REPRESENTATION OF CONCRETE AND ABSTRACT WORDS IN MENTAL LEXICON OF CHILDREN WITH LEARNING DISABILITY

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CERTIFICATE

This is to certify that this dissertation titled **"Representation of Concrete and Abstract Words in Mental Lexicon of Children with Learning Disability"** is a bonafide work submitted in part fulfillment for the degree of Master of Science (Speech-Language Pathology) by the student holding Registration Number: 17SLP029. This has been carried out under the guidance of a faculty member 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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DECLARATION

This is to certify that this dissertation entitled **"Representation of Concrete and Abstract Words in Mental Lexicon of Children with Learning Disability"** is the result of my own study under the guidance of Dr. Jayashree C Shanbal, Associate Professor in Language Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysuru, 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

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Chapter 1: Introduction

Language is the primary modality for the purpose of exchange of ideas and thoughts. We perceive the world around us through our senses. We see, touch, feel, articulate and manipulate entities of this world- physical or otherwise, and gain experiences from it. These sensorimotor experiences store a core set of information and this information is encased in linguistic units called words. These words are further stored in our mental dictionary and this dictionary is what we call as mental lexicon.

Language like other functions requires that information be learned and stored in memory. Language is the primary modality for the purpose of exchange of ideas and thoughts. We perceive the world around us through our senses. We see, touch, feel, articulate and manipulate entities of this world- physical or otherwise, and gain experiences from it. These sensorimotor experiences store a core set of information and this information is encased in linguistic units called words. These words are further stored in our mental dictionary and this dictionary is what we call as mental lexicon.

Several theories, models and priming studies have shown that these representations have a complex interwoven pattern. Thus organization of these concepts is important so as to enable appropriate selection of words for effective communication. When looking into organization of words, they are usually aligned with each other based on their features. Along those lines, a word can be bifurcated into two dimensions- of concrete and abstract, based on the ability of the word to evoke a sensory experience (Paivio, Yuille & Magidan, 1968). If the features of the word activate visual, tactile, somesthetic or other modality specific sensory

experiences, the word is said to have a high degree of ‘concreteness’ The concrete words symbolize tangible, physical entities and as such are loaded with sensori-motor information. Similarly, few arbitrary verbal codes or words that do not entail specific properties of sensori-motor experiences have low degree of ‘concreteness’. These words are labeled as abstract words.

Once the organization of the words is achieved, the next process in line is representation and processing of these words in the mental lexicon. In the field of Language, there existed a plethora of studies that delve into description and formulation of word processing skills. These studies augment our understanding how language especially word formation, representation and organization occurs in the human brain. Along these lines, the present study also aimed to look into mental representation of concrete and abstract words.

Need for the study

In the Indian educational framework, almost every child is exposed to more than one language. As such, their mental lexicon is theorized to have a representation of words in the languages known. Of late, a number of studies have been conducted to study the nature of this organization in their lexicon by means of studying concrete and abstract words’ representation. But these studies are limited to English and other European languages. Furthermore, in a majority of the studies the participants have been monolinguals who had medium of instruction in schools same as their native language. Thus there exists a dearth in the literature in cases where the population is at the least, bilingual. This scenario was found to be very much existent in an Indian population. The heterogeneity spread wide across the Indian languages substantiated the need to study these representations in the target population. There was also a lack

of studies which looked into these aspects in children with Learning Disability. Based on present researches, it was evident that lexical representation of concrete and abstract words had an impact on verbal language tasks as well as different operational tasks within and beyond the school environment. Thus there existed a need to study the representations and associated processes in question, in the children with Learning Disability.

Aim of the study

To examine the nature of representation of concrete and abstract words in children with Learning Disability.

Objectives of the study

a) To investigate the nature of representation of concrete and abstract words in the lexicon of children with Learning Disability, aged 9 to 11 years (including grades 4, 5 and 6) as compared to age and gender matched typically developing children.
b) To interpret the manner of organization of concrete words and abstract words in the lexicon of children having Learning Disability.

Hypotheses

$H_0 1$ There is no significant difference in the representation of concrete and abstract words in mental lexicon of children with learning disability as compared to typically developing children.

$H_0 2$ There is no significant difference in the manner of organization of concrete and abstract words in mental lexicon of children with learning disability in comparison to typically developing children

Chapter 2: Review of Literature

When looking into organization of words, they are usually aligned with each other based on their features. Along those lines, a word can be bifurcated into two dimensions- of concrete and abstract, based on the ability of the word to evoke a sensory experience (Paivio, Yuille & Magidan, 1968). If the features of the word activate visual, tactile, somasthetic or other modality specific sensory experiences, the word is said to have a high degree of 'concreteness' The concrete words symbolize tangible, physical entities and as such are loaded with sensori-motor information. Similarly, few arbitrary verbal codes or words that do not entail specific properties of sensori-motor experiences have low degree of 'concreteness'. These words are labeled as abstract words. Once the organization of the words is achieved, the next process in line is representation and processing of these words in the mental lexicon.

A study by Cruth and Warrington (2005), formulates that a difference in responses to concrete and abstract word can be ascribed to them having different qualitative representations, that is concrete concepts are categorized by semantic similarity and abstract concepts are organized by association. Paivio, Yuille and Magidan (1968) stated that concrete and abstract words are composed of specifically separate set of experiences. Thus they can undergo separate processing as well as have separate representations at the central level. When a variety of cognitive tasks such as paired associate learning, translation, comprehension tests, lexical decision task, free recall were examined in a number of studies (e.g. Day, 1977; de Groot, Danenburg, & van Hell, 1994; Holmes & Langford, 1976; James, 1975; PAivio, 1971, 1986) it was observed that concrete words are easier to process than abstract words. This advantage in processing of concrete words over abstract words has been referred

to *concreteness effect*. Several studies in literature that look into the concreteness effect also reveal that concrete words are more comprehensible than abstract words. This means that concrete words are understood better and more easily than abstract words.

ERP studies such as those on post-lexical semantic processing (N400) reveal that word concreteness alter some components of the potential. Words having high degree of concreteness elicit greater negativity than abstract words within the N400 epoch (Holcomb, Kounios, Anderson, & West, 1999; Kounios & Holcomb, 1994; West & Holcomb, 2000). This finding was interpreted as indicative of greater activation of semantic information for concrete words as compared to abstract words, thereby facilitating word comprehension and faster response.

There are two models which further look into the concreteness effects. These are context availability theory (Schwanenflugel, Akin, & Luh, 1992) and dual coding theory (Paivio, 1971, 1986). Studies in support of these models are discussed in the following segment.

Context Availability: Altarriba, Bauer and Benvenuto (1999) in their study, speak about context availability. They state that it is easier to recover a context involving concrete words rather than a context having an abstract word. For example, it would be easier to think of a context for the word book (concrete) than for the word fatigue (abstract). In their study the experiment included a concreteness rating scale, context availability scale and an imageability scale for different word types being studied. It was found that words that had high rating on concreteness, had a high-rating on context availability scale too. It was however found that correlations between context availability and imageability were not significant for concrete words. For abstract

words, this correlation was significant. Based on these results, it was conceded that correlation between scales was reliant on word type. These observations substantiate the fact that abstract and concrete words differ in their inherent characteristics.

Schwanenflugel and Shoben (1983) in their study concluded that concrete concepts are experienced in a wider range of contexts and also more frequently. Thus activation of these concepts has a wider spread in the network at central level. Thereby it can be hypothesized that in processing, concrete words have an advantage due to their ease of being assigned to context as compared to abstract words.

Dual Coding Theory: The Dual Coding Theory encompasses two channels of processing- verbal and non-verbal that function independently, but have interconnected representational systems. Processing in either channel can have a cumulative effect for the concept which is represented in both streams. Concrete concepts find representation in both channels whereas abstract concepts are readily represented only in verbal channel (Paivio, 1986). It thus explains the advantage that concrete concepts have during their processing owing to additive effect from both channels.

The Dual Coding Theory (Clark & Paivio, 1971, 1986) also gives examples of concrete words and hypothesizes that these words evoke images. This imagery enhances memory and comprehension. It is based on the assumption that basic mental structures are networks associating verbal and imaginal representations. The stored images of concrete words allow them to have connection with the imaginal system. Thus there is another additional way in which concrete words can be stored and retrieved. Abstract words, on the other hand, lack representation in the imaginal

system. This further enhances the likeability of concrete words being recalled as compared to abstract words.

Processing of the words involves development and activation of these structures, and this processing also includes effect of context on the spreading action of activation. In Dual Coding Theory, imagery and verbal mental representations are considered to be important determinants of word processing function. When studying the concreteness of a material, its processing is strongly determined by its imagery value. In theory, imagery and concreteness are reflective measures for the strength and availability of a word. Concrete words such as bottle, bus, watch and book denote tangible objects that will have greater likelihood to have corresponding images as compared to abstract words. Abstract words such as heat, force, weight, cold, fatigue do not refer to tangible objects or physical events. Thus they are less likely to evoke an image of specific referents.

Dual-coding theory finds evidence in studies which discuss the theory in relation to functional asymmetries between the two hemispheres. It is assumed that the imaginal system is represented in the right hemisphere and verbal representation in the left hemisphere. ERP studies have shown more negative response for concrete words than abstract words over the right hemisphere (Kounios & Holcomb, 1994). Dual coding theory also finds support in several behavior studies using visual hemifield stimulation (Day, 1977; Hines, 1977; Levine & Banich, 1982; Shibahara & Lucero-Wagoner, 2002), as well as in clinical studies of right-hemisphere damaged patients (Eviatar, Menn, & Zaidel, 1990; Funell, Corballis, & Gazzaniga, 2001; Villardita, Grioli, & Quattropani, 1988).

In a fMRI study by Fiebach and Friederici (2003) the authors utilized new event-related data in the processing of concrete and abstract words in a lexical decision task. It was observed that abstract words activated a sub-region of the left inferior frontal gyrus (BA 45) more intensely than concrete words. Concrete words, on the other hand, tended to activate the left basal temporal cortex. This study negates the assumption of a specific right-hemisphere involvement for processing of concrete words. Along with a set of other studies it was suggested that a revised view of the neuroanatomical bases of the imaginal representation system is needed in the dual-coding theory.

It is stated that memory for verbal materials is significantly affected by their imagery factor (Kieras, 1978). The nature of imagery though was contested by various intellects. Of this debate, three major suppositions were derived: the *mental picture* position, the *dual-code* position, and the *propositional representation* position. The *mental picture* position (Anderson & Bower, 1973; Pylyshyn, 1973) states that the meanings of words and sentences are themselves images ("mental pictures") that are experienced individually.

The *dual code* position (Paivio, 1971a,b) describes imagery in terms of differential availability of visual and verbal codes. These codes are associations developed implicitly based on past sensory experiences. This position has been used to explain many imagery related phenomena in the process of verbal learning. It thus has application in explaining concreteness, imagery and verbal associative learning in diverse educational domains. It also has implications in practice of educational psychology to its credit. At present, empirical evidences drawn from computer simulations of complex mental processes indicate that perception and comprehension processes require *deep* functional units, such as concepts, relations, properties,

features, and meanings. *Surface* units such as word meanings or sensory input representations are not sufficient to carry out these mental operations. Thus the dual code theory can account only for gross imagery effects. It is incapable of providing complete explanation of verbal and perceptual task performances due to lack of deeper lever machinery.

The *propositional representation* position (Anderson & Bower, 1973; Pylyshyn, 1973; Simon, 1972) states that regardless of the source modality of a word, all knowledge can be represented in a single, uniform, abstract type of representation. These representations are the *proposition* and are not limited to semantic knowledge. It differs from the dual-code theory in the sense that there exists no fundamental difference in representation of perceptual and verbal information in memory.

Brooks (1967, 1968) and Byrne (1974) based on a number of studies reported that perceptual activity interferes with the use of imagery. In his experiment, Brooks (1967) made his subjects listen to a passage in which spatial arrangement of an array of numbers was described. The subjects were then asked to recall the passage. This was compared to second task in which subjects had to read the passage concomitantly. In this second task, subjects had poorer recall as compared to listening-only condition. Based on this experiment it was concluded that subjects whose visual system was kept busy by reading were unable to create or utilize an image of the spatial array.

Recent research shows marked processing deficits to be present in childhood disorders such as Learning Disability. Clark and Paivio (1991) have quoted in their study that concreteness, imagery and verbal associative processes play major roles across educational domains such as comprehension of knowledge and its

representation, learning and memory of school material, operational instruction, differences between individuals and learning of motor skills.

A review article by Vellutino and Scanlon (1982, 1985) reliably indicates that students with learning disability and non-disabled students did not differ in associated learning or non-verbal tasks. However, in cases when the tasks included verbal component, non-disabled student performed better. Thus it was safe to conclude that concreteness and imagery value are important elements of educational material, and individual differences to evoke imagery reveals important outcome in imparting education.

Studies pertaining to the memory domain and its proposed link with words in the mental lexicon of children with Learning Disability brought forward interesting insights. On finite tasks such as lexical access, name retrieval and use of language-based strategy, children with learning disability were found to have evident deficits (Baker, Ceci & Herrmann, 1987). Kail, Hale, Leonard, and Nippold (1984), reported difficulty occurring in word-finding in children with learning disability due to insufficient representation of words in their memory. Inability of the students with learning disability to name unfamiliar pictorial information or gain from an external naming source could be attributed to their lower memory performance (Swanson, 1987). There are a number of theories proposed to understand the processing and representation of concrete and abstract words in children with Learning Disability.

Information Processing Theory: Information Processing Approach describes how sensory input is transformed, reduced, elaborated, stored, retrieved and used (Hunt, 1985; Newell, 1980; Neisser, 1976). Recent studies on information processing theory suggested that children with learning disability use inefficient strategies to approach

the input. As such they appear to not exhaust or even tap their intellectual capability (Barclay & Hagen, 1982; Swanson, 1985a, 1985b). Their limited performance in classrooms in terms of academic performance or social interaction is attributed to their inability to shift from one strategy to another, to dispose inappropriate strategies or to use multiple strategies at a time or in rapid succession, to solve any problem.

In the attempt to understand learning disability better, it was first needed to identify the stages and components of information processing, which tended to have an effect on the final result. The mental processes that underlay a child's performance needed to be identified and then assessed as to how efficiently and accurately these processes were being performed. The same was illustrated in the Information Processing Theory. Information processing theory has three general components, a constraint or a structural component defining parameters in which information is processed (e.g. short-term memory, sensory storage, long-term storage); a strategy component that describes the operations occurring at each stage and an executive process, which monitors the activities (e.g. strategies) of the learner. Each stage operates on the information provided to it and this flow of information occurs in a sequential manner, successive as well as temporal. This information undergoes manipulation at each stage and the transformed information serves as input for the next stage (Campione, Brown & Jerrara, 1982).

Children with Learning disability may fail at successfully assembling, adapting, alternating, assessing and abandoning certain cognitive strategies in the act of performing a task, when compared to non-disabled children (Swanson, 1987). The information processing approach enables us to look into the cognitive processes of a learning disabled child and theorize the underlying deficits. Knowledge about the underlying processes helps identify the individual differences between and within

ability groups and the changes occurring in these groups as a result of learning and instruction (Swanson, 1987). Furthermore, it allows us to differentiate the varied kind of deficiencies exhibited and the mental function set underlying each deficit.

Information processing theory evaluates the process of reading at each stage in terms of two skills- accuracy and automaticity. For accurate performance attention is necessary at the processing stage. For automatic stage of performance, attention does not play a significant role in processing (LaBerge and Samuels, 1974). Reading includes factors such as overt attention (e.g. selective attention, vigilance, arousal) automatic decoding of words, and accessing lexical word information. Researchers have studied and designed several models explain the skill of reading. Swanson (1987) drew conclusions from the reading model by Samuels to describe learning disabled children's reading failure. This model consists of four key elements: attention, visual memory, phonological memory, and semantic memory. An inability to utilize these resources efficiently could be extrapolated to draw hypotheses regarding reading failure. It can also be considered that these children tend to over-employ or consume excess attention on tasks such as decoding. This could be the impact of skills not being automatized.

Few studies also suggest that the reading difficulties are not as much due to attention allocation deficit, but more so due to difficulty in accessing lexical information. This theory has been supported by studies on spelling difficulties in children with learning disability (Gerber & Hall, 1987). In the study it was noted that automaticity is affected by the manner in which lexical information is acted upon and it also showed variations in a developmental trend.

Paivio (1965) proved in his study that words having concrete referents were acquired faster than abstract words. Later, Ollila and Olson (1972) in their word-learning task in first-graders found that while there existed a numeric difference between mean scores of concrete and abstract words learned (concrete words required less number of trials), this difference was not significant relative to word category. It was concluded that word learning was not significantly enhanced by concreteness across readiness group.

Ellis (1987) stated that dyslexia research needs to direct attention to cognitive systems that may utilize processes used in reading in later stages of life, for example, visual, semantic and phonological processes. Recent research to examine naming deficit in children allows one to delve into normal language development and language disruption, especially in developmental dyslexias. A handful of studies in children with dyslexia also depict "subtle dysnomia" apart from other characteristic features of the disorder (Rudel, 1985). This 'dysnomia' of sorts is noticeable in a variety of tasks ranging from rapid automatized naming (RAN) in the form of slow naming access speed, to generative naming deficts (Bowers & Swanson, 1987; Denckla & Rudel, 1976a, b ; Rubin & Liberman, 1983; Spring & Davis, 1988). These findings validate possible connections between constituents of naming system in early developmental ages and reading development in later stages of life. It also warrants the need to delve in a rigorous analysis of specific retrieval deficit hypothesis (Swanson, 1987).

Definitions of Learning Disability (LD) identify it as a construct that represents an unobservable latent variable that is not evident except when it is subjected to measurement (Fletcher, Denton & Francis, 2005). The nature of Learning Disability is defined to be dimensional, that is, the traits characteristic of LD exist on

a continuum and not as discrete categories (Ellis, 1984). It is now well established that Learning Disabilities is associated with specific impairments in cognitive processes. Models of Classification of Learning Disability such as Intra-Individual Differences Model (Schrank & Woodcock, 2001), state that a person with LD is one with strengths in many areas but weaknesses in some core cognitive processes that lead to under-achievement. These core cognitive processes encompass phonological awareness, rapid naming, phonological memory and other unitary processes of auditory and visual modality. Visual modality of processing is strongly supported by the Dual Coding Theory (Paivio, 1991) which explains word representation in mental lexicon in terms of visual processing skills. It suggests that words can be recognized independently of phonological processing.

Hence in children with LD who exhibited phonological deficits, representation of words in their mental lexicon need not be impacted. It is how these words are visualized or interpreted that can cause a significant impact on their representation. In order to perform successfully on a task, children with LD must select a plan of action from a repertoire of strategies relevant to problem solving or task-completion (Swanson, 1987). This skill requires them to have the necessary information and knowledge of their own capacity, that is, of their cognitive resources to be able to efficiently allocate those resources to the directed task at hand. Children with LD need to integrate a multitude of mental components into one complex act, for example, reading in order to perform the task successfully. A successful transfer and allocation of resources refines the learning process.

Therefore, in children with LD, under-performance is not only due to deficiency in certain cognitive areas, but more so due to poor coordination of several cognitive components involved in Information Processing. The Information

Processing Theory states that in children with LD, the deficits occur on two aspects of skill learning- Accuracy and Automatization. These processes are also discussed in the Triarchic Theory of Human Intelligence by Sternberg (1986). This theory encompasses componential, experiential and contextual sub-theories and assesses intelligence in terms of the child's internal and external world. At each of these componential levels, the theory provided several hypotheses depicting information processing deficits in children with LD. On extrapolation of these postulates to the Information Processing Theory (Swanson, 1987) it was concluded that the efficiency of a child's concept learning in terms of his internal world was based on his experiential history, which was brought to task.

The concept of Hebbian Learning memory further adds to this statement. Hebbian Learning postulates that there is biologically determined pre-wiring of circuits and additional connections created by strengthening or weakening the synaptic connections between neurons in the presence or absence of correlated firing patterns. For maintaining all of these circuits, stimulations is often needed to maintain the circuit, which also allows further tuning of the circuit based on the input (Hebb, 1949; Pulvermuller, 1996; Vaughan & Kurtzberg, 1992). Complete familiarity allows for unconscious or preconscious processing referred to as "Automatization", which requires little processing effort on the child's part. In children with LD, their ability to achieve automatization as a skill is considered to occur more slowly and gradually as compared to their non learning disabled counterparts (Swanson, 1987). Several studies describing the learning process talk about the role of the surroundings, as in the child's external world in Triarchich theory and or environmental context as in Context Availability Theory (Kieras, 1978; Schwanenflugel & Shoben, 1983; Schwanenflugel, Akin & Luh, 1992; Altarriba, Bauer & Benvenuto, 1999). These

studies suggested that children tended to adapt or modify to their environment to suit their needs, interests and motives. These contextual factors subjected to acceptance or rejection by the children determined how successful their performance was in a given environment.

Models on semantic processing

There are various models developed to explain semantic processing at various levels. Spreading Activation Model of Semantic Memory is one such model explained in the following section.

Spreading Activation Model of Semantic Memory: The spreading activation model of semantic memory (Collins and Loftus, 1975) has a set of assumptions in order to explain the processing of words.

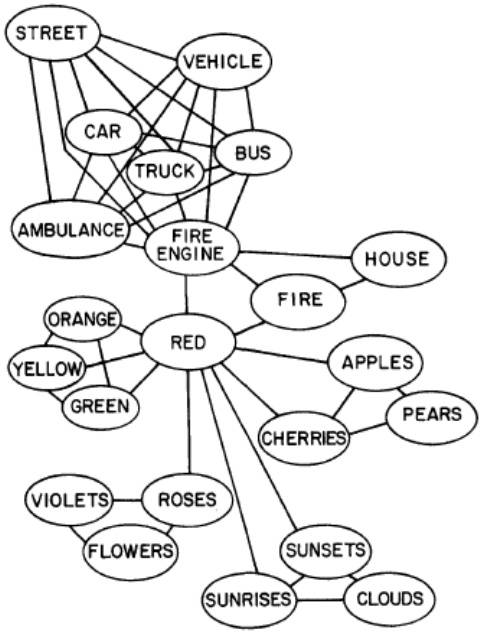

Figure 2.1: *A schematic representation of concept relatedness in a stereotypical fragment of human memory (where a shorter line represents greater relatedness.*
Source: Collins, A. M., & Loftus, E. F. (1975). A spreading-activation theory of semantic processing. Psychological review, 82(6), 407.

The model describes how when a concept is processed, the stimulation spreads along connected paths in a decreasing gradient. This distance of spread of activation is indicative of the strength or accessibility of the links in the path. It also assumes that the longer a concept is processed the longer the activation is released from the node and as this activation travels to linked concepts along a parallel path, it continues to activate other nodes that it encounters along the path. Only when activation from different sources summate and reach a minimum threshold at intersecting joints, the activation can travel to other nodes. Over time, this activation tends to decrease or reduces due to intervening activity. The more properties two concepts have in common the more links there are between two nodes based on these properties. The distance of these links is also indicative of how closely these concepts are interlinked, that is, how they have common properties.

An account of organization of adult semantic processing revealed that activation of brain regions in processing a certain stimulus or in performing a semantic task is not a random process. Neurophysiological studies such as Event Related Potentials (N400) show developmental trend. An ERP study by Mills, Prat, and Zangl (2004) recorded broadly distributed negativity over left and right hemisphere, in response to known words or newly learned word in infants with limited vocabularies. The authors suggested that this activity may reflect lexical-semantic processing as indexed in an adult N400. The neural activity became left-lateralized with increasing vocabulary size. This can be attributed to increased specificity in neural firing hence suggestive of a developmental change in topography reflecting rate of acquisition and number of exposures to a word (Mills & Conboy, 2005). Also, increasing exposure to a word will lead to more context-free knowledge. These research findings hence establish that synapses between neurons that do not fire

synchronously to a word stimuli will be weakened and lost over time. This will leave a smaller, more focal population of neurons that is responsive to the word (Collins & Loftus, 1975; Bleasdale, 1987)

Our understanding of language processing and language development when based entirely on behavior is limited in nature. Neurobiology (i.e. the internal mechanisms) also plays a significant role in painting a clearer picture of how language development occurs. Knowledge of the correlation between the internal mechanism and explicit observable behavior is indispensable for arriving at a clear understanding of language processing and language development. While studying the developmental underpinnings for language processing in clinical population such as Learning disability, one comes across a variety of concerns regarding the subject, one such major concern is to explain how words are processed at different levels and for different types in these children.

Chapter 3: Method

The aim of the study was to examine the nature of representation of concrete and abstract words in mental lexicon of children with Learning Disability, using a free word association task. This was a cross-sectional study across age range of 9 years to 11 years (including grades 4, 5 and 6). The participants of the study were classified into two groups- clinical group and control group. For this study, the research design employed was between groups design.

3.1 Participants

The participants included two groups, the control group with typically developing children and the clinical group with Learning Disability.

Control Group: Thirty typically developing children matched for age with Learning disability in the age range of 9 to 11 years (including 10 children in each grades 4, 5 and 6) were selected. These children were native speakers of Kannada, studying in English-medium schools in Mysuru, Karnataka.

The inclusionary criteria were as follows:

a) These children were native speakers of Kannada language.
b) The medium of instruction in their respective schools was English.
c) These children did not have any history of speech, language, neurological or hearing problems. The same was ascertained using the ICF CY Ten Question Disability Screening Checklist (WHO, 2003).

Clinical Group: A total of 12 children in the age range of 9 to 11 years (including 3 children in the grade 4, 3 children in grade 5 and 6 children in grade 6) constituted the

clinical group for the study. These participants too, were native speakers of Kannada, studying in an English medium school.

The inclusionary criteria for the clinical group were:

a) They were diagnosed with Learning Disability by a qualified Speech-Language Pathologist and a Clinical Psychologist.
b) These children had not attended any form of rehabilitative intervention.

3.2 Stimuli

A total of 60 words (30 concrete and 30 abstract) were selected from Kannada text books of standard IV, V and VI. These words were validated by two sets of professionals; One Educator and two Speech Language Pathologists who validated the familiarity of the words for the age ranges, ranking them on a 5 point rating scale of 1 being least familiar to 5 being most familiar.

Of these ratings, 40 highest rated words, (20 concrete and 20 abstract) were selected. Three separate word lists were prepared each for the age range of 9, 10 and 11 years. Two Speech Language Pathologists validated the assortment of words into categories of concrete and abstract for the final stimuli list. The final list is included in Appendix 1.

Examples of the stimuli (Final list of stimuli is attached in the appendix 1)

Concrete Words	Abstract Words
ಮೀಸೆ	ನಿಧಾನ
/mi:sɛ/	/nIdʱa;na/
ಮಳೆ	ಚಿಕಿತ್ಸೆ
/m^ɭɛ/	/ʧikitsɛ/
ದಟ್ಟವಾದ	ಹಿಂಸೆ
/d^ʈ ʈ ^va:ɗa/	/hImsɛ/

3.3 Procedure

The selected participants were presented with a list of concrete and abstract words, 20 each in number, in a randomized order. The mode of presentation of stimuli was auditory. The children were asked to respond verbally, by saying words that first came to their mind upon hearing the stimulus. The responses were audio-video recorded for analysis.

To limit the number of responses for feasibility in analysis, only the first five responses were considered. In cases where children responded in sentences instead of words, filtering of responses was carried out wherein only content words were considered as the target responses.

Analysis

The responses of each participant were transcribed for analysis. The responses were then sorted into categories, based on the coding system given by Borghi, Caramelli and Setti (2016), and Caramelli, Setti and Maurizzi (2004).

i) Thematic: Objects related by the virtue of occurring in the same situation or event. They include:

- Spatial relation e.g. /p^kʃI/-/a:kaʃa/ (bird-‘sky’) or /sImha/-/ka:dU/ ((lion-‘jungle’)
- Temporal relation e.g. cake - /hu:ttuhabba/ (birthday) or /s^ŋgIta/ (music) - /habba/ (party)
- Modality relations such as /i:ʤU u:dU/- /mi:nU/ (‘swimming’ for fish.\).
- Means-end relationship such as /baḷapa/ -/kappU borḍu/ (‘chalk’ to blackboard)

- Event relations e.g. /va:hana ʧʌlaIsU va:ga sitbɛlt d̪ʰarisuvudu/ (‘wearing seatbelt while driving’).

  (Or)

  Situational Component that include a set-up of space and time for the situation e.g. /nɛnə na:vU angaɗi jelli a:iskrim tinɖɛvU/ (‘Yesterday we ate ice-cream at the mall’).

ii) Attributive: Includes objects that are described by their physical features or characteristics such as :

- Perceptual object properties such as /ni:rU/- /vʌɖɖə/ (water-‘wet’).
- Object qualities such as /simha/- /ka:ɖU pra:ɳi/ (lion-‘wild animal’).
- Partonomic relations such as /a:nɛ/ -/ sonɖilU/ (elephant-‘trunk’).
- Functional attributes that include relations like /pɛnnU/-/bʌrɛjʌlU/ (pen- ‘for writing’).

iii) Taxonomic: Responses which signify a hierarchical nature of conceptual knowledge will be categorized under this section. It can include the following levels of relation:

- Super-ordinate level e.g. /ru:lʌr/- /stɛʃʌnʌrI sa:manU/ (ruler-‘stationary item’).
- Sub-Ordinate level e.g. /pUstʌka/- /pɔkɛt pUstʌka/ (book-‘pocket book’).
- Co-ordinate level e.g. /pɛnnU/- /pɛnsIl/ (pen-‘pencil’).

iv) Introspective: It includes the following types of relations

- Ego involvement for responses along the lines of /n^nna sv^nta anub^{h}^va ɖ^lli/ (‘in my own experience’).
- Emotions such as /tinn^lU n^n^ge kuʃI agut^ɗè/ (‘it makes me happy to eat’)
- Intentional states such as /na:nu nəmbUve/ or /na:nu maɖUve/ (‘I believe or do’).
- Cognitive process e.g. /gamana/- /rastə ɗa:ʈuv^gə gamana koɖi/ (attention- ‘pay attention while crossing the road’)

Another category, ‘Others’ was formulated for the purpose of analysis to code responses that did not align to any of the previous categories. These responses were irrelevant to the target stimuli and hence could not be sorted into the assigned categories.

Ten percent of the categorized data was subjected to analysis by two native Kannada speakers and the inter-judge reliability for the same was found to be hundred percent. The sorted data was tabulated and subjected to statistical analysis using the software Statistical Package for Social Sciences (SPSS) version 20.0.

Chapter 4: Results

The aim of the present study was to examine the nature of representation of concrete and abstract words in the mental lexicon of children with Learning Disability, using a free word association task. The objectives of the study included:

a) To investigate the nature of representation for concrete and abstract words in the lexicon of children with Learning Disability, aged 9 to 11 years (including grades 4, 5 and 6) as compared to age and gender matched typically developing children.
b) To interpret the manner of organization for concrete words and abstract words in the lexicon of children having Learning Disability.

To assess the normal distribution of data Shapiro-Wilk Test of Normality was performed. As the data followed normal distribution ($p > 0.05$) parametric tests were used for the analysis. The data was analyzed using the following statistical procedures:

i) Descriptive statistics was carried out to find the mean and standard deviation (SD) for performance of TDC and children with LD on free word association task for concrete and abstract words.
ii) Non-Parametric Mann-Whitney U test was performed to see the gender effect for all age groups with respect to all the parameters.
iii) Mixed ANOVA was performed to compare the performance of TDC and children with LD on free word association task. The test was carried out to see the main effect of groups (control versus clinical), categories (Thematic, Attributive, Introspective, Taxonomic, Others), types (concrete

words and abstract words) and interaction effect between groups and categories, groups and types; groups and types and categories.

iv) Bon-Ferroni pairwise comparison was carried out to compare the performance of TDC and children with LD across each category pair (Thematic-Attributive, Thematic-Taxonomic, Thematic-Introspective, Thematic-Others, etc) for concrete and abstract words.

v) Paired sample t-test was carried out to compare the categories of concrete and abstract words for TDC and children with LD.

vi) Independent two samples t-test was used to compare the performance of children with LD with the performance of TDC in each category (Thematic, Attributive, Taxonomic, Introspective and Others) and type (concrete words and abstract words).

The results of the present study are explained in the following sections:

4.1 Performance of typically developing children (TDC) on the free word association task for concrete and abstract words.

4.2 Performance of children with Learning Disability (LD) on free word association task for concrete and abstract words.

4.3 Comparison of performance of TDC and children with LD on free word association task for concrete and abstract words.

4.1 Performance of typically developing children (TDC) on the free word association task for concrete and abstract words

A non-parametric Mann-Whitney U test was performed to see the gender effect for all the age groups with respect to all the categories in TDC and children with LD. Since there was no significant gender effect found ($p>0.05$) the data was combined for males and females for further analyses. The overall mean scores for TDC across response categories for concrete words are depicted in Table 4.1. Analysis of results using descriptive statistics as in Table 4.1 revealed that for concrete words the highest number of responses were of Attributive type (Mean=50.63, SD=8.20) followed by responses belonging to Thematic category (Mean=33.47, SD=9.66), Taxonomic category (Mean=16.37, SD=6.18) and lastly to Introspective category (Mean=7.53, SD=5.80). The responses unrelated to the target word were sorted to 'Others' category which had the lowest mean scores amongst all category responses (Mean=1.27, SD=2.58).

Table 4.1

Overall mean and SD scores across categories of TDC (N=30) for concrete and abstract words

Categories	Concrete		Abstract	
	Mean	SD	Mean	SD
TT	33.47	9.66	37.77	10.37
AT	50.63	8.20	27.43	11.36
TX	16.37	6.18	18.30	8.71
IT	7.53	5.80	16.03	8.01
OT	1.27	2.58	1.43	2.19

Note: Categories: TT- Thematic, AT- Attributive, TX- Taxonomic, IT- Introspective, OT- Others.

Analysis of results for TDC on concrete words, using Repeated Measures ANOVA revealed a significant difference between categories, [F (4,116)=221.451, $p<0.05$]. Since the test showed that there was a significant difference between categories for TDC, Bon-Ferroni pairwise comparison was made which revealed significant difference ($p<0.05$) between all category pairs namely, Thematic-Attributive,Thematic-Taxonomic,Thematic-Introspective,Thematic-Others, Attributive-Taxonomic,Attributive-Introspective,Attributive-Others,Taxonomic-Introspective, Taxonomic-Others and Introspective-Others.

For abstract words, as indicated in Table 4.1 the highest mean score was recorded for Thematic category (Mean=37.77, SD=10.37) followed by Attributive category (Mean=27.43, SD=11.36), Taxonomic category (Mean=18.30, SD=8.71), Introspective category (Mean=16.03, SD=8.01) and lastly by 'Others' category (Mean=1.43, SD=2.19).

For abstract words, analysis of results using Repeated Measures ANOVA revealed significant difference between categories, [F(4, 116)=62.105, $p<0.05$]. Since the test showed that there was a significant difference between categories, Bon-Ferroni pairwise comparison was made which revealed significant difference ($p<0.05$) between all category pairs namely, Thematic-Taxonomic, Thematic-Introspective, Thematic-Others, Attributive-Others, Taxonomic-Others, and Introspective-Others except Thematic-Attributive pair, Attributive-Taxonomic pair, Attributive-Introspective pair and Taxonomic-Introspective pair ($p>0.05$).

The data was analyzed using paired sample t-test and a comparison was made to examine significant difference between the categories. The results indicated that there was a significant difference between scores for concrete and abstract words in Attributive category [ATC-ATA; t(29)=9.928, $p<0.05$] and Introspective category

[ITC-ITA; t(29)=-6.188, p<0.05)] for TDC. The descriptive statistics for attributive category indicated that the mean scores for ATC was greater than ATA as indicated in Table 4.1. Also, the results indicated that mean scores for ITC was lesser than ITA. On the other hand there was no significant difference between concrete and abstract words in Thematic [TTC-TTA;t(29)=-1.704, p>0.05], Taxonomic [TXC-TXA ;t(29)=-1.706, p>0.05] and 'Others' [OTC-OTA;t(29)=0.294, p>0.05].

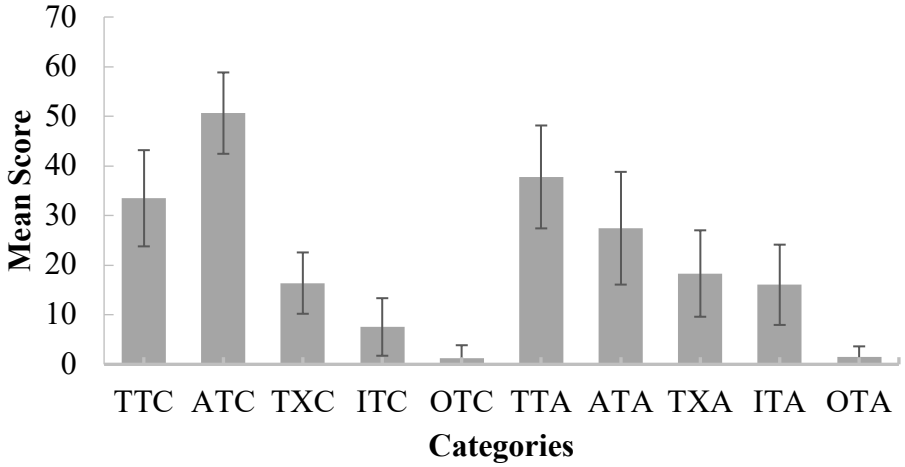

Figure 4.1: *Overall performance of TDC across categories for concrete and abstract words*

Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: 'Others' (abstract).

Further the performance of TDC on the free word association task for concrete and abstract words across grades are explained in the following sections.

4.1.1 Performance of TDC on concrete words across grades

The data was categorized based on the performance of TDC on concrete words for each grade 4, 5 and 6. The responses were analyzed to see the difference in responses across categories in each grade.

Analysis of results using on descriptive statistics for the performance of TDC in the 4th grade revealed that across categories, the highest mean score was recorded for Attributive category (Mean=53.7, SD=6.13) followed by Thematic category (Mean=33.80 , SD=8.84), Taxonomic category (Mean=15.30, SD=4.66) and Introspective category (Mean=7.20, SD=2.65). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.40, SD=0.69).

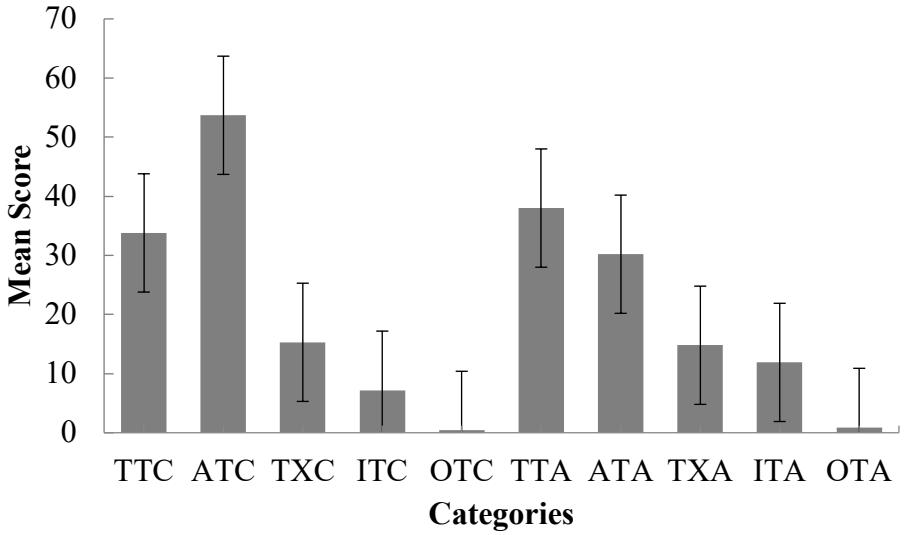

Figure 4.2: *Performance of TDC of grade 4 across categories for concrete and abstract words*
Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

Analysis using descriptive statistics for the performance of TDC in the 5th grade revealed that across categories, the highest mean score was recorded for the highest mean score was recorded for Attributive category (Mean=51.30, SD=9.30) followed by Thematic category (Mean=34.70, SD=12.47), Taxonomic category (Mean=17.0, SD=8.79) and Introspective category (Mean=8.0, SD=5.77). The

responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.90, SD=1.66).

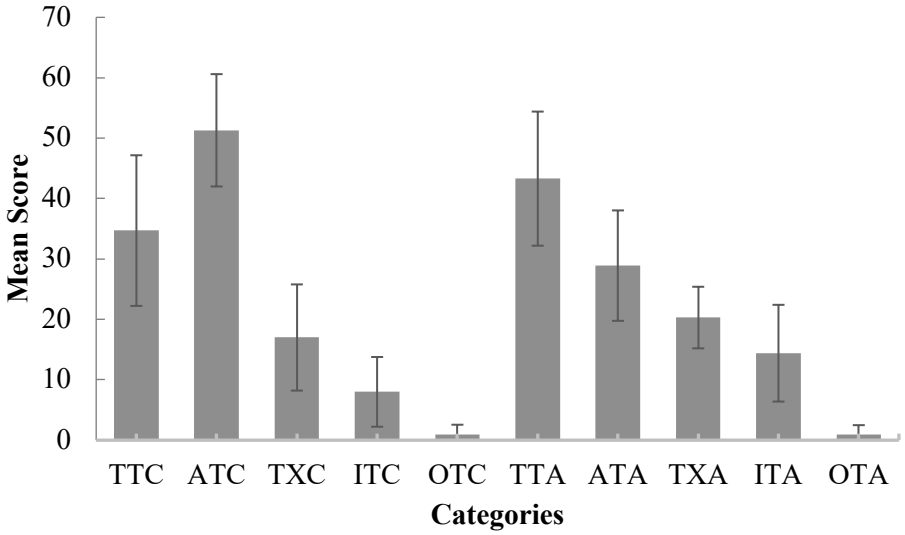

Figure 4.3: *Performance of TDC of grade 5 across categories for concrete and abstract words*

Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

Analysis of results using descriptive statistics for the performance of TDC in the 6th grade revealed that across categories, the highest mean score was recorded for the highest mean score was recorded for Attributive category (Mean=46.90, SD=8.08) followed by Thematic category (Mean=31.90, SD=7.93), Taxonomic category (Mean=16.8, SD=4.73) and Introspective category (Mean=7.40, SD=8.23). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=2.50, SD=3.95).

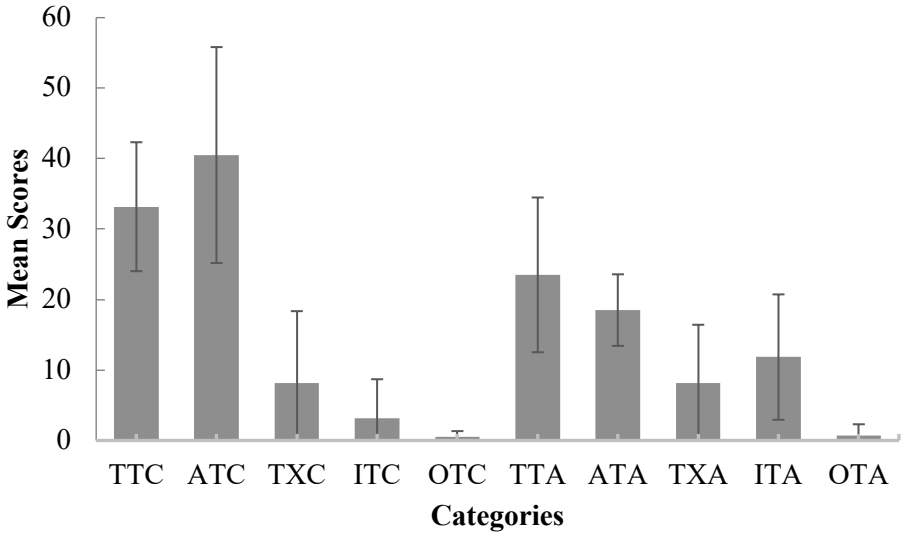

Figure 4.4: *Performance of TDC of grade 6 across categories for concrete and abstract words*
Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

4.1.2 Performance of TDC on abstract words across grades

The data was also categorized based on performance of TDC for each grade 4, 5 and 6. The responses were analyzed to see the difference in responses across categories in each grade.

For abstract words, the performance of TDC in the 4th grade revealed that the highest mean score was recorded for Thematic category (Mean=38.0, SD=10.85) followed by Attributive category (Mean=30.20, SD=11.77) Taxonomic category (Mean=14.80, SD=8.05) and Introspective category (Mean=11.90, SD=7.40). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.90, SD=1.28).

Across categories for abstract words, the performance of TDC in the 4th grade revealed that the highest mean score was recorded for Thematic category

(Mean=43.3, SD=11.10) followed by Attributive category (Mean=28.90, SD=9.14), Introspective category (Mean=20.30, SD=5.10) and lastly by Taxonomic category (Mean=14.4, SD=8.01). The responses unrelated to the target word and were categorized as 'Others' and had the lowest mean score (Mean=0.90, SD=1.59).

Performance of TDC in grade 6 for abstract words on analysis revealed that the highest mean score was recorded for Thematic category (Mean=32.0, SD=5.90) followed by Taxonomic category (Mean=25.7, SD=4.94), Attributive category (Mean=23.0, SD=12.76) and lastly by Introspective category (Mean=15.9, SD=9.33). The responses unrelated to the target word and were categorized as 'Others' and had the lowest mean score (Mean=2.5, SD=3.06).

In summary, the results for the performance of TDC indicated that TDC performed significantly better for concrete words than abstract words in Attributive category. For Introspective category, performance of TDC was significantly lesser on concrete words as compared to abstract words. Also the results indicated that there was no significant difference between concrete and abstract words for Thematic, Taxonomic and Other categories; however, the mean scores as indicated in Table 4.1 reveal poorer performance on concrete words than abstract words for Thematic and Taxonomic category. The numbers of unrelated responses, that is, mean scores for 'Others' category as indicated in Table 4.1 was observed to be lesser for concrete words than abstract words.

4.2 Performance of children with Learning Disability (LD) on free word association task for concrete and abstract words

The overall mean scores across response categories are depicted in Table 4.2. Analysis of results using descriptive statistics revealed that for concrete words the highest number of responses were of Attributive type (Mean=39.83, SD=11.49) followed by responses belonging to Thematic category (Mean=33.33, SD=7.05), Taxonomic category (Mean=12.08, SD=9.24) and lastly to Introspective category (Mean=2.58, SD=4.18). The responses unrelated to the target word were sorted to 'Others' category which had the lowest mean scores amongst all category responses (Mean=1.08, SD=1.37).

Table 4.2

Overall mean and SD scores across categories of LD (N=12) for concrete and abstract words

Categories	Concrete		Abstract	
	Mean	SD	Mean	SD
TT	33.33	7.05	31.17	11.55
AT	39.83	11.49	16.58	5.29
TX	12.08	9.24	10.33	6.55
IT	2.58	4.18	11.50	6.90
OT	1.08	1.37	1.75	2.80

Note: Categories: TT- Thematic, AT- Attributive, TX- Taxonomic, IT- Introspective

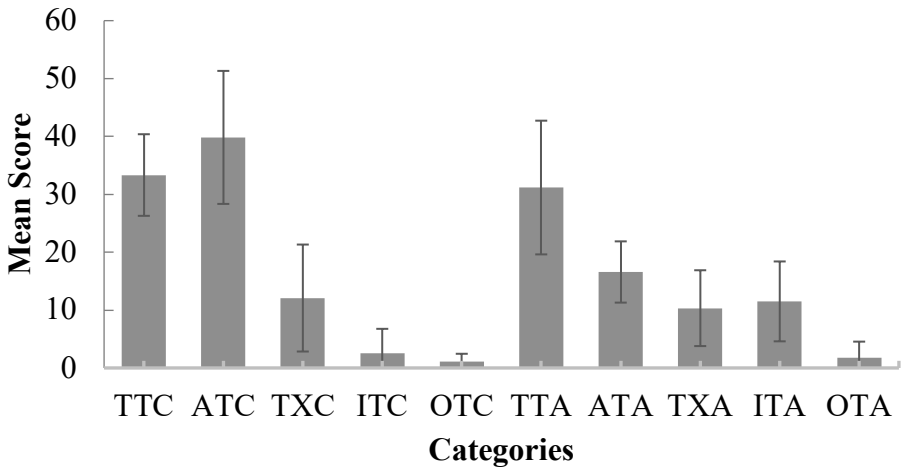

Figure 4.5: *Overall performance of children with LD across categories for concrete and abstract words*

Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

In children with LD, for concrete words, analysis of results using Repeated Measures ANOVA revealed significant difference between categories, $F(4, 44)=56.046$, $p<0.05$). Since the test showed that there was a significant difference between categories, further Bon-Ferroni pairwise comparison was carried out to see significant difference between categories for concrete words. Analysis of results using Bon-Ferroni pairwise test revealed significant difference ($p<0.05$) between all category pairs namely Thematic-Taxonomic, Thematic-Introspective, Thematic-Others, Attributive-Introspective and Attributive-Others as well as Attributive-Taxonomic ($p=0.05$) except Thematic-Attributive pair, Taxonomic-Introspective pair, Taxonomic-Others pair and Introspective-Others pair.

The data was analyzed using paired sample t-test and a comparison was made to see significant difference between the categories. The results indicated that there was a significant difference between scores for concrete and abstract words in Attributive category [ATC-ATA; $t(11)=9.928$, $p<0.05$)] and Introspective category

[ITC-ITA; t(11)=-4.040, p<0.05] for children with LD. The descriptive statistics for attributive category indicated that the mean scores for ATC was greater than ATA as indicated in Table 4.2. Also, the results indicated that mean scores for ITC was lesser than ITA. On the other hand there was no significant difference between concrete and abstract words in Thematic [TTC-TTA; t(11)=0.708, p>0.05], Taxonomic [TXC-TXA; t(11)=0.739, p>0.05] and Others [OTC-OTA; t(11)=-1.017, p>0.05].

On abstract words, the performance of children with LD depicted in Table 4.2 on analysis revealed that the highest mean score was recorded for Thematic category (Mean=31.17, SD=11.55) followed by Attributive category (Mean=16.58, SD=5.29), Introspective category (Mean=11.50, SD=6.90) and then by Taxonomic category (Mean=10.33, SD=6.55). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=1.75, SD=2.8).

Analysis of results for the performance of children with LD on abstract words using Repeated Measures-ANOVA revealed significant difference between categories [F(4,44)=25.245, p<0.05]. Since the test showed that there was a significant difference between categories, Bon-Ferroni pairwise comparison was made and the test revealed significant difference (p<0.05) between category pairs Thematic-Taxonomic, Thematic-Others and Attributive-Others. There was no significant difference found (p>0.05) between category pairs of Thematic-Attributive, Thematic-Introspective,Attributive-Taxonomic,Attributive-Introspective, Taxonomic-Introspective, Taxonomic-Others and Introspective-Others.

The data was also categorized based on performance of children with LD for each grade 4, 5 and 6. The responses were analyzed to see the difference in responses across categories in each grade.

4.2.1 Performance of children with LD on concrete words across grades

Analysis of results for the performance of Grade 4 children with LD on concrete words employing descriptive statistics revealed that across categories, the highest mean score was recorded for Attributive category (Mean=37.67, SD=4.04) followed by Thematic category (Mean=30.33, SD=0.57), Taxonomic category (Mean=19.33, SD=5.03)and Introspective category (Mean=3.0, SD=3.46). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=2.67, SD=1.52).

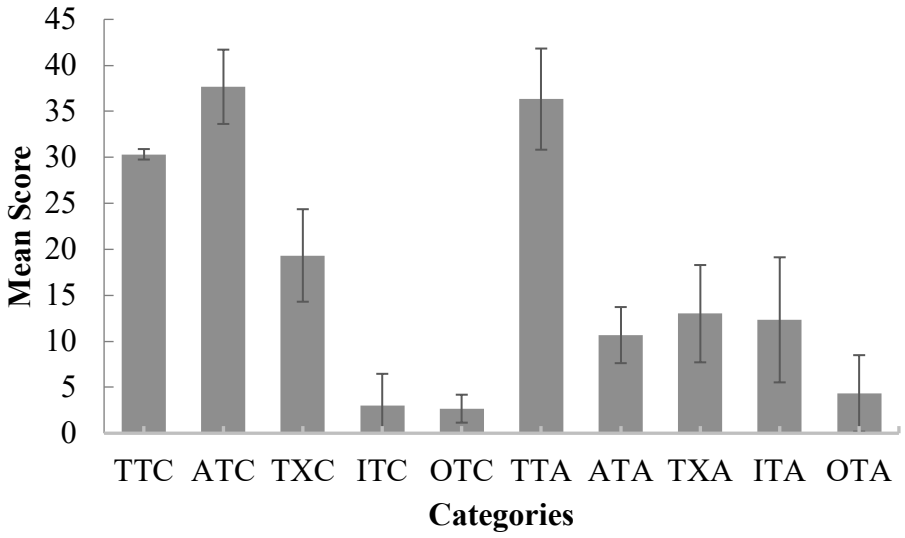

Figure 4.6: *Performance of children with LD of grade 4 across categories for concrete and abstract words*
Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

Analysis of results for performance of grade 5 children with LD on concrete words using descriptive statistics revealed that across categories, the highest mean score was recorded for Attributive category (Mean=40.67, SD=10.69) followed by Thematic category (Mean=36.67, SD=5.77), Taxonomic category (Mean=12.67, SD=7.76) and Introspective category (Mean=1.0, SD=1.73). The

responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.67, SD=1.15).

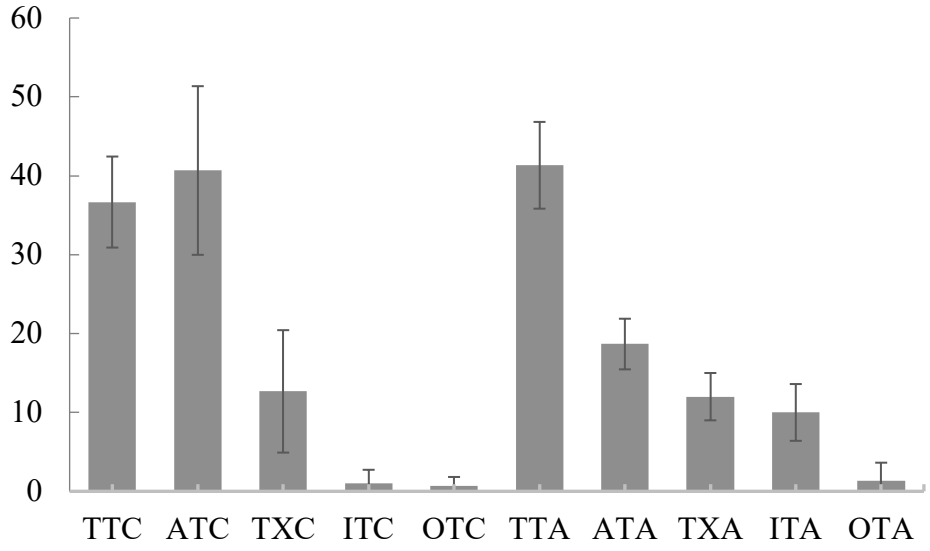

Figure 4.7: *Performance of children with LD of grade 5 across categories for concrete and abstract words*
Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

Analysis of results for the performance of grade 6 children with LD on concrete words using descriptive statistics revealed that across categories, the highest mean score was recorded for Attributive category (Mean=40.50, SD=15.32) followed by Thematic category (Mean=33.17, SD=9.15), Taxonomic category (Mean=8.17, SD=10.18) and Introspective category (Mean=3.17, SD=5.52). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.50, SD=0.83).

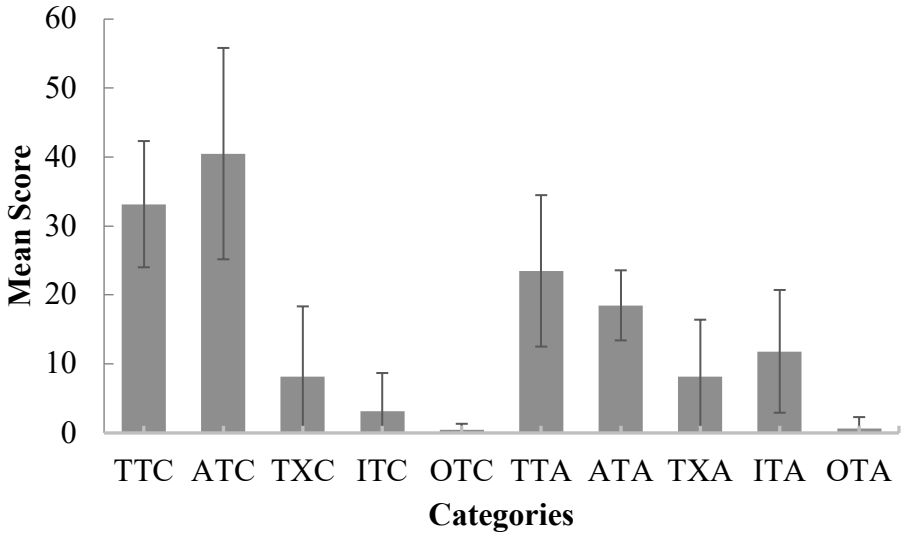

Figure 4.8: P*erformance of children with LD of grade 6 across categories for concrete and abstract words*

Note: TTC: Thematic (concrete), ATC: Attributive (concrete), TXC: Taxonomic (concrete), ITC: Introspective (concrete), OTC: Others (Concrete), TTA: Thematic (abstract), ATA: Attributive (abstract), TXA: Taxonomic (abstract), ITA: Introspective (abstract), OTC: Others (abstract).

4.2.2 Performance of children with LD on abstract words across grades

In grade 4 children with LD their performance on abstract words on analysis revealed that the highest mean score was recorded for Thematic category (Mean=36.33, SD=5.50) followed by Taxonomic category (Mean=13.00, SD=5.29), Introspective category (Mean=12.33, SD=6.80) and then by Attributive category (Mean=10.67, SD=3.05). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=4.43, SD=4.16).

For abstract words, performance of grade 5 children with LD on analysis revealed that the highest mean score was recorded for Thematic category (Mean=41.33, SD=5.50) followed by Attributive category (Mean=18.67, SD=3.21), Taxonomic category (Mean=12.00, SD=3.00) and then by Introspective category (Mean=10.00, SD=3.60). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=1.33, SD=2.30).

For abstract words, performance of grade 6 children with LD on analysis revealed that the highest mean score was recorded for Thematic category (Mean=23.50, SD=10.98) followed by Attributive category (Mean=18.50, SD=5.08), Introspective category (Mean=11.83, SD=8.90) and then by Taxonomic category (Mean=8.17, SD=8.25). The responses unrelated to the target word were categorized as 'Others' and had the lowest mean score (Mean=0.67, SD=1.63).

In summary, the results for the performance of TDC revealed that the performance of children with LD was significantly greater for concrete words than abstract words in Attributive category. For Introspective category, performance of children with LD was significantly lesser on concrete words as compared to abstract words. Also the results indicated that there was no significant difference between concrete and abstract words for Thematic, Taxonomic and Other categories; however, the mean scores as indicated in Table 4.2 revealed better performance on concrete words than abstract words for Thematic and Taxonomic category. The numbers of unrelated responses, that is, mean scores for 'Others' category as indicated in Table 4.2 was lesser for concrete words than abstract words.

4.3 Comparison of performance between children with LD and TDC across categories

Analysis of results on Mixed ANOVA revealed a significant main effect for types of words (concrete and abstract word) [$F(1,40)=37.821$, $p<0.05$], groups (TDC and children with LD), [$F(1,40)=64.953$, $p<0.05$] and categories (Thematic, Attributive, Taxonomic, Introspective, Others), [$F(4,160)=181.498$, $p<0.05$]. Also, there was no significant interaction effect found between groups and types [$F(1,40)=4.865$, $p>0.05$], groups and categories [$F(4,160)=3.355$, $p>0.05$], categories

and types $F(4,160)=43.893$, $p>0.05$); groups and categories and types [$F(4,160)=0.726$, $p>0.05$].

Since there was a significant difference between categories, further Bon-Ferroni pairwise comparison was carried out to see the pairwise significant difference between the categories. Analysis of results using Bon-Ferroni pairwise test revealed significant difference ($p<0.05$) between all category pairs namely, Thematic-Taxonomic,Thematic-Introspective,Thematic-Others,Attributive-Taxonomic, Attributive-Introspective, Attributive-Others, Taxonomic-Others and Introspective-Others except Thematic-Attributive pair and Taxonomic-Introspective pair ($p>0.05$).

Independent two samples t-test was used to analyze the data for presence of significant difference between the mean scores for Typically Developing Children (TDC) and children with Learning Disability (LD) across the response categories. Results of the statistical test revealed significant difference in the scores of Attributive category for concrete words between TDC and children with LD [$t(40)=3.427$, $p<0.05$]. The performance of children with LD was found to be poorer than TDC. Analysis of performance on concrete words for the categories Thematic [$t(40)=0.43$, $p>0.05$)], Taxonomic [$t(40)=1.75$, $p>0.05$)] and Introspective [$t(40)=2.67$, $p>0.05$)] revealed no significant difference between performance of children with LD and TDC ($p>0.05$). The scores however revealed that the performance of children with LD for these categories was poorer than TDC. The score for Others [$t(40)=0.23$, $p>0.05$)] revealed no significant difference between performance of children with LD and TDC ($p>0.05$). Nevertheless, children with LD were observed to have poorer scores than TDC in Others category. Similarly, for abstract words significant difference in the scores of Attributive category was

revealed [t(40)=3.156, p<0.05] between children with LD and TDC. The performance of children with LD was revealed to be poorer than that of TDC. For the categories Thematic [t(40)=1.80,p>0.05)], Taxonomic [t(40)=2.85,p>0.05)] and Introspective [t(40)=1.71,p>0.05)] the results revealed no significant difference between performance children with LD and TDC on abstract words (p>0.05). The scores however reveal that the performance of TDC was better compared to children with LD for these categories on abstract words too. The score for 'Others' category [t(40)=-0.39,p>0.05)], revealed no significant difference between performance of children with LD and TDC (p>0.05). But it was observed that children with LD had higher scores than TDC in 'Others' category on abstract words.

In summary, analysis of results revealed significant difference in performance between all category types. On comparison of performance of children with LD and TDC, significant difference in performance was observed on concrete words as well as abstract words for Attributive Category. The results indicated that children with LD performed poorer compared to TDC in making attributive associations. For categories Thematic, Taxonomic, Introspective and 'Others' category no significant difference in performance of children with LD as compared to TDC was observed on concrete words. The scores of the analyses indicated that performance of children with LD was poorer than TDC. Similar outcome was noted for performance on abstract words for categories Thematic, Taxonomic and Introspective, that is, children with LD performed poorer than TDC. However, for 'Others' category, it was observed that children with LD had higher scores than TDC. This indicated that on abstract words, children with LD produced higher number of unrelated responses as compared to TDC.

Chapter 5: Discussion

The present study aimed to examine the nature of representation of concrete and abstract words in the mental lexicon of children with Learning Disability, using a free word association task. The findings of the study are discussed in relation to the following primary objectives of the study.

a) To study the nature of representation for concrete and abstract words in the lexicon of children with Learning Disability (LD), aged 9 to 11 years (including grades 4, 5 and 6) as compared to age and gender matched typically developing children (TDC).
b) To interpret the manner of organization for concrete words and abstract words in the lexicon of children having Learning Disability.

5.1 Nature of representation for Concrete and Abstract Words in children with LD and TDC

The findings of the study revealed that for concrete words, responses of TDC were mainly Attributive type, that is, perceptual, physical properties, object-qualities, property relations, partonomic or functional associations in nature. A significant demarcation in the performance of TDC for Attributive category in the concrete type was noted when compared to other categories such as Thematic (spatial, temporal, modality, means-end relationship, situational and event based), Taxonomic (superordinate, subordinate and co-ordinate associations), Introspective (egocentric, cognitive processes, emotional state and intentional state relations) and Others (unrelated responses). This pattern of representation for concrete words was maintained throughout the grades in the present study. Across all the grades, the

nature of representation was dominantly Attributive in nature followed by Thematic, Taxonomic, Introspective and 'other' representations. These findings are in support of a study (Borghi & Caramelli, 2003) conducted on children aged 5, 8 and 10 years. The authors had concluded that from the age of 5 years onwards, the production of Thematic relations decreases while that of Attributive relations increases. The authors suggested that at younger ages, children embed actions into spatial frames that result in a principled manner to generalize objects and actions. With development, there occurred a decrease in action relations and increase in attributive relations in children's productions indicating a shift in the locus of their knowledge. They showed a shift from initially being grounded in their own or other people's direct action to being more focused in the objects' details or its properties. This change could be the result of an increase in capacity for abstraction which allows children to generalize events according to spatial context in which they occur as well as to detach objects from the events. On similar lines, the findings of the present study also indicated that the Thematic relations decreased and attributive relations increased (Barsalou & Weimer-Hastings, 2004; Weimer-Hastings, Krug & Xu, 2001; Caramelli, Setti & Maurizzi, 2004). It has been reported in the above studies that on imagery development in children around the age of 5 years to 8 years, there is development of iconic form of representation in which children tend to represent the world in terms of images rather than actions. However by the age of 8 years through adulthood, symbolic representations take precedence over these iconic representations (Schwanenflugel & Akin, 1994). Also evidences can be drawn from reports of Kosslyn (1980, 1981) in his theory of representational development which highlighted how young children rely mainly on imagery to access information stored in their memory whereas older children utilize abstract verbal representations from their

memory to access information. For e.g., in the present study, it could be inferred that with development, children tend to make more perceptual (wherein a typically developing child in the grade 6 exhibited response for /rɛkkɛ/ (wings)- beautiful, different colours, birds use it to fly) and object-directed associations (wherein a typically developing child in the grade 6 exhibited response for /di:pa/ (lamp)- gives light, we put oil, wick) than event-based or spatial associations (wherein a typically developing child in the grade 5 exhibited response for /rɛkkɛ:/ clouds, sky, white). In this study, the scores for unrelated responses on concrete words recorded as belonging to 'Others'. For example, for the stimulus /mu|̣|u / (thorn), response such as 'fish' was considered to be of Attributive kind whereas 'dolphin, navy, submarine, shark' were categorized as unrelated or 'other' responses. The outcome of the study indicated that such 'other' associations to be least amongst all the categories for concrete words. This is indicative of a well-developed semantic network for concrete words in TDC.

For the set of abstract words, responses of TDC were mainly belonging to Thematic category and were significantly greater than Taxonomic and Introspective category associations. The Thematic associations when compared to Attributive type of associations were higher in number. This implies that in TDC, for abstract words the nature of representation is mainly of Thematic in nature. Similar findings have been reported in a multitude of literature in which abstract concepts were shown to elicit more settings or event-based information in which they can occur rather than the kind of thing they refer to i.e. a perceptual or intrinsic object qualities (Borghi & Caramelli, 2003; Caramelli et al, 2004). Further, in the present study, Taxonomic associations were found to be lower than Thematic and Attributive associations. Recent studies have concluded a similar pattern wherein a concept such as 'sadness' yields associations which are situations or events that make people sad rather than

hierarchical information such as ‘sadness’ being an emotion (Caramelli et al, 2004; Weimer-Hasting & Graesser, 2000; Weimer-Hastings et al, 2001). The responses belonging to the category ‘Others’ were found to be least amongst all the set of responses. Example of such responses were, for instance the stimulus word /ka:pa:du/ (taking care) elicited responses like /s^mudra, nIru, m^lɛ/ ‘sea, water, rain’ which were categorized as belonging to ‘Others’ category.

The comparison between performance of TDC on concrete words and abstract words suggested that, Attributive associations for abstract words were significantly lower than that for concrete words. This finding is in line with a study by Weimer-Hastings, Barnard & Faelnar (2003) wherein the authors construed that abstract concepts elicited lower exemplars than concrete words. Another outcome of this comparison was a statistically significant difference in Introspective associations made for concrete and abstract words in TDC wherein it was found that abstract words had significantly higher Introspective associations than concrete words. For concrete words, sensori-motor information is more important for representation whereas for abstract words experiential information in terms of emotional content contributes more significantly to word representation and processing (Kousta, Vigliocco; Vinson & Andrews, 2011). Another study which utilized fMRI technique, supported this hypothesis by concluding that an area associated with emotional processing (rostral anterior cingulate cortex) was also found to get activated during the processing of abstract words (Vigliocco, Vinson, Kousta & Cappa, (2010). Another observation based on the findings of the study is that for concrete words, the associations made were concentrated to Attributive kind of relation and sparsely distributed to other representative categories. This finding of the study implies that for concrete words, the representations tend to be restricted to perceptual correlations.

This finding is in line with several other studies which demonstrated that for concrete words, Partonomy was the principal association type (Tversky & Hemenway, 1984) as well as semantically similar concepts (Cruth & Warrington, 2005). Also, in TDC, abstract words had greater number of representations distributed to other categories that is more of Thematic, Taxonomic and Introspective kind compared to concrete words. Abstract concepts tend to be more schematic in nature involving a large proportion of distributed features in contrast to concrete words (Weimer-Hastings & Xu, 2005). The responses belonging to the category 'Others' were found to occur less frequently for concrete words and more often for abstract words. Also, the numbers of responses were higher for concrete words than abstract words in TDC as observed from their mean scores (Table 4.1). Similar outcome is recorded in a number of studies that ascribe the finding to greater spreading activation in case of concrete words on account of their occurrence in greater number of contexts, or having dual channel representation (Paivio, 1991; Schwanenflugel & Shoben 1983; Clark & Paivio, 1971, 1986). Also, ERP studies have shown more negative responses for concrete words than abstract words over the right hemisphere (Kounios & Holcomb, 1994).

For concrete words in TDC, overall associations made were mainly Attributive in nature followed by associations belonging to Thematic, Taxonomic, Introspective and 'Others' categories. The difference between these category associations was found to be statistically significant. The performance of grade 4 TDC for concrete words when analyzed was found to follow the overall pattern observed for all grades. The nature of concrete word representation in these TDC of grade 4 was found to be mainly Attributive in nature followed by Thematic, Taxonomic , Introspective and 'Others' associations. In grade 5 and grade 6 TDC

also, associations made for concrete word stimuli were mainly of Attributive nature followed by Thematic, Taxonomic, Introspective and 'Others' associations. These associations are in line with the overall pattern of associations observed for all grades.

For abstract words in TDC, overall associations made were mainly Thematic in nature followed by Attributive, Introspective, Taxonomic and 'Others' associations. However, unlike as in case of concrete words in TDC, the nature of associations for abstract words across different categories was not statistically significant. It was found that for abstract words, grade 4 TDC follow the overall pattern observed for all grades. In grade 5 TDC children the associations for abstract words differ from the overall pattern of associations for abstract words in that the Introspective associations made were more compared to Taxonomic associations. For abstract words, in grade 6 responses were mainly Thematic in nature followed by Taxonomic, Attributive, Introspective and 'Others' associations. These responses differ from the overall pattern of associations for abstract words in that in grade 6 TDC Taxonomic associations made were more as compared to Attributive and Introspective associations in nature. Unrelated responses for each grade for both concrete and abstract words had the lowest strength which was in line with the overall score obtained for all grades.

In case of children with LD, analyzed frequency of responses on concrete words were found to be highest for Attributive category. The responses of children with LD did not show significant difference across all response categories for concrete words. Thematic associations made by children with LD for concrete words were found to be significantly greater than Taxonomic, Introspective and 'Other' category responses. Also, Attributive associations for concrete words were found to be significantly higher than Taxonomic, Introspective and 'Other' associations.

Although the Thematic associations for concrete words in children with LD were greater in number than Attributive associations (Table 4.2), they failed to show a statistically significant difference. This implies that in children with LD, nature of representation of concrete words is of both Thematic and Attributive kind. It was also found that higher numbers of relations were of Taxonomic kind than Introspective kind, although this difference was not statistically significant. These findings suggested that in children with LD, unlike TDC, the nature of representation of concrete words is not evidently apparent to be of one definite kind. Rather it has a distributed representation in form of Thematic and Attributive relations. This finding highlights the difference in nature of representation of concrete word between children with LD and TDC in the sense that, in the present study TDC exhibited a unambiguous nature of representation of concrete words. The scores for unrelated responses in children with LD on concrete words, recorded as belonging to 'Others' was found to be least amongst all categories (Table 4.1).

For abstract words, in children with LD, Thematic associations were highest in frequency as observed from the mean scores depicted in the study. However, the findings showed a significant difference in scores of children with LD for Thematic category only when compared to Taxonomic category and 'Others' category for abstract words. Attributive category responses on abstract words were significantly higher than unrelated responses of 'Others' category. These findings for nature of representation of abstract words in children with LD portray that abstract words are predominantly associated to Thematic relations. The next set of dominant representation is of Attributive kind. More of Introspective associations were made for abstract words in children with LD than Taxonomic associations. Thus it was concluded that though children with LD mimicked the typical form of representation

of abstract words as derived from their mean scores, they failed to show a significant difference across categories. This implied that the associations for abstract words in children with LD were ambiguous in nature. Further, abstract words showed a developmental lag in their nature of representation in the lexicon of children with LD, wherein Taxonomic associations were evidently lesser (Table 4.2) compared to associations made by TDC for abstract words as observed from their mean scores (Table 4.1). In the present study this lack of a definite pattern of representation for concrete and abstract word could presumably be due to fewer responses yielded by children with LD as observed from their mean scores (Table 4.2). This is indicative of the fact that in children with LD concrete and abstract concepts did not undergo as much activation as was observed in TDC based on their mean scores (Table 4.1) (Paivio, 1991; Schwanenflugel & Shoben, 1983). This difference observed in the present study was also recorded in another study (Vellutino and Scanlon , 1982, 1985) in which children with LD were found to perform poorer than TDC on verbal association tasks. This lack of associations made by children with LD on concrete and abstract words in the present study is found to be in line with other studies which utilized verbal finite tasks such as lexical access and naming tasks (Baker, Ceci & Herrmann, 1987; Kail, Hale, Leonard, & Nippold, 1984). The performance of children with LD in these studies was found to be a deficit. The reason for such performance by children with LD on verbal naming tasks was concluded to be a difficulty in word-finding process in these children. The authors suggested that this could probably be due to their lower memory performance. Another reason for the deficient performance was reported by Swanson (1987) in his study in which he stated that insufficient representation of words in the memory of children with LD could

have resulted in an inability to name unfamiliar pictorial information or gain from an external naming source.

The comparison between performance of children with LD on concrete words and abstract words suggested that Attributive associations for concrete words were significantly higher than Attributive associations for abstract words. Another outcome of this comparison was a significant difference in Introspective associations made for concrete and abstract words in children with LD wherein it was found that concrete words had significantly lesser Introspective associations than abstract words. Further it was observed that in children with LD concrete words had more Thematic and Taxonomic associations compared to abstract words although this difference was not statistically significant. In children with LD, Taxonomic category and Introspective category for concrete and abstract words were found to differ in their representation. For concrete words associations were more superordinate, subordinate and co-ordinate (Taxonomic) in nature after Attributive and Thematic associations succeeded by egocentric, cognitive processes, emotional state and intentional state associations (Introspective). Whereas for abstract words, more of Introspective associations were made after Thematic and Attributive associations, succeeded by Taxonomic relations.

Overall, the findings of the study illustrated higher scores for concrete words than abstract words on Thematic, Attributive and Taxonomic categories suggesting that children with LD were able to make more sets of associations for concrete words than for abstract words. This could also be explained considering that in children with LD, numbers of responses for abstract words were lower than for concrete words (Paivio, 1991; Schwanenflugel & Shoben, 1983). The responses belonging to the category 'Others' were found to occur less frequently for concrete words and more often for abstract words. This suggested a stronger semantic network and well-

regulated spread of activation in the neural semantic network for concrete words than abstract words in children with LD (Collins and Loftus, 1975) .

The performance of grade 4 children with LD for concrete words when analyzed was found to be mainly Attributive in nature followed by Thematic, Taxonomic, Introspective and 'Others' associations. It was seen that for concrete words grade 4 children follow the overall pattern observed for all grades. For abstract words, associations made were mainly Thematic in nature followed by Taxonomic, Introspective, and Attributive associations. This differed from the overall pattern observed for children with LD in that Taxonomic associations in grade 4 children were second-highest (TXA: Mean= 13.00, SD=5.29). Thus it was concluded that grade 4 children with LD tended to have more Taxonomic associations on abstract words followed by Introspective associations and then by Attributive relations. In grade 5 children with LD, the associations made for concrete words when analyzed were found to be mainly Attributive in nature followed by Thematic, Taxonomic and Introspective associations. For abstract words, the nature of representation in the lexicon of children with LD was mainly Thematic followed by Attributive, Taxonomic, Introspective and 'Others' category. These associations differ from the overall pattern of associations for abstract words in that, in grade 5 children with LD, Taxonomic associations were more as compared to Introspective associations. In children with LD of grade 6, associations made for concrete word stimuli were mainly of Attributive nature followed by Thematic, Taxonomic and Introspective associations. These associations were in line with the overall pattern of associations observed for all grades combined in children with LD. Unrelated responses for each grade for both concrete and abstract words had the lowest strength which was in line with the overall score obtained for all grades combined.

With the above mentioned findings, the first null hypothesis stating that, there is no significant difference in representation of concrete and abstract words in mental lexicon of children with learning disability as compared to typically developing children, is rejected. It can be inferred that children with LD exhibited similar nature of representation of concrete words as TDC across categories and grades. On abstract words, children with LD although exhibited a similar nature of representation as TDC, a developmental lag was observed for Taxonomic category associations in children with LD.

5.2 Manner of organization of concrete words and abstract words in children with Learning Disability (LD)

Developmental studies on representation of concrete and abstract words stated that the lexical organization of these words in mental lexicon of typically developing children begins as early as in pre-school years and is almost similar to adult manner of organization by 8 years of age (Schwanenflugel & Akin, 1994; Kosslyn (1980, 1981; Kieras, 1978). In the present study these findings were replicated for TDC and for children with LD wherein for concrete words the same manner of hierarchical organization of associative categories was recorded across all grades. For abstract words, in TDC the hierarchical pattern of organization was maintained across grades for categories Thematic and Attributive. Only the categories Taxonomic and Introspective showed a shift in hierarchy across grades. Taxonomic associations shifted to being third-most frequent association by grade 6. This finding is supported in literature which suggests that with development Taxonomic knowledge shows significant increase and starts to resemble the semantic system of a mature language user (Lippman, 1971; Clark, 1993; Anglin, 1977). On the other hand, in the present

study, children with LD exhibited a lag in organization of Taxonomic associations. It was observed that in the overall hierarchical manner of organization of abstract words, Taxonomic associations occupied the fourth position after Thematic, Atributive and Introspective associations. Thus it was concluded that organization of abstract words in the lexicon of children with LD is delayed compared to TDC.

Along the lines of this observation, based on the class of responses elicited in the present study, it was observed that children with LD exhibited a manner of organization of concrete and abstract words similar to the organization of words in the lexicon of younger age group TDC. Bowerman (1978) stated that lexical organization is not the same as conceptual organization. Words tend to marks some but not all conceptually available distinctions. As such, younger children tend to use 'fillers' to satisfy gaps in their semantic memory lexicon (Lucariello & Nelson, 1985). The analyzed responses of a child with LD in grade 4 (LD 1) (Raw scores for concrete words: TTC=30; ATC: 40; TXC=20; ITC=1; OTC=3) and responses of a typically developed child of the same grade (TDC 1) (Mean scores of TDC for concrete words (TTC: Mean =33.80, SD=8.84; ATC: Mean=53.70, SD=6.18; TXC: Mean=15.30, SD=4.66; ITC: Mean=7.20, SD=2.65; OTC: Mean=0.40, SD=0.69) substantiated the presence of such 'fillers' in the lexicon of children with LD in earlier grades. For e.g. for the stimulus /nIdʱa:na/ (slowly) LD 1 responded as 'when we are not in urgent situation' as opposed to the response of TDC 1 as 'relaxed'.

Another set of responses of LD 1 depicted a delay in organization of words in her lexicon. For the stimuli /kiri:ʈa/ (crown) the response was " /hIng.. hIng.. Irt∧dɛ/" while tracing the shape of a crown on her head using her hands. Similarly for the stimulus /nadɨ/ (river) LD 1 traced in air the shape of flowing river using her hands and for /rɛkkɛ/ (wings) flapped her hands in the air simulating flying action. Such

responses are evidenced to be present in the lexicon of younger children. The grounded cognition view describes how concrete concepts are embedded in sensori-motor simulations. Also due to 'Action Compatibility Effect (ACE)' people tend to represent knowledge in motor actions or embodied experiences. In children belonging to pre-school years, such motor simulations are predominantly present (Pecher & Zwaan, 2005; Barsalou & Wiemer-Hastings 2005; Barsalou, 1991, 2008). Thus it was concluded that children with LD exhibit manner of word organization similar to younger typically developing children.

When describing the word organization, several studies talk about the role of the surroundings of a child in the learning process such as in Triarchich theory it is a child's external world and/ or the environmental context as in Context Availability Theory (Kieras, 1978; Schwanenflugel & Shoben, 1983; Schwanenflugel, Akin & Luh, 1992; Altarriba, Bauer & Benvenuto, 1999). In the present study, responses of a typically developing child of grade 6 (TDC 23) for the stimulus /su:rjoɗ^ja/ (sunrise) were 'sun rises and rays come, cock screams, everyone wakes up'. These responses elucidate how the associations for 'sunrise' are essentially contextual and linked to their experiences in the external world. On the other hand, the responses of a child with LD (Raw score for concrete words: TTC=32; ATC: 38; TXC=8; ITC=0; OTC=0) compared to the responses of a age-matched TDC (TTC: Mean =31.90, SD=7.93; ATC: Mean =46.90, SD=8.08; TXC: Mean=16.8, SD=4.73; ITC: Mean=7.40, SD=8.23; OTC: Mean=2.50, SD=3.95) for the same set of stimuli depicted a very evident deficit in the learning process and word representation. The responses of this child with LD (LD 7) for the stimulus /su:rjoɗ^ja/ (sunrise) were 'warmth, closing eyes'. These responses are limited in number as well as depict restricted contextual information. This finding of the present study was in consonance

with the report of Swanson (1987) in which it was stated that the ability of children with LD to achieve automatization as a skill can be considered to occur more slowly and gradually as compared to their non learning disabled counterparts. Similarly, the Information Processing Theory (Swanson, 1987) concluded that the efficiency of a child's concept learning in terms of his internal world was based on his experiential history. In the present study, for the stimulus /s^mbr^ma:/ (celebration) the responses of typically developing child of grade 6 (TDC 23) included 'fun-fair, happiness, joyful, friends-family, games' which are indicative of having experienced the concept earlier. A history of such experiences allows complete familiarity resulting in unconscious or preconscious processing referred to as "Automatization", which requires little processing effort on the child's part (Swanson, 1987). Also, the responses of the same child (TDC 23) for /^nja:ja/ (injustice) were 'hurting others, lying, beating others, disrespecting, killing' and for /Udʃanavana/ (park) were 'slide, swing, see-saw, monkey bars, cricket'. The responses of a child with LD (LD 7) for /^nja:ja/ (injustice) were 'taking seats, saying "I want that" and taking it away' and for /Udʃa:navana/ (park) were 'playing, grass, tree, swing, slide'. On comparing and contrasting these responses it was concluded that LD 7 performed similar to TDC 23 for the stimulus 'park', suggesting a strong experiential history for playground and park.

The concept of Hebbian Learning memory further adds to this finding in which it is postulated that for maintenance and fine tuning of neural circuits environmental stimulations that serve as the input play a major role (Hebb, 1949; Pulvermuller, 1996; Vaughan & Kurtzberg, 1992). For the stimulus 'injustice', responses of the child with LD (LD 7) in contrast to responses of TDC 23, were lacking in number as well as nature suggestive of a lack of familiarity to the concept.

This finding maintained that for automatic or effortless processing to occur, familiarity to the concepts was a necessary pre-requisite.

Upon contrasting concrete words' and abstract words' responses the differences were credited to the quantitative or qualitative differences in representation and processing of these word types. Experiential information is a striking feature of abstract concepts whereas intrinsic item features are unique to concrete concepts (Weimer-Hastings & Xu, 2005; Schwanenflugel & Akin, 1994). The present study found similar manner of organization for concrete words as is apparent from the responses of TDC 23 for concrete word /ʤva:lamukʰi/ (volcano) which were 'lava, molten rock, mountain, magna'(intrinsic features). Similarly for abstract word /sankoʧa/ (hesitation) the responses were 'hiding, not showing face to anyone, not talking, feeling shy' which imply experience based information. In children with LD similar finding was observed wherein concrete words elicited responses depicting intrinsic features and abstract words elicited experience based responses For e.g. responses of LD 7 for concrete word /ʤva:lamukʰi/ (volcano) were 'fire, lava waves, burning' and for abstract word /sanko:ʧa/ (hesitation) were 'when talking to others, to ask doubts, talking about others'. Although these responses of children with LD are of similar manner as in TDC, they are limited in number and also represent the same feature or experience that is, they are much less varied when compared to TDC's responses.

However, in the present study not all children with LD exhibited considerably deviant performance when compared to performance of TDC in the same grade. The literature on Learning Disability established that the deficits are associated with specific impairments in cognitive processes of these children with LD. Models of Classification of Learning Disability such as Intra-Individual Differences Model

(Schrank & Woodcock, 2001) stated that a person with LD is one with strengths in many areas but weaknesses in some core cognitive processes that lead to under-achievement. Similar finding was replicated on qualitative analysis in the present study. Considering the responses of a child with LD (LD 4) whose raw scores in categories (Raw score for concrete words: TTC=40; ATC: 53; TXC=4; ITC=3; OTC=0) were found to be close to the mean scores of TDC of the same grade (grade 5) (TTC: Mean =34.70, SD=12.47; ATC: Mean =51.30, SD=9.31; TXC: Mean=17.0, SD=8.79; ITC: Mean=8.00, SD=5.77; OTC: Mean=0.90, SD=1.66). Few examples of the responses of a typically developing child in grade 5 (TDC 20) were compared to a child with LD (LD 4). For a concrete type stimulus /m^lɛ/ (rain) the responses of TDC 20 were 'cloud, snow, freeze, Venus has acid rain, we need rain for crops' and the responses of the child with LD 4 were 'outside, water, collect it to harvest, black clouds, gets collected in vessels outside'. Similarly, for the stimulus /ujja:lɛ/ (swing) responses of TDC 20 were 'nice to play, young kids, different types of swings, wind blows on going fast, chains' and responses of the child with LD 4 were 'we sit and swing, playground, should not stand and swing, chains'. For abstract word /ma:lInja/ (pollution) the responses of TDC 20 were 'we should not pollute, ozone is affected, water pollution should stop, not burst crackers, not throw things in river' and responses of LD 4 were 'water pollution, throwing plastic, mosquitoes, disease'. Similarly for another abstract stimulus /nɔ:vu/ (pain) responses of TDC 20 were 'when we fall down, pinch, beating, punching, tough' and responses of LD 4 were 'falling, on pinching it hurts, when someone says hurtful things'. These responses indicated how in a child with LD of comparatively lower severity, the manner of processing of concrete and abstract word mimicked the manner observed in TDC.

This finding is also evidenced in imagery based studies such as Dual Coding Theory (Paivio, 1991) and contextual-information processing (Schwanenflugel and Shoben, 1983; Swanson, 1987; Altarriba, Bauer & Benvenuto, 1999). Visual modality of processing (Paivio, 1991) suggests that words can be recognized independently of phonological processing. Hence in children with LD who exhibited phonological deficits, representation of words in their mental lexicon need not be impacted. Also, to perform successfully on a task children with LD must select a plan of action from a repertoire of strategies relevant to problem solving or task-completion. This skill requires them to have the necessary information and knowledge of their own capacity, that is, of their cognitive resources to be able to efficiently allocate those resources to the directed task at hand (Swanson, 1987).

In-depth analysis of responses of children with LD for concrete and abstract words also exhibited a delayed manner of organization of these words in their mental lexicon, when compared to TDC. *Based on the above findings the second null hypothesis that there is no significant difference in organization of concrete and abstract words in mental lexicon of children with learning disability in comparison to typically developing children, is rejected.*

Chapter 6: Summary and Conclusion

The aim of the present study was to examine the nature of representation of concrete and abstract words in the mental lexicon of children with Learning Disability, using a free word association task. The objectives of the study included to investigate the nature of representation for concrete and abstract words in the lexicon of children with Learning Disability, aged 9 to 11 years (including grades 4, 5 and 6) as compared to age and gender matched typically developing children. The other objective of the study was to interpret the manner of organization for concrete words and abstract words in the lexicon of children having Learning Disability.

The present study involved a free word association task for concrete and abstract words. The methodology employed in the study included thirty typically developing children (TDC) in the age range of 9 to 11 years (including grades 4, 5 and 6) forming the control group and twelve age-matched children with Learning Disability (LD) formed the clinical group. The participants of the group performed a free word association task in which age-appropriate stimuli was presented randomly through auditory mode and the children were asked to respond by saying what first came to their mind upon hearing the target word/stimuli. The responses were categorized in to five categories- Thematic, Attributive, Taxonomic, Introspective and 'Others'.

The findings indicated that in TDC, concrete words were found to have mainly Attributive nature of representation followed by Thematic, Taxonomic, Introspective and 'Others' representations whereas abstract words were found to be predominantly Thematic in nature followed by Attributive, Taxonomic, Introspective and 'Others' nature of representation. In children with Learning Disability, for concrete words a pattern similar to TDC was found in which Attributive representation was the

principal nature of representation followed by Thematic, Taxonomic, Introspective and 'Others' whereas for abstract words a slightly delayed pattern was observed. In children with LD abstract words primarily had Thematic associations and distributed associations of Attributive and Introspective kind. Taxonomic associations were notably reduced. Thus the overall nature of representation of abstract words in children with LD was Thematic followed by Attributive, Introspective, Taxonomic and 'Others' associations.

The manner of organization of the concrete and abstract words differed between children with LD and TDC. In contrast to TDC, the children with LD, concrete and abstract words had less varied associations and these associations relied heavily on the past experiences of these children. Also, compared to TDC, children with LD had a lag in the kinds of category associations for concrete and abstract words. These children also gave fewer numbers of responses as compared to TDC for concrete as well as abstract words. Thus, in conclusion it was observed that there existed a difference in the manner of organization of concrete and abstract words in the mental lexicon of children with LD when compared to TDC.

Implications of the study

Although there existed ample number of studies that looked into illustration of concrete and abstract words in typically developing children and children with Learning Disability, the same was not explored in depth for the Indian population. India has a polyglot population. Owing to diverse language use, one could anticipate that there would exist a difference in depiction of words in the mental lexicon of such a population. This study enabled one to understand the nature of representation of concrete and abstract words in mental lexicon of children with Learning Disability, as

compared to their typically developing peers. The study also interpreted the manner of organization of concrete and abstract words in the mental lexicon of children with Learning Disability across categories being studied. The outcome of this study thereby provided added information and helpful insight to clinicians for utilizing effective instructional and therapeutic intervention strategies to teach abstract and concrete concepts to these children with Learning disability in the clinical set up.

Limitations of the study

The present study included a limited sample size across grades in the populations of TDC and children with LD. Further, in the clinical group, equal number of participants of each gender was not maintained. Also, the type of Learning Disability for the clinical group was not controlled which could be indicative of heterogeneity in the sample.

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Appendix 1

List of test stimuli

For grade 4	
Concrete words	Abstract words
/mi:sɛ/ ಮೀಸೆ ‘moustache’	/nIdʰa:nɑ/ ನಿಧಾನ ‘slow’
/kUɖUrɛsʌvarI/ ಕುದುರೆಸವಾರಿ horse carriage	/gʌrʤʌnɛ/ ಗರ್ಜನೆ ‘roar’
/bɛ:sigɛka:lɑ/ ಬೇಸಿಗೆಕಾಲ summer season	/prɑja:ɳɑ/ ಪ್ರಯಾಣ ‘travel’
/to:ʈa/ ತೋಟ ‘farm’	/ha:rU/ ಹಾರು ‘fly’
/ka:gɛ/ ಕಾಗೆ ‘crow’	/no:vU/ ನೋವು ‘pain’
/ba:ɭɛ həɳɳU/ ಬಾಳೆಹಣ್ಣು ‘banana’	/kʌnʌsU/ ಕನಸು ‘dream’
/vIdjarʈʰI/ ವಿದ್ಯಾರ್ಥಿ ‘student’	/ɑlʌnka:rIsU/ ಅಲಂಕರಿಸು ‘to decorate’
/kIri:ʈɑ/ ಕಿರೀಟ ‘crown’	/spʌrdɛ/ ಸ್ಪರ್ಧೆ ‘competition’
/bɛnkI/ ಬೆಂಕಿ ‘fire’	/ʃʌkti/ ಶಕ್ತಿ ‘strength’
/bɛʈʈa/ ಬೆಟ್ಟ ‘hills’	/bʰʌjɑ/ ಭಯ ‘fear'
/dUɖɖU/ ದುಡ್ಡು ‘money’	/mIɲʧU/ ಮಿಂಚು ‘lightning’
/bIkʃUkɑ/ ಭಿಕ್ಷುಕ ‘beggar’	/sʌnto:ʃɑ/ ಸಂತೋಷ ‘happiness’

/sna:nɑ/ ಸ್ನಾನ ‘bath’	/sUɖU/ ಸುಡು ‘burn’
/nʌdɪ/ ನದಿ ‘river’	/so:marɪ/ ಸೋಮಾರಿ ‘lazy’
/kalUʧilə/ ಕಾಲುಚೀಲ ‘socks’	/sUstU/ ಸುಸ್ತು ‘tired’
/rɛkkɛ/ ರೆಕ್ಕೆ ‘wings’	/puʤɛ/ ಪೂಜೆ ‘prayer’
/ga:ɭI/ ಗಾಳಿ ‘wind’	/ʧʌɭI/ ಚಳಿ ‘cold’
/nʌvIlU/ ನವಿಲು ‘peacock’	/gɛlUvU/ ಗೆಲುವು ‘success’
/bɛ:jIsU/ ಬೇಯಿಸು ‘cook’	/a:ʃʧʌrjɑ/ ಆಶ್ಚರ್ಯ ‘surprise’
/hʌggɑ/ ಹಗ್ಗ ‘rope’	/mUɗɖUtʌnɑ/ ಮುದ್ದುತನ ‘caring’

For grade 5	
Concrete words	Abstract words
/mʌɭɛ/ ಮಳೆ ‘rain’	/ɟIkItsɛ/ ಚಿಕಿತ್ಸೆ ‘treatment’
/mo:ɖɑ/ ಮೋಡ ‘cloud’	/ma:lInjɑ/ ಮಾಲಿನ್ಯ ‘pollution’
/Ujja:lɛ/ ಉಯ್ಯಾಲೆ ‘swing’	/kʰa:rɑ/ ಖಾರ ‘spicy’
/ɟIʈʈɛ/ ಚಿಟ್ಟೆ ‘butterfly’	/sʌmbrʌmɑ/ ಸಂಭ್ರಮ ‘celebration’
/ɗipɑ/ ದೀಪ ‘lamp’	/bʌɖʌtʌnɑ/ ಬಡತನ ‘poverty’
/i:ʤU/ ಈಜು ‘swim’	/ɳja:nɑ/ ಜ್ಞಾನ ‘wisdom’
/rɛkkɛ/ ರೆಕ್ಕೆ ‘wings’	/bʰʌjɑ/ ಭಯ ‘fear’
/ba:vI/ ಬಾವಿ ‘well’	/ɗu:rɑ/ ದೂರ ‘far’
/bʌssUnIlɗa:ɳa/ ಬಸ್ಸುನಿಲ್ದಾಣ ‘bus stop’	/sʌha:jɑ/ ಸಹಾಯ ‘help’
/tIɳɖI/ ತಿಂಡಿ ‘snacks’	/ɗUkkɑ/ ದುಕ್ಕ ‘sadness’
/kamɑnɑbIllU/ ಕಾಮನಬಿಲ್ಲು ‘rainbow’	/no:vU/ ನೋವು ‘pain’
/grʌntʰa:lajɑ/ ಗ್ರಂಥಾಲಯ ‘library’	/prʌkrUtI/ ಪ್ರಕೃತಿ ‘nature’
/gʌli:ʤU/ ಗಲೀಜು ‘dirty’	/vʌɖɖɛ/ ವದ್ದೆ ‘wet’

/sna:nɑ/ ಸ್ನಾನ ‘bath’	/hʌsIvU/ ಹಸಿವು ‘hungry’
/a:ʈɑga:rɑ/ ಆಟಗಾರ ‘player’	/bIsI/ ಬಿಸಿ ‘hot’
/sʌInIkɑ/ ಸೈನಿಕ ‘soldiers’	/ka:pa:ɖU/ ಕಾಪಾಡು ‘caring’
/hʌɖʌgU/ ಹಡಗು ‘ship’	/sUndʌrɑ/ ಸುಂದರ ‘beautiful’
/a:spʌtrɛ/ ಆಸ್ಪತ್ರೆ ‘hospital’	/Upa:jɑ/ ಉಪಾಯ ‘solution’
/mUl̪U/ ಮುಳ್ಳು ‘thorn’	/sɑtjɑ/ ಸತ್ಯ ‘truth’
ಅಂಗಡಿ /ɑngʌɖI/ ‘shop’	/gɛl̪ɛtʌnɑ/ ಗೆಳೆತನ ‘friendship’

For grade 6	
Concrete words	Abstract words
/dʌʈʈva:ɗɑ/ ದಟ್ಟವಾದ ‘thick’	/hImsɛ/ ಹಿಂಸೆ ‘forcefulness’
/vIgrʌhɑ/ ವಿಗ್ರಹ ‘statue’	/pUnjɑ/ ಪುಣ್ಯ ‘merit/benovelence’
/ʤʌnʌkɑ/ ಜನಕ ‘infrequent’	/hɔʈʈɛkIʧʃu/ ಹೊಟ್ಟೆಕಿಚ್ಚು ‘jealous’
/Uʤja:nʌvʌnɑ/ ಉದ್ಯಾನವನ ‘park’	/prʌʃantʌva:ɗɑ/ ಪ್ರಶಾಂತವಾದ ‘peaceful’
/bɛ:ʈɛgarɑ/ ಬೇಟೆಗಾರ ‘hunter’	/parImaɭɑ/ ಪರಿಮಳ ‘fragrance’
/mʌrɑ/ ಮರ ‘tree	/mrUɗU/ ಮೃದು ‘soft’
/ɗvi:pɑ/ ದ್ವೀಪ ‘island’	/sɔmarI/ ಸೋಮಾರಿ ‘lazy’
/mʌtsjɑ/ ಮತ್ಸ್ಯ ‘fish’	/rʌUɖi/ ರೌಡಿ ‘villian’
/ko:ɭʌlU/ ಕೊಳಲು ‘flute’	/a:sʌktI/ ಆಸಕ್ತಿ ‘interest’
/pʌɲʤU/ ಪಂಜು ‘flame torch’	/ʧUpa:ɗɑ/ ಚೂಪಾದ ‘sharp’
/a:ʧarjɑ/ ಆಚಾರ್ಯ ‘teacher’	/ɑbʰInʌjɑ/ ಅಭಿನಯ ‘acting’

/sIɭɭɛ/ ಸಿಳ್ಳೆ ‘whistle’	/tapasU/ ತಪಸು ‘penance’
/ʤvalamUkʰI/ ಜ್ವಲಾಮುಖಿ ‘volcano’	/sʌmbrʌmɑ/ ಸಂಭ್ರಮ ‘celebration’
/su:rjo:dʌjɑ/ ಸೂರ್ಯೋದಯ ‘sunrise’	/pIsUgUʈʈU/ ಪಿಸುಗುಟ್ಟು ‘whisper’
/dInʌpʌtrIkɛ/ ದಿನಪತ್ರಿಕೆ ‘newspaper’	/sʌnko:ʧɑ/ ಸಂಕೋಚ ‘hesitation’
/ʧIgUrɛlɛ/ ಚಿಗುರೆಲೆ ‘young leaf’	/a:lo:ʧʌnɛ/ ಆಲೋಚನೆ ‘thinking’
/gramʌntɑrɑ/ ಗ್ರಾಮಂತರ ‘village side’	/hʌrʌsU/ ಹರಸು ‘blessing’
/kUttIgɛ/ ಕುತ್ತಿಗೆ ‘neck’	/prʌsIdʰɑ/ ಪ್ರಸಿದ್ಧ ‘famous’
/kUrUbɑ/ ಕುರುಬ ‘shepherd’	/ɑpʌru:pɑ/ ಅಪರೂಪ ‘rare’
/ʌnja:ja/ ಅನ್ಯಾಯ ‘injustice’	/sʌntɛ/ ಸಂತೆ ‘market’