring pattern for the three tasks of concept formation

	No. of tasks	**Scores for each task**		**Total scores**
	Task 1	Correct – 1 Incorrect – 0		10
	Task 2	Slightly different Correct – 1 Incorrect – 0	Maximally different Correct – 1 Incorrect – 0	80
	Task 3	Correct – 1 Incorrect – 0	Correct – 1 Incorrect – 0	80
Total Scores				170

The absurdness was correlated with measures of language skills, and vocabulary usage. Appropriate statistical measures were employed for the analysis of data obtained for the study.

Chapter IV

Results and Discussion

The present study aimed at the comparison of late talkers with typically developing children on the tasks of concept formation and tests of language abilities. In order to check the language performance, Computerized Linguistic Protocol for Screening (CLIP) and Screening Picture Vocabulary Test in Kannada (KPVT) were administered. A set of stimuli were prepared to examine concept formation in the participants based on color, shape, pattern, and face (for details of the stimuli development refer to the method chapter). A total of 30 children consisting of ten typically developing males (TDM), ten typically developing females (TDF), and ten 'Late talkers' (LT) served as participants for the present study.

Appropriate statistical analyses were performed in order to find out the relationship between concept formation and language performances. The results of tasks on concept formation and language skills are discussed in the present section. Figure 4.1 is a flow chart depicting the statistical analysis performed for all the tasks in the present study.

The results are discussed with respect to the performance of typically developing males (TDM) versus typically developing females (TDF). Further the results are with respect to the performance of typically developing children (TDC) versus children diagnosed as 'Late Talkers' (LT) on tasks of concept formation and language skills.

In order to know the abilities of concept formation, three main tasks were performed. The first one was 'naming' where all the participants were expected to name the images of animals shown. This task was performed to know their semantic representation of animal membership.

The second task was to indicate whether the images of animals which contained a referent and a variant looked same or different. This task was performed to check whether the participants are able to identify the images which looked same or different.

The third task was to 'find out' the variations where the participants were expected to verbally indicate the variations between the standard and the variant image. For example, the color of the cat is green, the eyes look bigger etc., the non - verbal response like pointing the variation of the variant image were also accepted. This was done in order to make this particular task language free for children diagnosed as Late talkers. But few of these children provided verbal responses as well.

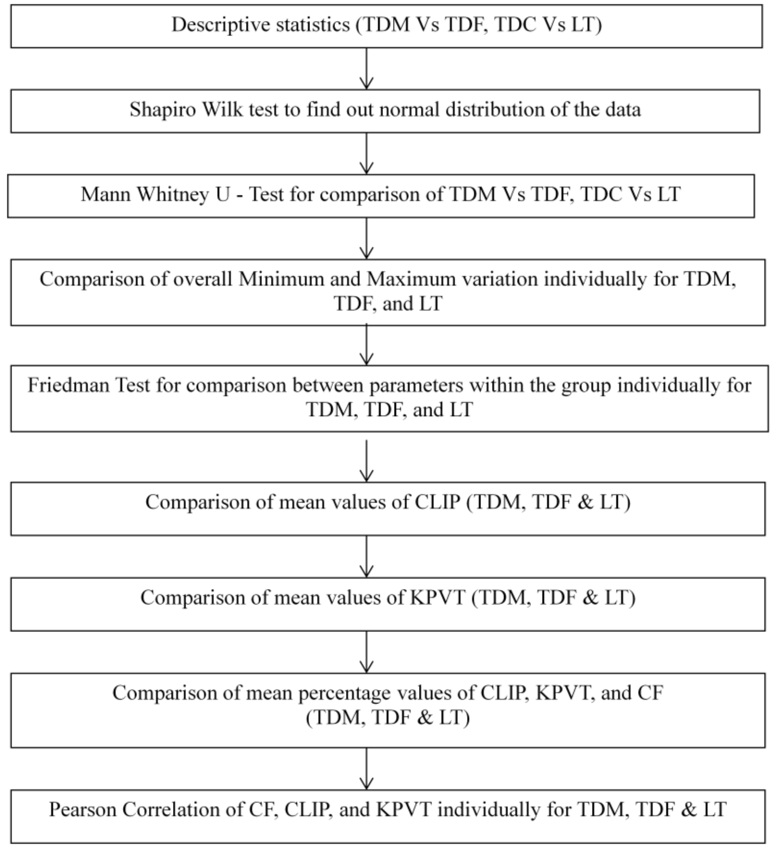

Figure 4.1 Flow chart depicting the statistical analyses performed for all the tasks in the present study.

Initially, a descriptive statistics was performed in order to obtain the mean and the median values along with the standard deviation for the groups of typically developing males (TDM), typically developing females (TDF) and children diagnosed as 'Late Talkers' (LT) for a) 'Naming' the standard animals, b) Identifying whether the 2 images (Standard and variant) are 'Same/different' and c) 'Finding out the difference' between standard and variant image with respect to the variables of color, shape, pattern and face.

There were 8 variables related to the task of indicating 'Same/different'. Four variables were related to minimum variation and four variables were related to maximum variation. They were, Same/difference - Color Minimun (SDC_Min), Same/difference –

Color Maximum (SDC_Max), Same/difference - Shape Minimum (SDS_Min), Same/difference - Shape Maximum (SDS_Max), Same/difference - Pattern Minimum (SDP_Min), Same/difference - Pattern Maximum (SDP_Max), Same/difference - Face Minimum (SDF_Min), and Same/difference - Face Maximum (SDF_Max).

There were 8 variables in the task of 'Finding difference'. Four variables were related to minimum variation and four variables were related to maximum variation. They were, Finding difference - Color Minimum (FDC_Min), Finding difference - Color Maximum (FDC_Max), Finding difference - Shape Minimum (FDS_Min), Finding difference - Shape Maximum (FDS_Max), Finding difference - Pattern Minimum (FDP_Min), Finding difference - Pattern Maximum (FDP_Max), Finding difference - Face Minimum (FDF_Min) and Finding difference - Face Maximum (FDF_Max).

4.1 Comparison of mean values of tasks on concept formation in TDM and TDF

Descriptive statistics was performed between TDM and TDF; TDC and LT to obtain mean, median, and standard deviation. Table 4.1 shows the descriptive statistics for all the tasks on concept formation (CF) of typically developing males (TDM) and typically developing females (TDF). Table 4.2 shows the descriptive statistics for all the tasks on concept formation (CF) of typically developing children (TDC) and Late Talkers (LT)

Table 4.1

Descriptive statistics of TDM and TDF for all the tasks on Concept Formation (CF).

Parameters	Group	N	M	SD	Median
Standard image	TDM	10	9.70	0.48	10.00
	TDF	10	9.80	0.42	10.00
SDC_Min	TDM	10	9.90	0.31	10.00
	TDF	10	9.80	0.42	10.00
SDC_Max	TDM	10	9.70	0.67	10.00
	TDF	10	9.90	0.31	10.00
SDS_Min	TDM	10	8.80	1.39	9.50
	TDF	10	9.30	0.82	9.50
SDS_Max	TDM	10	9.70	0.67	10.00
	TDF	10	9.80	0.42	10.00
SDP_Min	TDM	10	9.70	0.48	10.00
	TDF	10	9.50	0.70	10.00
SDP_Max	TDM	10	10.00	0	10.00
	TDF	10	9.90	0.31	10.00
SDF_Min	TDM	10	9.00	1.24	9.50
	TDF	10	9.20	1.03	9.50
SDF_Max	TDM	10	10.00	0	10.00
	TDF	10	10.00	0	10.00
FDC_Min	TDM	10	9.10	1.44	10.00
	TDF	10	9.70	0.48	10.00
FDC_Max	TDM	10	9.50	0.70	10.00
	TDF	10	9.80	0.42	10.00
FDS_Min	TDM	10	8.00	1.15	8.00
	TDF	10	9.40	0.84	10.00
FDS_Max	TDM	10	9.20	0.78	9.00
	TDF	10	9.80	0.42	10.00
FDP_Min	TDM	10	9.00	1.15	9.00
	TDF	10	9.10	0.87	9.00
FDP_Max	TDM	10	9.30	1.05	10.00
	TDF	10	9.80	0.42	10.00
FDF_Min	TDM	10	8.40	1.35	9.00
	TDF	10	9.50	1.08	10.00
FDF_Max	TDM	10	10.00	0	10.00
	TDF	10	10.00	0	10.00

TDM = Typically developing male, TDF = Typically developing female, M = Mean, SD = Standard deviation, N = Number of participants, SDC_Min = Same/difference color minimum, SDC_Max = Same/difference color maximum, SDS_Min = Same/differences shape minimum, SDS_Max = Same / difference shape maximum, SDP_Min = Same/difference pattern minimum, SDP_Max = Same/difference pattern maximum, SDF_Min = Same / difference face minimum, SDF_Max = Same / difference face maximum, FDC_Min = Finding difference color minimum, FDC_Max = Finding difference color maximum, FDS_Min = Finding differences shape minimum, FDS_Max = Finding difference shape maximum, FDP_Min = Finding difference pattern minimum, FDP_Max = Finding difference pattern maximum, FDF_Min = Finding difference face minimum, FDF_Max = Finding difference face maximum.

Table 4.2

Descriptive statistics of TDC and LT for all the tasks on Concept Formation (CF).

Parameters	Group	N	M	SD	Median
Standard image	TDC	20	9.75	0.44	10.00
	LT	10	7.60	3.16	4.50
SDC_Min	TDC	20	9.85	0.36	10.00
	LT	10	1.40	2.63	0
SDC_Max	TDC	20	9.80	0.52	10.00
	LT	10	1.30	2.21	0.50
SDS_Min	TDC	20	9.05	1.14	9.50
	LT	10	1.40	2.71	0
SDS_Max	TDC	20	9.75	0.55	10.00
	LT	10	1.10	2.51	0
SDP_Min	TDC	20	9.60	0.59	10.00
	LT	10	1.20	2.57	0
SDP_Max	TDC	20	9.95	0.22	10.00
	LT	10	1.00	2.30	0
SDF_Min	TDC	20	9.10	1.11	9.50
	LT	10	1.00	2.53	0
SDF_Max	TDC	20	10.00	0	10.00
	LT	10	1.30	2.54	0
FDC_Min	TDC	20	9.40	1.09	10.00
	LT	10	3.50	3.20	3.50
FDC_Max	TDC	20	9.65	0.58	10.00
	LT	10	4.80	2.65	5.00
FDS_Min	TDC	20	8.70	1.21	9.00
	LT	10	2.30	2.21	1.50
FDS_Max	TDC	20	9.50	0.68	10.00
	LT	10	2.90	2.13	2.50
FDP_Min	TDC	20	9.05	0.99	9.00
	LT	10	2.90	2.55	1.50
FDP_Max	TDC	20	9.55	0.82	10.00
	LT	10	4.30	2.31	3.50
FDF_Min	TDC	20	8.95	1.31	9.50
	LT	10	4.30	1.49	4.00
FDF_Max	TDC	20	10.00	0	10.00

	LT	10	8.10	1.37	8.50

TDC = Typically developing children, LT = Children diagnosed as 'Late Talkers', M = Mean, SD = Standard deviation, N = Number of participants, SDC_Min = Same/difference color minimum, SDC_Max = Same/difference color maximum, SDS_Min = Same/differences shape minimum, SDS_Max = Same/difference shape maximum, SDP_Min = Same/difference pattern minimum, SDP_Max = Same/difference pattern maximum, SDF_Min = Same/difference face minimum, SDF_Max = Same/difference face maximum, FDC_Min = Finding difference color minimum, FDC_Max = Finding difference color maximum, FDS_Min = Finding differences shape minimum, FDS_Max = Finding difference shape maximum, FDP_Min = Finding difference pattern minimum, FDP_Max = Finding difference pattern maximum, FDF_Min = Finding difference face minimum, FDF_Max = Finding difference face maximum.

In the 'Naming task', the mean values were found to be similar for both TDM and TDF. The graphical representation based on the mean values for 'Naming' task in TDM and TDF is depicted in figure 4.2.

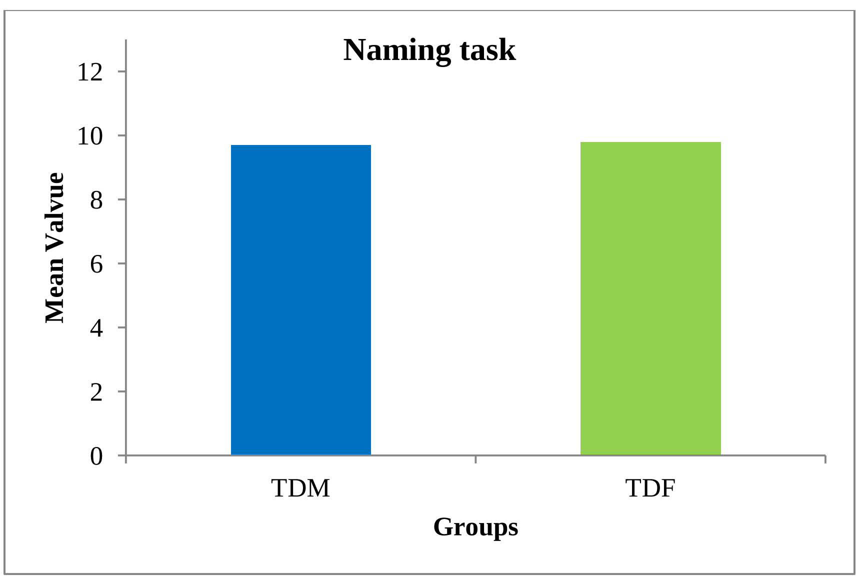

Figure 4.2 Graphical representations of mean values for TDM and TDF for 'Naming' task.

In indicating ‘Same/difference’ between standard and variant image, the mean values varied minimally between TDM and TDF. The graphical representation of mean values for ‘Same/difference’ task in TDM and TDF is depicted in figure 4.3.

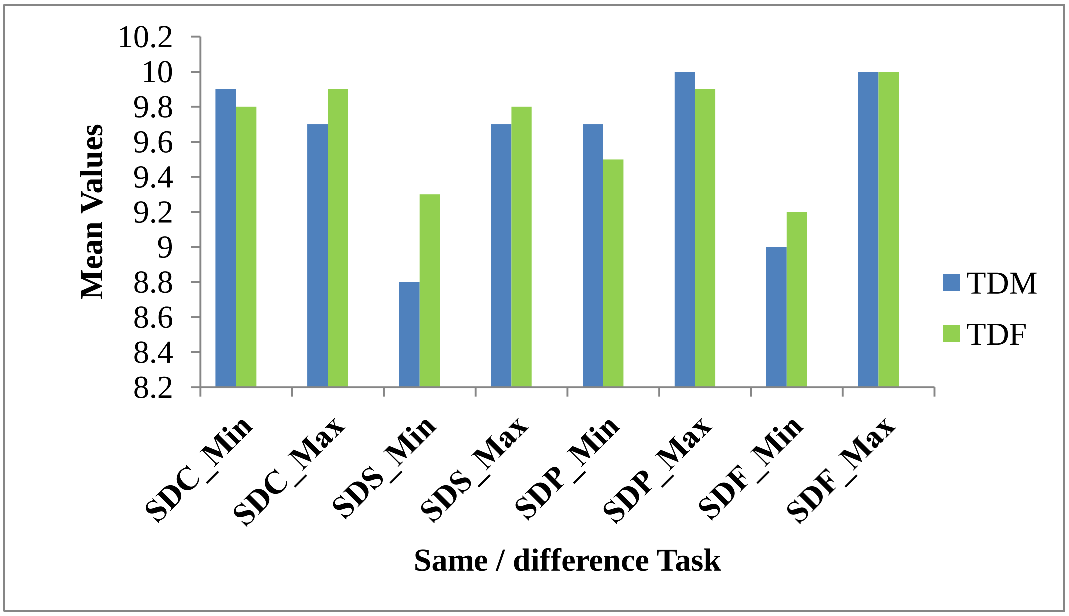

Figure 4.3 Graphical representations of mean values for ‘Same / difference’ task in TDM and TDF.

In ‘Finding difference’ between standard image and variant one, the mean values of minimally and maximally different variables were found to be slightly varied between TDM and TDF. The graphical representation of mean values for ‘Finding differences’ task in TDM and TDF is depicted in figure 4.4.

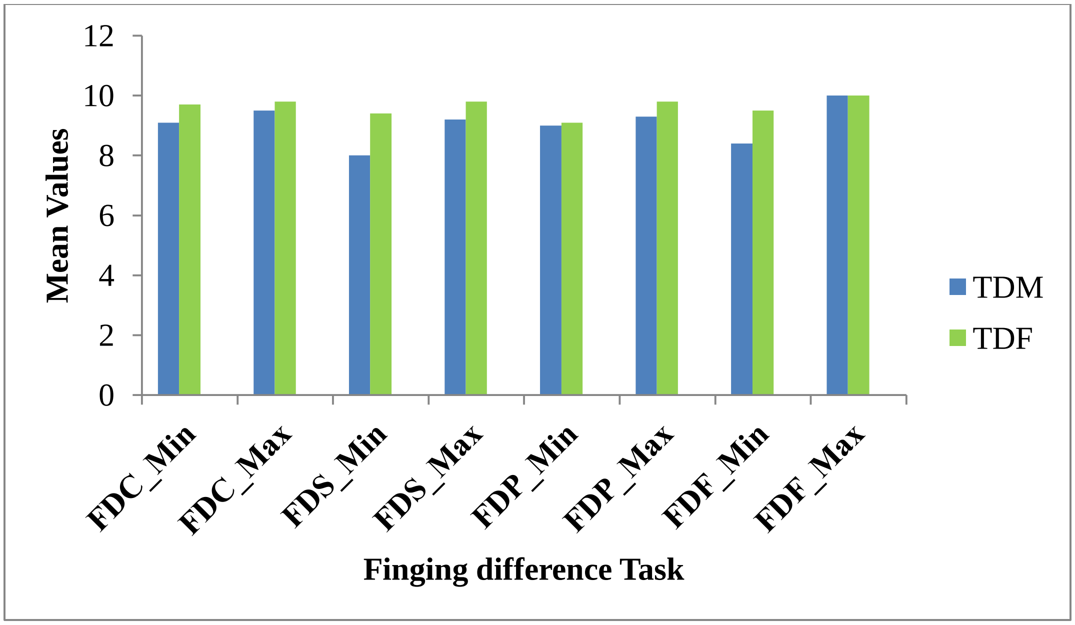

Figure 4.4 Graphical representations of mean values for 'Finding difference' task in TDM and TDF.

In the 'Naming task', the mean values of LT were found to be lower than that of TDC. The graphical representation of the mean values for 'Naming' task in TDC and LT is depicted in figure 4.5.

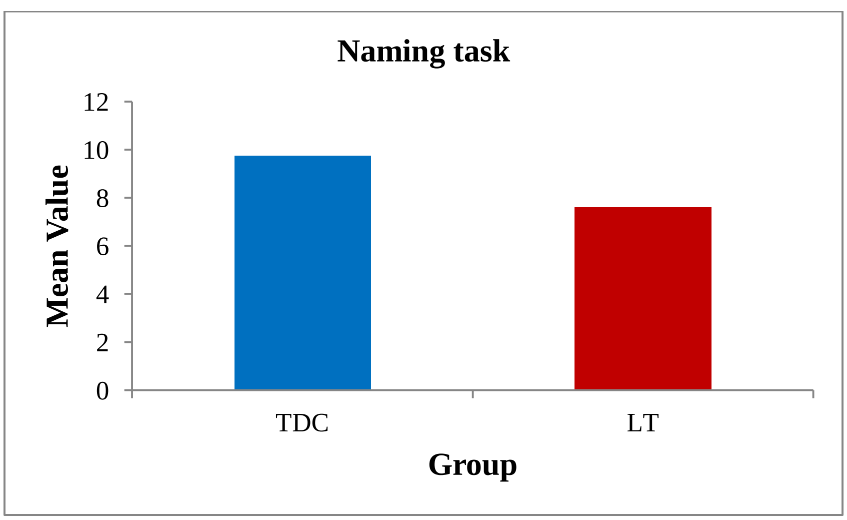

Figure 4.5 Graphical representations of mean values for 'Naming task' in TDC and LT.

In indicating 'Same/difference' between the standard image and variant one, the mean values of minimally and maximally different variables with respect to color, shape, pattern and face were found to be lesser for LT than TDC. The graphical representation of mean values for 'Same/difference' task in TDC and LT is depicted in figure 4.6.

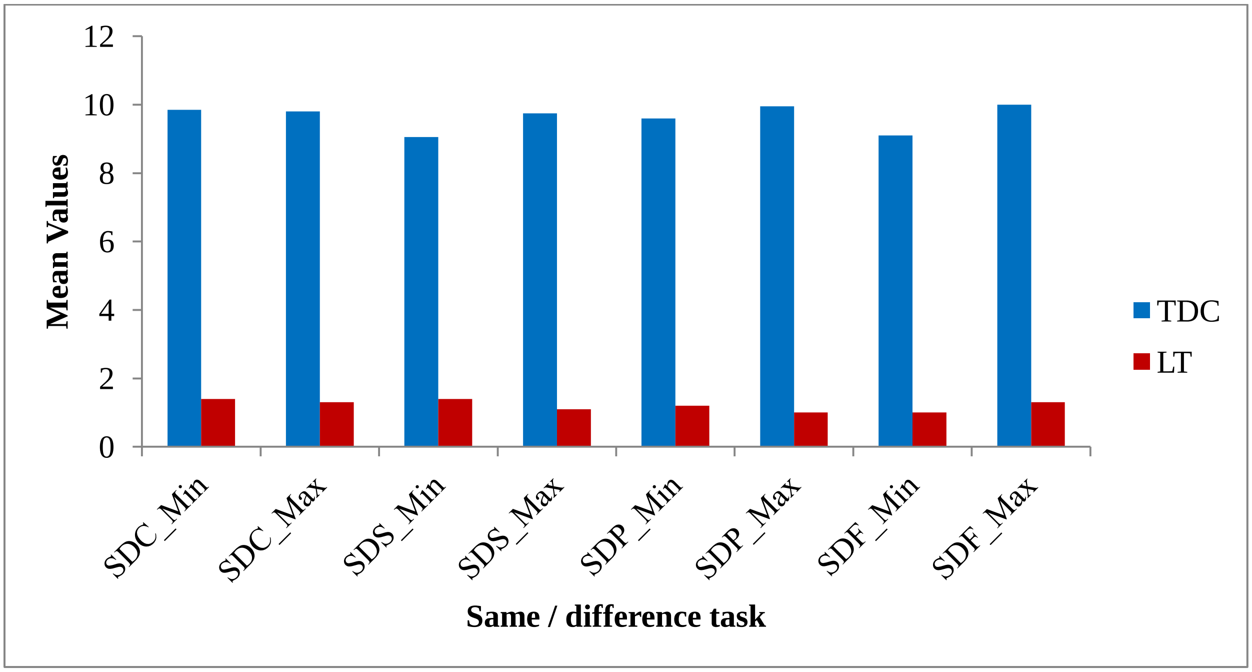

Figure 4.6 Graphical representations of mean values for 'Same / difference' task in TDC and LT

In 'Finding difference' between the standard image and variant one, the mean values of minimally and maximally different variables were found to be lesser for LT than TDC. The graphical representation for the mean values of 'Finding differences' task in TDC and LT is depicted in figure 4.7.

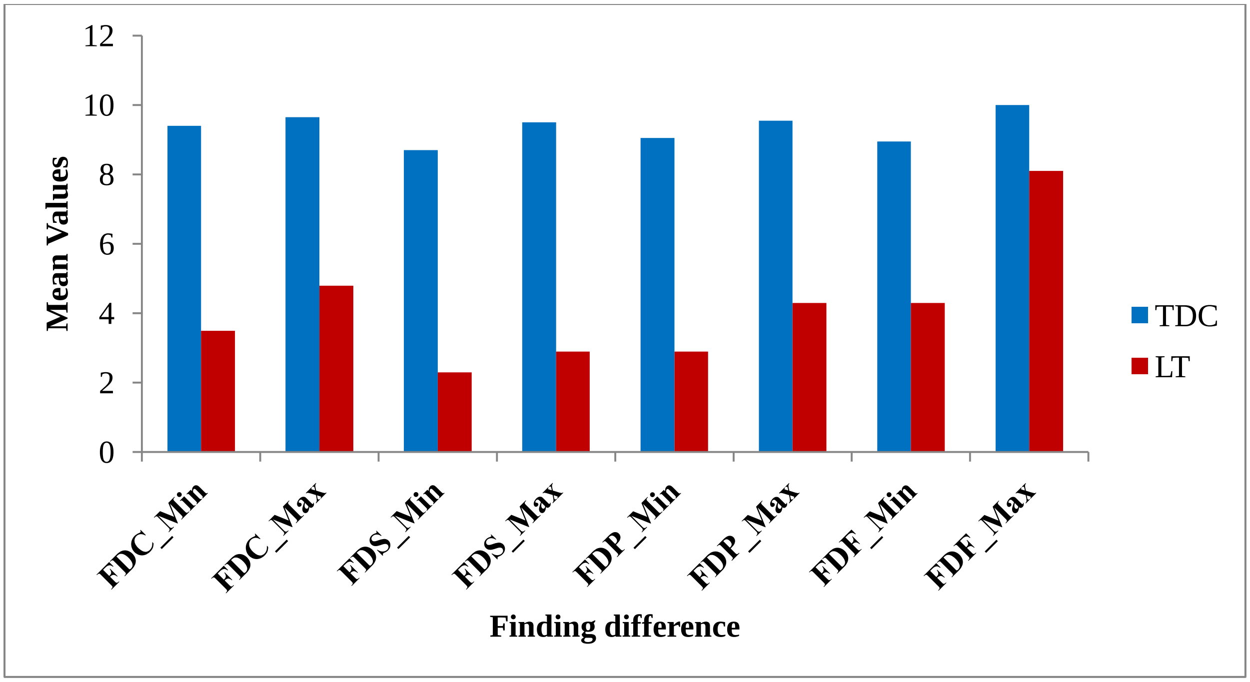

Figure 4.7 Graphical representations of mean values for 'Finding difference' task in TDC and LT.

4.2 Analyses Related to Normal Distribution

The scores obtained from all the participants were tested for normality using Shapiro – Wilk test. As per the test of normality, the scores for all the parameters of the present study were not normally distributed. Hence further analyses were carried out using non- parametric tests.

4.3 Analyses Related to the Overall Comparison of TDM and TDF on Concept Formation Task

A Mann-Whitney U test was performed across TDM and TDF to check for the performances with respect to 'Naming', 'Same/difference', and 'Finding difference' tasks of concept formation.

4.3.1 Naming task.

There was no significant difference found for 'Naming' task between TDM and TDF (/Z/ = 0.50, $p > 0.05$). This finding indicates that TDM and TDF were able to name the animals in a similar manner. The ability of naming the animals can be associated with the presence of good word retrieval skills which in turn requires deep semantic representations for object - word productions. Word retrieval is reported to be a continuous behavior that is positively influenced by semantic representation (Capone & McGregor, 2005). Word retrieval appears to be linked to the depth of semantic encoding, with greater depth leading to more efficient retrieval (Capone & McGregor, 2005). Further, it is also reported that extensive conceptual base supports word learning (Alt & Meyer, 2002). Naming is also reported to be an important means for conveying category membership and thus guiding induction. Naming is known to help children searching the similarities among members of category. This is known to be highly used by preschool children (Markman, 1987). Hence it is clear that TDM and TDF have good depth of conceptual knowledge based on the naming abilities.

4.3.2 Task of same / difference.

There was no significant difference found for minimum variations between TDM and TDF with respect to color (/Z/ = 0.61, $p > 0.05$), shape (/Z/ = 0.65, $p > 0.05$), pattern (/Z/ = 0.58, $p > 0.05$) and face (/Z/ = 2.2, $p > 0.05$). Further, maximum variations also did not show significant difference between TDM and TDF with respect to color (/Z/ = 0.66, $p > 0.05$), shape (/Z/ = 0.10, $p > 0.05$), pattern (/Z/ = 0.10, $p > 0.05$) and face (/Z/ = 0, $p > 0.05$). Most of the children were able to indicate whether the two images were same or different.

Hence, the performance related to task of indicating two pictures as 'Same / differences' with respect to color, shape, pattern, and face by TDM and TDF is in par with each other. i.e., TDM and TDF were similarly able to recognize and identify the variations of animals with respect to color, shape, pattern, and face. This finding is in agreement with the previous study which reported that there was no relationship found for 'Schematic concept formation' and gender (Shields, Gordon, & Evans, 2013). The performance is influenced by various factors, which includes detailed conceptual base / knowledge, matching abilities, and sorting skills.

TDM and TDF were also able to indicate that the images looked different for both minimum and maximum variations. The ability of TDM and TDF to indicate that the images looked different can be associated with the good and detailed enough conceptual base. It is also reported in literature that noticing these features requires well developed conceptual knowledge (Alt, Meyer, & Alt, 2013). This performance further indicates that they have acquired matching skills which is a function of concepts. They were able to match the features of color, shape, pattern and face of the variant image of animal with that of the referent image in such a way that they could recognize the differences made in the animals. It is also reported in the earlier studies that preschool children have the ability to match the objects. Matching is known to involve finding the objects that are same / alike. Once the children learn to match things, they can learn how to compare and classify items based on the physical attributes like color, shape, size etc (Destifanis & Firchow, 2004; White, 2011; Kerry Hogan, 2013; Lewis, 2014).

The ability of indicating similarities and differences means that they are able to compare the pictures. It is known that children compare or sort or classify things based on shape, color and size. They have the ability to compare and contrast the images based on concept relevant features which reflects fine development of category learning/concept attainment (Picchetti, 2011).

Preschool children will have the ability to sort out things. When children learn to sort objects they actually attend to the similarities and differences of the objects / pictures. Literature states that sorting task will eliminate the possibility of making mistakes (White, 2012; Lewis, 2014).

4.3.3 Task of 'finding difference'.

For the task of 'finding difference' there were no difference found between TDM and TDF for maximum variations with respect to color ($/Z/ = 1.03$, $p > 0.05$), shape ($/Z/ = 1.91$, $p > 0.05$), pattern ($/Z/ = 1.12$, $p > 0.05$), and face ($/Z/ = 0$, $p > 0.05$). Further the comparison for minimum variation showed no significant difference for color ($/Z/ = 0.71$, $p > 0.05$), and pattern (1.08, $p > 0.05$) except for shape (($/Z/ = 2.596$, $p < 0.05$) and face ($/Z/ = 2.236$, $p < 0.05$) where TDF had better mean scores compared to TDM for FDS_Min (mean value of TDM = 8 & TDF = 9.4) and FDF_Min (mean value of TDM = 8.4 & TDF = 9.5). Most of the children were able to find out the difference between the standard image and the variant one.

TDM and TDF have performed similarly for maximum variations of color, shape, pattern, and face. Although the performance of both TDM and TDF was good, their performance varied for stimuli with respect to minimal variations of shape and face only with TDF having better mean score compared to TDM. This indicates that both TDM and TDF have developed a depth in concept formation with respect to color and pattern compared to shape and face. This can be explained with the help of factors such as semantic memory, integration of concepts, capacity to categorize objects, well represented conceptual schema, and ability to distinguish features. It is found in the earlier studies that typically developing children were capable of identifying many semantic features like color, pattern, shape, presence of eyes etc., (Alt, Plante, & Creusere, 2004; Alt & Plante, 2006). This can be interpreted as TDM and TDF had good semantic memory i.e. integration of concepts as it is responsible for integrating information at perceptual level for example, finding out variation with respect to face using the available processing tasks. This is further supported by Plaisted (2001) who reported that semantic memory is important for integrating information at perceptual level, highlighting the influence of cognitive processes over the conceptual knowledge.

It is reported that three – four year old children will have the capability to categorize objects on a variety of dimensions. One such dimension is perceptual features like color, shape, pattern, and face (Gelman & Coley, 1990; Mandler, 1993; Mandler & Donough, 1993; Verhoeven & Snow, 2001; Alt & Plante, 2006). It is reported in the literature that preschool children will know the basic colors and it is also a means that children will use to observe and categorize what they see around. Along with the color, it is also reported that preschool children can notice the patterns too. They begin to recognize the patterns of objects, animals etc. Toddlers can recognize, identify and name the simple geometric shapes (Boehm, 2013). It is reported that shape is a means children use to observe and categorize what they see which in turn helps them to organize the diverse world around them. It is evident that even infants begin to react instinctively to the arrangement of shapes that make up the human face. Eyes, ears, nose, mouth etc are shapes which the children are exposed to (Smith, 2003). These concepts are known to stabilize by 6 years of age (Gagatsis & Patronis, 1990).

TDM and TDF having the ability to identify variations based on the category of animals shows a more abstract well – represented conceptual schema i.e., TDM and TDF having the ability to correctly exclude the variations from the category of animals is a result of broader conceptual knowledge for the animal category. To explain this in detail TDM and TDF had the ability to recognize the referent and variant images of cat e.g., the brown colored skin of cat from that of green colored skin speaks the conceptual representation that is detailed enough to recognize the essential features of 'cat' and also handle the variations in these features (Alt, Meyer, & Alt, 2013).

TDM and TDF have also developed different schemas with respect to animals because the ability to distinguish patterns, colors, shape etc., will correspond to different schema which in turn helps in learning ability. This finding is supported by Edmonds (1974). Rhodes and Colleagues (2008) found that the capacity to accept legal and reject the variability in a category shows a broader and more conceptually developed schema and that a conceptual schema would lead to acceptance of a standard image as 'normal'.

It can be interpreted that TDM and TDF had the ability to use the learnt concepts in a natural situation and to generalize them. This is supported in the literature as concept formation mirrors the experiences gained with the natural and social worlds because better concepts will be forming while interacting with the world and cultural aspects (Vygotsky, 1934). The findings are also supported by Gelman and Susan (1998) who stated that the concepts learnt by children have effect on their reasoning abilities and the concepts learnt are not uniform across individuals and tasks.

4.4 Analyses Related to the Comparison of TDC and LT on Concept Formation Task

A Mann-Whitney U test was performed across typically developing children (TDC) as against to the children diagnosed as Late Talkers (LT). Results are discussed under three sections (Naming, 'Same / difference', and 'Finding difference') which were the tasks used in the study.

4.4.1 Naming task.

There was a significant difference found for naming task between TDC and LT (/Z/ = 4.49, $p < 0.05$) suggesting that TDC were able to name the animals well when compared to LT. LT being performed lower indicated poor vocabulary growth in these children. This is supported by earlier studies which reported slow expressive vocabulary growth in children diagnosed as late talkers (Whitehurst & Fischel, 1994; Paul, 1996; Recorla & Lee, 2000; Rescorla, Mirak, & Singh, 2000). It is also known that naming errors are related with less encoded semantic information (McGregor, Newman, Reilly, & Capone, 2002). Poor naming abilities also reflect the lack of word retrieval abilities because word retrieval requires deep semantic representations for object - word productions. Word retrieval is a continuous behavior that is positively influenced by semantic representation (Capone & Gregor, 2005).

McGregor et al., (2002) found that children with Specific Language Impairment (SLI) made more naming errors than did unimpaired peers and had more words with weak semantic representations. The difficulties with encoding and depth of semantic knowledge noted in children with SLI reflect the less developed conceptual knowledge (Smith, 2003). Hence it may be attributed that poor naming abilities in children diagnosed as ‘Late talkers’ are because of weak semantic representation which in turn reflects poor conceptual knowledge (Gregor, Rost, Guo, & Sheng, 2010). This is a supporting evidence because children diagnosed as ‘Late talkers’ who continue to exhibit poor expressive skills even after the age of four years will eventually be diagnosed as SLI (Rescorla, 2000, 2002; Rescorla & Lee, 2000; Rescorla & Roberts, 2002) . It has been suggested that the term late talkers be used to describe children who are delayed in acquiring language and who are between the ages of two and four and that the term SLI be used to describe children who exhibit persisting language impairments at age of four or older (Rescorla & Lee, 2000).

4.4.2 Same / difference task.

There was a significant difference found for minimum variations between TDC and LT with respect to color ($/Z/ = 4.90$, $p < 0.05$), shape ($/Z/ = 4.45$, $p < 0.05$), pattern ($/Z/ = 4.65$, $p < 0.05$) and face ($/Z/ = 4.36$, $p < 0.05$). Further maximum variations also showed a significant difference between TDC and LT with respect to color ($/Z/ = 4.88$, $p < 0.05$), shape ($/Z/ = 4.79$, $p < 0.05$), pattern ($/Z/ = 5.15$, $p < 0.05$) and face ($/Z/ = 5.27$, $p < 0.05$).

This finding suggests that TDC and LT have performed differently in indicating that the images looked different with respect to color, shape, pattern and face of the animals. LT were not able to indicate that the images shown were looking different irrespective of minimal / maximal variations between the standard and variant image. The poor performance of the LT group to recognize the differences shows poorly developed/ inadequate acquisition of concept formation with respect to the features of color, shape, pattern and face. It is found in the earlier studies that children with SLI were not capable to identify many semantic features like color, pattern, shape, presence of eyes etc., as typically developing (TD) peers (Alt, Plante, & Creusere, 2004; Yoshida & Smith, 2005; Alt & Plante, 2006; Lewis, 2014). This finding indicates that they might be lacking matching skills which in turn impairs the sorting skills. It is reported that these skills reflect the concept attainment (Picchetti, 2011; White, 2012; Lewis, 2014). This concept attainment would develop normally in typical children which might be affected in children diagnosed as LT.

4.4.3 Finding difference task.

After indicating whether the images are same / different, children were asked to find out the difference seen between the images. For this task, there was a significant difference found for minimum variations between TDC and LT with respect to color (/Z/ = 4.39, $p < 0.05$), shape (/Z/ = 4.45, $p < 0.05$), pattern (/Z/ = 4.42, $p < 0.05$) and face (/Z/ = 4.36, $p < 0.05$). The task using the stimuli with maximum variations also showed a significant difference between the groups of TDC and LT with respect to color (/Z/ = 4.10, $p < 0.05$), shape (/Z/ = 4.52, $p < 0.05$), pattern (/Z/ = 4.44, $p < 0.05$) and face (/Z/ = 4.89, $p < 0.05$).

This indicates that LT have performed poorer in identifying the differences for all the variables than TDC suggesting inadequate abilities in identifying the variations made in the animals. Their inability to identify the even maximum variations suggests that these children might be having poor conceptual knowledge. Although there are very few studies to support these findings in LT there are many studies done in children with SLI (McGregor, 2002; Alt & Plante, 2006). It is found in the earlier studies that children with SLI were not capable to identify many semantic features like color, pattern, shape, presence of eyes etc., as typically developing (TD) peers (Alt, Plante, & Creusere, 2004; Alt & Plante, 2006). It is also found that when asked to rate the weirdness of images, SLI performed poorer compared to normal children. McGregor (2002) also found that SLI made more errors compared to normal children in finding weirdness of images. Color, shape, pattern, and face are basic concepts which help to build the semantic knowledge. Children with speech and language difficulties are known to have considerable difficulty in learning many basic concepts where these basic concepts are to begin in preschooler years and moves through the age of six (Spector, 1979).

The failure to identify the variations indicates that LT may not know many details about animals as compared to TDC. Their general concepts of animals showed an underlying continuity. This is further supported by Crowe and Prescott (2003) who found the same finding in a category production task.

Further results show that LT were better in identifying the maximum variations with respect to color, shape, pattern and face than the minimum variations. This indicates that they have developed concepts in a superficial level but lack in the depth of concept formation abilities. Literature has found that ability to find the minimal differences reflects the depth of concept development (Smith, 2003; Alt et al, 2004; Alt, Meyer, & Alt, 2013). Literature also suggests that preschool children can attend to the features, including children with language impairment and can fast map these features (Alt et al, 2004). But this was not observed in the present study.

The results also indicate that LT lack in categorizing animals and their properties / features and to retain them in their memory. The skills of categorization might be delayed because it is found in the literature that before infants begin to speak they form categories of animals, faces, emotional expressions and objects and by two years they can make interpretation regarding nouns (Gelman, 1996). Apart from categorization, it also indicates that children diagnosed as 'Late talkers' lack matching and reasoning abilities. Further they might have under developed schema responsible for conceptual for conceptual knowledge. These skills will eventually improve with stimulation if the children are not being progressed to SLI.

4.5 Analyses Related to Overall Minimum and Maximum Variations of Parameters within Each Group

To find out the performance between minimum and maximum variation, Wilcoxon Signed ranked test was administered individually for TDM, TDF and LT on 'Color Maximum – Color Minimum (C_Max – C_Min)', 'Shape Maximum – Shape Minimum (S_Max – S_Min)', 'Pattern Maximum - Pattern Minimum (P_Max – P_Min)', and 'Face Maximum – Face Minimum (F_Max – F_Min)'.

4.5.1 Typically developing males (TDM).

Wilcoxon test on TDM reveals that there was a significant difference found for S_Max – S_Min ($/Z/ = 2.214$, $p < 0.05$) and F_Max – F_Min ($/Z/ = 2.530$, $p < 0.05$) and there was no significant difference found for C_Max – C_Min ($/Z/ = 0.743$, $p > 0.05$), P_Max – P_Min ($/Z/ = 1.656$, $p > 0.05$). This finding indicates that TDM have performed similarly for minimum and maximum variation of color and pattern which suggest that they have developed concepts of color and pattern in depth. Whereas they have performed differently for minimum and maximum variation of shape and face shows they are still developing the depth in these concepts.

4.5.2 Typically developing females (TDF).

Wilcoxon test administered on the scores obtained from TDF revealed that there was a significant difference for S_Max – S_Min (/Z/ = 1.896, $p < 0.05$) and F_Max – F_Min (/Z/ = 2.232, $p < 0.05$), P_Max – P_Min (/Z/ = 2.232, $p < 0.05$). There was no significant difference for C_Max – C_Min (/Z/ = 0.816, $p > 0.05$). TDF have performed similarly for minimum and maximum variations of color which indicates that they have achieved a depth of color concept. They have performed differently for minimum and maximum variations of shape, face, and pattern indicating the ongoing development of concepts with respect to shape, face and pattern.

4.5.3 Late talkers (LT).

Wilcoxon test on LT showed no significant difference for C_Max – C_Min (/Z/ = 1.852, $p > 0.05$) and S_Max – S_Min (/Z/ = 0.564, $p > 0.05$) and there was a significant difference found for F_Max – F_Min (/Z/ = 2.831, $p < 0.05$) and P_Max – P_Min (/Z/ = 2.111, $p < 0.05$). LT have performed similarly for minimum and maximum variations of color and shape shows they are developing these concepts in a similar trend. Whereas, they have performed differently for minimum and maximum variations of face and pattern shows they are still developing these concepts in a varying extent.

4.6 Analyses Related to 'Same / Difference' Tasks and 'Finding Difference' Tasks with Respect to Minimum and Maximum Variation within Each Group

A Friedman test was performed individually for all three groups (TDM, TDF & LT) for four tasks. It was performed individually for the minimum variation of same/different task, maximum variation of same different task, minimum variation of finding difference task and maximum variation of finding difference task.

4.6.1 Analyses related to same – difference task for minimum variation.

Initially Friedman test was administered for same/difference task of minimum variation individually for TDM, TDF, and LT.

4.6.1.1 Typically developing male (TDM).

When Friedman test was performed for tasks of SDC_Min, SDS_Min, SDP_Min and SDF_Min in TDM, the performance significantly changed $\{\chi^2\ (2) = 11.81,\ p < 0.05\}$. This indicates that in indicating two images as different, TDM have performed differently across minimum variations of color, shape, pattern and face suggesting the dissimilarity in the extent of developing the depth of these concepts.

To follow up this finding, a Wilcoxon Signed rank test was administered for performing a pair wise comparison of 'SDS_Min and SDC_Min', 'SDP_Min and SDC_Min', 'SDF_Min and SD C_Min', 'SDP_Min and SDS_Min', 'SDF_Min and SDS_Min', and 'SDF_Min and SDP_Min'. There was a significant difference found between pairs of SDS_Min and SDC_Min (/Z/ = 2.070, $p < 0.05$), SDF_Min and SDC_Min (/Z/ = 2.041, $p < 0.05$), SDP_Min and SDS_Min (/Z/ = 2.041, $p < 0.05$). There was no significant difference found between the pairs of SDP_Min and SDC_Min (/Z/ =

1.414, $p > 0.05$), SDF_Min and SDS_Min (/Z/ = 0.707, $p > 0.05$), SDF_Min and SDP_Min (/Z/ = 1.841, $p > 0.05$).

4.6.1.2 Typically developing female (TDF).

When Friedman test was performed for tasks of SDC_Min, SDS_Min, SDP_Min and SDF_Min in TDF, the performance did not change significantly across the tasks {χ^2 (2) = 2.1, $p > 0.05$}. This suggested no further test required for the same.

4.6.1.3 Late talker (LT).

When Friedman test was performed for tasks of SDC_Min, SDS_Min, SDP_Min and SDF_Min in LT, the performance did not change significantly across the tasks {χ^2 (2) = 1.6, $p > 0.05$}. This suggested no further test required for the same.

4.6.2 Analyses related to same – difference task for maximum variation.

When Friedman test was performed across tasks of SDC_Max, SDS_Max, SDP_Max and SDF_Max individually in TDM, TDF and LT, the performance did not change significantly across the tasks in all three groups. This finding indicates that in indicating the images as different, TDM, TDF and LT have performed similarly for color, shape, pattern and face.

4.6.3 Analyses related to finding difference task for minimum variation.

Later Friedman test was administered for finding difference task of minimum variations individually in TDM, TDF, and LT.

4.6.3.1 Typically developing males (TDM).

When Friedman test was performed across tasks of FDC_Min, FDS_Min, FDP_Min and FDF_Min in TDM, the performance significantly changed {χ^2 (2) = 9.03,

$p < 0.05$}. This result indicates that in finding out the minimum variations of animals, TDM have performed differently for color, shape, pattern and face. This shows that they have the depth of these concepts in a varying trend/extent.

To follow up this finding, a Wilcoxon Signed rank test was administered for performing a pair wise comparison of 'FDS_Min and FDC_Min', 'FDP_Min and FD C_Min', 'FDF_Min and FDC_Min', 'FDP_Min and FDS_Min', 'FDF_Min and FDS_Min', and 'FDF_Min and SDP_Min' in TDM. There was no significant difference found between FDP_Min and FDC_Min (/Z/ = 0.333, $p > 0.05$), FDF_Min and FDS_Min (/Z/ = 0.966, $p > 0.05$), and FDF_Min and SDP_Min (/Z/ = 1.100, $p > 0.05$). There was a significant difference found between FDS_Min and FDC_Min (/Z/ = 2.209, $p < 0.05$), FD F_Min and FDC_Min (/Z/ = 2.111, $p = 0.05$), FDP_Min and FDS_Min (/Z/ = 2.157, $p < 0.05$).

4.6.3.2 Typically developing females (TDF).

When Friedman test was performed across tasks of FDC_Min, FDS_Min, FDP_Min and FDF_Min in TDF, the performance did not change significantly across the tasks {χ^2 (2) = 2.44, $p > 0.05$}. This suggests no further test required for the same.

4.6.3.3 Late talkers (LT).

When Friedman test was performed across tasks of FDC_Min, FDS_Min, FDP_Min and FDF_Min in LT, the performance did not change significantly across the tasks {χ^2 (2) = 6.85, $p > 0.05$}.

4.6.4 Analyses related to "finding difference" task for maximum variation.

A Friedman test was administered for maximum variations of 'Finding difference' task individually for TDM, TDF, and LT.

4.6.4.1 Typically developing males (TDM).

When Friedman test was performed in TDM across tasks of FDC_Max, FDS_Max, FDP_Max and FDF_Max, the performance significantly changed $\{\chi^2 (2) = 8.32, p < 0.05\}$. This result indicates that in identifying the maximum variation, TDM have performed differently across color, shape, pattern and face showing they have developed these concepts to a varying extent.

To follow up this finding, a Wilcoxon Signed rank test was administered for performing a pair wise comparison of 'FD S_Max and FDC_Max', 'FDP_Max and FDC_Max', 'FDF_Max and FDC_Max', 'FDP_Max and FDS_Max', 'FDF_Max and FDS_Max', and 'FDF_Max and SDP_Max'. There was no significant difference found between pairs FDS_Max and FDC_Max (/Z/ = 1.342, p > 0.05), FDP_Max and FDC_Max (/Z/ = 0.816, p > 0.05), FDP_Max and FDS_Max (/Z/ = 0.447, p > 0.05), and FDF_Max and SDP_Max (/Z/ = 1.841, p > 0.05). There was a significant difference found between FDF_Max and FDC_Max (/Z/ = 1.890, p < 0.05), FDF_Max and FDS_Max (/Z/ = 2.271, p < 0.05).

4.6.4.2 Typically developing female (TDF).

When Friedman test was performed in TDF across tasks of FDC_Max, FDS_Max, FDP_Max and FDF_Max, the performance did not change significantly across the tasks in all three groups $\{\chi^2(2) = 2.25, p > 0.05\}$. This suggested no further test required for the same.

4.6.4.3 Late talkers (LT).

When Friedman test was performed in LT across tasks of FDC_Max, FDS_Max, FDP_Max and FDF_Max, the performance significantly changed {χ^2 (2) = 22.03, $p < 0.05$}. This result indicates that in identifying the maximum variation, LT have performed differently across color, shape, pattern and face showing they are developing these concepts in a varying trend.

To follow up this finding, a Wilcoxon Signed rank test was administered for performing a pair wise comparison of 'FDS_Max and FDC_Max', 'FDP_Max and FDC_Max', 'FDF_Max and FDC_Max', 'FDP_Max and FDS_Max', 'FDF_Max and FDS_Max', and 'FDF_Max and SDP_Max'. There was no significant difference found between FDP_Max and FDC_Max (/Z/ = 0. 957, $p > 0.05$). There was a significant difference found between pairs of FDS_Max and FDC_Max (/Z/ = 2.393, $p < 0.05$), FDF_Max and FDC_Max (/Z/ = 2.655, $p < 0.05$), FDP_Max and FDS_Max (/Z/ = 2.392, $p < 0.05$), FDF_Max and FDS_Max (/Z/ = 2.809, $p = 0.05$), and FDF_Max and SDP_Max (/Z/ = 2.680, $p < 0.05$).

The TDM performed equally for the tasks to indicate whether the images with maximum variations were same or different with respect to color, shape, pattern, and face suggesting that TDM have developed these concepts in a similar amount. Further, when asked to indicate whether the images with minimum variations were same or different, they have performed differently for all the variables related to color, shape, pattern, and face. Although most of the TDM were able to indicate whether images are same or different they are still acquiring the depth of concepts in a different trend only with respect to minimal variations. Further on pair wise comparison, it can be clearly noted that TDM have differently performed across pairs of shape and color, face and color, pattern and shape and have performed similarly across pattern and color, face and shape, face and pattern. Based on the mean values, it was found that TDM have performed well for variation of color (SDC_Min = 9.9) than pattern (SDP_Min = 9.7), face (SDF_Min = 9), and shape (SDS_Min = 8.8) although the differences were very minimal. Hence, this finding clearly showed that TDM are developing the concepts for shape and color, face and color, pattern and shape in a different amount/trend and have developed concepts for pattern and color, face and shape, and face and pattern in a similar amount/trend.

During the task of identifying the minimum variations, TDM have performed differently for color, shape, pattern, and face suggesting that they have acquired these concepts in a different trend. Further on a pair wise comparison, it was found that they have performed similarly for shape – color, pattern – color, pattern – shape, face and pattern and differently for face – color, face and shape. When asked to find out the minimum variations also they have performed differently across all variables. In Pair wise comparison they have similarly performed across pattern – color, face – shape, face – pattern whereas they have differently performed for shape – color, face – color, pattern and shape. Hence it can be concluded that TDM have acquired these concepts superficially and is in the process of stabilization respectively. It is understood that whether the variations were minimum or maximum and the tasks are finding out "same/difference" or identifying the variations, there was a differential performance seen in TDM with respect to color, shape, face and pattern changes.

With regard to TDF, the findings showed that they have performed similarly for color, shape, pattern, and face irrespective of minimum or maximum variations for both 'same/difference' task and identifying variations, indicating a similar trend in the acquisition of these concepts. This finding clearly indicates that TDF have developed and have stabilized these concepts in depth compared to TDM. Language acquisition is found to be faster in females compared to males and language is in turn preceded by concepts. This in turn suggests that females will have faster rate in acquiring concepts too. It is known that males produce their first words and sentences later than females. In a normal range of language acquisition females will fall under the earlier end and males at the later end (Ozcalskan & Goldin – Meadow, 2010).

Whereas LT have performed poorly in all the tasks and in all the variables compared to TDC. Further, within group comparison across variables in LT indicated that for the task of finding out "same or difference" in animals they have performed similarly for color, shape, pattern, and face irrespective of minimum and maximum variations. In the task of identifying the variations which are maximal showed differential performance but with respect to minimum variations the performance was similar. LT performing similarly for minimum variations with respect to color, shape, pattern, and face indicates that the process of forming concepts are emerging with respect to minimum variation between standard and variant images used in present study. Whereas, their inability to indicate these variations can be attributed to the lack of expressive skills. The pair wise comparison indicated the significant differences between the four features on maximum variations. Based on the mean values it was found that LT have performed better for face (FDF_Max = 8) than color (FDC_Max = 4.8), pattern (FDP_Max = 4.3), and shape (FDS_Max = 2.3).

4.7 Analyses Related to the Computerized Linguistic Protocol for Screening (CLIP)

Descriptive statistics was performed to obtain the mean and median values along with the standard deviation for the groups of TDM, TDF, and LT with respect to 'Semantics – reception', 'Semantics – expression', 'Syntax – reception' and 'Syntax – expression' sections of CLIP. TDM and TDF had similar mean values for receptive and expressive skills with respect to semantics and syntax.

LT having lesser mean values than TDC showed a lack of age adequate receptive and expressive skills. Within the group of LT the mean values for receptive skills of semantic section was higher than the mean values for expressive skills of semantics, receptive and expressive skills of syntax section.

Table 4.3 depicts the descriptive statistics representing the mean, median, and SD values for all the sections of CLIP with respect to TDM, TDF, and LT. Figure 4.8 is the graphical representation of mean values of CLIP in TDM, TDF, and LT.

Table 4.3

Descriptive statistics of TDM, TDF, and LT on CLIP

Parameter	**Group**	**M**	**SD**	**Median**
Sem_Rec	TDM	29.40	0.96	29.50
	TDF	29.80	0.63	30
	LT	27.50	3.38	29
Sem_Exp	TDM	22.60	1.17	22
	TDF	23.80	0.91	23.50
	LT	16.50	10.04	22
Syn_Rec	TDM	22.40	2.79	23
	TDF	23.50	1.26	24
	LT	18.23	7.39	22
Syn_Exp	TDM	15.20	1.54	16
	TDF	15.70	1.94	15
	LT	10.80	7.11	14.50

TDM = Typically developing male, TDF = Typically developing female, LT = Children diagnosed as 'Late talkers', M = Mean, SD= Standard deviation, Sem_Rec = Semantics –

Reception, Sem_Exp = Semantics – Expression, Syn_Rec = Syntax – Reception, Syn_Exp = Syntax – Expression.

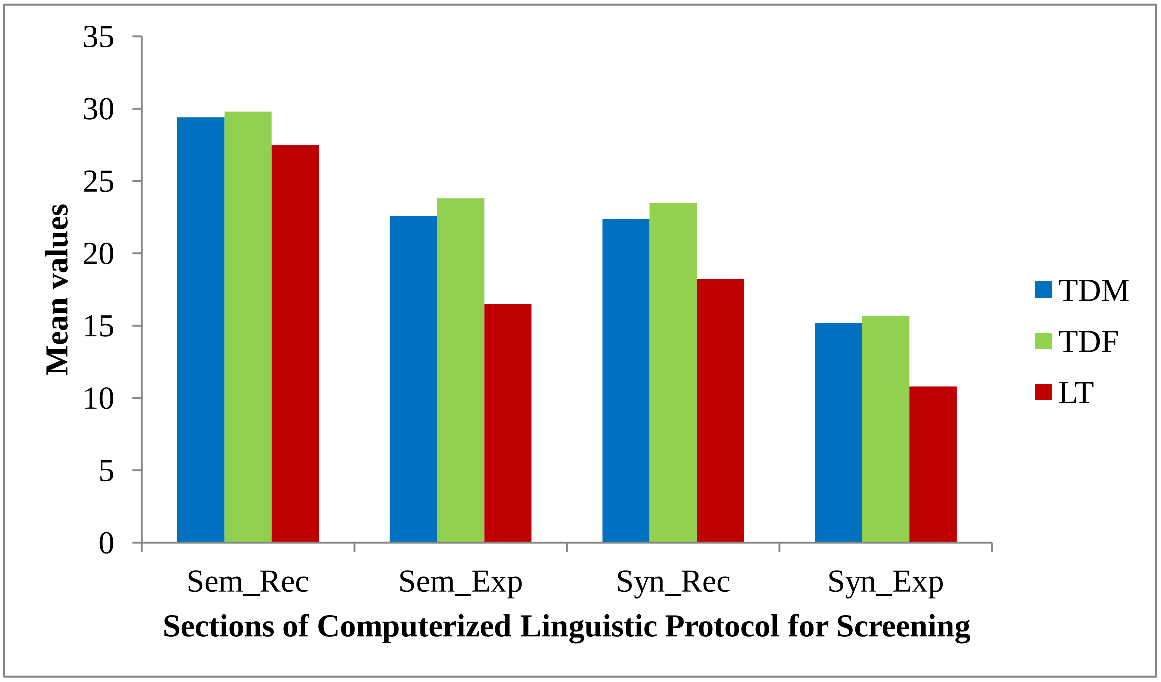

Figure 4.8 Graphical representations of mean values for all the sections of CLIP on TDM, TDF, and LT.

The mean values of CLIP indicate that TDM and TDF have age adequate receptive and expressive skills with respect to semantics and syntax tasks. Whereas, LT had age adequate receptive skills with respect to only semantics and not expressive skills with respect to semantics, receptive skills of syntax and expressive skills of syntax. This suggests that they have acquired better comprehension with respect to semantics than syntax and have not acquired expressive skills with respect to both syntax and semantics. It is reported in the previous studies that children in the age of three to four years can learn even complex sentence structures i.e. a sentence containing more than a clause and the basic pattern of sentence suggesting that the development of syntax is yet to establish.

They also may have a fine semantic development which can be reflected in their vocabulary usage. They will be having the acquisition of nouns, pronouns, auxiliary verbs, irregular verbs, conjunctions, comparatives markers and superlative markers, negation, yes / no questions. The syntax development would be in process of stabilization till 9 years but with respect to semantics they can understand these with 58 % accuracy (Klima & Bellugi, 1966; Gaer, 1969; Evin & Trip, 1970; Bloom, 1970; Brown, 1973; Layton, Stick, Clark, & Eve, 1974, David, 1974; Garman, 1976; Menyuk, 1977; Hood & Bloom, 1979; Wing & Scholnik, 1981; Drozd, 1995; Seymour & Roeper, 1999; Braisby & Dockrell, 1999).

The children diagnosed as LT have performed poorer in all sections compared to TDC. This suggests that they do not have age adequate language skills except receptive skills of semantics domain suggesting better acquisition of receptive part of semantic skills. But they have not acquired age adequate skills with respect to expression of semantics, reception of syntax, and expression of syntax. This finding is in support with Bernstein, Tigerman, and Farber (2002) who reported that children diagnosed as 'Late talkers' will have a delay in their language expression than the reception. Further it is reported that children diagnosed as 'Late talkers' will have slow expressive language growth (Whitehurst & Fischel, 1994; Paul, 1996; Recorla & Lee, 2000; Rescorla, Mirak, & Singh, 2000). They will have poorer outcomes because of poor vocabulary usage because they acquire their lexicon slowly. Their milestones also may not be developing in a normal rate and hence having poor naming and lower syntactic abilities (Scarborough, 1990, 1991). Leonard (2000) found that LT will have marginal levels of syntactic and semantic skills and hence stated that LT must be regarded as children at risk for language disorder.

4.8 Analyses Related to the Screening Picture Vocabulary Test in Kannada (KPVT)

Descriptive statistics was performed to obtain the mean and median values along with the standard deviation for the groups of TDM, TDF, and LT for KPVT. Table 4.4 depicts the results of descriptive statistics showing mean, median, and standard deviation for all three groups on KPVT. Figure 4.9 is the graphical representation of mean values of KPVT in TDM, TDF, and LT.

Table 4.4

Descriptive statistics of TDM, TDF, and LT on KPVT

Groups	**N**	**M**	**SD**	**Median**
TDM	10	63.33	15.71	68.33
TDF	10	68.99	12.67	68.33
LT	10	19.66	10.82	18.33

TDC = Typically developing male, TDF = Typically developing female, LT = Children diagnosed as ‘Late talkers’, KPVT = Screening Picture Vocabulary Test in Kannada, M = Mean, SD = Standard deviation, N = No. of participants.

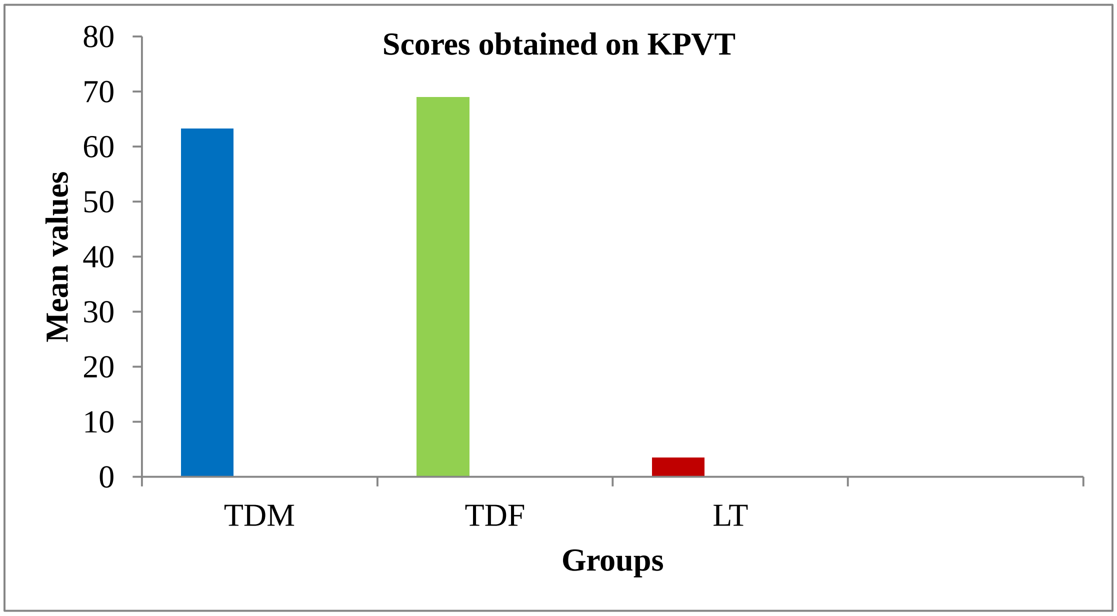

Figure 4.9 Graphical representations of mean values for KPVT on TDM, TDF, and LT

This result suggests that TDM and TDF have better vocabulary usage compared to LT who had very poor usage of vocabulary. It can be reasoned that the poor vocabulary development in LT may be due to less extensive conceptual base support for word learning. Poor concept formation accounts for the lower levels of vocabulary acquisition in SLI (Gregor, Newman, Reilly, & Capone, 2002). The same finding was found in study done by Gray, Plante, Vance, and Heurichsen (1999).

It is reported that by 18 months, children would have begun a vocabulary explosion, adding roughly nine words each day to their vocabulary. The new words will encode concepts and hence it can be assumed that one to two year old children are skillful at concept acquisition (Carey, 1978). Further, literature has reported that children in 3 – 4 years can use 1000 – 1600 words (Owens & Robert, 1996; Stahl & Stephen, 1999). Preschool children will be continuing to build vocabulary by learning about the meanings of the words. This will take place based on physical context, semantic memory, prior knowledge, social contact conversation. In physical context presence of objects and things is exposed to the child in both words and visual reference for words. Prior knowledge is important for building up further words using learnt words. Also, social contact to get involved in conversation and reading, support of semantic memory, are the most probably used way to build up vocabulary. Hence it can be interpreted that TDM and TDF have acquired these skills age adequately (Gathercol et al., 1992; Simmons & Kammenui, 1995; Bloom & Markson, 1998; Tabors, Beals & Weizman, 2001; Kamil & Heibert, 2005; Newtom, Padak, & Rasinki, 2008; Lecleraq & Majerus, 2010). LT have performed poorly in vocabulary usage suggesting a lack in these skills.

4.9 Correlation of Concept Formation and Language Performance

In order to find the correlation, a Pearson Correlation was performed separately in TDM, TDF, and LT across tasks of Concept formation (CF), Computerized Linguistic Protocol for Screening (CLIP), and Screening Picture Vocabulary Test in Kannada (KPVT).

4.9.1 Correlation of CF, CLIP, and KPVT in TDM.

In TDM, there was a negative correlation between Concept formation (CF), Computerized Linguistic Protocol for Screening (CLIP) and Screening Picture Vocabulary Test in Kannada (KPVT). Table 4.5 depicts the correlation between CF, CLIP and KPVT in TDM. This suggests that there was no effect of concept formation on receptive skills, expressive skills and on vocabulary usage in TDM.

Table 4.5

Correlation of CF task, CLIP and KPVT in TDM

TDM	**CF**	**CLIP**	**KPVT**
CF	1	-0.18	0.26
CLIP	0.6	1	-0.2
KPVT	0.26	-0.24	0

TDM = Typically developing males, CF = Concept formation, CLIP = Computerized Linguistic protocol for Screening, KPVT = Screening Picture Vocabulary Test in Kannada.

4.9.2 Correlation of CF, CLIP, and KPVT in TDF.

In TDF, there was again a negative correlation between Concept formation (CF), Computerized Linguistic Protocol for Screening (CLIP) and Screening Picture Vocabulary Test in Kannada (KPVT). Table 4.6 depicts the correlation between CF, CLIP and KPVT in TDF. This suggests there was no effect of concept formation on receptive skills, expressive skills and on vocabulary usage in TDM.

Table 4.6

Correlation of CF task, CLIP and KPVT in TDF

TDF	**CF**	**CLIP**	**KPVT**
CF	1	0.06	-0.03
CLIP	0.06	1	-0.16
KPVT	-0.03	-0.16	1

TDF = Typically developing females, CF = Concept formation, CLIP = Computerized Linguistic protocol for Screening, KPVT = Screening Picture Vocabulary Test in Kannada.

Hence in both TDM and TDF, the negative correlation between language and concept formation indicates that the tests were not sensitive enough to check the minimal discrepancies. A detailed diagnostic test may provide the correlation between the language performance and concept formation. Secondly, the test on concept formation including animal membership only cannot represent the function of entire system. A measure of one kind of knowledge or detecting individual features does not cover someone's entire representation, in other words it cannot indicate how an individual integrates them into larger representation (Funnell et al., 2006). Further the tasks used for examining concept formation in TDC would have been simpler to them.

4.9.3 Correlation of CF, CLIP, and KPVT in LT.

In LT, a positive correlation was found between Concept formation (CF) and Computerized Linguistic protocol for Screening (CLIP) at the level of $p < 0.001$. There was no correlation found for CF with KPVT and CLIP with KPVT. Table 4.7 depicts the correlation between CF, CLIP and KPVT in LT. This shows concept formation had an effect on receptive skills, expressive skill and vise versa in LT.

Table 4.7

Correlation of CF task, CLIP and KPVT in LT

LT	**CF**	**CLIP**	**KPVT**
CF	1	0.93	0.53
CLIP	0.9	1	0.51
KPVT	-0.53	0.12	1

LT = Late Talkers, CF = Concept formation, CLIP = Computerized Linguistic Protocol for Screening, KPVT = Screening Picture Vocabulary Test in Kannada.

Impairment in language may be due to the lack in the conceptual development because conceptual development is closely related to language development. This is supported by Smith, 2003; Yoshida and Smith, 2005. Language involves cognition and concept formation helps in performing cognitive activities. Concepts play an important function for a range of cognitive tasks like identifying objects in the world, forming analogies, making inferences that extends the existing knowledge through inductive inference where these inferences are not only based on similarities but variations also (Carey, 1985; Gelman & Markman, 1986, 1987). Language development mainly includes receptive skills and expressive skills. It is reported that concept formation precedes expressive skills, i.e. even before infants begin to speak they begin to form categories of speech sounds, faces, emotional expressions, colors, objects, animals, and mappings across modalities (Gelman, 1999). In forming these categories concepts play a major role. If categorizing skills are impaired then children' experiences will be filled with confusions with respect to objects, properties, sensations, events etc and hence it will be too difficult to hold in the memory (Thamaray, 2015).

Further adequate comprehension of different concepts will help children to follow instructions and be specific / precise in what they are talking about. Before children use concepts in spoken language they need to have a good understanding about what these concepts are and what they really mean. This will further help in following instructions at home, at preschool and in the social environment (Thamaray, 2015). If they do not have appropriate concepts then they might have problems in understanding and following instructions.

It is believed that the new words learnt encode concepts suggesting that concept acquisition is related to vocabulary usage which in turn is a language skill. During this acquisition, concept formation precedes language. Arunachalam and Waxman (2010) has reported that, for a child to acquire new words, first the child should identify a conceptual unit followed by a linguistic unit and later the child must create mapping between them or link between them. Earlier studies on children diagnosed as 'Late talkers' indicate that these children will have a poor vocabulary usage (Whitehurst & Fischel, 1994; Paul, 1996; Recorla & Lee, 2000; Rescorla, Mirak, & Singh, 2000). Apart from these skills, 'matching' will help this process of acquisition. Literature reports that matching will help children in pre reading skills which in turn will strengthen the vocabulary. Matching involves recognition of similarities and differences. This type of recognizing the similarities and differences between the features will prepare the children in the future to apply these skills in finding differences between letters and numerals. Along with matching, sorting is also a conceptual task and both are known to be useful in development of language as it provides the opportunities to hear a verbal label associated with visual cue. Once the verbal children hear the label they will repeat the word during the task and may eventually start using it in natural contexts (Smith, 2003; Gregor, 2010; White, 2011; Hogan, 2013; & Lewis, 2014). Features like color, shape, size etc also act as symbols and hence help the child to read the letters in the later period. Capone and Gregor (2005) have reported that shapes will enrich the semantic knowledge which in turn will help in improving the word productions. It is known that concepts help in understanding direction, location, position, number, quantity, sequence, attributes, dimension, size and similarities. Having knowledge on concepts also helps understanding the rules and structures of language. Appropriate rules and structures of language system play a role in the society. One of the language structures helpful in the process of understanding and use of language is having the knowledge of concepts (Thamaray, 2015). If concepts are impaired then children might use incorrect concepts in their expressive language. They may not be specific while talking and may have vague statements like ‘that one’, ‘this one’ etc., or may use gestures and pointing rather than words. For example, instead of saying ‘I want big red car toy’, they might say ‘that one there’. Further they might fail in communicating their wants, needs, thoughts, and ideas through language (Markman, 1989) which was observed in the present study as well.

Another way of discussion would be the role played by language on the concept formation. Initially, language serves as representations of ideas and concepts where concepts take place through linguistic behaviors. During the process of designing a concept, linguistic behaviors represent the structure of thought. Secondly, language serves in the process of execution of concepts into action.

On the basis of these studies it can be concluded that Language abilities and concept formation are interrelated and hence may have effect on each other and it is extremely evident in children with language impairment such as LT. It is clear that during early word learning, concept formation and language converge crucially (Arunachalam & Waxman, 2010; Seel, 2012). This was the reason for assessing both language and concept formation tests in all the participants. Literature reports that when trying to measure the conceptual knowledge of children it is important to know the language issues especially in language impaired children (Gregor, 2010).

Further, there is an ongoing debate stating whether ability to think comes first or ability to speak comes first. There are three main aspects in ongoing research. One being language development is largely independent of cognition. Second that cognition influences both language and its rate. Third being language precedes cognition and it influences on thought development (Evans, Vyvyan, & Green, 2006). It is also reported that language and thought seem to be inseparable (Vygotsky, 1986).

Chapter V

Summary and Conclusion

The present study aimed at the comparison of concept formation and language performances across 'Late talkers' (LT) and typically developing children (TDC). A total of 30 children including ten typically developing males (TDM), ten typically developing females (TDF), and ten 'Late talkers' (LT) served as participants for the present study. In order to check the language performance, CLIP (Computerized Linguistic Protocol for Screening) and KPVT (Screening Picture Vocabulary Test in Kannada) were administered. A stimulus on concept formation was developed based on the method used by Jaswal and Markman (2002), Janani and Prema (2004), and Alt, Meyers, and Alt (2013).

Twelve images of domestic animals were collected which served as standard images. Minimum and maximum variations were made for each standard image with respect to four features i.e. color, shape, pattern, and face. Standard image and its respective eight variant images formed one set. Out of 12 sets, two complete sets consisting of 18 images were used for practice trials and ten sets consisting of 90 images served as test stimuli. The children were asked to perform three tasks. In the first task, the children were expected to name the ten standard animals. In the second task, they were instructed to indicate whether the two animals (standard & variant) looked similar or different. In the third task, they were instructed to identify the variations. Both verbal and non-verbal responses were accepted for third task only. Every correct response was scored '1' and incorrect response was given '0'.

Appropriate statistical analyses were administered and the results were discussed initially for TDM Vs TDF and TDC Vs LT for all three tasks. Further discussions were based on within group comparison for TDM, TDF and LT individually for all three tasks. On comparing TDM Vs TDF it was found that the performance was similar across the tasks. Hence TDM and TDF together formed the group TDC. On comparing TDC and LT, the performance of LT was found to be poorer than TDC in all the tasks. Although it was not clear from the study that which aspect of variation (i.e. color, shape, pattern, and face) was better in TDC it was evident that females performed similarly across minimum and maximum variation irrespective of the stimuli, TDM performed differently to minimal variations and not for maximal. Whereas LT performed poorer as compared to TDC on all these aspects and further their performance was different within same / different, finding different in minimum and maximum variation.

These results indicated that TDM and TDF have performed similarly for most of the tasks indicating a similar amount of development of concepts for most of the features. But LT's poor performance in all tasks indicated impairment in the development of concepts. It is known in the literature that SLI would have poor conceptualization of features (Specter, 1979; McGregor, 2002; Crowe & Prescott, 2003; Alt, Plante, & Creusere, 2004; Yoshida & Smith, 2005; Alt & Plante, 2006; Alt, Meyers, & Alt, 2013; Lewis, 2014). Further, TDM performing differently for the features of color, shape, pattern and face suggests that they are developing these concepts in a different trend / amount as compared to TDF who performed similarly for all the features suggesting that they have acquired these concepts in a similar amount. This was depicted in the way TDF were able to recognize even the minimal variations of features further indicating the presence of a depth in conceptual representations. Literature has found that ability to find the minimal differences will reflect the depth of concept development (Smith, 2003; Alt, Meyer, & Alt, 2013). Whereas, LT's poor performance indicated that they have an impaired development of concepts. Their different performance in finding out maximum variations indicates that there is an ongoing development of these concepts and they are yet to get established and stabilized.

Correlation analysis was performed to check for the correlation between language performances and concept formation across the three groups. In TDM and TDF there was a negative correlation between Concept formation (CF), Computerized Linguistic Protocol for Screening (CLIP) and Screening Picture Vocabulary Test in Kannada (KPVT) suggesting concept formation did not have an effect on receptive skills, expressive skills and on vocabulary usage in TDM and TDF. This indicates that the tests were not sensitive enough to check the minimal discrepancies. A detailed diagnostic test may provide the correlation between the language performance and concept formation. Secondly, measure of one kind of knowledge or detecting individual features may not cover the entire representation (Funnell et al., 2006). There is evidence that concept formation and language converge during the early word learning in children and the participants in the present study have progressed from early word learning stage (Arunachalam & Waxman, 2010; Seel, 2012).

Whereas in LT, the positive correlation found between Concept formation (CF) and Computerized Linguistic protocol for Screening (CLIP) shows concept formation had an effect on receptive skills, expressive skill and vise versa in LT. It is known that language development mainly includes receptive skills and expressive skills. It is reported that concept formation precedes expressive skills, i.e. even before infants begin to speak they begin to form categories of speech sounds, faces, emotional expressions, colors, objects, animals, and mappings across modalities (Gelman, 1999). In forming these categories concepts play a major role. Since the language skills are yet to develop age adequately in children diagnosed as LT there is role played by conceptual knowledge in the early learning process which was not evident in typically developing children.

Hence it can be concluded that concept formation which is the sub-division of cognition has a role to play in the language development and vice versa. Further it can be concluded that in three – four year old children the features of color, shape, pattern and face are acquired differently by male and female. The females have faster development compared to males who will be still developing the depth of concepts. Hence, children diagnosed as 'Late talkers' will have an impaired conceptual development which might be affecting their receptive and expressive skills respectively.

5.1 Clinical Implications

1. The study helped in understanding the differential acquisition of concepts in male and female typically developing children.
2. The present study helped in understanding the development of concepts in children diagnosed as 'Late talkers' in the age range of three – four years.
3. The study enhanced the knowledge of correlation between minimal and maximum variations of visual images and their impact on accuracy of performances in TDC and LT.

4. The study also helped in finding out the severity of impaired conceptual acquisition in children diagnosed as ‘Late talkers’.
5. The present study further helped in understanding the correlation between concept formation and language performance in TDC and LT.
6. The knowledge of conceptual development in typical and clinical population helps in rehabilitation of children with expressive language delay.

5.2 Limitations

The study assessed only a part of conceptual development by selecting animals which may not represent the whole system. The study included small sample size and did not include different age range. Inclusion of different age range will help in understanding the milestone of concept development which will in turn help in the process of assessment and intervention.

5.3 Future Direction

The study examined only the correlation between language and concept formation. There are evidences that show the relation between cognitive skills and concept formation and further their influence on language development. There is an ongoing debate on whether the ability to think comes first or ability to speak comes first. Based on this, three kinds of statements are made. Firstly that language development is independent of cognition. Secondly language and its rate of development are influenced by cognition. Thirdly language precedes cognition and thus it influences the thought (Evans, Vyvyan, & Green, 2006). Hence the study can be extended to investigate relation between cognition, concept formation, and language development.

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