LISTENING COMPREHENSION TO SENTENCE AMBIGUITIES OF TYPICALLY DEVELOPING CHILDREN IN ENGLISH

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Certificate

This is to certify that this dissertation entitled "**Listening comprehension to sentence ambiguities of typically developing children in English"** is a bonafide work in part fulfillment for the Degree of Master of Science (Speech- Language Pathology) of the student (Registration No. 16SLP008). 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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Declaration

This dissertation entitled **"Listening comprehension to sentence ambiguities of typically developing children in English"** is the result of my own study under the guidance of Dr. Jayashree C. Shanbal, Reader in Language Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

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Dedicated to LORD , My Achan, Amma & Manikutty

GOD OWES US NOTHING BUT GIVES US EVERYTHING

PRAYER IS THE KEY THAT UNLOCK ALL DOORS

PRAY WELL BEFORE YOU QUIT

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CHAPTER 1: Introduction

A sentence is the largest independent unit of grammar. The sentence is traditionally defined as a word or group of words that expresses a complete idea. The individual word is the smallest unit of language that conveys meaning, the structure of a sentence provides more precise meaning than a set of unconnected words provide. The four basic structures of the sentence include 'simple sentence*'* which has only one independent clause and no dependent clause (e.g. I bought a chair), 'compound sentence' with multiple independent clauses and no dependent clause (e.g. I wrote him a letter but he didn't reply me), '*complex sentence'* where **a**t least one independent clause and one dependent clause (e.g., I saw a man who was wearing a white shirt), 'complex-compound sentence' which has at least 2 or more independent clauses and one or more dependent clauses (e.g. I like Physics, but my friend likes Biology who want to become a doctor).

Based on the function the various types of sentences include 'declarative sentence' which declares a fact or opinion (e.g. He bought a new laptop), '*interrogative sentence'* which asks a question or request information (e.g. How are you?), *'imperative sentence'* which is a form of a command (e.g. Turn off the light), '*exclamatory sentence'* which expresses an exclamation (e.g. what a nice car!).

Sentence comprehension in fact focuses on how readers and listeners map recognized words onto the meanings of sentences. It takes place whenever a reader or listener processes a language utterance, either in isolation or in the context of a

conversation or text. It is the process of discovering the cues that shows how words in a sentence relate to one another and also an ability to understand the meaning and relation among the words and to relate to them in some way. Sentence comprehension requires the construction of coordinated representation at many levels (e.g. orthographic, phonological, semantic, thematic and syntactic) to derive the propositional content of a message. During comprehension, readers and listeners construct a mental model or discourse model (Garnham, 1981; Gernsbacher, 1991; Johnson-Laird, 1983; Marslen-Wilson & Tyler, 1987; Morrow & Bower, 1989; Webber, 1979). In order to build the model the individual must recognize each of the words in the sentence and determine the syntactic (and semantic) relationship among them, as defined by the grammar of the language.

The process of assigning syntactic relationships is generally referred to as parsing, though this term is sometimes used to include both the assignment of syntactic relationships and interpretation (Altmann, 1989). As a result of parsing the sentence, the individual can determine the propositional content or "message" expressed by the sentence, that is, ‘who did what to whom’ etc. As the propositional content of the sentence is extracted, new events and entities are introduced into the model and reference is made to those that are already been introduced. The referring expressions known as anaphoras and other contextually dependent expressions play a primary role in this process. In the event of understanding a sentence, we use syntactic information. The syntactic processes and information that is used in sentence comprehension are structure binding, checking agreement, mapping thematic roles, complexity etc.

Successful language comprehension requires an understanding of words and utterances in isolation along with the ability to integrate utterances so as to build a rich coherent mental representation of the objects and events specified in such utterances and the relations between them (Bishop, 1997). Humans are well adapted for the perception of speech using procedures that are unique to speech and that form a specialized speech module (Lieberman & Mattingly, 1985). Furthermore, interpretation of a single utterance facilitates the understanding of subsequent utterances if the new information is relevant to the context. The structure-building framework of Gernsbacher (1990) provides a model for understanding this process. He proposed that as a representation is built up, memory cells will enhance activation of related meanings at the same time suppressing activation of unrelated meanings. If they are not suppressed, a new representation will be initiated to accommodate this information. This framework is supported in computational models of sentence processing that have demonstrated that "the processing of sentence contexts involves activating appropriate information units while inhibiting (or suppressing) all other types of information" (MacDonald, Pearlmutter, & Seidenberg, 1994). As the signal starts to arrive, listeners try to map the acoustic signal onto a representation in the mental lexicon. This process of retrieving semantic information from the mental lexicon is referred to as lexical access. Semantic priming, word frequency, morphological structure, lexical ambiguity, retention of lexical items etc are the factors considered to be involved in lexical access. Recent studies suggest that there are in fact two routes to recognition for polymorphemic words, one based on

morphological analysis and the other based on whole-word storage .Whereas syntactic processing takes place through syntactic parser, which together with the grammar guides the order of which elements of a sentence are processed and the manner in which syntactic structure is built up. Models of spoken word recognition attempt to explain how the continuous acoustic stream is parsed into words and how these words are then mapped onto stored lexical entries. Recent studies of spoken word recognition support interactive models such as the TRACE Model (McClelland & Elman, 1986) and the Distributed Cohort Model, or DCM, (Gaskell & Marslen-Wilson, 1997; Becker, 1976; Welsh, 1978; Morton, 1969; Rubenstein, Garfield, & Millikan, 1970; Schvaneveldt et al., 1976). These models, differ in structure, but make similar predictions about word recognition and incorporate bottom-up (such as distinctive features of phonemes) and top-down cues (such as contextual support) in the process. However, neither TRACE nor DCM specifically addresses children's abilities. Spoken word recognition in children has been addressed in terms of the development of speech perception skills. Jusczyk (1997) has proposed a model of the course of development from initial speech perception abilities to spoken word recognition and lexical access. Juscyzk's Word Recognition and Phonemic Structure Acquisition (WRAPSA) model provides a possible account of how infants' early speech perception skills develop into a system that is capable of word recognition in continuous speech. There are four steps considered in this model: preliminary analysis of the speech signal, weighting of the speech signal, pattern extraction, and matching and storing representations.

Ambiguity is a type of uncertainty of meaning in which several interpretations are plausible. It is thus an attribute of any idea or statement whose intended meaning cannot be definitively resolved according to a rule or process with a finite number of steps. The concept of ambiguity is generally contrasted with vagueness. In ambiguity, specific and distinct interpretations are permitted, whereas with information that is vague, it is difficult to form any interpretation at the desired level of specificity. An ambiguous sentence often occurs in our day-to-day conversation. Linguistic ambiguity occurs whenever a given word, phrase or sentence possesses two or more distinct semantic interpretations. Inspite of encountering these ambiguous sentences quite frequently, most of them go undetected by the speaker and listener. This happens as the listeners usually use the contextual cues and derive a meaning that is close to speaker's intended meaning (Price, Ostendorf, Shattuck-Hufnagel & Fong, 1991). It is when the listener fails to detect the meaning of the sentences, the ambiguities in these sentences are detected and there arises a need to disambiguate the ambiguous sentences. Detection of ambiguity has been defined as the ability to detect & report that a sentence can have more than one meaning(Cairns, Schlisselberg, Waltzman,2004)

Literature suggests that listening comprehension level represents a potential for reading comprehension. Reading comprehension is different from language comprehension because of the reliance on print, as opposed to oral language, to perceive the words and derive meaning (Hoover & Gough, 1990). Syntactic ambiguity detection contributes to reading comprehension skills in

second and third graders (e.g., Cairns et al., 2004; Yuill, 2009). Syntactic ambiguity detection may interfere linguistic comprehension as it aids a listener to overcome comprehension difficulties caused by misinterpreting an ambiguous sentence. Thus, it will be riveting to understand the early development of sentence ambiguity resolving. Children with learning disabilities have been reported to demonstrate syntactic deficits when compared to academically achieving age peers matched for intellectual ability and racio-ethnic and socioeconomic background (Vogel, 1974; Johnson & Myklebust, 1967; Rosenthal, 1970; Semel & Wiig, 1975). The present study would thus be a study of developing linguistic competence.

CHAPTER 2: Review of Literature

Language is like walking (Chomsky, 1960). He opined that humans are born with an understanding of the underlying mechanisms of language. Chomsky's universal grammar is the baseline why humans can recognize grammatically correct yet nonsensical phrases, such as the famous phrase "colorless green ideas sleep furiously". Developments in transformational theory (Chomsky 1965) have made it possible to identify a number of different levels of linguistic ambiguity. Linguistic ambiguity occurs whenever a given sentence possesses two or more distinct semantic interpretations. Lexical, phonologic, and syntactic ambiguities are the major types explained in the literature. Lexical ambiguity or polysemy occurs when a given lexical item has more than one semantic interpretation (e.g. bright - a bright (intelligent) person vs. bright (sunny) weather). Lexically ambiguous words are more frequent in English language. In fact, the more common a word is, more likely it is to be ambiguous (Miller, 1951). Phonologic ambiguity occurs when a given phonological sequence can be interpreted in more than one way , it can either be due to confusion of word boundary (eighty cups v/s eight tea) or condition were two different words have similar pronunciation (sail vs. sale). Syntactic ambiguities are broadly of two types – one based on surface structure relations and other based on deep structure relations. Surface structure ambiguity results when the words of a sentence can be bracketed in two different ways, with each bracketing expressing a different semantic inference. For example the sentence "He sent her kids story books" can be bracketed as (He) (sent) (her kids) (story books) or (He) (sent) (her) (kids story

books). In the former type, the woman's kids are being sent story books, in latter one, the woman is being sent kids' story books. In surface structure ambiguity, two slightly different deep structures are mapped onto single surface structure. Whereas, the deep structure ambiguity occurs when two different deep structures are mapped onto a single surface structure. Here the two deep structures enumerate two different sets of structural relations between key words in the sentence. For example in the sentence, "The duck is ready to eat". The key word duck in the sentence can either be a logical subject or an object.

It is generally acknowledged that metalinguistic awareness plays a role in decoding ability (National Institute of Child Health and Human Development, 2000) less is known about the role metalinguistic awareness plays in language comprehension. Ambiguity detection is considered an important metalinguistic awareness skill that is also indicative of the child's developing linguistic representations (Cairns, Schlisselberg, Waltzman & Mc Daniel, 2006).

2.1 Metalinguistic awareness in typically developing children

Metalinguistic awareness in general, refers to an individual's awareness of and control over one's language. As described by Phelps (2003), metalinguistic awareness skill allows one to reflect upon and manipulate the structural features of spoken language. Malakoff and Hakuta (1991) described the skill as an awareness of language and its underlying nature, by which the function of a language for an individual is not only limited to the comprehension or production of an utterance, but also considers the linguistic form and structure, and how these

can be manipulated to vary the underlying the meaning of the utterance. When an unusual utterance is encountered the listener consciously reflects on the linguistic and logistic form and has to consciously manipulate the linguistic structure to interpret the utterance during listening comprehension (Tunmer Pratt & Herriman, 1984). Awareness of these metalinguistic skills, as reported by Chaney(1992), included variety of linguistic skills- phonological awareness skills such segmenting words into syllables and phonemes, as well as detecting lexical and structural ambiguities, separating words from their referents, and judging semantic and syntactic appropriateness. The author reported that these metalinguistic awareness skills can be divided into four broad categories: (1) Phonological awareness; (2) Semantic or word awareness ; (3) Syntactic awareness ; and (4) Pragmatic awareness.

Cairns et al (2006) opined that just as children learn to deduce the meaning of sentence by the understanding the content words in it, children also learn the syntactic form in grammatically well formed utterances. This ability of children to evaluate the syntactic form of the sentence were assessed by asking the child to make grammatical judgements, and if a child is able to judge that a sentence is ill formed, it was suggested that the child would have internalized the basic grammar of that language.

Various studies repeatedly discussed development of metalinguistic abilities in relation to the effect on development of reading abilities development of phonological awareness under the broad categories of metalinguistic awareness skills have received most attention in order to understand the developments of

metalinguistic awareness in children different authors have used varied methodologies to gather evidence specific to word and syntactic awareness researchers used tasks like word referred task grammatically judgement tasks error detection and or error correction tasks and ambiguity detection tasks on both syntactic and lexical types of ambiguity (Osherson & Markman 1975; Cairns et al 2006 Cairns 2004). A vast number of studies on syntactic awareness have examined the ability of the child to make grammatical judgement and how well they are able to correct the error.

Hakes (1980) studied children of 4 to 8 years, and presented grammatical and ungrammatical sentences. Judgements that needed to be done where based on synonymy and acceptability of sentences. Older children gave better responses to both grammatical and ungrammatical sentences. The author interpreted that as the child's knowledge of the rules of the language increases with age, the child has more understanding of the constraints in that language and this way, the child does not accept the sentences that do not follow the constraints.

A study in Kannada assessed syntactic and word awareness skills in 8-13 year old Kannada speaking with learning disability (Priya & Manjula, 2008-2009). Metasyntactic skills were compared with age matched typically developing children using grammatical judgement tasks on the following sections : morphophonemic structures plurals, tenses, PNG markers, sentence types and others, the metasemantic skills were assessed by child's knowledge of the relationship between the group of words under the categories of synonyms, antonyms, homonymy, semantic anomaly, semantic contiguity, semantic

similarity, paradigmatic relations and syntagmatic relations. The results of their study indicated that metalinguistic abilities were related to the later reading acquisition in children. The typically developing group was found to perform at maximum possible scores on the tests, except for the homonymy section. On metasyntactic tasks, the older typically developing children were found to perform better than the younger age groups.

Assessing grammatical judgement in children is just one method to carry out research on metalinguistic skills of syntactic and word awareness. There have been other works on children's judgements about whether or not pairs of sentences are synonymous, and whether certain sentences are ambiguous. Synonymy judgments require a comparison of the underlying representation, that would be the same for a pair of sentences, and comparison of the superficial forms that would be different. On the other hand, the judgement of ambiguous sentences involves understanding a sentence with a single superficial form, but two or more different underling forms (Tunmer et al., 1984)

2.2 Sentence disambiguation as a metalinguistic skill

Many researchers have looked into the development of both lexical and syntactic ambiguities to understand the development metalinguistic skills (Cairns et al, 2004). Cairns et al, (2004), investigated the metalinguistic skill of ambiguity detection. The authors reported a longitudinal study of 44 children, from the first through third grades. The longitudinal study was carried out through two experiments, the first experiment administered to the first graders and

the second experiment to the same children when they were in second grade. The children's ability detect the ambiguity of lexically ambiguous sentences (example "children saw the bat lying by the fence") and structurally ambiguous sentences (example "the girl tickled the baby with the teddy bear") was assessed. Ambiguity detection skill was found to be related to first – grade trading readiness and to second – and third- grade reading achievement. The results suggest that the decision of lexical ambiguity develops in the first grade correlates highly with reading readiness measures. In this study, the ability to detect structural ambiguity emerged in the second grade and was predictor of third grade reading ability. The authors opined that ambiguity detection in sentences depended on the listening comprehension for spoken language, and thus referred to it as a psycholinguistic skill. They argue that this tasks recruits processing operations described by the psycholinguistic theory of auditory comprehension. The psycholinguistic theories of auditory comprehension, (Treiman et al (2003); Osada (2004) attempted to explain the properties of the human mind and how it analyses the structure of spoken language using the world knowledge acquired by the individual. In the case of ambiguity detection, Cairns et al. (2004) concluded that lexical and syntactic processing skill have to be applied effectively and that once the sentences are processed, the same processing options are used to reprocess the sentence and arrived at the secondary meaning of the ambiguity. As Treiman et al (2003) explains, listening comprehension, unlike reading comprehension, use top-down processes, where the spoken utterance is processed in real time. Simultaneously as the auditory input is received, and listeners, keep

adjusting and or modifying their understanding of what they hear based on prior knowledge and the incoming information being received.

Keil (1978) addressed the issue of tasks specificity. Here children's ability to perceive linguistic ambiguities was correlated with that of syntactic ambiguity. Under the task of linguistic ambiguities, the author studied both lexical and syntactic ambiguities. Each ambiguous sentence was followed by a question related to the sentence. The results indicated significant increase in the mean scores through grades one, three, five and eight. In addition, significant correlations between the scores of syntactic and lexical ambiguity tasks were found for children through all grades considered in the study. The author reported that children improve lexical ambiguities between the first and third grades, but in the case of syntactic ambiguities, additional abilities to process were required.

Shultz and Pilon (1973) assessed children in the age range of 6-15 year old children on their ability to detect various types of linguistic ambiguities. The authors described three types of linguistic ambiguities – (a) Lexical ambiguity, (b) Phonological ambiguity and (c) Syntactic ambiguity, which were subdivided into surface-structure and deep structure ambiguities. They included 28 English-speaking children in the study (first, fourth, seventh and tenth grade children between the ages of 6 and 15 years). Their stimuli consisted of six ambiguous sentences for each type of ambiguity. The authors concluded that syntactic ambiguity was not detected largely as opposed to lexical and phonological ambiguities. Until 7^{th} grade, detection of the two types of ambiguity did not appear till 12 year of age. They reported that detection of lexical ambiguities

exhibited a steady improvement across grades, and the development was found to be linear with the age. In the grade 1, phonological ambiguities were detected and in grade 4 increased sharply and reported to be leveled off beyond grade 4. The authors have explained the difference in development of phonological and lexical ambiguity detection skills. They suggested that separate storage locations for homophonous words accounted for their faster retrieval.

2.3 Theories/ models of sentence disambiguation

Ambiguities are highly common in spoken language, yet as MacKay (1987) point out, it is surprising how listeners rarely face difficulty comprehending them. A number of studies are reported in the literature that investigates what psycholinguistic methods or mature listeners or readers for the comprehension of ambiguous sentences use strategies. This vast literature has been reduced on studies related to the lexical issues of sentence disambiguation, resulting in a number of supported findings but an even larger set of conflicting evidence and theoretical claims (Swinney & Love, 2002).

Earlier literature on models of sentence disambiguation majorly discussed three three hypotheses of ambiguity resolution (Wiig , Semel, and Abele,1981). The *Oblivion hypothesis* by McKay (1966) proposed that the listener is able to interpret the meaning of the ambiguous sentence only in the presence of the non ambiguous context of the sentence. Evidence for this model was shown by the slower reaction time in normal adults in interpreting ambiguous sentences. The *exhaustive computation hypothesis* (cited in Mehler, Segui & Carey, 1978; Wiig

et al, 1981) postulates that the listener immediately interprets all possible meanings of the ambiguous sentence . The *unitary perception hypothesis* (Carey, Mehler & Bever , 1970) stated that "under certain syntactic relations (of ambiguous sentences) pertaining to a single structural description will be perceived and processed ."

Katz and Fodor (1963) had put forth the structure of semantic theory and they opined that the different meanings of a polysemous word are all filed under a single lexical entry and that of homonyms are filed under separate lexical entries. One of the earlier studies on the processing of ambiguous sentences by adult listeners included study by Foss Bever and silver (1968). Their study included twenty participants who were required to verify whether a picture that was presented at the end of an ambiguous or non ambiguous sentence, did or did not represent the meaning of the immediately preceding sentence. Pictures representing both alternatives of the ambiguous sentences were presented on separate trials, and the latency of responses (the verification time) was measured. The verification time (time from identification of the stimulus to the subject's response as right or wrong) was measured for each of ambiguous and unambiguous sentences, only if responses to these sentences were correct. The results showed that time for verification of unambiguous sentence was the same as when "expected" meaning of the ambiguous sentence was shown in the picture. The verification time to the picture representing the "unexpected" meaning of the ambiguity was longer than verification time to corresponding control sentences.

The study by Foss et al (1968) was intended to understand which of the hypotheses as mentioned by MacKay (1966) best explains the process of comprehension of ambiguous sentences. Here they measured the verification time based on the premise that if a participant interpreted the ambiguous sentence in one way but then so a picture depicting the other meaning, the response time to verify this second picture would be relatively longer, since the meaning of the sentence would have to be reinterpreted, a process which presumably takes time. On the other hand, they opined, if the participant held both or neither of the interpretation in their memory, then no re interpretation was required and the time to respond to an ambiguous sentence was not affected. The former supported the unitary perception hypotheses the later supported the exhaustive computation or oblivion hypotheses. The results supported a model of normal sentence comprehension in which the listeners typically assign only one immediate interpretation to an ambiguous sentence and this correlates with the unitary perception hypotheses. The authors explained this based on the arguments that when the subjects were faced with an unexpected picture following ambiguous sentence they tended to interpret it as wrong more often than when an expected picture was presented. They concluded that once the ambiguity has already been interpreted in the expected form. It would become difficult for the listener to immediately reinterpret in the unexpected way.

MacKay (1987) supported this argument stating that only the prime meaning of an ambiguous sentence is interpreted first. If the subject has not interpreted the second meaning it may take a considerably longer time. As a non-

automatic process is required to activate the second meaning, the author argued that a considerable time might be required even to perceive the second meaning as a different activating mechanism must be applied. Study by MacKay & Bever (1967) had demonstrated similar results supporting that one meaning is interpreted than the other. The authors state that even though only one interpretation of the ambiguity is realized at a time, both meanings are primed simultaneously and in parallel.

The later studies focused mainly on the contribution of additional cues available during sentence disambiguation and access of these meanings in the presence or absence of these cues Onifer & Swinney (1981) examined two hypotheses concerning the process involved during resolution of lexical ambiguities and also, the nature of lexical access. The hypotheses were

(a) The exhaustive success hypothesis: (as discussed by MacKay 1966);

(b) The terminating ordered search hypothesis: the most frequent interpretation is accessed first, and if it is appropriate to the context and no further meanings need to be processed (Hogaboam & Perfetti, 1975).

A cross modal lexical priming task was used in their study. The authors chose lexical ambiguities where in the relative frequency of use of one of the meanings was much higher than the other meaning. They also included a biasing context were bias was toward the more frequent. Two separate sentences were constructed for each experimental ambiguity. Subjects had to listen to the sentences and make decisions while simultaneously, they also had to make lexical decisions about visually presented words. These words were related to both the

primary and secondary meanings of the ambiguity. Based on the results, the authors opined that all meanings of the lexical ambiguity appear to be accessed momentarily regardless of the relative frequency of use of those meanings or the bias provided by the semantic context in which those words occur, thus supporting the exhaustive access hypotheses. Thus, these data imply that, even in the presence of biasing context, memory of initially accesses both meanings of an ambiguity, and then very quickly discards all but the contextually relevant meaning.

In similar to Onifer & Swinney (1981), Swinney & Love (2002) used a cross – modal lexical priming task, and found similar results supporting the exhaustive access hypotheses. They stated that during auditory sentence processing the context does not place prior constraints on lexical access and all information associated with an auditory lexical form is made available at for the first instance, for processing the auditorily presented sentence. These priming studies explains that listeners do not maintain multiple meanings for long but instead make a rapid selection within a few hundred milliseconds of encountering an ambiguous word even when both meanings are consistent with the sentence context (e.g., Seidenberg et al. 1982; Swinney 1979). Seidenberg et al. (1982) proposed that such selection may occur because of limits on processing capacity that make it difficult to maintain multiple interpretations in parallel (Mason & Just 2007; Miyake, Just, & Carpenter 1994).

Numerous studies have shown that additional processing is required to recover from such misinterpretations (e.g., Duffy et al. 1988; Kambe, Rayner, and Duffy 2001; Rodd et al. 2010). Further, neuroimaging data have indicated that both semantic and syntactic processes involve parts of the temporal and the inferior frontal cortex. The left MTG and BA 45/47 are the relevant areas in the semantic domain, although activation of BA 45/47 appears to depend on the amount of strategic and/or memory processes required. In the syntactic domain, the relevant temporal region is the anterior left STG and the relevant frontal regions are left BA 44 and the adjacent frontal operculum. Although a larger portion of BA 44 seems to support aspects of syntactic working memory, the inferior tip of BA 44 and the frontal operculum are required specifically for local phrase-structure building and syntactic ambiguity (Vitello, 2015).

A connectionist model, the mental node hypothesis, was applied to understand how huge amounts of heterogeneous contextual information get automatically and rapidly integrated for comprehension (MacKay, 1987). This model explains that when a single phonological node is activated (for e.g. bat), it sends bottom up connections to two lexical content nodes (Bat: animal, Bat : Cricket bat).

Markovitch (1983) studied issues of how lexical ambiguities are processed. Previous studies have demonstrated that if the context of the ambiguity is strong or if a meaning dominance is present, only a single meaning of an ambiguity is accessed (Foss et al., 1968), otherwise multiple meanings may be accessed (MacKay, 1966; Onifer & Swinney, 1981; Swinney & Love, 2002).

There are also reports that even with strong context, multiple meanings may still be accessed (Onifer & Swinney 1981) this observation was made only when a distracter, such as a lexical decision task was given simultaneously with the sentence disambiguation task. The author summarized these observations as follows:

(a) If context or dominance is fairly strong, then only a single meaning of a lexical ambiguity is accessed (supported with the experiment by Simpson 1981)

(b) If neither of the above is present then multiple meanings may be accessed (supported with experiments by Holley- Wilcox & Blank, 1980), and

(c) Even with strong context or dominance, multiple meanings may still be accessed, if the normal act of disambiguation is disrupted by a distraction such as a simultaneously presented lexical decision task.

A number of studies have also examined the processing of syntactic ambiguities in the study by McKoon and Ratcliff (2007), the authors discussed two main classes of theories that attempt to explain the same. Constraint based theories (MacDonald, 1994., Spivey-Knowlton et al., 1993) assume that multiple kinds of information including some kinds of meaning information, interact immediately and simultaneously to choose the appropriate syntactic structure for the words of a sentence. Another class of models like the "garden path" model (Frazier., 1987 Frazier & Clifton 1996., Frazier & Rayner 1982) assumes that

there are two stages of processing. The first is an encapsulated module for syntactic processing that is influenced only by syntactic information, while the meaning information enters processing only at the second stage. When processing garden path sentences, the listener is led down the garden path due to the transient and ambiguity at a certain stage of their processing, and has to recover by conscious reanalysis, and the ambiguity is resolved by the end of the sentence (Siloni 2014).

Simple View of Reading (Gough & Tunmer, 1986) a theoretical model posits that the main components of reading are decoding and linguistic comprehension. Decoding is defined as "efficient word recognition" (Hoover & Gough, 1990). Language comprehension or listening comprehension is defined as the ability to derive meaning from spoken words when they are part of sentences or other discourse. Language comprehension at a minimum includes "receptive vocabulary, grammatical understanding, and discourse comprehension" (Catts, Adlof, & Weismer, 2006).

Aim of the study

The primary aim of the present study is to investigate listening comprehension through resolution of sentence ambiguities by typically developing children in English. The objectives of the study were as follows :

i. To study the performance of typically developing children on resolution of sentence ambiguities in English.

ii. To study the pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English such as lexical , phonological, surface structure and deep structure ambiguities.

Hypothesis

i. There is no significant difference in the performance of typically developing children on resolution of sentence ambiguities in English

ii. There is no significant pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English such as lexical, phonological, surface structure and deep structure.

CHAPTER 3: Method

The present study was designed to study listening comprehension to sentence ambiguities by typically developing children in English.

The objectives of the study were as follows:

- To study the performance of typically developing children on resolution of sentence ambiguities in English.
- To investigate the pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English as in lexical, phonological, surface structure and deep structure ambiguities.

A cross-sectional research design with four groups was used to test the performance of students from grades 3 to 9.

3.1 Participants

The study group included 40 typically developing children (10 participants in each group) from the grades 3 ($8.0 \leq A \leq 9.0$ years), 5 ($10.0 \leq A \leq 11.0$ years), 7 ($12.0 \leq A \leq 13.0$ years) and 9 ($14.0 \leq A \leq 15.0$) where 'A' is the age of the child.

Participant Inclusion Criteria

- Participants were native speakers of Malayalam and used English as spoken language. Their English use was tested using a Language use questionnaire (Languages Of School-Going Children, A Sample Survey in Mysore. (Shanbal & Prema, 2007). Participants who claimed English use

'*Most of the time' or 'Always*' for the major domains were selected for the study.

- All participants were screened using the ICF CY checklist (WHO work group, 2003) for ruling out any sensory, neurological or gross motor impairment.
- CBSE school students from Ernakulam, Kerala were selected for the study.

AIISH Ethical guidelines for Bio-Behavioral Sciences were followed for this study and an informed consent was obtained from all the participants and/ or caretakers before the actual testing.

3.2 Test material

Six ambiguous sentences of each of the four types were created according to the following criteria:

a) Vocabulary was judged to be simple enough for the youngest children included in the study
b) Sentence length was relatively short and uniform across types.
c) Syntactic constructions were relatively simple and roughly corresponded across types.
d) Sentences were made with weak bias towards either of the subordinate meanings.

The stimulus was validated by three experienced SLPs for accuracy, sentence length & syntactic constructions.

A control sentence was created for each of the ambiguous sentences. This was accomplished by introducing a minimal change in the ambiguous sentence. One of the ambiguous elements was discarded to disambiguate the ambiguous sentences. The control sentences were developed with strong bias to either of the meanings. For example, 'he often goes to the river' would serve as the control(unambiguous) version of 'he often goes to the bank' (lexical ambiguity – type 1), 'the doctor has lost his temper' –' the doctor is out of patience' (phonologic ambiguity – type 2), 'he sent her some story books' – 'he sent her kids story books' (surface structure ambiguity – type 3), 'the duck is about to ready to eat' – 'the duck is ready to eat'(deep structure ambiguity – type 4)

Line drawings was prepared in order to illustrate the meaning of the sentences. Each experimental sentence had four pictorial choices (Appendix 2). For the ambiguous sentences, two choices were the actual interpretations and two choices acted as distracters but these were phonemically or semantically related to the target sentence. For the control sentences, one of the choice was the actual interpretation of the sentence, one represented the interpretation of its ambiguous counterpart, and the rest of the two were the distracters which were semantically and phonemically related to the target sentence. For example, the ambiguous sentence "He is drawing a gun," will feature (1) a man drawing a picture of a gun, (2) a cowboy drawing a gun out of a holster, (3) a man throwing a gun, and (4) a

man holding a smoking gun (after firing). Here the two actual choices will be (1) a man drawing a picture of a gun, & (2) a cowboy drawing a gun out of a holster.

The order of sentences was randomized with the restriction that no more than two ambiguous or control sentences appeared in a series. The total stimuli was divided into two samples and randomly assigned to each participant (Appendix 1). The sentences were arranged with the notion of not having more than 2 ambiguous or unambiguous sentences continuously. All sentences were read out in an even flat intonation pattern to avoid possible disambiguation in favor of one of the two meanings.

3.3 Procedure

All the participants were tested individually. Prior to the actual testing, the child's use of English language was assessed using a Questionnaire (Languages Of School-Going Children, A Sample Survey in Mysore (Shanbal & Prema, 2007). and screened for past history of neurological problems and gross motor dysfunction using ICF-CY checklist (WHO work group, 2003) .

Examples of each type was given along with pictures as a practice trial before beginning the actual testing as the examiner explained the concept of ambiguity as in the sentence may have one or more than one meaning. One-half of the children of each grade and gender was randomly assigned either of the lists. There were two types of measures in the study (1) Paraphrase measure (PM) – Where the participant had to listen to the sentence and explain in his/her own words what the sentence meant. If he /she detected the ambiguity, they were

asked to explain both the meanings. Whenever the participant explained only one interpretation, the examiner confirmed the response by asking if the sentence could also mean anything else. This was done for every sentence, regardless of the ambiguity. (2) Visual measure (VM): Examiner presented four pictures illustrating the two possible meanings and asked the participant to point to the picture or pictures, which depicted the meaning of the given sentence. In either condition, the participant had to confirm his/her response by giving appropriate justification. Whenever the participant indicated only one picture, he/she was asked to explain why the other picture did not apply. The sentences were repeated again if the participant indicated any difficulty remembering the sentence.

3.4 Scoring & Analysis

The following scoring procedure was adopted for the study:

Ambiguous sentences: For the paraphrase measure (PM), a score of '1' was given only if the participant detected the ambiguity and explained both the meanings correctly and a score of '0' was given for any errors present. For the visual measure (VM) , a score of '1' was given if the participant chose the correct pictures depicting both the meaning of ambiguous sentence presented, if not a score of '0' was given. The maximum possible score was 3 for both PM and VM.

Control sentences: For the PM, a score of '1' was given if the sentence was identified as unambiguous and paraphrased correctly. If the participant made any error, a score of '0' was given. Whereas for the VM, a score of '1' was given when the right picture was chosen from the cue card and a score of '0' was given

for any incorrect selection. The maximum possible score was 3 for both PM and VM.

Each type of ambiguous sentences and the unambiguous control sentences were scored separately for VM (score out of 3) and PM (score out of 3) across each grades.

The data was analyzed for accuracy measures using Statistical Package for Social Sciences (SPSS) software version 20.0.

CHAPTER 4: Results

The primary aim of the present study was to investigate listening comprehension through resolution of sentence ambiguities by typically developing children from 3rd, 5th, 7th and 9th grades in English and to study the pattern of development for resolution of sentence ambiguities across types of ambiguities (Type 1-Lexical ambiguity, Type 2 - Phonologic ambiguity, Type 3 - Surface structure ambiguity, Type 4 - Deep structure ambiguity).

Forty typically developing children (10 participants in each grade) participated in the study. The stimuli included three sentences in each of the ambiguity types and three control sentences, which were randomly assigned to each of the participants. The task of the participants was to paraphrase what the target sentence meant and to identify which picture(s) suited best to explain the meaning of the target sentence. The data was statistically analyzed for accuracy measures to compare the performance of children broadly on four types of sentences in both paraphrase measure (PM) and visual measure (VM)

For statistical analysis, SPSS (Statistical package for the Social Sciences) software version 20.0 was used. The distribution of the data was analyzed using Shapiro Wilk's test of normality, and the results revealed skewed non-normal distribution of data. Hence non-parametric tests were carried out to infer about performance of the participants on listening comprehension to sentence ambiguities and also to compare accuracy scores of participants across grades , types of sentences and both measures (PM and VM) . In addition, there were

constants observed in unambiguous control sentences i.e., all the participants correctly interpreted the meaning of the sentences in both PM and VM, as a result only the ambiguous sentences were considered for further analysis.

The following non – parametric tests were done using SPSS software:

Kruskal- Wallis test was done to compare accuracy scores of both PM and VM across grades. If there was a significant difference ($p<0.05$), Mann Whitney test was done to compare the performance of participants between classes. Friedman's test was done to compare performance of ambiguous sentences in PM and VM within classes and statistical significance was given by Chi-square statistic. If there was a significant difference ($p<0.05$) then pair wise Wilcoxon signed rank test was done across types of ambiguous sentences. Further Wilcoxon Signed Rank test was done for pair wise analysis of statistical significance between PM vs. VM and ambiguous vs. unambiguous sentences within each grades.

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

4.1 Performance of typically developing children on resolution of sentence ambiguities in English

4.2 Performance of the pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English.

4.1 Performance of typically developing children on resolution of sentence ambiguities in English

The first aspect of the results to stand out is that every participant was able to interpret the meaning of unambiguous sentences presented correctly. On this basis, it was concluded that the sentences were well within the grasp of even the youngest class group. Hence it can be concluded that unambiguous sentences were comprehended better than ambiguous sentences. As a result only the ambiguous sentences were considered for further analysis .The performance of the participants for the ambiguous sentences was of the following types:

a) Two meanings were detected and interpreted correctly on both paraphrase & visual measure.(PM and VM)

b) One meaning was detected and interpreted correctly in paraphrase measure and both the meanings interpreted correctly in visual measure.

c) One meaning detected and interpreted correctly in both paraphrase and visual measure.

It was never the condition where two meanings were detected in the paraphrase measure and one meaning in visual measure. In contrast, there were high instances of ‘type b’ (mentioned above) & hence it was clear that the picture cues did serve to facilitate ambiguity detection.

Descriptive statistics was used to compute the mean, Median and standard deviation (SD) of the correct responses for listening comprehension to sentence ambiguities. Table 4.1 shows the mean, Median , and SD scores of participants in the 3rd, 5th ,7th and 9th grades on both ambiguous (score of both PM and VM) and unambiguous sentences (score of both PM and VM).

Table 4.1:

Mean, Median, and SD scores in the 3rd, 5th, 7th and 9th grades on ambiguous and unambiguous sentences for PM and VM

Measures	Class	N	Mean	Median	SD
	3.00	10	1.10	1.00	0.73
	5.00	10	2.20	2.00	0.42
SaP1	7.00	10	2.50	2.50	0.52
	9.00	10	2.30	2.00	0.67
	Total	40	2.02	2.00	0.80
	3.00	10	1.30	1.00	0.67
	5.00	10	2.50	2.50	0.52
SaV1	7.00	10	2.90	3.00	0.31
	9.00	10	3.00	3.00	0.00
	Total	40	2.42	3.00	0.81

Measures	Class	N	Mean	Median	SD
	3.00	10	1.70	2.00	0.94
	5.00	10	1.70	2.00	0.48
SaP2	7.00	10	2.20	2.00	0.42
	9.00	10	2.30	2.00	0.48
	Total	40	1.97	2.00	0.65
	3.00	10	2.20	2.50	0.91
	5.00	10	2.70	3.00	0.48
SaV2	7.00	10	2.90	3.00	0.31
	9.00	10	2.90	3.00	0.31
	Total	40	2.67	3.00	0.61
	3.00	10	0.20	0.00	0.42
	5.00	10	1.70	2.00	0.48
SaP3	7.00	10	2.20	2.00	0.63
	9.00	10	2.80	3.00	0.42
	Total	40	1.72	2.00	1.08
	3.00	10	0.70	1.00	0.48
	5.00	10	2.60	3.00	0.51
SaV3	7.00	10	2.90	3.00	0.31
	9.00	10	3.00	3.00	0.00
	Total	40	2.30	3.00	1.01

Measures	Class	N	Mean	Median	SD
SaP4	3.00	10	1.10	1.00	0.56
	5.00	10	2.20	2.00	0.78
	7.00	10	2.40	2.00	0.51
	9.00	10	2.60	3.00	0.51
	Total	40	2.07	2.00	0.82
SaV4	3.00	10	1.50	2.00	0.70
	5.00	10	2.50	3.00	0.70
	7.00	10	2.80	3.00	0.42
	9.00	10	3.00	3.00	0.00
	Total	40	2.45	3.00	0.78
SuP1	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00
SuV1	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00

Measures	Class	N	Mean	Median	SD
SuP2	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00
SuV2	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00
SuP3	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00
SuV3	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00

Measures	Class	N	Mean	Median	SD
	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
SuP4	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00
	3.00	10	3.00	3.00	0.00
	5.00	10	3.00	3.00	0.00
.SuV4	7.00	10	3.00	3.00	0.00
	9.00	10	3.00	3.00	0.00
	Total	40	3.00	3.00	0.00

Note: SaP– Ambiguous sentence paraphrase measure, SaV- Ambiguous sentence visual measure, SuP- Unambiguous sentence paraphrase measure, SuV- Unambiguous sentence visual measure. The numbers along with it depicts the type of sentences.

Descriptive statistics was used to compute the mean, Median & standard deviation (SD) of the correct responses for listening comprehension to sentence ambiguities. Analysis of results as observed from table 4.1 indicated the following:

Type 1: Listening comprehension to sentence ambiguities for the PM showed better performance in 7^{th} grade (Median = 2.5; SD =0.73) followed by 9^{th} (Median

= 2.0; SD = 0.67), 5th (Median = 2.0; SD = 0.42 and 3rd grades (Median=1.0; SD = 0.73). Whereas the performance of children on VM showed better performance in both 7th (Median=3.0; SD =0.31) and 9th grades (Median = 3.0; SD = 0.0) followed by 5th grade (Median = 2.5; SD = 0.67) and 3rd grade (Median = 1.00; SD = 0.73). The results indicated a developmental trend with performance of children improving from 3rd grade to 9th grade on VM. There was no developmental trend seen for the scores of PM.

Type2: Listening comprehension to sentence ambiguities for the PM showed similar performance in 3rd (Median = 2.0; SD =0.94), 5th (Median = 2.0; SD = 0.48), 7th (Median = 2.0 ; SD = 0.42) and 9th grades (Median = 2.0 : SD = 0.48). The scores for VM showed similar pattern , i.e. better performance in both 5th (Median=3.0 ;SD =0.48), 7th (Median = 3.0 ; SD = 0.31) and 9th grades (Median = 3.0 ; SD = 0.31) and were better than 3rd graders (Median = 2.5 ; SD = 0.91).The results indicated a developmental trend with performance of children improving from 3rd grade to 9th grade on PM and VM.

Type 3: Listening comprehension to sentence ambiguities of the PM showed better performance in 9th grade (Median = 3.0; SD =0.42) followed by similar performance in 5th (Median = 2.0; SD = 0.48) and 7th grades (Median = 2.0; SD = 0.63) and were better than 3rd graders (Median = 0.00 : SD = 0.42). Whereas the VM showed similar performance in 5th (Median=3.0 ;SD =0.51) and 7th (Median = 3.0 ; SD = 0.31) and 9th grades (Median = 3.0 ; SD = 0.00) and were better than 3rd graders (Median = 2.5 ; SD = 0.91). The results indicated a

developmental trend with performance of children improving from 3rd grade to 9th grade on PM and VM.

Type 4: Listening comprehension to sentence ambiguities PM showed better performance in 9th grade (Median = 3.0; SD =0.51) followed by similar performance in 5th (Median = 2.0; SD = 0.78) and 7th grades (Median = 2.0; SD = 0.51) and better than 3rd grade (Median = 1.00; SD = 0.56). Whereas the VM showed similar performance in 5th (Median=3.0 ;SD =0.70) 7th (Median = 3.0 ; SD = 0.42) and 9th grades (Median = 3.0 ; SD = 0.00) and were better than 3rd graders (Median = 2.0 ; SD = 0.70). The results indicated a developmental trend with performance of children better from 5th grade and above on PM and VM.

4.2 The pattern of development for resolution of sentence ambiguities across the types of ambiguity in English

Descriptive statistics was used to compute the mean, Median & standard deviation (SD) of the correct responses for listening comprehension to sentence ambiguities of each type across classes. Table 4.2.1 shows mean, Median and SD scores of participants on listening comprehension to sentence ambiguities of each types of ambiguity , both PM and VM between grades.

Table 4.2

Mean, Median and SD scores of participants on listening comprehension to sentence ambiguities of each types of ambiguity , both PM and VM between grades.

Grades	Types	Mean	Median	SD
3	SaP1	1.10	1.0	0.73
3	SaV1	1.30	1.00	0.67
3	SaP2	1.70	2.000	0.94
3	SaV2	2.20	2.50	0.91
3	SaP3	0.20	0.00	0.42
3	SaV3	0.70	1.00	0.48
3	SaP4	1.10	1.00	0.56
3	SaV4	1.50	2.00	0.70
5	SaP1	2.20	2.00	0.42
5	SaV1	2.50	2.50	0.52
5	SaP2	1.70	2.00	0.48
5	SaV2	2.70	3.00	0.48
5	SaP3	1.70	2.00	0.48
5	SaV3	2.60	3.00	0.51
5	SaP4	2.20	2.00	0.78
5	SaV4	2.50	3.00	0.70
7	SaP1	2.50	2.50	0.52
7	SaV1	2.90	3.00	0.31
7	SaP2	2.20	2.00	0.42
7	SaV2	2.30	2.00	0.48
7	SaP3	2.20	2.00	0.63
7	SaV3	2.90	3.00	0.31
7	SaP4	2.40	2.00	0.51
7	SaV4	3.00	3.00	0.00
9	SaP1	2.30	2.00	0.67

Grades	Types	Mean	Median	SD
9	SaV1	3.00	3.00	0.00
9	SaP2	2.30	2.00	0.48
9	SaV2	2.90	3.00	0.31
9	SaP3	2.20	2.00	0.63
9	SaV3	3.00	3.00	0.00
9	SaP4	2.60	3.00	0.51
9	SaV4	3.00	3.00	0.00

Note: SaP – Ambiguous sentence paraphrase measure, SaV- Ambiguous sentence visual measure. The numbers along with it depicts the type of sentence.

Kruskal Wallis test was done and the results revealed a significant difference in SaP1 ($X^2(3) = 17.23$; $p<0.05$), SaV1 ($X^2(3)= 28.08$; $p<0.05$), SaP3 ($X^2(3) = 30.07$; $p<0.05$), SaV3 ($X^2(3) = 31.22$; $p<0.05$), SaP4 ($X^2(3) = 18.53$; $p<0.05$) and SaV4 ($X^2(3) = 23.68$; $p<0.05$) in all grades . There was no significant difference in the accuracy scores of participants in SaP2 ($X^2(3) = 7.17$; $p >0.05$) and SaV2 ($X^2(3) = 6.79$; $p>0.05$). Results suggested a significant difference across measures and types of sentence ambiguity, hence they were subjected to Mann Whitney – U test.

Analysis of results on Mann Whitney – U test revealed that for 3rd and 5th grades, there was a significant difference in the scores of SaP1 ($|z|= 3.17$, $p<0.05$), SaV1 ($|z|= 3.22$, $p<0.05$), SaP3 ($|z|= 3.78$, $p<0.05$), SaV3 ($|z|= 3.93$, $p<0.05$), SaP4 ($|z|= 2.82$, $p<0.05$), and SaV4 ($|z|= 2.70$, $p<0.05$). There was no significant difference in SaP2 ($|z|= 0.04$, $p >0.05$) and SaV2 ($|z|= 1.25$, $p > 0.05$) . Further

analysis of results from table 4.1 reveals better performance of 5th graders compared to 3rd grade on the accuracy scores of SaP1, SaV1, SaP3, SaV3, SaP4 and SaV4. For 3rd and 7th grade there was a significant difference in the scores of SaP1 ($|z|= 3.37$, $p<0.05$), SaV1 ($|z|= 3.86$, $p<0.05$), SaV2 ($|z|= 2.01$, $p<0.05$) SaP3 ($|z|= 3.89$, $p<0.05$), SaV3 ($|z|= 4.06$, $p<0.05$), SaP4 ($|z|= 3.53$, $p<0.05$), and SaV4 ($|z|= 3.56$, $p<0.05$). There was no significant difference in the scores of SaP2 ($|z|= 1.37$, $p>0.05$). Further analysis of results from table 4.1 reveals better performance of 7th graders compared to 3rd grade on the accuracy scores of SaP1, SaV1,SaV2, SaP3 ,SaV3, SaP4 and SaV4. For 3rd and 9th grade there was a significant difference in the scores of SaP1 ($|z|= 2.94$, $p<0.05$), SaV1 ($|z|= 4.09$, $p<0.05$), SaV2 ($|z|= 2.01$, $p<0.05$) SaP3 ($|z|= 4.04$, $p<0.05$), SaV3 ($|z|= 4.14$, $p<0.05$), SaP4 ($|z|= 3.65$, $p<0.05$), and SaV4 ($|z|= 4.10$, $p<0.05$). There was no significant difference in the scores of SaP2 ($|z|= 1.58$, $p > 0.05$). Further analysis of results from table 4.1 reveals better performance of 9th graders compared to 5th grade on the accuracy scores of SaP1, SaV1,SaV2, SaP3 ,SaV3, SaP4 and SaV4. For 5th and 7th grade there was a significant difference in the accuracy scores of SaP1 ($|z|= 1.37$, $p<0.05$), SaV1 ($|z|= 1.90$, $p<0.05$), SaV2 ($|z|= 1.09$, $p<0.05$), SaP3 ($|z|= 1.83$, $p<0.05$), SaV3 ($|z|= 1.51$, $p<0.05$), SaP4 ($|z|= 0.50$, $p<0.05$) and SaV4 ($|z|= 1.03$, $p<0.05$). There was no significant difference in the scores of SaP2 ($|z|= 1.58$, $p > 0.05$). Further analysis of results from table 4.1 reveals better performance of 7th graders compared to 5th grade on the accuracy scores of SaP1, SaV1,SaV2, SaP3 ,SaV3, SaP4 and SaV4. Finally on comparing between 5th and 9th grade there was a significant difference in the accuracy scores of SaV1 ($|z|=$

2.51, p<0.05), SaP2 (|z|= 2.38, p<0.05), SaP3 (|z|= 3.53, p<0.05), SaV3 (|z|= 2.17, p<0.05), and SaV4 (|z|= 2.16, p<0.05). There was no significant difference in the scores of SaP1 (|z|= 0.54, p>0.05), SaV2 (|z|= 1.09, p<0.05), SaP4 (|z|= 1.17, p < 0.05). Further analysis of results from table 4.1 reveals better performance of 9^{th} graders compared to 5^{th} grade on the accuracy scores of SaV1, SaP2, SaP3 ,SaV3,SaV4. For 7^{th} and 9^{th} grade there was a significant difference only in the accuracy scores of SaP3 (|z|= 2.23, p<0.05). There was no significant difference SaV1 (|z|= 0.31, p>0.05), SaP2 (|z|= 0.61, p>0.05), SaV2 (|z|= 1.00, p>0.05), SaV3 (|z|= 0.31, p>0.05), SaP4 (|z|= 0.38, p>0.05) and SaV4 (|z|= 0.14, p>0.05). Further analysis of results from table 4.1 reveals better performance of 9^{th} graders compared to 7^{th} grade on the accuracy scores of SaP1.

On comparing the accuracy scores of participants, the results revealed the following

Lexical ambiguity: There was a developmental trend seen in the performance of participants with scores improving from 3^{rd} to 9^{th} grade on resolution of lexical ambiguity on VM and there was no developmental trend seen on PM but all the 9th graders correctly scored to all the sentences.

e.g. Stimulus – 'He often goes to the bank'

Correct response (PM) – The participant explained the sentence as either the guy often goes to the bank to get money or he often visits the river bank.

Correct response (VM) - The participant chose the picture of a man going to the bank to withdraw money and a man going to the river bank.

Phonological ambiguity: There was a developmental trend seen in the participants with performance of children improving from 3rd grade to 9th grade on PM and VM . Analysis of results from table 4.1 shows more than half of the participants from 5^{th} grade and above have scored well.

e.g. Stimulus – 'He brought it because of the sale(sail)'

Correct response (PM) – The participant explained both the meanings as he brought it as there was sale going on and he brought it as he had to go for a sail.

Correct response (VM) - The participant was able to choose the cue card with a sail boat and a discount sale put up in a market.

Surface structure ambiguity: There was a developmental trend seen in the participants with performance of children improving from 3rd grade to 9th grade on PM and VM . Analysis of results from table 4.1 shows more than half of the participants from 5^{th} grade and above have scored well. In addition all the 9^{th} graders comprehended the ambiguity and gave correct answers on PM and VM.

e.g. Stimulus – 'She did not like disturbing children'

Correct response (PM) – The participant explained the sentence correctly either the lady dint like children who were disturbing or she herself did not like to disturb children.

Correct response (VM) – The child chose two pictures which depicted a lady being irritated by a group of children and a lady not disturbing few children when they are reading.

Deep structure ambiguity: There was a developmental trend seen in the participants with performance of children improving from 3rd grade to 9th grade on PM and VM. Analysis of results from table 4.1 shows more than half of the participants from 5th grade and above have scored well. In addition, all the 9th graders comprehended the ambiguity and gave correct answers on VM.

e.g.Stimulus – 'The duck is ready to eat '

Correct response (PM) – The child explained the sentence as either the duck itself is ready to eat its food or the duck is cooked and kept ready to eat.

Correct response (VM) – The child chose a picture of a live duck about to eat a worm and a dish of duck kept ready on a table.

Table 4.2.1 shows the mean, Median and SD scores of participants on listening comprehension to sentence ambiguities on PM within each grades.

Table 4.2.1

Mean, Median and SD scores of participants on listening comprehension to sentence ambiguities on PM within each grade.

Grade	Measure	Mean	Median	SD
3	SaP1	1.10	1.00	0.73
3	SaP2	1.70	2.00	0.94
3	SaP3	0.20	0.00	0.42
3	SaP4	1.10	1.00	0.56
5	SaP1	2.20	2.00	0.42
5	SaP2	1.70	2.00	0.48

Grade	Measure	Mean	Median	SD
5	SaP3	1.70	2.00	0.48
5	SaP4	2.20	2.00	0.78
7	SaP1	2.50	2.50	0.52
7	SaP2	2.20	2.00	0.42
7	SaP3	2.20	2.00	0.63
7	SaP4	2.40	2.00	0.51
9	SaP1	2.30	2.00	0.67
9	SaP2	2.30	2.00	0.48
9	SaP3	3.00	3.00	0.00
9	SaP4	2.60	3.00	0.51

Note: SaP – Ambiguous sentence paraphrase measure and the numbers along with it depicts the type of sentence.

Friedman test was done and found a significant difference on PM only within 3rd grade (χ^2 (3) = 15.73; p<0.05) and no significant difference in 5th (χ^2 (3) = 8.00; p>0.05), 7th (χ^2 (3) = 2.04; p>0.05), and 9th grade (χ^2 (3) = 5.43; p>0.05). Hence, the accuracy scores of PM between types of ambiguity within 3rd grade were subjected to Wilcoxon Signed Rank test. The results revealed there was a significant difference between accuracy scores of SaP1 and SaP3 (|z|= 2.25, p < 0.05), SaP2 and SaP3 (|z|= 2.76, p < 0.05), SaP3 and SaP4 (|z|= 2.46, p < 0.05). There was no significant difference in accuracy scores of SaP1 and SaP2 (|z|= 1.16, p > 0.05), SaP1 and SaP4 (|z|= 0.00, p > 0.05), SaP2 and SaP4 (|z|= 1.38, p > 0.05). Analysis of results from table 4.2.2 reveals the accuracy scores on PM was better for SaP2 (Median = 2.00; SD = 0.94) followed by similar performance in SaP4 (Median = 1.00; SD = 0.56), and SaP1 (Median =1.00; SD = 0.73) and were

better than scores of SaP3 (Median = 0.00; SD = 0.42). This implies SaP2 developed first followed by SaP1, SaP4 and the later developed is SaP3.

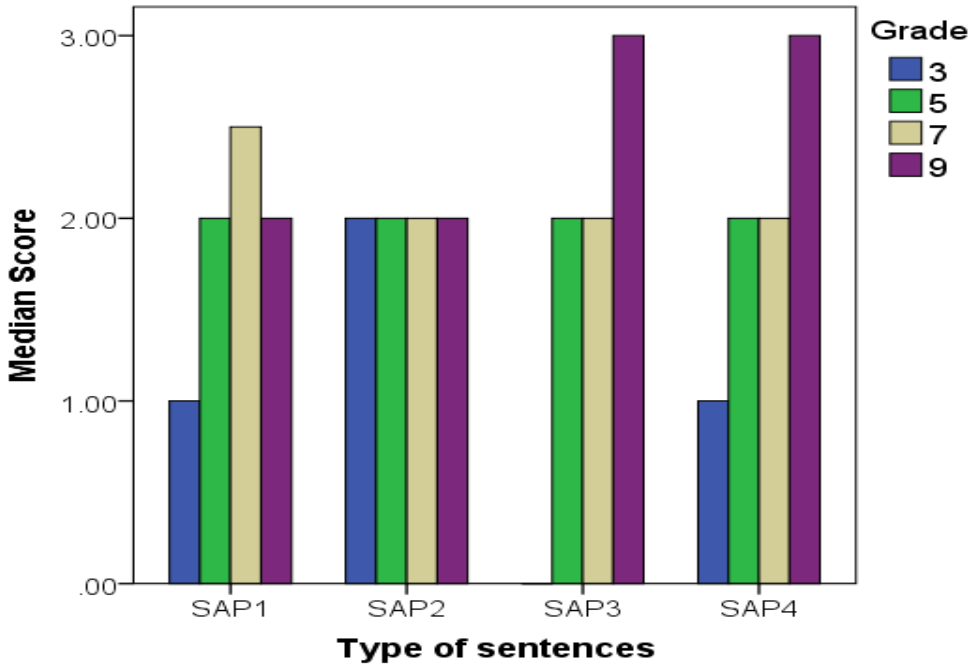

Fig 4.2a Median scores sentence ambiguities in PM across grades

Table 4.2.2 shows mean, Median and SD scores of participants on listening comprehension to sentence ambiguities on VM within each class

Table 4.2.2

Mean, Median and SD scores of participants on listening comprehension to sentence ambiguities on VM within each class.

Grade	Type	Mean	Median	SD
3	SaV1	1.30	1.00	0.67
3	SaV2	2.20	2.50	0.91
3	SaV3	0.70	1.00	0.48
3	SaV4	1.50	2.00	0.70
5	SaV1	1.30	1.00	0.67
5	SaV2	2.70	3.00	0.48
5	SaV3	2.60	3.00	0.51
5	SaV4	2.50	3.00	0.70
7	SaV1	2.90	3.00	0.31
7	SaV2	2.90	3.00	0.31
7	SaV3	2.90	3.00	0.31
7	SaV4	2.80	3.00	0.42
9	SaV1	3.00	3.00	0.00
9	SaV2	2.90	3.00	0.31
9	SaV3	3.00	3.00	0.00
9	SaV4	3.00	3.00	0.00

Note: SaV- Ambiguous sentence visual measure and the numbers along with it depicts the type of sentence.

Friedman test was done and a significant difference was found on accuracy scores of VM only within 3rd grade (χ^2 (3) = 14.51; $p<0.05$) and there was no significant difference in 5th (X^2 (3) = 1.09; $p>0.05$), 7th (χ^2 (3) = 0.69; $p>0.05$), and 9th grade (χ^2 (3) = 3.00; $p>0.05$). Hence, the accuracy scores of VM between types of ambiguity was subjected to Wilcoxon Signed Rank test. The results revealed that there was a significant difference between accuracy scores of SaV1 and SaV2 ($|z|= 2.00$, $p < 0.05$), SaV1 and SaV3 ($|z|= 2.12$, $p < 0.05$), SaV2

and SaV3 (|z|= 2.58, p < 0.05), SaV2 and SaV4 (|z|= 2.11, p < 0.05), and SaV3 and SaV4 (|z|= 2.53, p < 0.05). There was no significant difference between accuracy scores of SaV1 and SaV4 (|z|= 0.81, p > 0.05). Analysis of results from table 4.2.3 reveals the accuracy scores on VM was better for SaV2 (Median = 2.5; SD = 0.91) followed by SaV4 (Median = 2.00; SD = 0.70) , and similar performance in SaV1 (Median =1.00 ; SD = 0.67) and SaV3 (Median =1.00 ; SD = 0.48). In addition, as observed there is a linear increase in the performance scores of participants from 3rd grade to 9th grade.

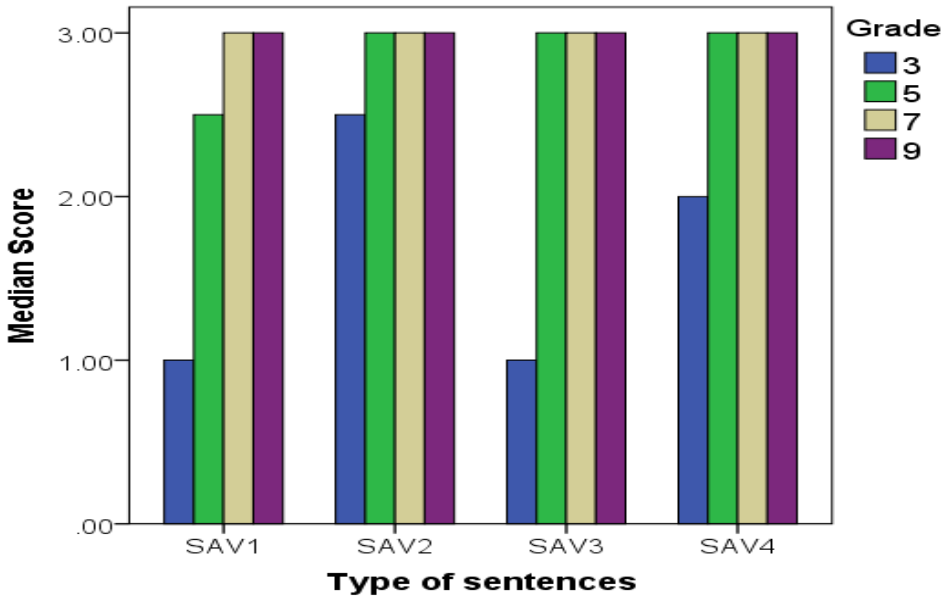

Fig 4.2b Median scores sentence ambiguities in VM across grades

On comparing the accuracy scores of PM within grades reveal a significant difference across types of sentence ambiguity only in 3rd grade Among the 3rd graders, analysis of results from table 4.2.2 shows the phonologically ambiguous sentences were easily comprehended followed similar performance in deep structure ambiguity, lexical ambiguity. The least score was found in surface

structure ambiguity. Similar comparisons was done on accuracy scores of VM within grades reveal a significant difference across types of sentence ambiguity only in 3rd grade. Among the 3rd graders, analysis of results from table 4.2.2 shows the phonologically ambiguous sentences were easily comprehended followed by deep structure ambiguity, and were better than similar performance seen in lexical ambiguity and surface structure ambiguity.

Wilcoxon Signed Rank test was done and the results revealed that in the 3rd grade, there was a significant difference in the accuracy scores of SaV3 and SaP3 ($|z| = 2.23$, $p < 0.05$), and SaV4 and SaP4 ($|z| = 2.00$, $p < 0.05$). There was no significant difference observed on scores of SaV1 and SaP1 ($|z| = 1.41$, $p > 0.05$) and SaV2 and SaP2 ($|z| = 1.89$, $p > 0.05$). In the 5th grade , there was a significant difference in the accuracy scores of SaV2 and SaP2 ($|z| = 2.88$, $p < 0.05$), SaV3 and SaP3 ($|z| = 2.71$, $p < 0.05$), and found no significant difference on scores of SaV1 and SaP1 ($|z| = 1.73$, $p > 0.05$) SaV4 and SaP4 ($|z| = 0.82$, $p > 0.05$). In the 7th grade there was a significant difference in the accuracy scores of SaV2 and SaP2 ($|z| = 2.64$, $p < 0.05$). SaV3 and SaP3 ($|z| = 2.33$, $p < 0.05$), and SaV4 and SaP4 ($|z| = 2.00$, $p < 0.05$) and found no significant difference on scores of SaV1 and SaP1 ($|z| = 1.73$, $p > 0.05$). Whereas in the 9th grade there was a significant difference in the accuracy scores of SaV1 and SaP1 ($|z| = 2.33$, $p < 0.05$, SaV2 and SaP2 ($|z| = 2.44$, $p < 0.05$) and SaV4 and SaP4 ($|z| = 2.00$, $p < 0.05$), and found no significant difference on scores of SaV3 and SaP3 ($|z| = 1.41$, $p > 0.05$). Analysis from table 4.1 shows better performance on SaV3 (Median = 1, SD = 0.48) was better than SaP3 (Median = 0.00, SD = 0.42) in the 3rd grade. In the 5th grade, SaV2 (Median

= 3, SD = 0.48) shows better performance of was better than SaP2 (Median = 2, SD = 0.48) and that of SaV3 (Median = 3, SD = 0.51) was better than SaP3 (Median = 2, SD=0.48).

Further Wilcoxon signed rank test was done to compare accuracy scores of ambiguous and unambiguous sentences within each grade and the results revealed among the 3rd graders there was a significant difference in the scores of SuP1and SaP1($|z|= 2.85$, $p < 0.05$), SuV1 and SaV1($|z|= 2.85$, $p < 0.05$),SuP2 and SaP2($|z|= 2.56$, $p < 0.05$),SuV2 and SaV2($|z|= 2.07$, $p < 0.05$),SuP3 and SaP3 ($|z|= 2.97p < 0.05$), SaV3 and SuV3 ($|z|= 2.91$, $p < 0.05$),SuP4 and SaP4 ($|z|= 2.91$, $p < 0.05$) and SuV4 and SaV4 ($|z|= 2.87$, $p < 0.05$). This implies that the performance of participants on unambiguous sentences were better than ambiguous sentences across all the types of ambiguity. In the 5th grade there was a significant difference in the scores of SuP1and SaP1($|z|= 2.82$, $p < 0.05$), SuV1 and SaV1($|z|= 2.23$, $p < 0.05$),SuP2 and SaP2($|z|= 2.91$, $p < 0.05$),SuV2 and SaV2($|z|= 1.73$, $p < 0.05$),SuP3 and SaP3 ($|z|= 2.91p < 0.05$), SaV3 and SuV3 ($|z|= 2.00$, $p < 0.05$) and SuP4 and SaP4 ($|z|= 2.27$, $p < 0.05$) .There was no significant difference on the scores of SuV4 and SaV4($|z|= 1.89$, $p > 0.05$). This implies that the performance of participants on unambiguous sentences were better than ambiguous sentences across all the types of ambiguity except type 4. In the 7th grade there was a significant difference in the scores of SuP1and SaP1($|z|= 2.23$, $p < 0.05$), SuP2 and SaP2($|z|= 2.82$, $p< 0.05$),),SuP3 and SaP3 ($|z|= 2.53$, $p < 0.05$), and SuP4 and SaP4 ($|z|= 2.44$, $p < 0.05$) . There was no significant difference on the scores of SuV1 and SaV1 ($|z|= 1.00$ $p > 0.05$), SuV2 and SaV2 ($|z|= 1.00$, $p > 0.05$), SuV3

and SaV3 (|z|= 1.00, p > 0.05) and SuV4 and SaV4 (|z|= 1.41, p > 0.05). This implies that the performance of participants on unambiguous sentences were better than ambiguous sentences across type 1 ,2, 3 & 4 on PM , whereas on the VM participants performed equally well between ambiguous and unambiguous sentences. In the 9th grade there was a significant difference in the scores of SuP1and SaP1 (|z|= 2.33, p < 0.05), SuP2 and SaP2 (|z|= 2.64, p < 0.05), and SuP4 and SaP4 (|z|= 2.00, p < 0.05). There was no significant difference on the scores of SuV1 and SaV1 (|z|= 0.00, p > 0.05), SuV2 and SaV2 (|z|= 1.00, p > 0.05), SuP3 and SaP3 (|z|= 1.41,p > 0.05), SuV3 and SaV3 (|z|= 0.00, p > 0.05) SuV4 and SaV4(|z|= 0.00, p > 0.05). This implies that the performance of participants on unambiguous sentences were better than ambiguous sentences across SaP1, SaP2 and SaP4. The participants performed equally well across SaP3, and all the VM across the types of sentence ambiguity.

On comparing ambiguous and unambiguous sentences within grades, the results reveal the performance of participants on unambiguous sentences were better than ambiguous sentences across the types of sentence ambiguity in the 3rd graders. The performance of participants on unambiguous sentences were better than ambiguous sentences across the types of sentence ambiguity except deep structure ambiguity(VM), which was equally performed in both ambiguous and unambiguous sentences in the 5th grade participants. In the 7th grade participants, the performance of participants on unambiguous sentences was better than ambiguous sentences across the types of sentence ambiguity on PM, whereas on the VM participants performed equally well between ambiguous and

unambiguous sentences. The performance of participants on unambiguous sentences were better than ambiguous sentences across types of sentence ambiguity on PM , whereas on the VM participants performed equally well between ambiguous and unambiguous sentences.

CHAPTER 5: Discussion

The aim of the present study was to investigate listening comprehension through resolution of sentence ambiguities by typically developing children from 3rd, 5th, 7th and 9th grades and to study the pattern of development for resolution of sentence ambiguities across types of ambiguities (Type 1-Lexical ambiguity, Type 2 - Phonologic ambiguity, Type 3 - Surface structure ambiguity, Type 4 - Deep structure ambiguity) in English. The performance of participants were compared across and between classes, across measures (PM and VM) and types of ambiguities.

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

4.1 Performance of typically developing children on resolution of sentence ambiguities in English

4.2 Performance of the pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English

4.1 Performance of typically developing children on resolution of sentence ambiguities in English

The results of the present study revealed that the comprehension of ambiguous sentences were difficult than comprehension of unambiguous sentences. All the participants irrespective of the grade and type of sentence, they were able to paraphrase each of the sentences presented correctly. The accuracy scores of control sentences were fully correct and due to the constancy of results it

was not considered for further analysis. The control sentences presented in the study was made with a slight change in the ambiguous sentence such that the context and/or dominance makes it easier for the listener to resolve the ambiguity. For e.g. 'I saw many bats on the tree' served as the control version of 'I saw many bats there'. Here the control sentence is strongly biased toward the animal 'bat' whereas the ambiguous sentence is weakly biased to the subordinate meanings and hence the participants' performance was better for control sentence than ambiguous sentences. The differences were evident on the accuracy scores of ambiguous vs. unambiguous sentences and the results of the present study are consistent with the findings of other studies which proves resolution of ambiguous sentences based on context or frequency . These findings are in line with oblivion hypothesis (MacKay, 1966) that proves the meaning of an ambiguous word or set of words may not be seen until the ambiguity is resolved on the basis of the non ambiguous context of a sentence and exclusive access hypothesis which says one can use cues from the context to immediately select the correct meaning of an ambiguous word. This means to say that if the sentence was strongly biased towards either of the meaning, only that meaning was retrieved. Only when the sentence was weakly biased towards the subordinate meaning, more than one meaning was retrieved. Context is a factor which influences ambiguity resolution, that is for e.g ' the duck is ready to eat, come on I am hungry' , at once when you hear this sentence , the first meaning that is triggered will be the cooked duck which is kept ready to eat . Similarly for e.g., 'she fed her cat food' the first meaning of will be that "there is a girl who fed her

cat some food". This is because of the dominance of that meaning over ' a girl who fed another girl with food which is given to cats. . Context and dominance are hence considered the independent contributors to the processing of ambiguous words (Simpson, 1981). Context provided by the sentence itself as well as previous sentences and the nonlinguistic part in some way acts to select the suitable meaning of an ambiguous word, allowing only that meaning to be activated (Simpson, 1981). The meanings of ambiguous words are ordered in semantic memory according to their relative frequencies. Given a neutral context, or if there is no context at all, this order will determine which meaning is retrieved when an ambiguous word is encountered. In the presence of a highly restrictive context, the one that makes only one meaning possible, that meaning consistent with the context will be activated, regardless of its position in the hierarchy of meanings. Whereas, in the intermediate case, in which the context merely makes one meaning somewhat more likely, both dominance and context influence lexical access. If the context and dominance provide redundant information, that is, if the context is biased toward the dominant meaning, then that meaning alone will be activated. When the information from the two sources conflicts and the context is biased toward the subordinate meaning, both of the meanings appear to be retrieved. Given proper conditions, either process may be seen to operate alone, or they may operate simultaneously. The consistent facilitation for the context appropriate meaning seen here is compatible with most current word recognition models (Becker, 1976; Marslen-Wilson & Welsh, 1978; Morton, 1969), in which lexical access is sensitive to context. Most such models (Rubenstein, Garfield, &

Millikan, 1970; Schvaneveldt et al., 1976) assume that each meaning of an ambiguous word is represented separately in semantic memory, and is sensitive both to related semantic information and to sensory information regarding the visual or auditory characteristics of the word. This means that the various representations of a word are sensitive to identical sensory information, but different semantic information. Providing some of the semantic information related to one of the meanings in advance of the ambiguous word (i.e., providing context) renders the representation corresponding to that meaning more accessible. This priming effect may be attributed either to a passive feature incrementing system (Morton, 1969), or to a more active process of retrieving .words related to the context as representing hypotheses about upcoming information (Becker, 1976; Becker & Killion, 1977; Marslen-Wilson & Welsh, 1978). It is assumed that the system is also sensitive to the frequency of the meanings (Hogaboam & Perfetti, 1975).

In the present study the major observation was the better score on control sentences over ambiguous sentences. From the above explanations it is assumed that when no prior semantic information is provided, the recognition of the ambiguous word must depend solely on an analysis of the sensory information. Since all of the ambiguous word's representations are defined by the same sensory (i.e., auditory or visual) features, a bias must exist so that fewer features are necessary for activation of the representation of the most frequent meaning (Morton, 1969). Since no context or weak context is probably the exception rather than the rule in normal language processing, we might view this frequency bias as

a default procedure which is normally overridden by context. A very weak context, however, may not be sufficient to override this effect if it biases a subordinate meaning. Although this latter suggestion is consistent with the present data, it is difficult to reconcile with the word recognition models discussed above. Morton (1979), for example, states explicitly that activation of one of the meanings is accompanied by inhibition of others. Such a process would not allow for multiple accesses under any circumstances.

Recent studies have highlighted an additional contribution of recent experience, demonstrating that listeners are also biased to select recently encountered meanings (Rodd et al. 2013). In the present study the better performance of participants on control sentences than ambiguous sentences can also be attributed to the biasing towards recently encountered meaning. In addition , the early priming studies have found that listeners do not maintain multiple meanings for long but instead make a rapid selection within a few hundred milliseconds of encountering an ambiguous word even when both meanings are consistent with the sentence context (e.g., Seidenberg et al. 1982; Swinney 1979). Seidenberg et al. (1982) proposed that such selection may occur because of limits on processing capacity that make it difficult to maintain multiple interpretations in parallel (Mason & Just 2007; Miyake, Just, & Carpenter 1994). Early selection sometimes makes listeners to initially select the inappropriate meaning. For example, in the sentence ‘usually the bank is not the place to start if you want to catch a fish in this stream’ most readers/listeners will initially select the wrong, financial, meaning of ‘bank’. Numerous studies have shown that

additional processing is required to recover from such misinterpretations (e.g., Duffy et al. 1988; Kambe, Rayner, and Duffy 2001; Rodd et al. 2010a).

In summary, present study suggests the resolving of ambiguous sentence is better when the sentence is strongly biased towards either of the subordinate meaning that is initially multiple meanings get activated, but single meaning is then rapidly selected on the basis of the immediate sentence context, the frequency (dominance) of the different meanings and recent experience with the word. However the exact fate of the non-selected meaning is uncertain. For example, non-selected meanings may be completely suppressed (Gernsbacher & St John 2001; MacDonald et al. 1994) or retain a low level of activation (McRae, Spivey-Knowlton, Tanenhaus 1998).

4.2 Performance of the pattern of development for resolution of sentence ambiguities in terms of the types of ambiguity in English

The results suggest that the ability to detect linguistic ambiguity develops at different rates depending on the particular type of ambiguity. The scores of participants on both paraphrase measure (PM) and visual measure (VM) were found to be significantly different. The performance of the participants for the ambiguous sentences were of the following types:

d) Two meanings were detected & interpreted correctly on both paraphrase & visual measure.(PM and VM)

e) One meaning was detected and interpreted correctly in paraphrase measure and both the meanings interpreted correctly in visual measure.

f) One meaning detected and interpreted correctly in both paraphrase & visual measure.

It was never the condition where two meanings were detected in the paraphrase measure and one meaning in visual measure. In contrast, there were high instances of pattern (b) & in addition the results of present study show a significant difference in performance of participants on VM compared to PM . These findings can be attributed to the fact that visual cue has facilitated the recall of lexical entries which in turn has supported in detecting the ambiguity.

While considering performance of lexical ambiguities on PM , detection of lexical ambiguities exhibited a steady, almost linear improvement across grades. Within the 3rd grade, phonological ambiguities were more often detected than lexical and both syntactic ambiguities. The ambiguity detection across lexical and deep structure ambiguity was found to be emerging and that of surface structure ambiguity was not observed in the present study. In the 5th grade, detection of ambiguity across types of sentence ambiguity was found to be still emerging but with more than half of the participants detecting all the types of ambiguities. In 7th grade, lexical ambiguities were more often detected than the other three types but still emerging in detecting these ambiguities. In 9th grade, detection of surface structure and deep structure ambiguity was completed, and that of lexical and phonological ambiguities were not completely developed. Overall results of PM across types of sentence ambiguities suggest lexical processing or semantics develops prior to syntactic processing.

Specifically, these findings contribute to the fact which suggests the primacy of lexical over syntactic processing. This primacy apparently exists both in the context of the processing of sentences and in the context of the development of linguistic competence. Various investigators have provided evidence that individual lexical items in a sentence may be processed before an analysis of the syntactic structure is completed (Herriot 1968; Macnamara, Green, & O'Cleirigh 1972; Mehler & Carey 1968; Schlesinger 1968; Slobin 1966; Turner & Rommetveit 1967). Studies show that children acquire language by first determining meaning, independent of syntax, and then by constructing systematic relations between meaning and syntax.

The present study findings suggest that deep structure ambiguities are processed and detected better than surface structure ambiguity. This finding is contradictory to the previous finding that, the detection of surface-structure ambiguities was processed more rapidly by adults (MacKay 1966; MacKay & Bever 1967). One possible explanation for this discrepancy would be that surface structure cues were not readily used by children in the present experiment to detect the two meanings. Shultz and Pillon (1973) have opined that in order to detect surface structure ambiguity, the listeners make use of the intonation cue as in to bracket out the sentences accordingly. In the present study, the fact that the sentences were read out in a flat, even intonation pattern probably would have limited the availability of these cues. Another possibility might be that the detection-non detection measure used in the present study was less sensitive than the continuous latency measures used in the adult studies.

Another finding in the present study is the relative superiority of phonological over lexical ambiguity detection at every grade level. This could be explained in terms of a theory that postulates separate storage locations for homophonous words but not for the different senses of polysemous words. Polysemous words are those that have many possible meanings for a word or phrase. Whereas the homophones are words that sound similar but have different meaning and spelling. According to Katz and Fodor (1963), the different meanings of a polysemous word are all filed under a single lexical entry. In contrast, homophones are filed under separate lexical entries. It has been assumed that each lexical entry is accompanied by a list of syntactic and semantic features, which serve to define the word and limit its uses (Katz & Fodor 1963). In order to detect the ambiguity of a polysemous word, one would presumably have to first locate the lexical entry and then process much of the list of features. On the other hand, detecting homophonic ambiguity would entail only the recognition that there are two different storage locations, neither list of features would need to be searched extensively. Assuming that the location of a lexical entry is a relatively rapid and easy process compared to the processing of a list of features, the ambiguity of homophonous words would be easier to detect than the ambiguity of a polysemous word or homonyms.

Summary and Conclusion

The current study was done in order to understand the performance on listening comprehension to sentence ambiguities in children. The aim of the present study was to investigate listening comprehension through resolution of sentence ambiguities by typically developing children from 3rd, 5th, 7th and 9th grades and to study the pattern of development for resolution of sentence ambiguities across types of ambiguities.

The present study was done across CBSE typically developing students of 3^{rd}, 5^{th}, 7^{th}, and 9^{th} grade but as the study was chosen to be done in English, their English use was tested using a Language use questionnaire (Languages Of School-Going Children, A Sample Survey in Mysore. (Shanbal & Prema, 2007), participants who claimed English use '*Most of the time' or 'Always*' for the major domains were selected for the study.

The study included four types of ambiguity across two measures. Four types of ambiguity were that of lexical, phonologic, surface structure and deep structure and for detecting these ambiguities, a paraphrase measure (PM) and a visual measure (VM) was developed. Six sentences with weak bias to either of the meanings were developed under each type of ambiguity. Each of these sentences had a control counterpart, which were developed with strong bias towards either of the subordinate meanings of the ambiguous sentence. The total stimuli was divided into two samples and randomly assigned to each participant.

The results of the study revealed an overall better performance in control sentences than ambiguous sentences, this was assumed to be mainly due to agreement with oblivion hypothesis (MacKay, 1966) that proves the meaning of an ambiguous word or set of words may not be seen until the ambiguity is resolved on the basis of the non ambiguous context of a sentence and exclusive access hypothesis which says one can use cues from the context to immediately select the correct meaning of an ambiguous word. The consistent facilitation for the context appropriate meaning seen here is compatible with most current word recognition models (Becker, 1976; Marslen-Wilson & Welsh, 1978; Morton, 1969), in which lexical access is sensitive to context. An additional contribution of recent experience, demonstrating that listeners are also biased to select recently encountered meanings (Rodd et al. 2013). Finally from the results of the present study it can be concluded that, the resolving of ambiguous sentence is better when the sentence is strongly biased towards either of the subordinate meaning that is initially multiple meanings get activated, but single meaning is then rapidly selected on the basis of the immediate sentence context, the frequency (dominance) of the different meanings and recent experience with the word.

The study also tried to find the developmental trend on detecting the ambiguity across types of sentence ambiguity. The accuracy scores of the types of sentence ambiguities had a linear increase. In the 3^{rd} grade, the phonological ambiguities were more often detected than lexical and both syntactic ambiguities. The ambiguity detection across types were emerging . In the 5^{th} grade, detection of ambiguity across types of sentence ambiguity was found to be complete but

that of lexical ambiguity was still emerging. This can be attributed to difficulty in selecting homonyms from the lexicon (Katz & Foder, 1969). By 7th grade, lexical , phonological surface structure and deep structure ambiguity was complete. The 9^{th} graders performed equally well as 7^{th} graders. We can conclude because of the additional visual cue given the participants were easily able to recall and detect the ambiguity and explain the subordinate meanings easily. While considering performance of lexical ambiguities on PM, detection of lexical ambiguities exhibited a steady, almost linear improvement across grades. Within the 3^{rd} grade, phonological ambiguities were more often detected than lexical and both syntactic ambiguities. The ambiguity detection across lexical and deep structure ambiguity was found to be emerging and that of surface structure ambiguity was not observed in the present study. In the 5^{th} grade, detection of ambiguity across types of sentence ambiguity was found to be still emerging but with more than half of the participants detecting all the types of ambiguities. In 7th grade, lexical ambiguities were more often detected than the other three types but still emerging in detecting these ambiguities. In 9th grade, detection of surface structure and deep structure ambiguity was completed, and that of lexical and phonological ambiguities were not completely developed. Overall results of PM and VM across types of sentence ambiguities suggest lexical processing or semantics develops prior to syntactic processing. Even though both PM and VM demanded verbal justification , accuracy scores of PM to be considered relatively conservative index as it was expected that the paraphrase measure would in actual reflect the

child's ability to detect ambiguity, while the picture measure would be more liberal because of the added pictorial suggestion of each of the two meanings.

Implications of the study

The present study gives insight into the general performance of listening comprehension to sentence ambiguities in typically developing children across 3rd, 5th, 7th and 9th grades. In addition, the study has also tried to find a pattern of development across the different types of sentence ambiguities, their emerging period and period of completion seen in typically developing children. Literature suggests that persons with poorer language skills do not access meanings of words/phrases with multiple meanings in the same manner as persons with better language skills. Those with better language skills are primed for both meanings of a homophone at the single word level (absence of context) while persons with poorer language skills are only primed for the dominant meaning (Atchley, Story, & Buchanan, 2001; Gooding & Hare, 2004). Thus, it should be a requisite to study effect of language skill on sentence ambiguity resolution in children. Understanding this ability to resolve sentence ambiguities would be one of the variable of its kind to understand a different level of semantic and syntactic processing abilities in children, which could be of developmental in nature. The findings of the present study can prove useful in both assessment and management of children who have difficulties in various levels of academics & spoken language. It can also know whether ability to resolve sentence ambiguity would be one of the variables of its kind to understand semantic and syntactic

abilities. Considering the management , at the semantic level the interpretation may stress on the acquisition of multiple meanings of words and can facilitate alternative interpretations in the presence of a variety of semantic-referential and contextual cues. Whereas at the syntactic level the child may need assistance to recognize which syntactic structures and sentence transformations may result in ambiguity when they occur out of a referential context.

Limitations of the study

The current study was done to understand the performance of listening comprehension to sentence ambiguities and to find the developmental pattern of ambiguity detection but here only simple detection- non detection measure was used. In addition, the stimulus in each type of ambiguity was limited to 3. Future research can be supplemented with a reaction time measure along with detection – non detection measure, which will further provide detailed information on the processing capabilities of participants.

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Appendix 1

SAMPLE A :

1. No one liked the plant. - A
2. He went to the bank for money. - C
3. She needs a match for the stove. - C
4. He saw many bats there . -A
5. We saw her pet duck. -C
6. She filled the tank.- A
7. The doctor is out of patients/patience -A
8. I have enough for eight cups. –C
9. He bought it from the sale.-C
10. It was a plain sight.-A
11. He saw three pairs of footwears -C
12. She gave food to her cat.- C
13. The hall of the auditorium was huge. -A
14. She hit the man who had an umbrella. -C
15. She helped the boy with the hat.-A
16. He saw a fish eating a man.-C
17. He sent her kids story book -A
18. He saw the dog with one eye -A
19. She was on a call. -C
20. The duck is about to eat -C
21. She did not like disturbing children- A
22. Flying kites from roof top can be dangerous. - C
23. He is drawing a gun - A
24. Policemen looks very scary - C

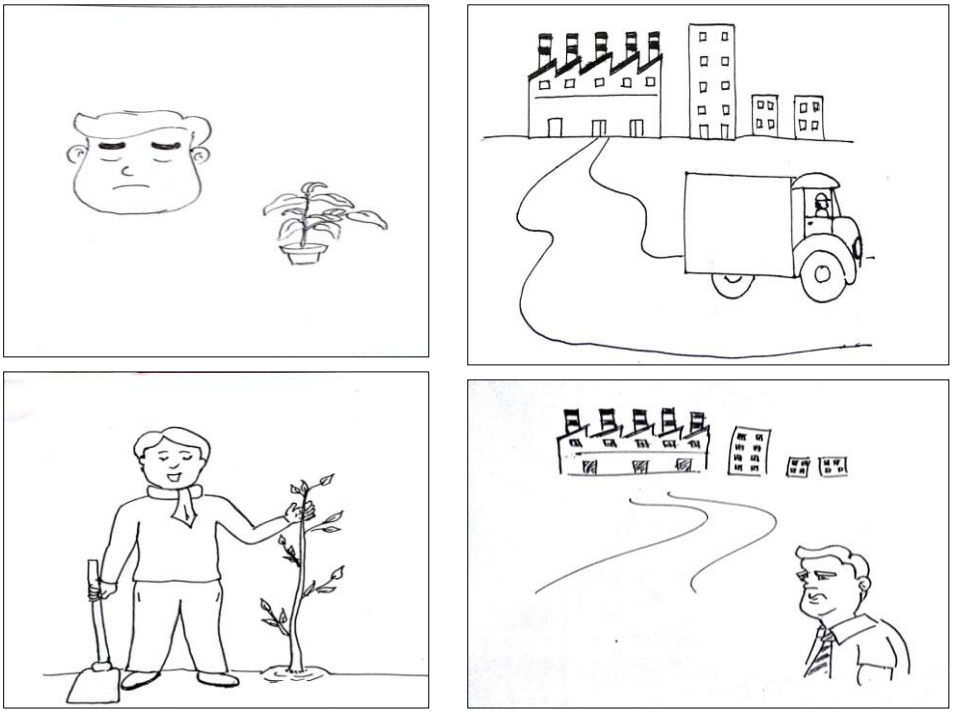
SAMPLE B

1. No one liked the factory. - C
2. He went to the bank .- A
3. She is looking for a match.-A
4. He saw many bats in the tree -C
5. We saw her duck.-A
6. She filled the fish tank - C
7. The doctor has lost his temper –C
8. He bought it because of the sail(sale).- A
9. I have enough for eighty (eight tea) cups.-A
10. It was an empty sight .-C
11. He saw three pairs.-A
12. The hole in the auditorium was huge -C
13. She fed her cat food. -A
14. She hit the man with an umbrella.-A
15. She helped the boy to reach for the hat.- C
16. He saw a man-eating fish. - C
17. He sent her some story books. - C
18. He saw the dog with his one eye. - C
19. She was on the phone. -A
20. The duck is ready to eat .-A
21. She did not like naughty children.- C
22. Flying kites can be dangerous. -A
23. He is drawing a gun with a pencil - C
24. Policemen are frightening people –A
25.

Appendix 2

Cue Cards:

Cue card 1



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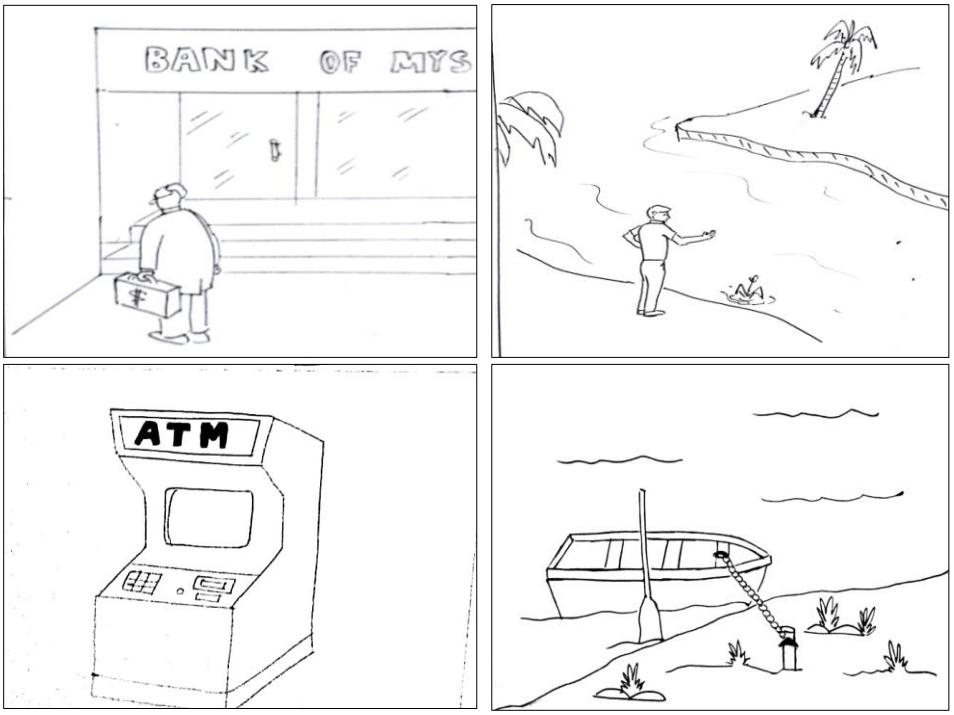

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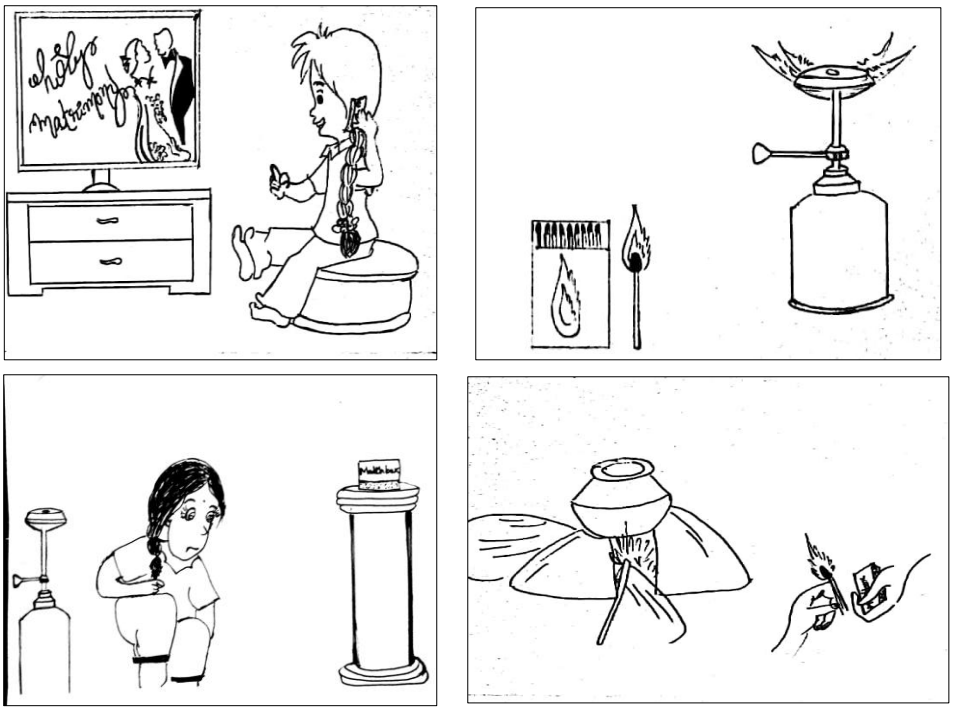

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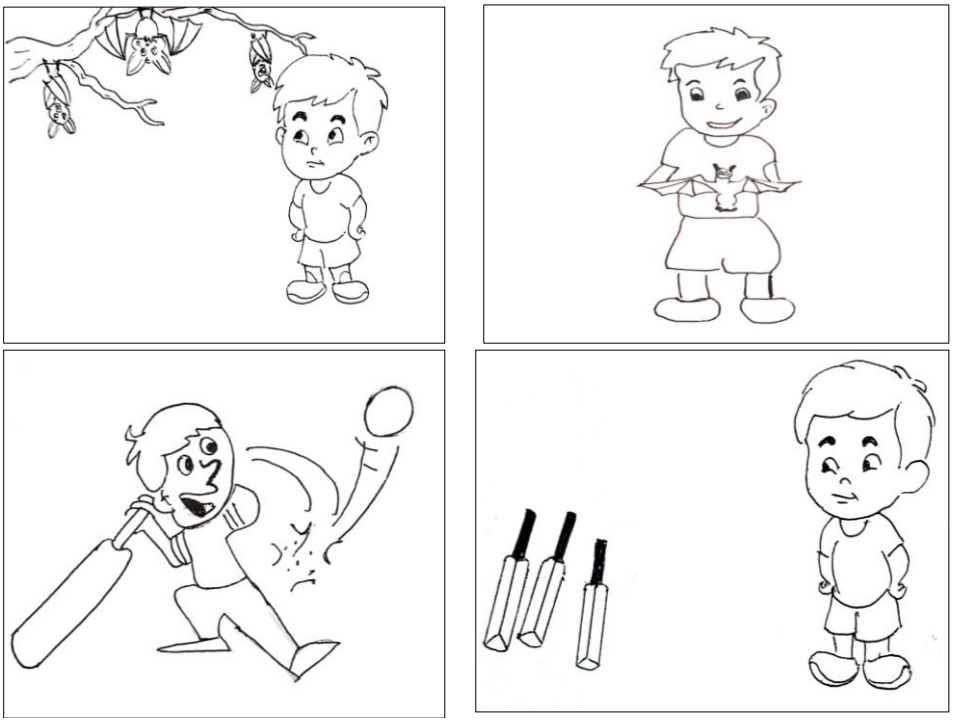

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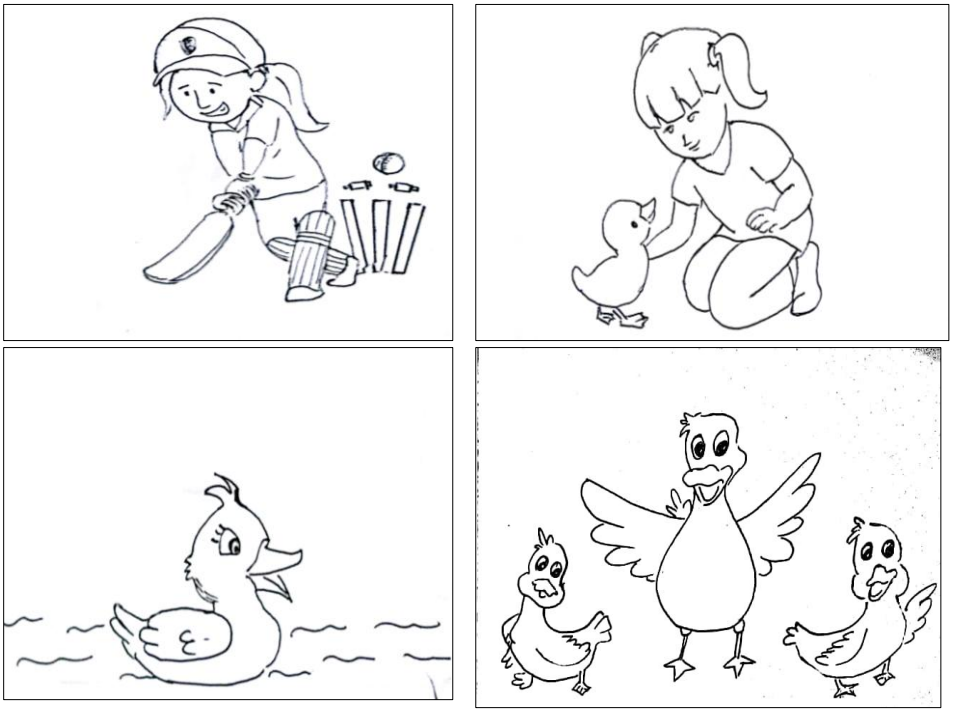

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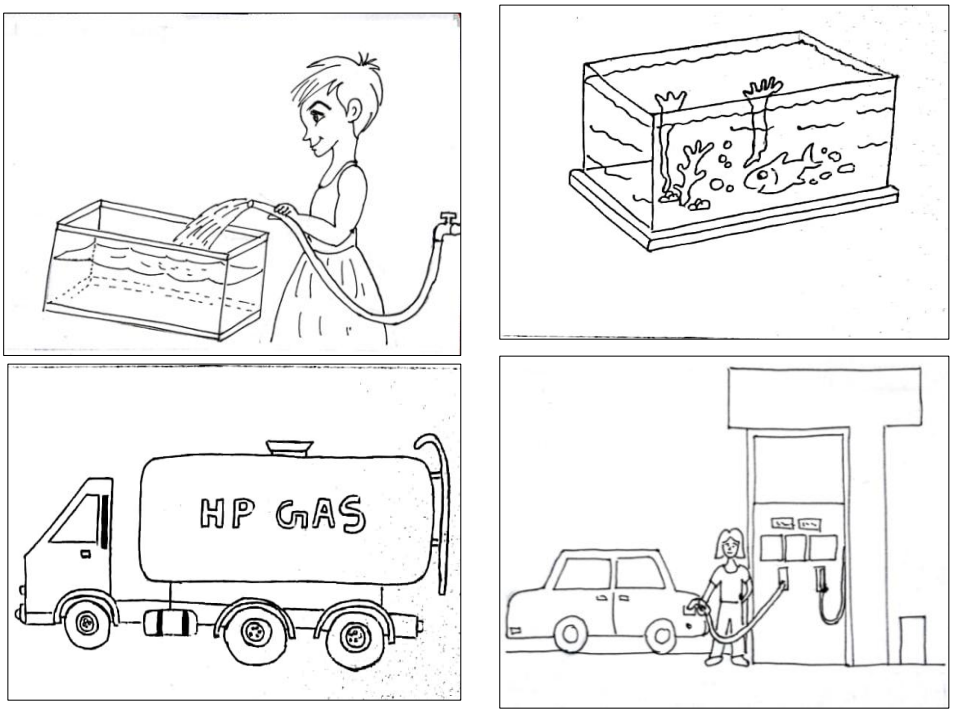
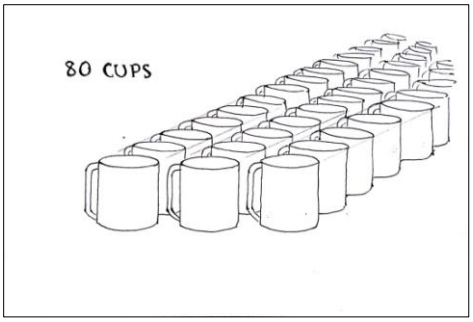
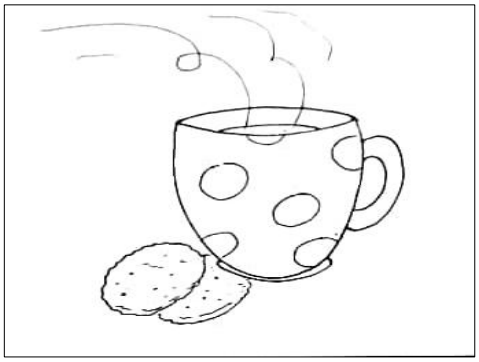


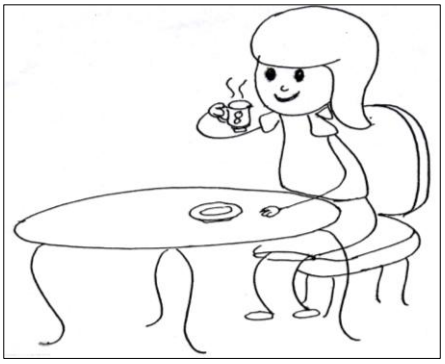
Cue card 7

Cue card 8

Cue card 9







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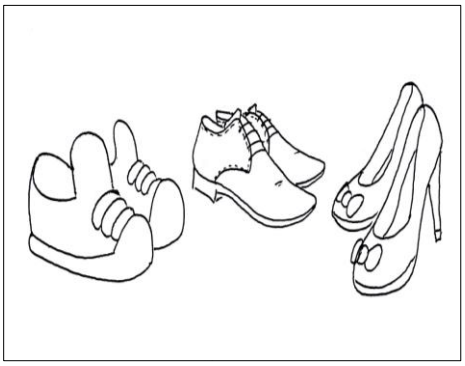

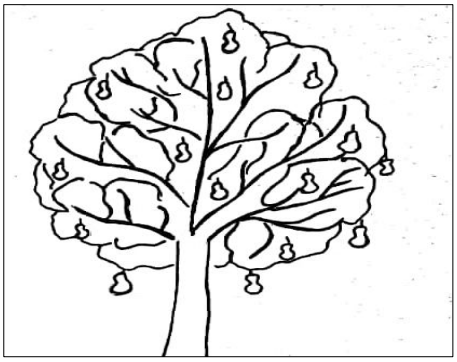

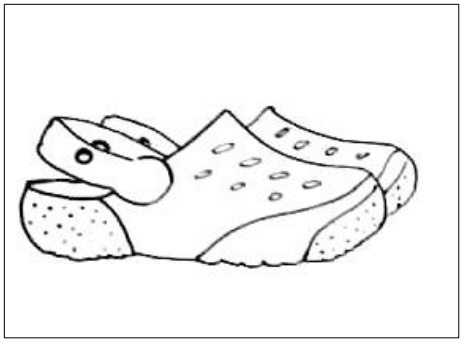

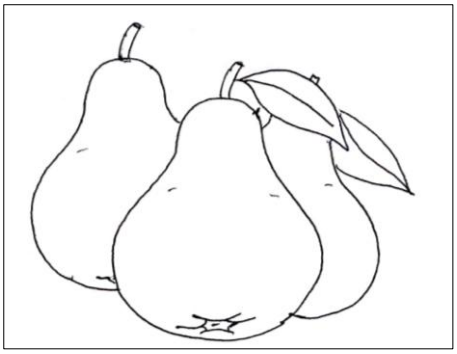

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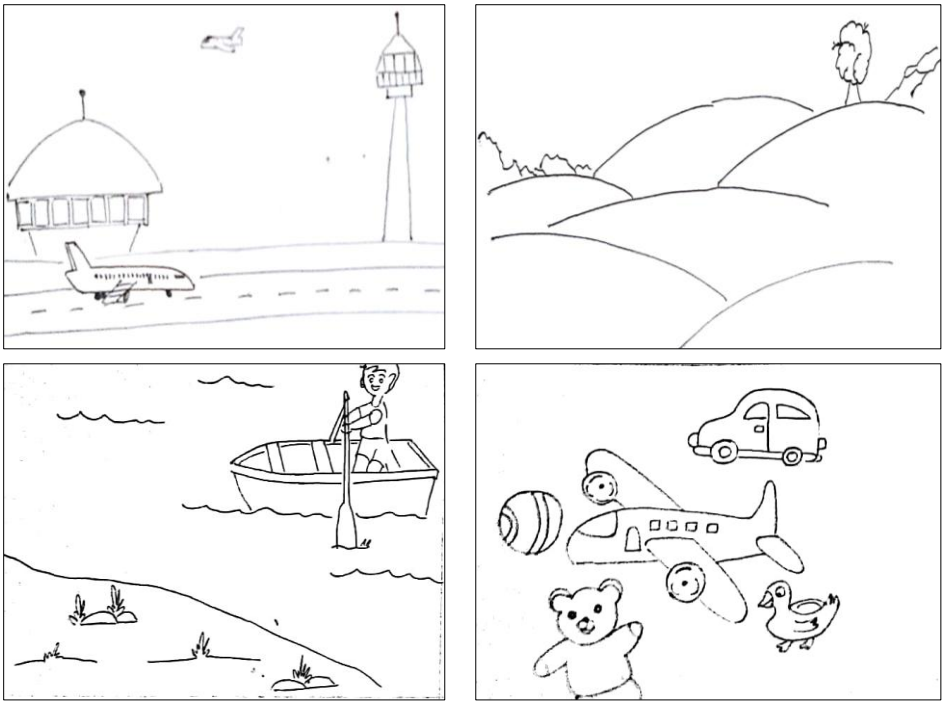

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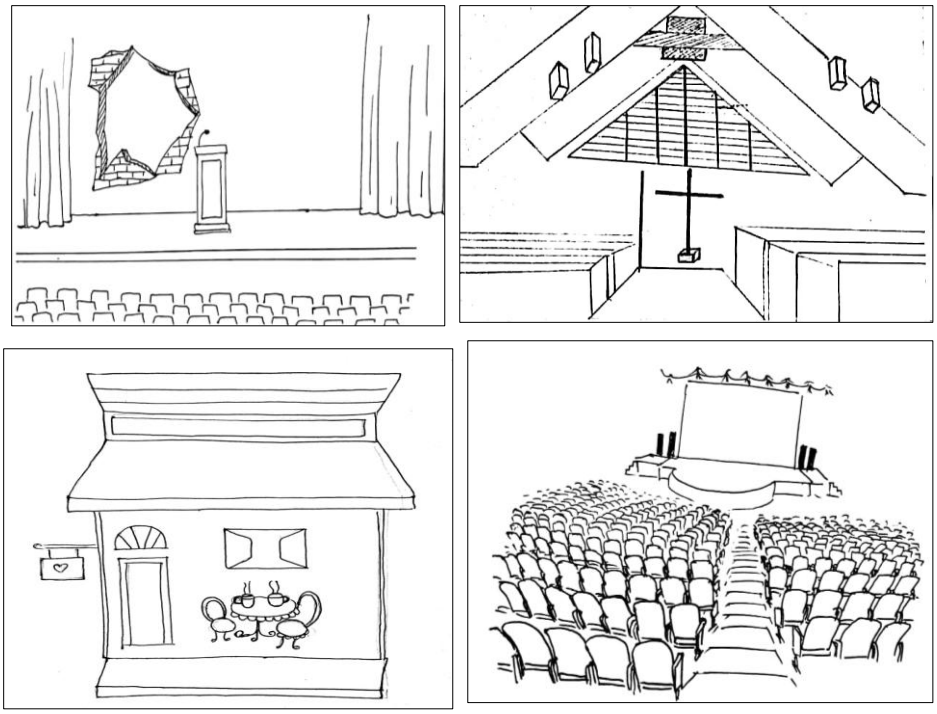
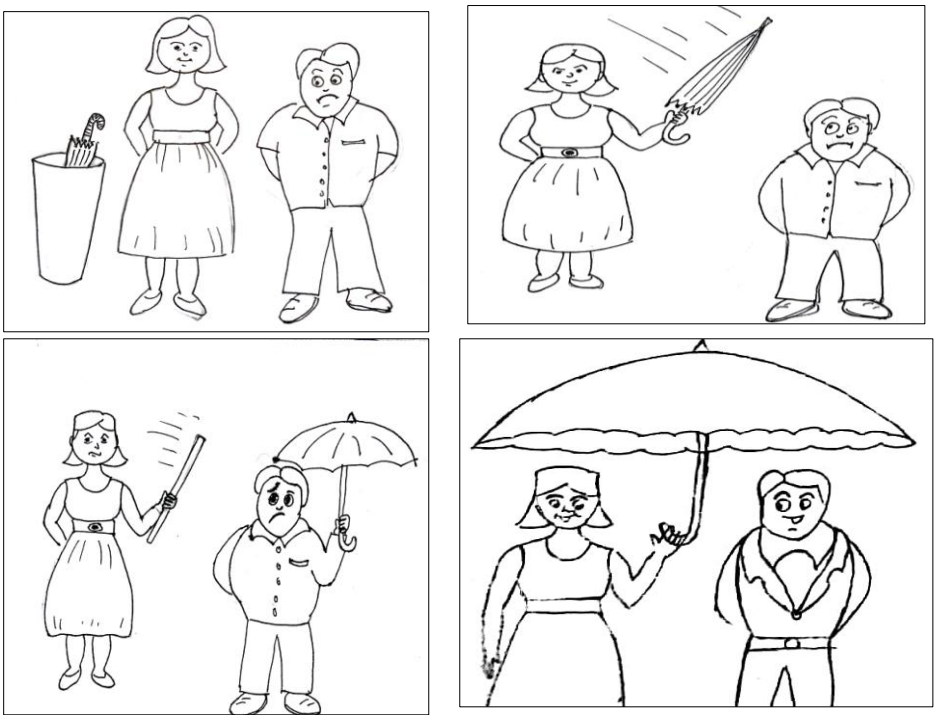


Cue card 13

Cue card 14



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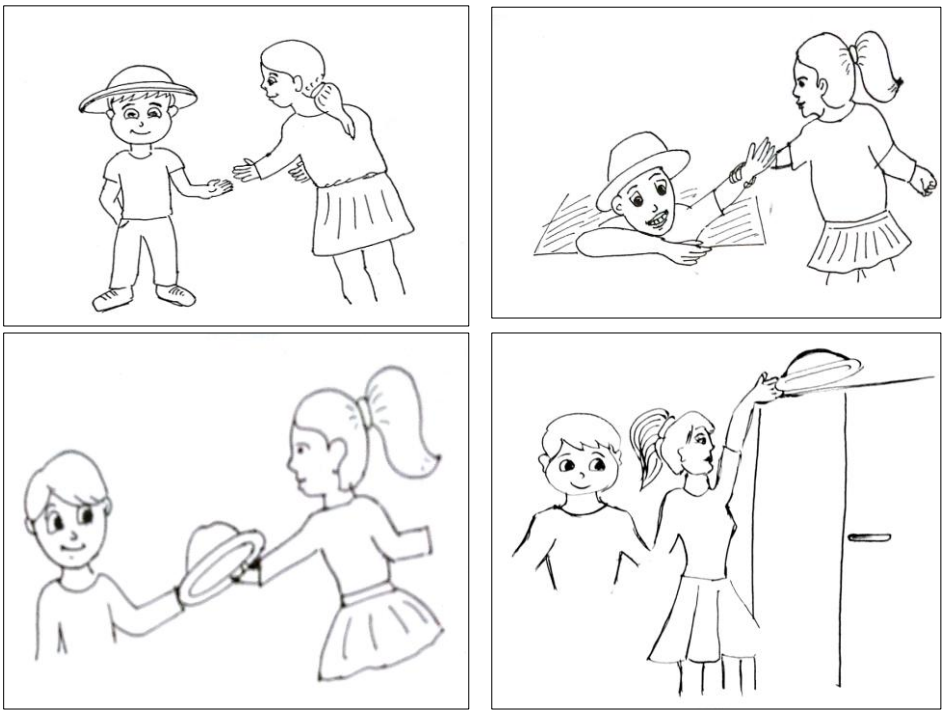

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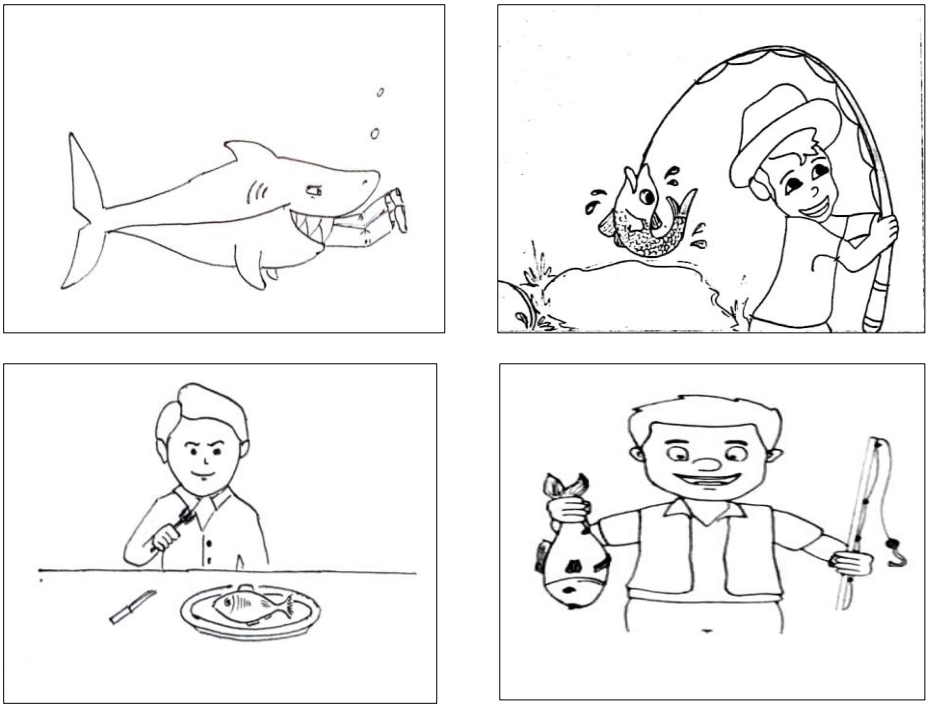

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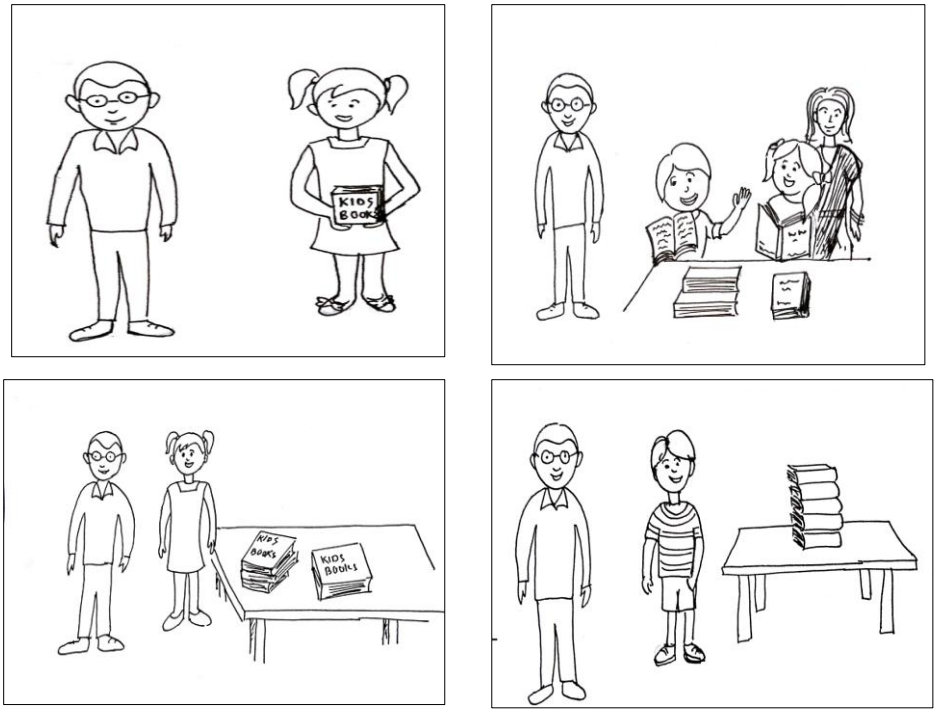

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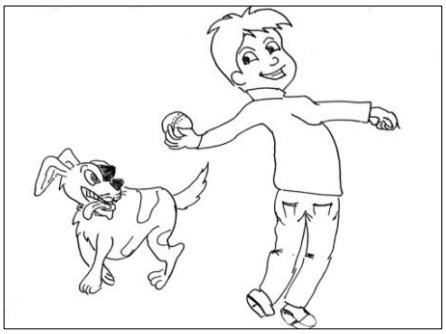
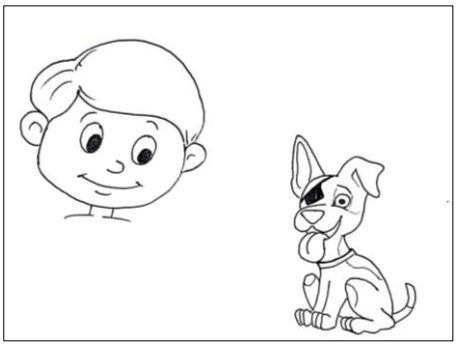
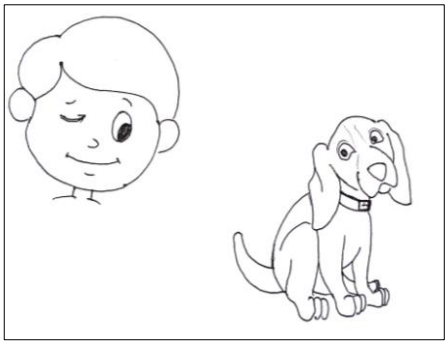


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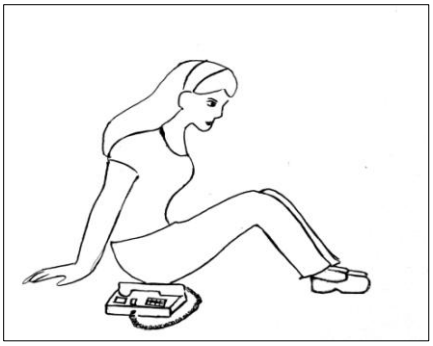


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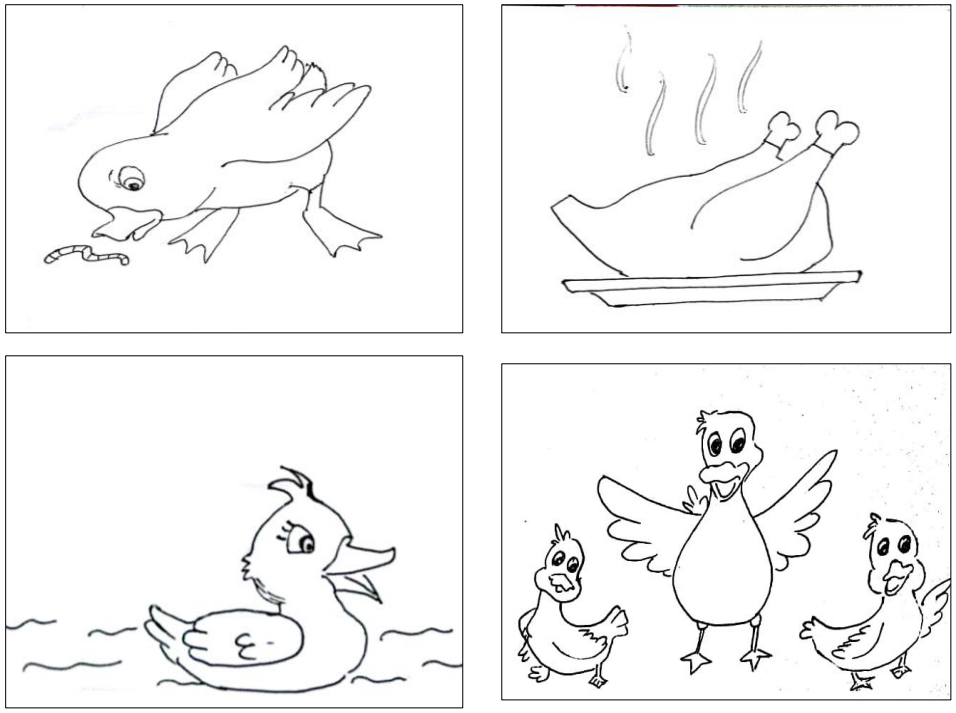

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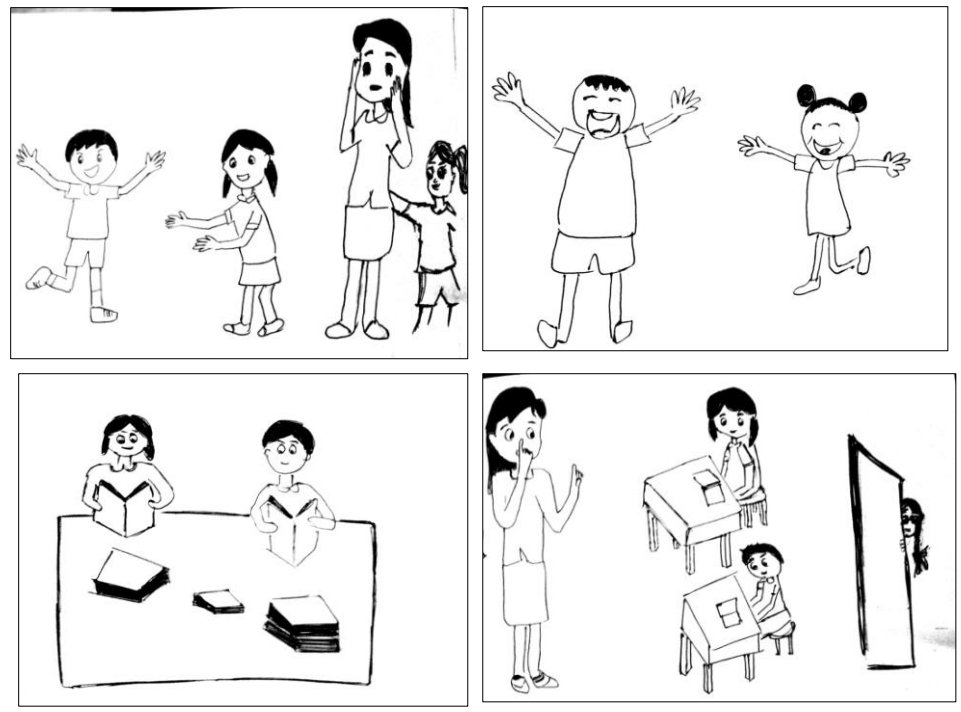

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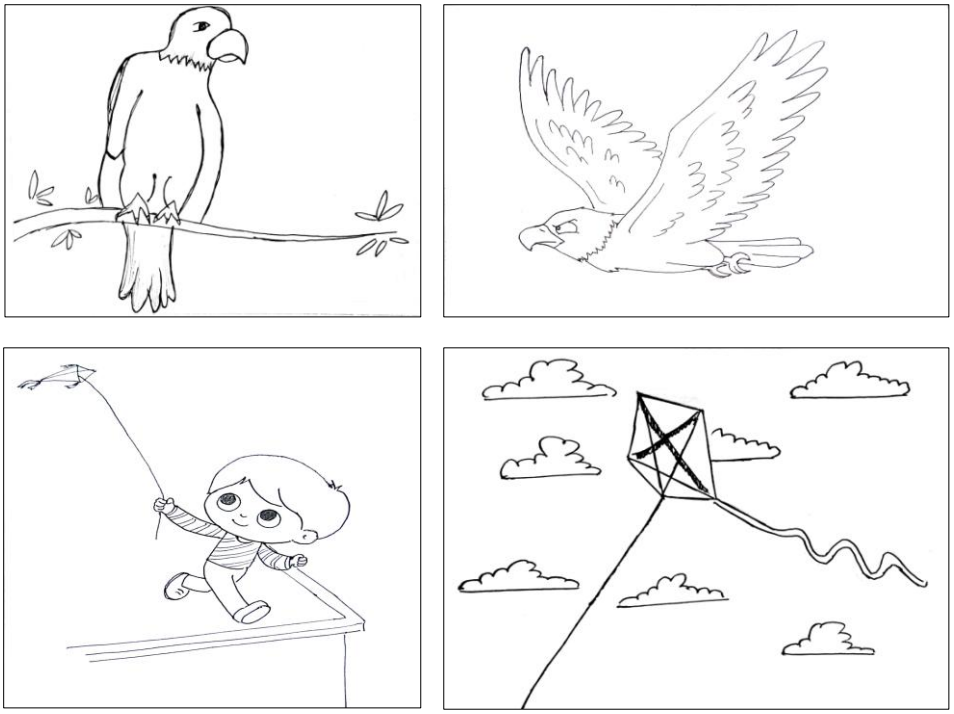

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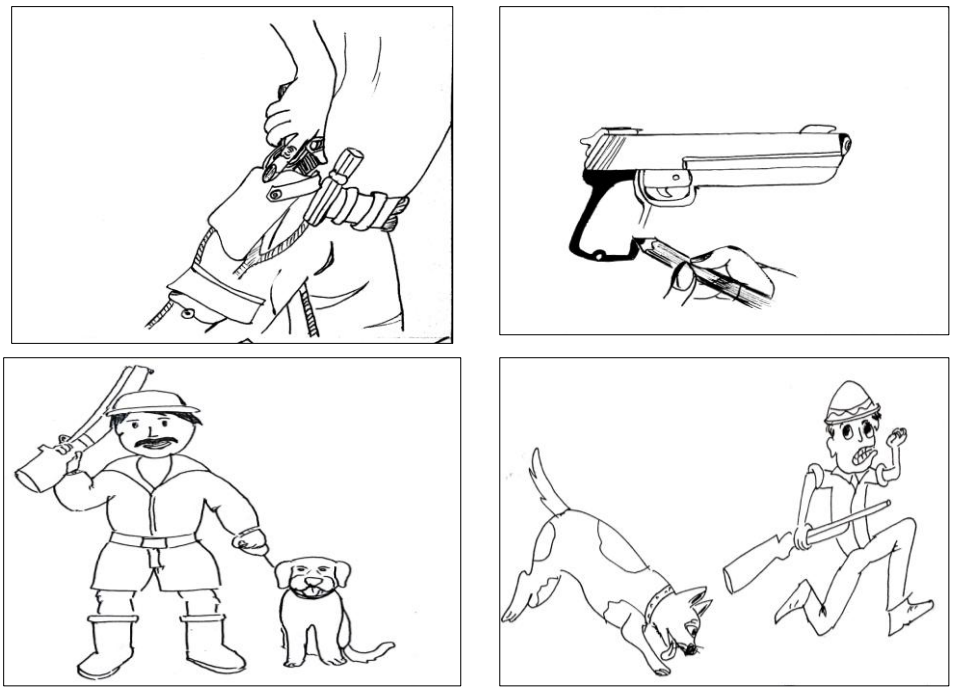

Cue card 24