MENTAL LEXICON IN CHILDREN: REPRESENTATION OF CONCRETE AND ABSTRACT WORDS

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May, 2017

CERTIFICATE

This is to certify that this dissertation entitled **"Mental lexicon in children: Representation of concrete and abstract words "** is a bonafide work submitted in part fulfilment for degree of Master of Science (Speech-Language Pathology) of the student Registration Number: 15SLP020. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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CERTIFICATE

This is to certify that this dissertation entitled " **Mental lexicon in children: Representation of concrete and abstract words** " has been prepared under my supervision and guidance. It is also being certified that this dissertation 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 " **Mental lexicon in children: Representation of concrete and abstract words** " is the result of my own study under the guidance of Dr.Prema K.S., Professor of Language Pathology, Department of Speech Language Sciences, 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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Table of Contents

List of Tables

List of Figures

CHAPTER I

Introduction

Understanding and producing meaningful utterances forms the basis of any communication. Language being the primary mode of communication serves as a medium to exchange thoughts and ideas. Words stored in the mental lexicon of individuals form the basic component of a language and word meaning provides the core information upon which all communication is built (Vinson, 2009). Simply stated, the mental lexicon is comparable to a mental dictionary that contains information about a word with respect to its meaning, pronunciation, syntactic characteristics, and associated or related words. The mental lexicon is accessed in every act of linguistic communication. For example, in our act of expression of thoughts or when we decipher a word that we hear, generally we choose the right words from our mental lexicon. Studies using priming paradigms have shown that words are linked to each other along phonological, semantic, syntactic dimensions besides others such as emotional, social, and contextual. When a word is activated, other words of similar form (Goldinger, Luce & Pisoni, 1989; Luce, Pisoni & Goldinger, 1990), meaning (Meyer & Schevaneldt, 1971), syntax (Sereno, 1991), orthography (Segui & Grainger, 1990), emotional content (Wurm, Vakoch, Aycock, & Childers, 2003) etc are also activated, suggesting that the mental lexicon is complex and highly interconnected. Therefore, organization of mental lexicon is important for selection of words, for meaningful communication.

Each word stored in the mental lexicon of an individual is presumed to represent a concept of the world. These concepts are acquired by individuals from infancy on employing active and passive learning from the environment and real world experiences. It consists of a vast amount of knowledge about living and non

living things gathered from seeing them, using them, observing others use them, talking and reading about them (Cree & McRae, 2003). This knowledge is assumed to be represented and processed in the semantic memory of individuals, the basic building blocks of which are said to be semantic features. Semantic features simply refer to bundles of attributes related to a given word corresponding to a particular concept. The attributes reflect a particular type of knowledge/information about the word which is stored in the mental lexicon such that these attributes or semantic features combined together reflect the meaning of that particular concept. They play a major role in the conceptual organization and categorization in semantic memory. Research relating to semantic representation (McRae, Cree, Seidenberg, & McNorgan, 2005; Vinson & Vigliocco, 2002; Vinson & Vigliocco, 2008) amongst others have investigated semantic features extensively, as they provide valuable insights into language organization and processing.

The features associated with words differ across several dimensions (e.g. valence, meaningfulness, concreteness) and form the core of the mental lexicon. One such dimension is concreteness. Concreteness talks about how directly a concept (represented by a word) activates sensory experience (Paivio, Yuille, & Magidan, 1968). Concepts that are rated high in concreteness are labeled "concrete" while concepts rated low in concreteness are labeled "abstract". For example, the concept "fork" refers to visual, tactile, and perhaps even gustatory sensory experiences, and is therefore highly concrete; this is contrasted with a concept such as "justice", which does not directly refer to any specific sensory experience, and is therefore very low in concreteness and is labeled "abstract". The fact that concrete and abstract words

evoke distinctly different experiences, in turn suggest that they could be processed and represented differently at the central level. In order to investigate these differences, several authors in the past have conducted a number of experiments. The results of these experiments have shown contrasted behavioural responses to concrete versus abstract words across an array of psychometrics including lexical decision (e.g., Bleasdale, 1987; Schwanenflugel & Shoben, 1983) and eye-fixation (e.g. Juhasz & Rayner, 2003). Also, these studies have consistently discovered slower response times to abstract targets (Paivio, 1991; Schwanenflugel & Shoben, 1983). The difference in responses to abstract versus concrete concepts can be due to either quantitative or qualitative differences in representation and processing. Quantitative explanations of the differences refer to differences in amount of processing power or amount of activation, whereas qualitative accounts focus on the type of processing (similarity vs. association). Two classic theories claim that there are quantitative differences in the representations of either concept-type: either that concrete concepts were represented in two coding streams whereas abstract concepts were represented in only one (Paivio, 1991); or that concrete concepts were experienced in a greater number of contexts, and therefore cause greater spreading activation (Schwanenflugel & Shoben, 1983). The dual-coding theory (Paivio, 1991) proposes that concepts are represented in two different coding streams: one verbal and one non-verbal. These two streams are proposed to function independently, and thus, processing in either stream can have additive processing effects if they are both representing the same concept. That is, if a concept were to be represented in both, access to that concept would be facilitated by both streams. Paivio (1986) proposes that concrete concepts can be represented in both streams, whereas abstract concepts can only be represented

in the verbal stream; thus explaining the processing advantage seen for concrete concepts. Kieras (1978) proposed that processing is heavily reliant on context availability, and Schwanenflugal and Shoben (1983) stated that this could explain processing advantages seen for concrete words; due to it being easier to assign context to concrete words compared to abstract words. This was tested and supported by an experiment where the authors used sentences to provide context for both concrete and abstract words. They found that, given equivalent contextual support, lexical decision times did not significantly differ between concrete and abstract targets. Therefore they concluded that concrete concepts reserve a processing advantage only because, in general, concrete concepts have more contextual information available.

In contrast to the above theories, Crutch & Warrington (2005) proposed that the differences in responses to abstract and concrete words can be attributed to each having qualitatively different representation systems; namely, that concrete concepts are organized by semantic similarity, and that abstract concepts are organized by association. This was supported by their findings in a study involving a patient with semantic refractory access dysphasia; a disorder which is defined by the reduction in the ability to utilize the semantic access system following its activation. This patient experienced interference by associated words for abstract concepts (but not for concrete concepts) and by semantically similar words for concrete concepts (but not for abstract concepts) when the words were presented in an array. Hence, the theory predicts that, once activated, an abstract word would predominantly co-activate associated concepts, whereas a concrete word would predominantly co-activate semantically similar concepts. Several authors have investigated the processing of

concrete and abstract concepts in children as well. Caramelli, Setti, & Maurizzi, (2004) studied the development of abstract and concrete conceptual knowledge as assessed by the kinds of relations elicited, in school age children. In consonance with other studies on adults (Wiemer-Hastings, Krug, & Xu (2001) abstract and concrete concepts showed the activation of a specific pattern of relations in school age children as well. Concrete concepts elicited a large number of attributive and thematic relations. Hence, concrete concepts conveyed information mainly related to the properties of the objects they refer to, such as shape or parts. This finding was in line with previous studies showing the relevance of perceptual characteristics of an object in children's conceptual knowledge (Tversky & Hemenway, 1984). Similarly, Borghi & Caramelli (2003) found an increasing number of attributive relations produced from age 5 to age 8 in an association production task, for concrete words. On the other hand, abstract concepts elicited thematic relations and were characterized by information referring to the situations and events they are experienced in. Overall, the information elicited by concrete concepts rested on a wider range of relations than that elicited by abstract concepts (Wiemer-Hastings, Barnard, & Faelnar, 2003). Concrete concepts elicited attributive and thematic relations as well as a smaller number of taxonomic relations, i.e. information on categories. For example, the concept 'dog' could elicit attributive information about dogs having four legs and a tail, thematic information about dogs running in a meadow and eating bones and information about dogs being animals and, more specifically, domestic animals.

The pattern of relations characterizing concrete concepts is already well established in school going children (as young as 8 years), as it does not change with age. Abstract concepts, instead, not referring to perceivable objects, are not organized

in conventional taxonomic categories (Wiemer-Hastings et al., 2003) nor display features as distinctive as those displayed by concrete concepts. Hence, they are characterized mainly by the contextual information that defines the events which they are experienced in. Thus, for example, the concept 'duty' could elicit mainly situational information and examples such as 'at school' and 'to do the homework'.

This specific kind of information that abstract concepts are made up from, already present in 8-year-old children, becomes more specific with age due to children's mastery wider domains of abstract concepts, resulting in the increase of thematic relation production. Further, the language that an individual learns influences how s(h)e talks about objects and events. Also, some languages offer more terms than others for particular domains (Clark, 2004). Language representation is also influenced by the cultural exposure and learning environment. The studies done till date on lexical semantic representation in children, are limited to English and other European languages (Cree & McRae, 2003; Randall, Moss, Rodd, Greer, & Tyler, 2004; Mason-Baughman, 2009; Kiran & Thompson, 2003). Very few studies have been reported for Indian languages, in this context. Chitra & Prema (2008) examined the nature of lexical-semantic organization of nouns, verbs and adjectives in Kannada-English bilingual children. Prema & Prarthana (2013) investigated the distribution of semantic features for two categories of nouns (living vs. non-living) in adults who were native speakers of Kannada. However, these studies did not look into the nature of representation of abstract and concrete words. Empirical evidence from studies on Indian languages (the structure of which being different from the European languages), is likely to enlighten our understanding of distribution of semantic features and their representation. Also, since the representation of abstract words in

the lexicon is heavily influenced by thematic relations, which in turn vary by culture and language, it would be interesting to examine the lexical semantic representation of concrete and abstract words in the mental lexicon of Indian children. India is a multilingual country, and children in India are generally exposed to more than one language throughout their developmental age, based on their geographical location. Hence, the representation of words in the mental lexicon is likely to be different from that of the children in Western countries, who are predominantly monolingual. The language considered in the present study, Kannada, is a member of the Dravidian family of languages and is spoken in South India. It follows the Brahmi script and is syllabic in nature. School going children in Karnataka, who are native speakers of Kannada (more specifically Mysuru), are generally exposed to other languages such as Hindi and English. Hence, it would be interesting to investigate the representation of abstract and concrete words in the mental lexicon of these children.

1.1 Need for the study

Review of literature on the lexical semantic representation of words in the mental lexicon suggests a dearth of Indian studies, particularly with reference to the representation of concrete and abstract words in the mental lexicon of children. Hence, there is a strong need for this study to be undertaken, in order to understand the organization of concrete and abstract concepts in children.

1.2 Aim of the study

The aim of the study is to examine the nature of representation of concrete and abstract words in the mental lexicon of children aged between 6 and 9 years, who are native speakers of Kannada, using a free word association task.

1.3 Objectives

The objectives of the study are as follows:

- To examine the nature of representation of concrete and abstract words in the mental lexicon of children aged between 6 and 9 years, who are native speakers of Kannada, with respect to age and gender.
- To examine the organization of concrete and abstract words in the mental lexicon of children.

1.4 Hypotheses

1. There is no significant difference in the representation for concrete and abstract words in the mental lexicon with respect to age.

2. There is no significant difference in the representation for concrete and abstract words in the mental lexicon with respect to gender.

3. There is no significant difference in the organization of concrete and abstract words in the mental lexicon.

CHAPTER II

Review of Literature

Language can be defined as a socially shared code or conventional system for representing concepts through the use of arbitrary symbols and rule-governed combination of symbols (Owens, 2000). It is a complex rule system which comprises of the domains phonology, morphosyntax, semantics and pragmatics. These domains were grouped as form, content and use based on their functions (Bloom & Lahey, 1978). Acquisition of these domains is a complex process which begins during childhood. It is through the acquisition of these domains that humans learn to perceive and produce words to make sense of the world around them (Crain & Lillo-Martin, 1999). Language is acquired in stages by children, closely following the maturation of underlying neuronal mechanisms necessary for the same. Several theories have been put forth, in the past, in an attempt to describe language acquisition. Some of the major theories are:

- The behaviorists account put forth by Mowrer (1960), Osgood (1963), Staats (1971) & Skinner (1957) that views language as a behaviour which is both observable and measurable. This theory postulates that language is learnt as a consequence of reinforcement or rewards that occur following a desirable behaviour. This theory contends that the immediate environment plays a crucial role in the child's ability to acquire language.
- The cognitive view to language acquisition emphasizes on the child's intellectual development prior to language learning i.e., good cognitive skills is a pre-requisite to acquire language.

- The interactionist theory put forth by Swiss psychologist Jean Piaget states that children acquire language through their cognitive skills and social interaction. Language is acquired due to the continued interaction between a child's cognitive development and social development.
- Finally, the nativist theory given by American linguist and philosopher Noam Chomsky states that all human beings have 'universal grammar' that gives us the ability to acquire language naturally. He also states that we are born with a Language Acquisition Device (LAD) which automatically helps us understand and make sense of speech, when exposed to it. The assumption behind this theory is that there is 'biological predisposition' in human beings to learn language and that the environment merely acts as a trigger.

  Thus, these theories help understand how a child acquires language.

As stated earlier, language is comprised of phonology, morphology, syntax, semantics and pragmatics. Phonology deals with the acquisition of the sounds of a language, and their systematic organization. The domain of morphosyntax talks about the acquisition of grammatical rules that govern linguistic units. Pragmatics deals with the use of language. Semantics is concerned with the relationship between a word and its referent. Lexical semantics is concerned with how lexical units relate to the structure of language. Lexical units consist of words as well as sub-units such as affixes, compound words and phrases. These lexical units make up the lexicon, also known as the catalogue of words in a language. When a child learns about the meaning of a word, it is stored in the lexicon. As pre-schoolers, the process of storing the first associations for words is known as fast mapping (Carey, 1978). These initial

maps of word meaning which are made quickly, are further refined with multiple exposures to the word. This refinement is known as “extended” or “slow mapping” (Carey, 1978). It involves increased accuracy of extensions, increased elaboration of meaning, and development of a semantic network. Words are learnt through several processes such as:

- Induction: Here, learners generate hypotheses based on the situation in which the novel word occurs. As the child encounters new situations or context in which the word occurs, these hypotheses are either strengthened or eliminated accordingly. This process allows him to choose the appropriate meaning of a word.
- Social Cues to Reference: Here, children make use of social interactions to understand the meaning of a word. For example, at about 6 months of age children observe the eye gaze of a speaker that is directed towards an object while referring to it, in order to understand the meaning of the word.
- Sentential Contexts as Cues to Word Meanings

  Another method used by children to understand the meaning of a word is by making use of sentential context in which the word occurs, so as to arrive at the possible meaning.

A child’s lexicon consists of several types of words. Authors have constantly debated over the kind of words that dominate the lexicon of children. The Noun Bias Hypothesis, which was put forth by Gentner (1981, 1982) states that children acquire nouns early and more easily compared to other word categories, because they are conceptually simpler. However, Bassano (2000), in his study, observed

that verbs appeared as early as nouns. Fenson, Dale & Reznick et al. (1994), conducted an extensive cross-sectional study in order to determine the proportions of the various word classes in English and the age at which they were manifested in the children's speech. The authors found a constant growth of overall vocabulary, however there was a notable increase of nouns at an early stage followed by acquisition of predicates (verbs and adjectives). Finally, there was an increase in the proportion of function words. The results of studies conducted by Bloom, Tinker & Margulis (1993) suggest that nouns amount to one-third of the vocabulary at 50 word stage. During the school age period and adult years, the child's vocabulary and the specificity of their definitions increase. Gradually, the child acquires an abstract knowledge of meaning that is independent of particular context or individual interpretations. As children accumulate experience with new situations and words, they perceive the ways in which various stimuli, contexts, and words are inter-related. Words become associated through contexts that overlap in a physical or conceptual way. In essence, children learn to relate words to each other with increasing flexibility. As a consequence, they are constantly redefining, and expanding their mental lexicon.

In order to understand how children organize words in the mental lexicon, several models have been proposed.

The Heirarchical Semantic Network Model (Collins & Quillian, 1969)

This model assumes that concepts are stored within a hierarchical structure, with properties stored together with a concept following the principle of cognitive economy. Cognitive economy refers to the fact that properties of concepts are stored

at the highest possible level in the hierarchy and not re-represented at lower levels. According to this model, activation would radiate outward through the network from each node until each individual unit's activation would mutually affect one another. When the activation of two nodes overlap, then the two are related. If the nodes have a close semantic relation, they should be in proximity to each other in the network and responses would be faster because the spreading activation will have less distance to cover. The authors propose three levels in a hierarchical nature:

1. Superordinate categories (e.g., the major category of animals). Here the ideas are abstract and form the highest level of nodes.
2. Ordinate categories (e.g., cats, dogs, birds and properties of these animal species).
3. Subordinate categories (e.g., canary). This is the lowest level of the hierarchy of nodes which are concrete, corresponding to the exact species of animals.

Spreading Activation Model of Semantic Memory (Collins & Loftus, 1975)

This model is an improvement upon the hierarchical conceptualization of semantic information. It assumes that words are arranged in networks of nodes, but not hierarchically. All information is represented at the node level. Associated concepts, for example, "red" and "rose" are associated by links between the nodes. The closer the relationship between concepts, the shorter is the link. Spreading activation refers to the idea that finding one concept in the network will also activate concepts linked to it. The activation of one node spreads out to related concepts like a sound wave

ripples outward from its source in all direction at once. The link between the target word and its association become weaker as the spreading continues to expand.

Words in the mental lexicon get organized in several ways, depending on the child's experience. These differences in organization pave way for several organizational shifts that are reported to occur at different age levels, although no clear cut age boundaries have been identified. The first shift is known as the thematic-taxonomic shift. This is an early change in the children's word associations, where there is a shift from thematic to taxonomic organization. Thematic organization is based on associations that relate words to some integrated context in which they are experienced as a whole. For example, when asked to think of words that go with wagon, children exhibiting thematic associations might respond with "the sidewalk", "my playhouse". Here the experience associated with playing with the wagon has provided the theme that pulls these words together into a cohesive collection. In contrast, taxonomic organization is based on associations or classifications in which items share features that define them as a class. For e.g., taxonomic responses to word "wagon" would probably include items such as " my truck", " daddy's car", "a bus". Children begin to build hierarchies of taxonomic relations, at age 2 years (Clark, 1993). There are notable increases in taxonomic knowledge between ages 3 and 5 years (Anglin, 1977). This shift from thematic to taxonomic responses is presumed to result from the rapid expansion of vocabulary characteristic of middle childhood. The syntagmatic-paradigmatic shift occurs almost in parallel to the thematic-taxonomic shift. At the age of 5, most children respond to a word stimulus with a word that occurs syntactically in sequence with the stimulus. However, by nine years of age,

most children are able to provide a response from the same form class as the stimulus word. A predominance of paradigmatic over syntagmatic responses is indicative of a more developed semantic system, as this pattern is typical of mature language users (Lippman, 1971). In summary the lexical semantic development in children is a complex phenomenon that encompasses the relationship between words and their semantic role. There is significant development in both of these dimensions, which is evident in children from their pre-school years. As the semantic system of the child develops, words get organized in a hierarchical manner and the shift in their vocabulary becomes evident.

Words represented in the lexicon of the children are held together by the semantic features associated with them. These features, in combination reflect the meaning of a concept. The features associated with words differ across dimensions such as concreteness and abstractness. Concreteness talks about how directly a concept (represented by a word) activates sensory experience (Paivio, Yuille, & Magidan, 1968). Concepts that are rated high in concreteness are labeled "concrete" while concepts rated low in concreteness are labeled "abstract". For example, the concept "fork" refers to visual, tactile, and perhaps even gustatory sensory experiences, and is therefore highly concrete; this is contrasted with a concept such as "justice", which does not directly refer to any specific sensory experience, and is therefore very low in concreteness and is labeled "abstract". Several authors have observed developmental differences in the acquisition of concrete and abstract words. Significant difference in the acquisition of concrete and abstract words is reported with children of first grade showing mastery over concrete words, whereas in

adolescents mastery is seen over the abstract words as well (Schwanenflugel, 1991). A similar trend is also observed in reading, with children facing more difficulties while reading abstract words in comparison to concrete words (Yore & Ollila, 1985). The above observations are supported through a lexical decision task in which nine year olds displayed concreteness effect i.e., tasks relating to concrete words had a quicker reaction time compared to that of abstract words (Schwanenflugel & Akin, 1994). Further, the concrete concepts and the pattern of relations characterizing them are reported to be well established in 8 year old children with minimal change with age (Wiemer-Hastings, Krug, & Xu, 2001) . However, the abstract concepts, as reported by the authors, were characterized primarily by contextual or situational information as against taxonomic categories in the case of concrete concepts. These thematic productions increase with age as children gain mastery over a wider range of abstract concepts. Developmental studies of concrete and abstract conceptual knowledge revealed an activation of a specific pattern of relations in the school aged children. While concrete words elicited a large number of attributive relations, the abstract words predominantly elicited thematic relations, in an association production task (Caramelli, Setti & Maurizzi, 2004). In summary, authors who have studied the acquisition of concrete and abstract words have found that concrete words were acquired earlier compared to abstract words. Also, concrete and abstract words were associated with different types of relations, in the semantic network.

Several theories have been proposed to explain the representation of concrete and abstract words in the mental lexicon. Qualitative differences (for example, Crutch & Warrington, 2005) and quantitative differences [for example, Context Availability

Model (CAM) of comprehension (Bransford & McCarrell 1974; Kieras 1978; Schwanenflugel & Shoben 1983)] between the representations of these two types of words have been reported. Organizational differences between concrete and abstract words have been proposed by stating that concrete words are organized based on semantic similarity and abstract words based on semantic association.

- The Qualitatively Different Representational (QDR) framework assumes that abstract concepts are represented in an associative neural network and concrete concepts in terms of a categorical organization. The theory predicts that an abstract word would activate associated concepts predominantly, and a concrete word would activate semantically similar concepts. Evidence to the above is offered through studies conducted on patients with aphasia and deep dyslexia (Crutch & Warrignton, 2005). When a task of matching spoken word with written word (concrete and abstract words) in the presence of distracters was given, persons with stroke aphasia showed more errors on abstract words when the distracters were semantically associated (thematically related) with the target word, whereas for concrete words there were more errors when the distracters were taxonomically related to the target words. Similarly in deep dyslexic patients, the reading task elicited more semantically associative reading errors for abstract words than synonym errors and vice versa for concrete words.

- Context Availability Model (CAM) of comprehension (Bransford & McCarrell 1974; Kieras 1978; Schwanenflugel & Shoben 1983) stated that comprehension of words depended on the ease of availability of contextual information. For example, in a lexical decision task, the participant's response is

based on his ability to generate a meaningful context for the word provided. This model explains the concreteness effect by stating that it is relatively easier for individuals to generate contexts for concrete words in comparison to abstract words. Studies conducted by Altarriba, Bauer, & Benvenuto (1999); Schwanenflugel & Shoben (1983) have found a correlation between the participants' rating of difficulty in generating contexts for a given word, to their judgments of the word's concreteness.

- Dual coding theory by Paivio (1986) stated that concrete and abstract words were represented differently. The authors propose that concrete words are represented using both sensorimotor and linguistic information, whereas the representation of abstract words rely primarily on coding of linguistic information. Hence, concrete words are accessed more easily owing to the dual nature of representation (verbal code and an imagery code), as opposed to abstract words which depend on linguistic information for representation. Studies on processing of concrete and abstract words in adults have demonstrated that concrete words were processed, learned and recalled faster than abstract words (Paivio, 1986; Paivio, Yuille, & Madigan, 1986). Brain imaging studies supporting Paivio's claims, show that abstract word processing shows strong activation in left hemisphere whereas concrete word processing shows bilateral activation (Sabsevitz et al., 2005). However, these studies used single words as stimuli, which require superficial level of processing. Sentence evaluation tasks, requiring deeper level of processing did not reveal any significant laterality effects (Desai et al., 2010).

- The Language and Situated Simulation (LASS) theory, proposed by Barsalou et al. (2008) is a multiple representation theory, quite similar to the dual coding

theory. It talks about the importance of linguistic information in order to understand abstract concepts; however does not advance definite predictions regarding the difference in processing of concrete and abstract words.

- Marques & Nunes (2012) conducted an experiment which involved a single word association task. The authors examined the multiple representational systems involved in the representation of concrete and abstract words (i.e., if language was more important for the representation of abstract words as proposed by the dual coding theory) and the activation of semantically associated concepts for abstract words and semantically similar concepts for concrete words. They concluded that linguistic information was indeed more important to represent abstract concepts

- The grounded cognition view proposes that concrete concepts are grounded in sensory-motor simulation. For e.g., when a person thinks about a banana, the visual network in the brain simulates seeing a banana, the motor system recreates holding, peeling and eating the banana. Similarly, the olfactory and gustatory system simulate the smell and taste of a banana. These simulations can involve different networks in the brain to different extents. For instance, a carpenter may form different simulations of a chair while making a chair (fine hand movements associated with chopping and shaping wood) compared to moving a chair into the house (size, weight of the chair). Action Compatibility Effect (ACE) emphasizes the role of action in the grounded cognition view. Several language comprehension studies required the participants to perform motor actions while reading words or sentences. The participants verified the sentences more quickly if the motor action described in the sentence corresponded to the action being performed. For e.g., participants were faster to verify the sentence "You handed her the ball" while making a hand movement away from themselves

compared to when they made a hand movement towards themselves. Therefore, while processing an utterance, not only the associated sensory events but also the action associated with the utterance are represented in the brain.

- Talmy's theory of force dynamics helps explain abstract concepts in terms of patterns of forces. Here two units are identified i.e., the agonist and the antagonist. The agonist is a unit that tends to act or rest, and the antagonist is a unit that opposes the agonist. For example, in the case of a concrete sentence such as "the wall prevented John from leaving the house", John can be understood as the agonist that has a tendency to leave the house and the wall as a stronger entity that compels the boy to stay. Similarly in an abstract sentence such as "a lawyer persuading the jury to convict the defendant", jury can be perceived to be the agonist in rest, while the lawyer who is the anatagonist, opposes this. In order to test this theory, Madden and Pecher (2010) designed an experiment. Here the participants were asked to provide sensibility ratings for sentences which described one of the force patterns (force action, force rest, allow action, allow rest). This was done for both concrete and abstract situations. Before each sentence, an animation of two geometrical shapes interacting simulating one of the force patterns, was presented (e.g., a square moving towards a triangle and causing it to topple). The results stated that the participants were able to comprehend both concrete and abstract sentences faster when the preceding animation matched the force pattern in the presented sentences. Therefore, the authors concluded that concrete and abstract concepts could be represented in a similar manner.

In order to evaluate these theories, researchers in the past have employed several methods.

- Imaging procedures have attempted to study the difference in the brain activation sites for concrete and abstract words. Binder, Westbury, & McKiernan et al. (2005) studied the representation of concrete and abstract words using fMRI, during a lexical decision task. This study was conducted on the premise that abstract and concrete words have similar neural substrates, with concrete words showing stronger activation. This premise was based on the Context Availability Model (Bransford & McCarrell 1974; Kieras 1978; Schwanenflugel & Shoben 1983). The model postulates that differences in processing concrete and abstract words can be attributed to the differences in availability of context. It is proposed that concrete words can be more easily embedded in a context compared to abstract words. The results of the study revealed that concrete words activated anatomical sites in both hemispheres whereas abstract words activated sites only in the left hemisphere. These results are in consonance with the Dual Coding hypotheses (Paivio, 1986), which states that concrete words rely on both linguistic and non-linguistic information for representation, whereas abstract words are represented using linguistic information.

- Event related potentials (ERPs) such as N400, that is elicited during semantic incongruities or anomalies, are also used to study the mental representation of words. A study conducted by Torkildsen, Sannerud, & Syversen et al., (2006) revealed N400 like incongruity effect in 20 month old children when presented with a picture-word mismatch paradigm. The authors found that the incongruity response was earlier and greater for between-category violations when compared to within-category violations.

The study suggested that the N400 component was sensitive to lexical semantic organization of basic level words in toddlers.

- Another frequently used tool to study the lexical semantic organization of concrete and abstract words is the free word association task. Free word association is a task that requires participants to produce the first word that comes to mind when a stimulus is presented. The word is required to be related to the stimulus in a specific manner (e.g., rhyming, meaning, etc). In the past, researchers have attempted to determine the strength of association by counting the number of people who have produced a particular word as response. This was then divided by the total number of participants to obtain the strength of association. In this manner, responses were classified in a hierarchical manner from strongest to weakest associations. Later, this procedure was modified to permit as many words as the participant could think of, when a stimulus was presented. Caramelli, Setti & Maurizzi (2004) conducted a study on school age children aged between 8 and 12 years. The study examined the representation of concrete and abstract words using an association production task. Here, the children were asked to write the first thing that came to mind when they were presented with a concrete or an abstract word. Results revealed that concrete concepts mainly elicited attributive and thematic relations, whereas abstract concepts mainly elicited thematic relations.

The kind of responses that a word elicits can be determined by several factors. Factors such as culture, language, socio-economic status, etc., influence the representation of concepts in the mental lexicon of children. The bilingual advantage hypothesis [Bialystok, (2001); Oller, Eilers, Urbano, & Cobo-Lewis, (1997)] opined

that bilingual children may have a more developed semantic network compared to age-matched peers. This could be due to their ability to understand that different words can denote the same concept, at an early stage. The authors also state that bilingual children have superior metalinguistic awareness in comparison with monolingual children. Therefore, it is assumed that lexical semantic organization would differ across monolinguals, bilinguals and multilinguals. Also, a review of the studies done on Western population reveals that abstract words are represented in the mental lexicon using thematic relations, predominantly. Since thematic relations are based on personal experiences, socio-economic status and culture, the organization of concrete and abstract words would vary across monolinguals, bilinguals and multilinguals. A few Indian studies on lexical semantic organization (Chitra & Prema, 2008; Prema & Prarthana, 2013) have attempted to investigate the distribution of semantic features for different categories of nouns, and nouns vs verbs, respectively. However, these studies have not touched upon the representation of concrete and abstract words. In summary, researchers in the past have attempted to understand the lexical semantic representation of words in the lexicon of children using various methods. A few researchers have examined the organization of concrete and abstract concepts, in order to determine how they differed. However, these studies were carried out on Western population, which may not hold good for the Indian population owing to linguistic, cultural, and socio-economic differences between the two groups. In view of the above, the present study was designed to investigate the representation of concrete and abstract words in the mental lexicon of Kannada speaking children residing in Mysuru.

CHAPTER III

METHOD

The aim of the study was to examine the nature of representation of concrete and abstract in the mental lexicon of children aged between 6 and 9 years, who are native speakers of Kannada, using a free word association task. The cross-sectional study was carried out by adapting a single group design. Further, a within group comparison was made for independent variables age and gender.

Participants

A total of 30 children in the age range of 6-9 years were chosen for the study. The participants for the study were native speakers of Kannada, chosen from Kannada medium schools in Mysuru. They were grouped as follows

Table 3.1
Distribution of participants

AGE RANGE (in years)	No. of children	
	MALE	**FEMALE**
≥6 to 7≤	5	5
>7 to 8≤	5	5
>8 to 9≤	5	5
TOTAL	15	15

The inclusionary criteria were as follows:

1. Native speakers of Kannada language.

2. No history of any speech, language, neurological, hearing problems. This was ascertained using the WHO Ten Question Disability Screening Checklist (Singi, Kumar, Malhi, & Kumar, 2007).

Stimuli

20 Concrete and 20 abstract words chosen from the Kannada text books of Standards I, II and III were used as stimuli. These words were subjected to judgment by:

- Two educators for appropriateness (i.e., if the stimuli are appropriate for children aged between 6 and 9 years).
- Two Speech Language Pathologists to validate the nature of the stimuli (i.e., concrete or abstract).

A measure of agreement (Cohen's Kappa) computed between the ratings of both the special educators revealed a Kappa coefficient of 0.843, and that of the speech language pathologists revealed a coefficient of 0.724 that were indicative of a strong agreement between the ratings.

Examples of the stimuli (A complete list of the stimuli used is provided in the Appendix section).

Table 3.2
Examples of stimuli

CONCRETE WORDS	ABSTRACT WORDS
/ kɑnnɑɖɑkɑ/	/ a:ro:gja/
ಕನ್ನಡಕ	ಆರೋಗ್ಯ
'spectacles'	'health'
/ ga:ḷipaṭa /	/ a:se_/
ಗಾಳಿಪಟ	ಆಸೆ
'kite'	'desire'

/ beʈʈa /	/ madza: /
ಬೆಟ್ಟ	ಮಜ
‘mountain’	‘enjoyment’
/ ouʃaɖi /	/na:tʃike /
ಔಷಧಿ	ನಾಚಿಕೆ
‘medicine’	‘shyness’
/maiɖa:na /	/ʃakʈi /
ಮೈದಾನ	ಶಕ್ತಿ
‘ground’	‘strength’

Procedure

Written consent was taken from the teachers of all the participants before they were included in the study. Each of the 30 children was presented with a randomized list of 20 concrete and 20 abstract words through auditory mode. They were given the following instruction:

/ na:nu iva :ga hu :vu anʈa he :ɭ ʈini. iɖanna ke :ɭiʈʈakʃɳa ninna manasige ja :va ja:va paɖagaɭeɭɭa baruʈʈe?/

ನಾನು ಇವಾಗ ಹೂವು ಅಂತ ಹೇಳ್ತಿನಿ. ಇದನ್ನ ಕೇಳಿತ್ತಕ್ಕಣ ನಿನ್ನ ಮನಸಿಗೆ ಯಾವ ಯಾವ ಪದಗಳೆಲ್ಲ ಬರುತ್ತೆ?

The children were familiarized with the task, with appropriate examples. Despite this, children provided their responses in terms of phrases or sentences, instead of words.

Examples:

Concrete: /hu:vu/ : giɖa, mara, parimaḷa, baṇṇa, pu:dze, ʈalege ha:koḷḷuvuɖu

ಹೂವು : ಗಿಡ, ಮರ, ಪರಿಮಳ, ಬಣ್ಣ, ಪೂಜೆ, ತಲೆಗೆ ಹಾಕೊಳ್ಳುವುದು

'flower: plant, tree, fragrance, colour, worship, to adorn one's hair with flowers.

Abstract: / ʧaḷi / : sweṭer, ska:rf, ʧaḷiga:la, sku:l radza, bisi ʈinḍi, naɖuka

ಚಳಿ : ಸ್ವೆಟರು, ಸ್ಕಾರ್ಫ್, ಸ್ಕೂಲು ರಜ, ಬಿಸಿ ತಿಂಡಿ, ನಡುಕ

'cold: sweater, scarf, holiday for school, hot snacks, shivering'

Each of the participant's responses was audio-video recorded for analysis.

Analysis

The responses of the participants for each of the test stimuli were transcribed. In order to examine the concrete-abstract word representation, the utterances (i.e., responses provided by the children) were then classified by the investigator and also two qualified speech-language pathologists. The following classification is based on the coding system given by (Borghi, Caramelli, & Setti, 2016) and (Caramelli, Setti, & Maurizzi, 2004):

1. Thematic: These are relations that link objects co-occuring in the same situation or event. They include:
    - Spatial relations such as *camel*- 'desert' [/ga:ḷipaṭa - aɖu a :ka:ʃaɖalli ha:ruʈʈe/]

- Temporal relations such as rose- ‘at St.Valentine’s day’ [/dza:ʈre - ho:ɖa va:ra namma u:ralli iṯṯu /]
- Modality relations such as eagle- ‘in dive’ [/mi:nu - i:dzuṯṯaɖe/]
- Means-end relations such as harmony- ‘guitar’ [/ouʃaɖi - ouʃaɖi ʈinɖre uʃa:r a:gʈivi/]
- Event relations which refer to complex situations such as medal- ‘received it at the prize ceremony’ [/maḷe - maḷe ni:ranna bʌket alli hiɖkonɖu ju:z ma:ɖʈivi/]

(or)

- Situational components that include: space-physical and situation settings (in the factory, at work) and time (yesterday). [/ka:pa:ɖu - ja:ra:ɖɖaru bʰa:vige biɖɖare ka:pa:ɖuṯṯeve/]

Related utterances were considered as a single theme.

2. Attributive: Relations which refer to physical characteristics or qualities of objects. They refer to
    - perceptual object properties (color, shape, size,etc) such as camel-‘it is tall’[/ka:manabillu - ɖoɖɖaɖa:giraṯṯe/]
    - object qualities such as dog-‘domestic animals’ [/navilu - aɖu ka:ɖalli iruṯṯe/]
    - partonomic relations referring to object parts such as camel-‘it has a lump’[/ʈo:ṭa - hu:vugaḷu iruṯṯe/]
    - functional attributes such as spoon-‘it is used to eat’ [/ʧamaʧa - ʈinnakke ju:z ma:ɖʈivi/]

3. Taxonomic: These relations establish the hierarchical structure of conceptual knowledge. They include:
    - Superordinate level : baboon – ‘animal’/ risk- ‘an unsafe situation’ [/navilu - aḏu onḏu pakʃi/]
    - Subordinate level : bicycle – ‘mountain bike’/risk- ‘fire’ [/habba - dasara, gaɳeʃa habba/]
    - Co-ordinate level : hamster – ‘mouse’/risk – ‘danger’ [/vima:na - helika:ptʌr/].
4. Introspective: These relations included
    - Ego involvement such as “it happened to me” [/ga:bari - onḏu sala: na:nu kaɭeḏu ho:ḏe, nanage ṯumba ga:bari a:jiṯu/]
    - Emotions such as “I’m scared when...” [/kanasu - ḏevvaḏa kanasu banḏre nanage bʰaja a:guṯṯe/]
    - Intentional states such as “I believe that….” [/saha:ja - na:vu jellarigu saha:ja ma:ḍa be:ku/]
    - Cognitive processes such as “it requires attention” [/dzo:pa:na - namma buk, pensil ba:ks ella dzo:pa:naḏinḏa iṯko be:ku/]

Operational definitions for each of the above classification type were provided in advance and the speech-language pathologists were asked to analyze the responses based on them.

Inter-rater agreement for the analysis (Cronbach’s Alpha) was carried out separately for each of the response categories (thematic, attributive, taxonomic and

introspective). Results revealed a good agreement between the ratings (coefficients ranging between 0.721 and 0.793).

The following comparisons were made with the data:

- A qualitative analysis of the nature of representation of concrete and abstract words in the mental lexicon of children.

  Appropriate statistical methods were employed:

- For a within group and across group comparison with age as the independent variable.
- For a within group and across group comparison with gender as the independent variable.
- To examine the interaction between age and gender.
- To examine the organization of concrete and abstract words in terms of thematic (Th), attributive (Att), taxonomic (Tx) and introspective (Int) relations.

CHAPTER IV

Results and Discussion

The primary objective of the study was to examine the nature of representation of concrete and abstract words in the mental lexicon of children aged between 6 and 9 years, who are native speakers of Kannada, using a free word association task.

The secondary objectives were to examine:

- The nature of representation of concrete and abstract words in the mental lexicon across age.
- The nature of representation of concrete and abstract words in the mental lexicon for both the genders.
- The organization of concrete and abstract words in the mental lexicon.

A single group design was employed for the study. A comparison across age groups with gender as the independent variable, and a comparison between genders with age as the independent variable were carried out. Further, a within group comparison across the response categories i.e., thematic (Th), attributive (Att), taxonomic (Tx) and introspective (Int) was also carried out.

The results of the study are discussed under the following sections:

- Descriptive statistics
- Comparison between groups with age and gender as independent variables
- Within group comparison across the response categories i.e., thematic (Th), attributive (Att) , taxonomic (Tx) and introspective (Int)

For statistical analysis, SPSS (Statistical Package for the Social Sciences) software – Version 17.0 was used. The distribution of the data was tested using Shapiro-Wilk test of Normality. Results revealed a skewed distribution of data (i.e., $p<0.05$), hence non-parametric test were carried out for all the comparisons mentioned above.

4.1 Descriptive statistics

The number of non-responses for each group was computed. The results obtained were as follows:

Table 4.1.1
Number of non-responses for concrete and abstract stimuli

AGE	GENDER	NrA	NrC		TOTAL
6-7 yrs	Male	15	0	15	31
	Female	16	0	16	
7-8 yrs	Male	10	3	13	24
	Female	10	1	11	
8-9 yrs	Male	5	5	10	15
	Female	2	3	5	

Table 4.1.1 represents the number of concrete and abstract stimuli for which the children did not provide responses. An evident decrease in the number of non-responses across the age groups is seen. Also, in every age group there is greater number of non-responses from the males compared to the females. It is evident from the scores that both males and females responded more frequently to concrete stimuli compared to abstract ones.

Following this, descriptive statistics was employed to calculate the mean, standard deviation and median of the scores across all the categories (thematic, attributive, taxonomic and introspective).

Table 4.1.2

Mean, standard deviation and median scores across all age groups for the response categories

GROUP	GENDER		PThA	PThC	PAttA	PAttC	PTxA	PTxC	PIntA	PIntC
6-7 yrs	**Male**	N	5	5	5	5	5	5	5	5
		Mean	25.42	5.35	5.53	56.44	11.86	10.80	17.02	3.33
		S.D.	34.69	11.29	6.62	13.63	4.29	9.91	6.46	2.57
		Median	**0.73**	**0.32**	**3.85**	**60.00**	**11.54**	**9.30**	**15.79**	**3.08**
	Female	N	5	5	5	5	5	5	5	5
		Mean	0.69	0.34	9.06	35.62	1.64	25.70	20.05	4.68
		S.D.	0.11	0.14	6.91	7.67	2.30	12.60	14.13	7.98
		Median	**0.71**	**0.27**	**10.34**	**32.50**	**0**	**27.27**	**23.81**	**0**
	Total	N	10	10	10	10	10	10	10	10
		Mean	13.06	2.84	7.29	46.03	6.75	18.25	18.54	4.01
		S.D.	26.55	7.97	6.64	15.13	6.29	13.26	10.48	5.63
		Median	**0.72**	**0.30**	**6.50**	**43.78**	**5.01**	**16.81**	**19**	**2.60**
7-8 yrs	**Male**	N	5	5	5	5	5	5	5	5
		Mean	0.72	0.26	3.43	56.91	3.82	15.28	20.31	1.86
		S.D.	0.05	0.06	4.80	8.23	4.39	7.90	9.49	2.55
		Median	**0.73**	**0.26**	**0**	**54.76**	**3.85**	**14.28**	**19.23**	**0**
	Female	N	5	5	5	5	5	5	5	5
		Mean	0.81	0.27	4.81	62.83	2.16	4.08	11.87	5.54
		S.D.	0.17	0.08	6.42	7.17	3.02	6.09	9.81	3.89
		Median	**0.85**	**0.28**	**3.44**	**66.04**	**0**	**2.27**	**14.81**	**4.65**
	Total	N	10	10	10	10	10	10	10	10
		Mean	0.77	0.27	4.12	59.86	2.99	9.68	16.08	3.70
		S.D.	0.13	0.07	5.40	7.92	3.66	8.89	10.13	3.66
		Median	**0.76**	**0.27**	**1.72**	**60.90**	**1.92**	**8.52**	**15.83**	**4.54**
		N	5	5	5	5	5	5	5	5
8-9 yrs	**Male**	Mean	0.76	0.25	10.17	52.90	3.18	14.14	10.32	7.61
		S.D.	0.08	0.06	4.47	7.64	3.84	5.50	3.45	4.90
		Median	**0.80**	**0.23**	**11.11**	**50**	**2.86**	**15.38**	**11.11**	**8.33**

	Female	N	5	5	5	5	5	5	5	5
		Mean	0.69	0.25	6.45	55.22	0	11.46	24.16	8.58
		S.D.	0.14	0.11	4.46	10.57	0	14.31	12.89	4.54
		Median	**0.75**	**0.22**	**7.69**	**50**	**0**	**5.77**	**25**	**7.32**
	Total	N	10	10	10	10	10	10	10	10
		Mean	0.73	0.25	8.31	54.06	1.59	12.80	17.25	8.09
		S.D.	0.12	0.08	4.65	8.78	3.06	10.31	11.51	4.48
		Median	**0.76**	**0.22**	**8.13**	**50**	**0**	**12.90**	**13.39**	**7.82**
TOTAL	**Male**	N	15	15	15	15	15	15	15	15
		Mean	8.97	1.95	6.38	55.42	6.29	13.41	15.88	4.27
		S.D.	22.11	6.52	5.77	9.62	5.63	7.64	7.72	4.12
		Median	**0.74**	**0.26**	**7.17**	**54.76**	**4.54**	**14.28**	**15.38**	**4.54**
	Female	N	15	15	15	15	15	15	15	15
		Mean	0.73	0.29	6.77	51.22	1.26	13.74	18.69	6.27
		S.D.	0.14	0.11	7.86	14.28	2.23	14.17	12.65	5.60
		Median	**0.77**	**0.27**	**5**	**50**	**0**	**12.50**	**15.38**	**5**
	Total	N	30	30	30	30	30	30	30	30
		Mean	4.85	1.12	6.58	53.32	3.78	13.58	17.29	5.27
		S.D.	15.92	4.61	5.72	12.16	4.92	11.19	10.40	4.94
		Median	**0.75**	**0.27**	**6.07**	**52.59**	**1.43**	**12.83**	**15.38**	**4.65**

From table 4.1.2, it is evident that the standard deviation is high. Hence, median scores were considered for comparison.

Table 4.1.3
Median scores across age groups for all the response categories

GROUP	GENDER	ThA	ThC	AttA	AttC	TxA	TxC	IntA	IntC
6-7 yrs	Male	0.73	0.32	3.85	60	11.54	9.30	15.79	3.08
	Female	0.71	0.27	10.34	32.5	0	27.27	23.81	0
	TOTAL	**0.72**	**0.29**	**6.5**	**43.78**	**5.01**	**16.81**	**19.0**	**2.6**
7-8 yrs	Male	0.73	0.26	0	54.76	3.8	14.28	19.23	0
	Female	0.85	0.27	3.44	66.03	0	2.27	14.81	4.65
	TOTAL	**0.76**	**0.27**	**1.72**	**60.91**	**1.92**	**8.52**	**15.83**	**4.54**
8-9 yrs	Male	0.80	0.23	11.11	50	2.86	15.38	11.11	8.33

	Female	0.75	0.22	7.69	50	0	5.77	25	7.32
	TOTAL	**0.76**	**0.22**	**8.13**	**50**	**0**	**12.9**	**13.39**	**7.82**
TOTAL	Male	0.74	0.26	7.14	54.76	4.54	14.28	15.38	4.54
	Female	0.76	0.27	5	50	0	12.5	15.38	5
	TOTAL	**0.75**	**0.27**	**6.07**	**52.59**	**1.43**	**12.83**	**15.38**	**4.65**

The following figures represent age-wise median scores for both males and females.

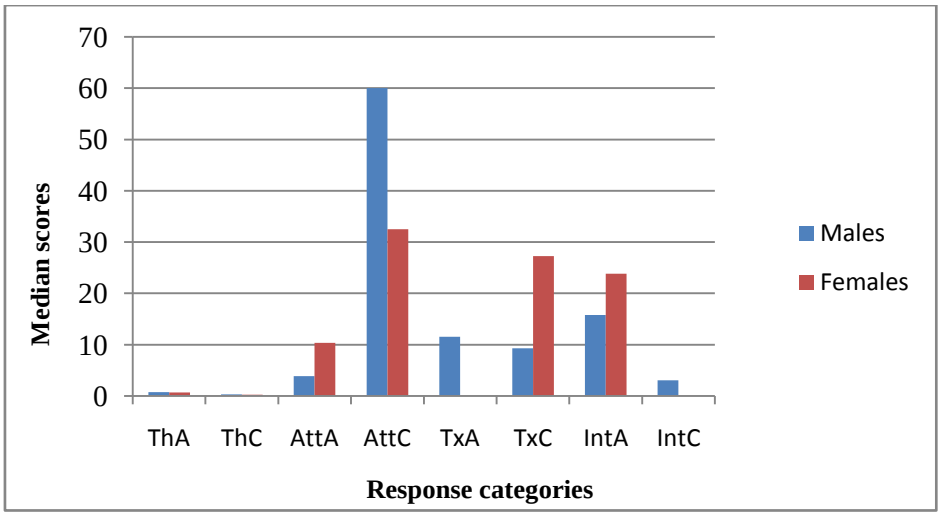

Fig. 4.1.1: **Median scores for the 6-7 yrs age group across the response categories**

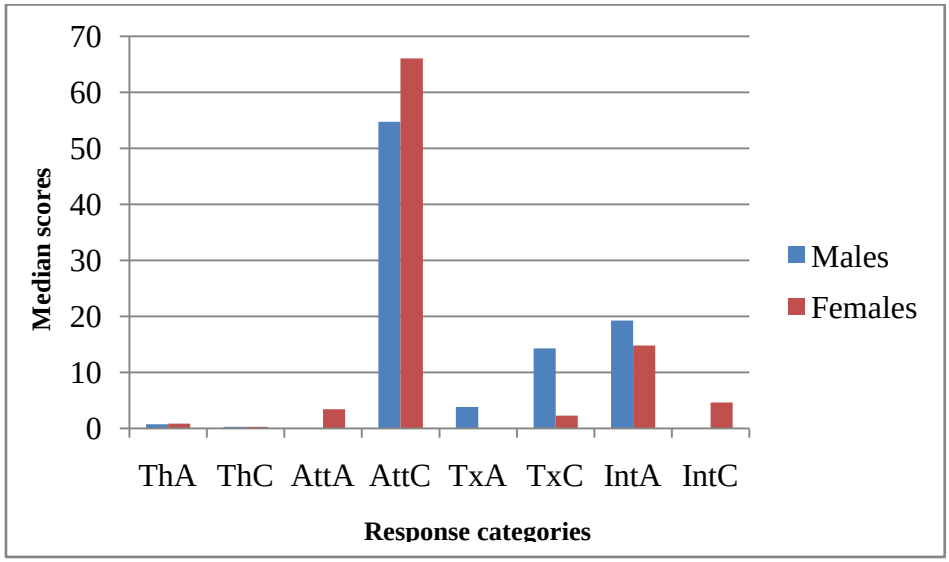

Fig. 4.1.2: **Median scores for the 7-8 yrs age group across the response categories**

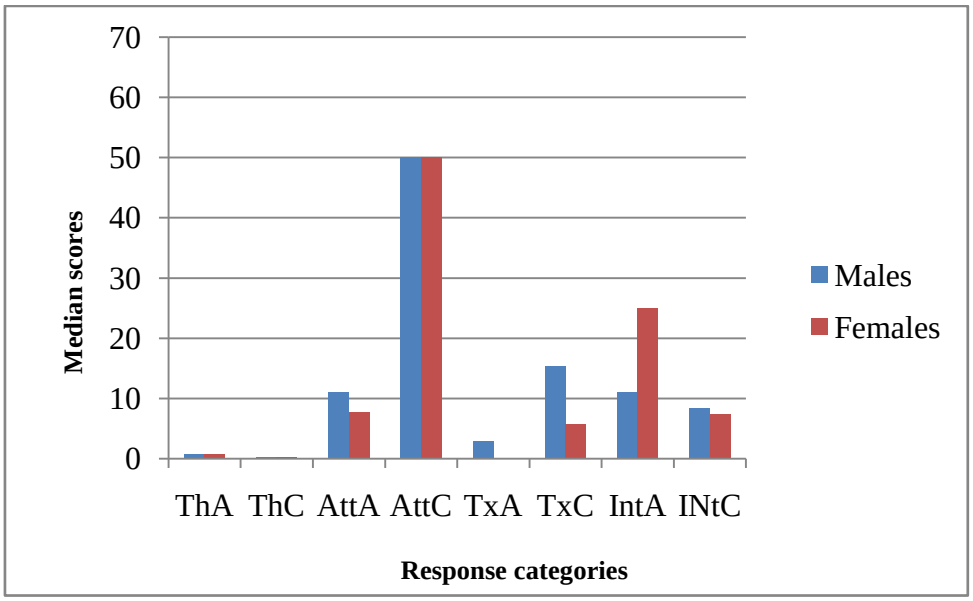

Fig. 4.1.3: **Median scores for the 8-9 yrs age group across all response categories**

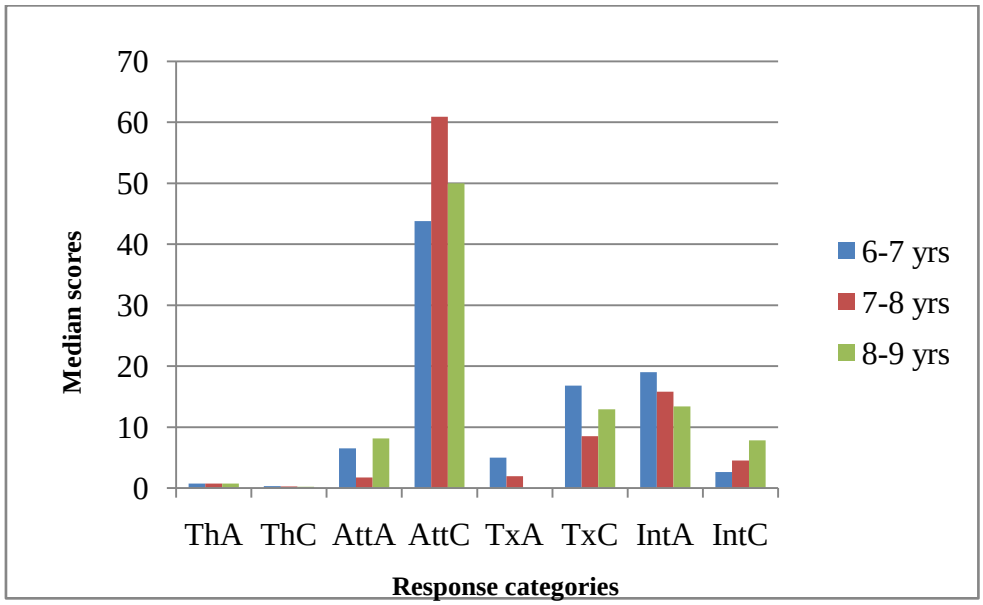

Fig.4.1.4: **A comparison of total median scores across the age groups**

Figure 4.1.4 represents the median scores in various response categories for all the age groups.

Thematic responses for concrete and abstract stimuli do not show any observable trend across the age groups. Attributive responses for concrete stimuli show an overall increase across age with an evident increase between 6-7 years and 7-8 years. This could be indicative of the increasing vocabulary with age, and the ability of the children to use more features to describe an entity, as age increases. Taxonomic responses for abstract and concrete stimuli show a decreasing trend across age, indicating that the children rely on other kinds of relations in order to represent abstract and concrete stimuli in their lexicon (attributive, thematic or introspective). Introspective responses for abstract stimuli show a decreasing trend across age, and those for concrete stimuli show an increasing trend.

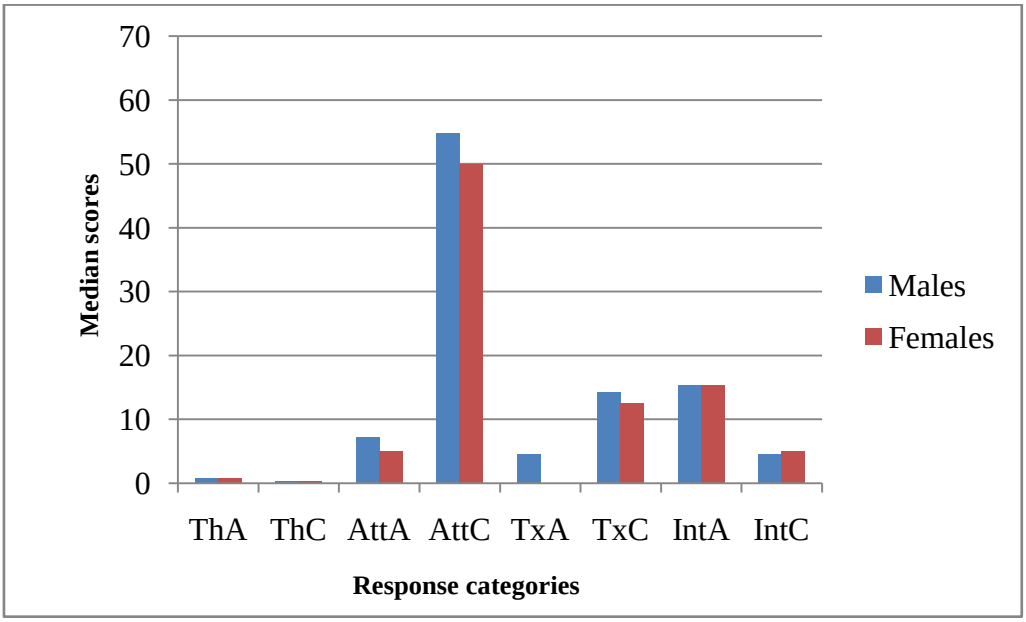

Fig. 4.1.5: **A comparison of total median scores between the genders**

Fig. 4.1.5 depicts the total median scores for all the response categories for both males and females.

Thematic responses for concrete and abstract stimuli do not show an evident pattern with respect to gender. Males have provided more attributive responses than females for both concrete and abstract stimuli. The taxonomic responses show a trend similar

to that of the attributive responses. The number of introspective responses for concrete and abstract stimuli appears to be similar across both genders.

In the current study, an upper limit for the number of utterances/responses for every stimulus was not proposed. Hence, every child produced varying number of responses for each stimulus. Therefore, a comparison of the percentage scores of the data as opposed a direct comparison of the raw data was carried. Also, due to the skewed distribution of the data, non-parametric tests were employed for comparison of data. The statistical analysis (non-parametric tests) was carried out in the following manner:

4.2 Between group comparisons

4.2.1 Age as independent variable

Comparison between groups was carried out with age as an independent variable. An age-wise comparison of scores irrespective of gender was done using the Kruskall Wallis test.

Table 4.2.1.1: *Age wise comparison irrespective of gender*

Test statistic	**PThA**	**PThC**	**PAttA**	**PAttC**	**PTxA**	**PTxC**	**PIntA**	**PIntC**
Chi-square	0.427	3.290	3.610	7.407	5.381	2.351	0.215	6.256
Asymp. Sig (2-tailed)	0.808	0.193	0.164	**0.025**	0.068	0.309	0.898	**0.044**

Results of the age-wise comparison irrespective of gender revealed a significant difference for the response categories AttC and IntC. Therefore, these two parameters were further subjected to pair-wise comparison with respect to age, using Mann-Whitney U test, in order to examine if there was a significant difference between two age groups.

Table 4.2.1.2: *Pair-wise significant differences*

Response category	6-7 vs 7-8 yrs	6-7 vs 8-9 yrs	7-8 vs 8-9 yrs
AttC	✓ (p=0.023)	X	X
IntC	X	✓ (p=0.027)	✓(p=0.04)

The pair-wise comparison with respect to age revealed significant differences for AttC between the age groups 6-7 yrs and 7-8 yrs. The comparison also revealed significant differences for IntC between the age groups 6-7 yrs and 8-9 yrs; 7-8 yrs and 8-9 yrs.

Following this an age wise comparison with respect to gender was made using Kruskall Wallis test.

Males

Table 4.2.1.3: *Age-wise comparison for males*

Test statistic	PThA	PThC	PAttA	PAttC	PTxA	PTxC	PIntA	PIntC
Chi-square	0.501	1.580	3.92	0.860	8.207	0.560	4.58	4.916
Asymp. Sig (2-tailed)	0.778	0.454	0.141	0.651	**0.017**	0.756	0.101	0.086

When a comparison across the response categories for males of all three age groups was made, the parameter TxA showed a significant difference.

Females

Table 4.2.1.4: *Age-wise comparison for females*

Test statistic	PThA	PThC	PAttA	PAttC	PTxA	PTxC	PIntA	PIntC
Chi-square	2.940	1.28	1.395	10.22	2.504	5.457	3.046	2.174
Asymp. Sig (2-tailed)	0.230	0.527	0.498	**0.006**	0.286	0.065	0.218	0.337

When a comparison across the response categories for females of all three age groups was made, the parameter AttC showed a significant difference.

These two parameters were further subjected to pair-wise comparisons with respect to age groups using Mann-Whitney U test.

Table 4.2.1.5: *Pair-wise significant differences for males and females*

Response category	6-7 vs 7-8 yrs	6-7 vs 8-9 yrs	7-8 vs 8-9 yrs
TxA (Males)	✓ (p=0.016)	✓ (p=0.016)	X
AttC (Females)	✓ (p=0.009)	✓ (p=0.009)	X

For males, the parameter TxA showed a significant difference between age groups 6-7 yrs and 7-8 yrs, and also 6-7 yrs and 8-9 yrs.

For females, the parameter AttC showed a significant difference between age groups 6-7 yrs and 7-8 yrs, and also 6-7 yrs and 8-9 yrs.

4.2.2 Gender as independent variable

With gender as the independent variable, a Mann-Whitney U test was administered taking all the three age groups together. This was done to examine if a gender related difference existed in the scores across all age groups considered as a whole.

Table 4.2.2.1: *Gender as independent variable*

Test statistic	PThA	PThC	PAttA	PAttC	PTxA	PTxC	PIntA	PIntC
Z	-0.249	-0.145	-0.168	-0.602	-2.705	-0.540	-0.349	-0.988
Asymp. Sig (2-tailed)	0.803	0.885	0.866	0.547	**0.007**	0.589	0.693	0.323

Results indicated that the taxonomic responses for abstract stimuli showed a significant difference between genders.

Following this, an age group-wise comparison was carried out using Mann-Whitney U test, with gender as the independent variable.

Table 4.2.2.2: *Age-group wise comparison between genders (6-7 yrs)*

Test statistic	**PThA**	**PThC**	**PAttA**	**PAttC**	**PTxA**	**PTxC**	**PIntA**	**PIntC**
Z	-0.940	-0.419	-0.952	-2.095	-2.643	-1.776	-0.313	-0.431
Asymp. Sig (2-tailed)	0.347	0.675	0.341	**0.036**	**0.008**	0.076	0.754	0.666

In the age group of 6 to 7 years, TxA and AttC showed significant difference between male and female. The age groups 7 to 8 years and 8 to 9 years did not show a significant different for any of the response categories.

The overall between group comparisons did not yield a significant age and gender related effects on the scores for the response categories.

4.3 Within group comparison

Since there was no significant age and gender effect observed from the previous statistical analyses, a within group comparison of the scores across the response categories was carried out irrespective of age and gender. The within group comparisons were carried out for concrete stimuli and abstract stimuli separately.

4.3.1 Concrete stimuli

Friedman test was performed to evaluate if the difference in scores obtained for concrete stimuli, across the response categories was significant.

Table 4.3.1.1: *Mean ranks for the response categories*

Response Categories	Mean Rank
AttC	3.93
TxC	2.60
IntC	1.97
ThC	1.50

Table 4.3.1.2: *Test statistic and significance*

Test statistic	Score
Chi square	60.685
Asymp. Sig. (2-tailed)	0.000

Results revealed a significant difference ($p<0.05$) across all the response categories.

Further a pair-wise significance test was performed using the Wilcoxon signed rank test. Each of the response categories was paired with every other response category, yielding a total of six pairs.

Table 4.3.1.3: *Pair-wise comparison of significance*

Test statistic	AttC-ThC	TxC-ThC	IntC-ThC	TxC-AttC	IntC-AttC	IntC-TxC
Z value	-4.782	-4.062	-3.240	-4.720	-4.782	-2.881
Asymp. Sig. (2-tailed)	0.000	0.000	0.001	0.000	0.000	0.004

Results revealed significant difference across all the pairs ($p<0.05$) suggesting that the representation of concrete words in the mental lexicon of children is attributive followed by taxonomic, introspective and thematic relations in that order.

4.3.2 Abstract stimuli

Friedman test was performed to evaluate if the difference across the scores for the response categories was significant.

Table 4.3.2.1: *Mean ranks for the response categories*

Response Categories	Mean Rank
IntA	3.53
AttA	2.58
ThA	2.00
TxA	1.88

Table 4.3.2.2: *Test statistic and significance*

Test statistic	Score
Chi square	31.639
Asymp. Sig. (2-tailed)	0.000

Results revealed a significant difference ($p<0.05$) across all the response categories.

Further a pair-wise significance test was performed using the Wilcoxon signed rank test.

Table 4.3.2.3: *Pair-wise comparison of significance*

Test statistic	AttA-ThA	TxA-ThA	IntA-ThA	TxA-AttA	IntA-AttA	IntA-TxA
Z value	-2.828	-1.100	-3.651	-1.946	-3.670	-4.361
Asymp. Sig. (2-tailed)	0.005	0.271	0.000	0.050	0.000	0.000

Results revealed significant difference across all the pairs ($p<0.05$) except TxA-ThA. Suggesting that the representation of abstract words in the mental lexicon of children is introspective followed attributive, thematic and taxonomic relations in that order.

Discussion

The main aim of the study was to examine the nature of representation of concrete and abstract words in the mental lexicon of children aged between 6 and 9 years. The study also examined the nature of representation of concrete and abstract words with respect to age and gender; and the organization of concrete and abstract words in the mental lexicon of children. A free word association task was used for the same, where the children were presented with a list of twenty concrete words and twenty abstract words (through auditory mode), one at a time, in a random order. They were required to respond verbally with whatever came to their mind as soon as they heard the respective stimuli. The results were analyzed under the following sections:

- Descriptive statistics
- Comparison between groups with age and gender as independent variables
- Within group comparison across the response categories i.e., thematic (Th), attributive (Att) , taxonomic (Tx) and introspective (Int)

Overall, there was a significant difference between the representation of concrete and abstract words in the mental lexicon, in terms of thematic, attributive, taxonomic and introspective relations. However, no significant difference was found in the representation of concrete and abstract words, with respect to age and gender.

The number of non-responses for each age group was computed. A comparison of the frequency of non-responses across age groups and type of stimuli revealed that the children found it more difficult to provide responses for abstract stimuli compared to concrete ones. However, it is evident from Table 4.1.1 that the

frequency of non-responses shows a decreasing trend with age. This is in consonance with a study conducted by Schwanenflugel (1991). The results of the study states that concrete concepts get refined with age and are mastered during adolescence.

A comparison between the total median scores obtained indicated a higher median score for concrete words (70.34) as against abstract words (23.63). Therefore, the overall production was higher for concrete than for abstract words. Caramelli, Setti & Maurizzi (2004), similarly found a greater number of responses for concrete words in comparison with abstract words. This, they hypothesized was due to better familiarity with concrete concepts. This notion is further reinforced by the Dual Coding hypothesis (Paivio, 1986), which proposes a dual representation for concrete concepts (sensorimotor as well as linguistic), as against a single representation modality (linguistic) for abstract concepts.

The first objective of the study was to examine the nature of representation of concrete and abstract words with respect to age and gender. An age-wise comparison of scores revealed significant differences ($p<0.05$) for the parameter AttC and IntC. The parameter AttC varied significantly ($p<0.05$) between 6-7 years and 7-8 years indicating that the number of attributive responses for concrete words increased with age. Introspective relations for concrete stimuli showed an increase between 6-7 years and 8-9 years; 7-8 years and 8-9 years, with no difference between 6-7 years and 7-8 years. This suggests that an increase in vocabulary as well as experiences could contribute to an increase in the number of introspective responses for concrete stimuli. When an age-wise comparison of scores with respect to gender was made, the parameters TxA and AttC showed significant differences ($p<0.05$), for males and

females respectively. For males, the parameter TxA showed a significant decrease across the age groups 6-7 years and 7-8 years; 6-7 years and 8-9 years. This could be due to an increase in the use of other types of relations such as introspective, in order to define abstract concepts. Female participants showed an increase in the attributive responses for concrete stimuli across all three age groups. This could be attributed to the increase in vocabulary and acquisition of more defining features for a concrete concept, with age. Borghi and Caramelli (2003), based on the results of their study conducted on children from the age groups of 5 years, 8 years and 10 years stated that the use of attributive relations to represent words increased with age. Along a similar vein, results of the study conducted by Caramelli, Setti & Maurizzi (2004) depicted an increasing distinction between the type of responses concrete and abstract words elicited, with an increase in age. The authors also stated that the use of attributive responses to characterize concrete concepts and thematic responses to characterize abstract concepts steadily increased with age. However, the current study did not show a significant age-based trend.

A comparison of scores obtained by the male and female participants revealed a significant difference ($p<0.05$) for the parameters TxA and AttC. Males produced significantly more taxonomic responses for abstract stimuli and attributive responses for concrete stimuli compared to females. In general, the male participants tended to give more precise, semantically related responses (i.e., taxonomic and attributive), whereas females responded with lengthy thematic or introspective utterances. However, there was no significant effect of gender, overall. Therefore, the hypotheses

that there is no difference in the nature of representation of concrete and abstract words with respect to age and gender have been accepted.

The second objective of the study was to investigate the organization of concrete and abstract words in the mental lexicon of children. A comparison of scores across all the four response categories for concrete stimuli revealed significant differences ($p<0.05$). The scores indicated that children primarily used attributive relations to describe a concrete concept. This was followed by taxonomic and introspective relations. The scores indicated that children seldom used thematic relations to illustrate a concrete concept. This finding is in consonance with a study conducted by Tversky & Hemenway (1984), which states the importance of an object's perceptual characteristics in the process of developing conceptual knowledge. These results are also in agreement with the study by Caramelli, Setti & Maurizzi (2004). Their results indicated that concrete words elicited attributive and taxonomic responses more frequently. These results support the Qualitatively Different Representational (QDR) framework, which proposes that concrete concepts activate semantically similar concepts. Abstract stimuli mainly elicited introspective relations, followed by attributive and finally thematic and taxonomic relations. Barsalou & Wiemer-Hastings (2005), in their exploratory study found that the words that were rated higher in abstractness elicited more introspective responses. Kousta et al. (2011) proposed that abstract words denoting emotional states elicited more introspective relations compared to neutral abstract words. In the current study, several of the abstract word stimuli denote emotional states; hence the results are well founded. Imaging studies in the past (Binder et al., 2009) have reported greater activation

language network of the left hemisphere (i.e., Inferior Frontal Gyrus and Superior Temporal Sulcus) while processing abstract stimuli. Also, the Dual Coding theory (Paivio, 1986) proposes a dominant linguistic representation for abstract words. However, an fMRI study conducted by Vigliocco et al. (2010) showed activation of the rostral anterior cingulated cortex, an area associated with emotional processing, when the participants processed abstract words. This indicates that introspective relations, usually associated with emotions, are important in order to represent abstract concepts. Studies conducted by Barsalou & Wiemer-Hastings (2005) on adults, and Setti, Borghi & Caramelli (2016) on children revealed a preponderance of thematic relations for abstract stimuli. In the current study, there were fewer thematic relations compared to any other category of responses for abstract stimuli. This could be due to the fact that, related thematic utterances were grouped together and considered as one unit, whereas attributive and taxonomic relations were individually scored. Hence, the overall frequency of thematic responses might have reduced compared to the other category of responses. In essence, there was a significant difference in the representation of concrete and abstract words in the mental lexicon. Therefore; the hypothesis that there is no difference in the organization of concrete and abstract words in the mental lexicon of children has been rejected.

In summary, it is observed form the results of the current study that the organization of concrete and abstract words in the mental lexicon is different. While concrete words are mapped using attributive relations, abstract concepts are represented with the help of introspective relations, according to this study. Although researchers in the past have found significant differences in the representation of

concrete and abstract words with respect to age, the current study did not reveal any significant differences both with respect to age as well as gender.

CHAPTER V

Summary and conclusion

The present study aimed at examining the nature of representation of concrete and abstract words in the mental lexicon of children aged between 6 and 9 years, who were native speakers of Kannada, using a free word association task. It was studied under the following objectives:

- To investigate the nature of representation of concrete and abstract words with respect to age and gender.
- To investigate the organization of concrete and abstract words in the mental lexicon.

Looking into the literature, several authors have reported of significant differences between the representation of concrete and abstract words. Caramelli, Setti & Maurizzi (2004) have reported that concrete words were represented with the help of attributive or taxonomic features, whereas abstract words were represented using thematic features. Crutch & Warrington (2005) have also reported similar results. Studies by Schwanenflugel (1991) and Yore & Olilla (1985) have reported an age based trend in the acquisition of concrete and abstract words, with concrete words being mastered earlier and abstract words being mastered by adolescence. Researchers in the past have employed several methods to study the representation of words in the mental lexicon of both children and adult, such as imaging techniques, Event Related Potentials (ERPs), and word association tasks. Free word association task involves the participant responding with the first word that comes to his mind,

when presented with a word stimulus. Studies using this method have been carried out in European languages (e.g., Caramelli, Setti & Maurizzi, 2004). It is widely accepted that representation of concepts in the mental lexicon is heavily influenced by language, culture and socio-economic status. The few Indian studies conducted in this context investigated semantic features of nouns vs verbs (Chitra & Prema, 2008), and living vs non-living things (Prema & Prarthana, 2013) however not with respect to concrete and abstract words. Hence, there was a need to study the representation of concrete and abstract words in the mental lexicon of children.

The methodology employed in this study included thirty children in the age range of 6 to 9 years, who were native speakers of Kannada. They were further divided into the age groups ≥6 to 7≤; ≥7 to 8≤ and ≥8 to 9≤ years. Each group had 10 participants, 5 male and 5 female respectively. Each child was presented with 20 concrete and 20 abstract words in random order through auditory mode, and was asked to say whatever came to his/her mind as soon as he/she heard the word. The responses for each word were categorized into thematic, attributive, taxonomic or introspective relations.

The scores for each of the response categories were converted to percentage, and compared between concrete and abstract stimuli. The scores were also compared across the age groups and between both genders. The analysis was done using SPSS software (version 17.0) results revealed that the children predominantly used attributive relations followed by taxonomic, introspective and thematic relations to understand concrete words. On the other hand, they represented abstract words mainly with the help of introspective stimuli followed by attributive, thematic and taxonomic

relations. The hypothesis put forth in relation to this was that there was no difference in the organization of concrete and abstract words in the mental lexicon of children. Therefore, this hypothesis has been rejected. The current study did not reveal any age and gender related differences in the representation of concrete and abstract words. The hypothesis put forth in relation to this was that there was no difference in the representation of concrete and abstract words with respect to age and gender. Hence, these hypotheses have been accepted. To summarize, there indeed exists a difference in the representation of concrete and abstract words in the mental lexicon of children. However, there was no significant effect of age or gender observed in the study.

5.1 Implications

- This study provides an understanding of how concrete and abstract words are represented in the mental lexicon of typically developing children.
- The results obtained would help provide clinicians with essential features that need to be taught while teaching a concrete or abstract concept.

5.2 Limitations and future directions

- The current study had a limited sample size. Further, the number of male and female participants chosen in each age group for gender comparison was less in number. Therefore, in future a larger sample size can be taken up for investigation.
- The representation of concrete and abstract words for typically developing children can be compared with that of children with communication disorders.

Such a comparison might provide clinicians with directions for therapeutic intervention.

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Appendix

Stimuli used for the study

Concrete words	Abstract words
/dza:ɳa/ **ಜಾಣ** ‘smart’	/kannaɖaka/ **ಕನ್ನಡಕ** ‘spectacles’
/tʃanɖa/ **ಚಂದ** ‘good’	/ga:ɭipaʈa/ **ಗಾಳಿಪಟ** ‘kite’
/a:ro:gja/ **ಆರೋಗ್ಯ** ‘health’	/ouʃaɖʰa/ **ಔಷಧ** ‘medicine’
/madza/ **ಮಜ** ‘fun'	/radza/ **ರಜ** ‘holiday’
/pa:pa/ **ಪಾಪ** ‘poor fellow’	/dza:ʈre/ **ಜಾತ್ರೆ** ‘fair’
/sulabʰa/ **ಸುಲಭ** ‘easy’	/beʈʈa/ **ಬೆಟ್ಟ** ‘mountain’
/a:se/ **ಆಸೆ** ‘desire’	/haɳa/ **ಹಣ** ‘money’

/sulɭu/ **ಸುಳ್ಳು** ‘lie’	/maiɖa:na/ **ಮೈದಾನ** ‘ground’
/ʃakʈi/ **ಶಕ್ತಿ** ‘strength’	/maɭe/ **ಮಳೆ** ‘rain’
/dzopa:na/ **ಜೋಪಾನ** ‘careful’	/vima:na/ **ವಿಮಾನ** ‘aeroplane’
/ga:bari/ **ಗಾಬರಿ** ‘fear’	/ʈo:ʈa/ **ತೋಟ** ‘garden’
/saha:ja/ **ಸಹಾಯ** ‘help’	/aŋgaɖi/ **ಅಂಗಡಿ** ‘shop’
/na:tʃike/ **ನಾಚಿಕೆ** ‘shyness’	/navilu/ **ನವಿಲು** ‘peacock’
/kanasu/ **ಕನಸು** ‘dream’	/a:kaʃa/ **ಆಕಾಶ** ‘sky’
/ka:pa:ɖu/ **ಕಾಪಾಡು** ‘save/protect’	/haɳɳu/ **ಹಣ್ಣು** ‘fruit’

/dzagaɭa/ **ಜಗಳ** ‘fight’	/ɖasara/ **ದಸರ** ‘dasara festival’
/abʰja:sa/ **ಅಭ್ಯಾಸ** ‘habit’	/ka:manabillu/ **ಕಾಮನಬಿಲ್ಲು** ‘rainbow’
/hogaɭu/ **ಹೊಗಳು** ‘praise’	/laŋga/ **ಲಂಗ** ‘skirt’
/avasara/ **ಅವಸರ** ‘hurry’	/ʧamatʃa/ **ಚಮಚ** ‘spoon’
/mo:sa/ **ಮೋಸ** ‘cheat’	/habba/ **ಹಬ್ಬ** ‘festival’

A ten – question disability screening test

These questions can be used in a house-to-house survey to identify children who could benefit from extra stimulation or special care. This could also be used in child centres and schools where teachers might be able to provide direct assistance or refer children with particular needs to special health or educational facilities.

1. Compared with other children, did the child have any serious delay in sitting, standing or walking?
2. Does the child speak at all?
3. Can the child make himself understood in words; can he say recognizable words?
4. Does the child having difficulty seeing?
5. Does the child have any difficulty hearing?
6. When you ask the child to do something does he seem to understand what you are asking?
7. Does the child have any weakness and/or stiffness in the limbs and/or difficulty in walking or moving his arms?
8. Has the child had often fits, become rigid or lost consciousness in the last six months?
9. Has the child had any other serious accidents or illness?
10. Compared with other children his age, does the child appear in any way backward, slow or dull?