DEVELOPMENT OF COGNITIVE LINGUISTIC ASSESSMENT PROTOCOL FOR CHILDREN

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A dissertation submitted in part fulfillment for the degree of
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Certificate

*This is to certify that this dissertation entitled "**Development of cognitive linguistic assessment protocol for children** " is a bonafide work in part fulfillment for the degree of Master of Science (Speech-Language Pathology) of the student Registration No. L0480003. This has been carried under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award of any diploma or degree.*

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*This is to certify that this dissertation entitled "**Development of cognitive linguistic assessment protocol for children**" has been prepared under my supervision & guidance. It is also certified that this dissertation has not been submitted earlier to any other University for the award of any diploma or degree.*

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This is to certify that this master's dissertation entitled "Development of Cognitive Linguistic Assessment Protocol for Children" is the result of my own study and has not been submitted earlier to any other University for that award of any degree or diploma.

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CHAPTER 1
INTRODUCTION

Language is one of the most mysterious products of human mind. It is a means of communication and socialization as well as a vehicle for thought. Bloom (1988) defined language as a code by which ideas about the world are represented through a conventional system of arbitrary signals of communication. Owens (1992) defined language as a socially shared code or conventional system for representing concepts through the use of arbitrary symbols and ruled governed combinations of these symbols.

Thus for a speech language pathologist to understand this complex human behavioral of language system of language it is important to study and integrate its characteristics in terms of four major dimensions:

1) The cognitive dimension
2) The linguistic dimension
3) The dimension of language performance
4) The dimension of communicative environment.

In order for an individual to be able to communicate with others in his linguistic environment he must master the rules that govern the linguistic code. However as the language code passes through each individual's cognitive filter, the resulting effect is the unique style of using language. Cognition has historically been considered the base upon which the language develops. Cognitive processes specifically the symbolic thought make language possible and precede language development (Piaget 1970,

Brown 1973). Cognition constitutes the foundations or underpinning for language (Bloom, Lahey and Muma 1978).

Our verbal behavior is determined by what we know, by what we perceive and think in a given circumstance and by the cognitive operations in productions and comprehension. The cognitive processess is usually described in terms of discrete units of attention, perception, memory, concept formation and representation. Hierarchical organization is characteristic of cognitive processing, in that attention is necessary for memory processing and attention and memory are basic cognitive skills that support the perception and comprehension of both linguistic and non-linguistic input (Hartley 1995).

Piaget's model of cognition tries to integrate the process and products of cognition with language in various stages of early development (Inhelder and Piaget 1958; Piaget1969). Piaget identified four distinct intellectual structures that form an invariant developmental sequence. Cognitive process exhibit enormous changes from infancy to adulthood. Theorizing about cognitive development is dominated by the views of Piaget, who argues that the growing child passes from stage to stage during development, with each stage characterized by different set of cognitive processes.

It is suggested that cognitive development is jointly determined by the biological characteristics of the individual and the environment in which the child grows. While the environment provides the experience necessary for the development,

many cognitive processes will develop in any of a variety of environments. Nevertheless the rate of development is neither biologically predetermined nor completely responsive to environmental manipulations.

The acquisition of language has often been accentuated as unique human accomplishment. However researchers argue that language development is not isolated from cognitive development. The young child encounters spoken language as a part of total environment and uses non linguistic information also to communicate with others in the environment. The convoluted relationship between language and cognition is often debatable in literature. Young children have usable concepts for which they later learn the names. As language development proceeds, children appear to move from receptive phase to more productive phase; this transition appears to depend on the development of cognitive skills.

Thus there is an intricate relationship between cognition and language, especially the cognitive processes like attention, memory and organization are important for comprehending and producing language (ASHA 1987). Moreover the higher level cognitive processes like reasoning, problem solving and metacognitive thinking are largely mediated by language. Therefore a speech pathologist plays a very important role to assess these cognitive linguistic skills and to rendered appropriate intervention for the clinical population lacking these skills. There are many tests to assess these cognitive linguistic skills in children e.g., Stanford- Binet test or Stanford – Binet intelligence scale (Binet and Simon 1905), Bayley scales of infant

development (Bayley 1969), Griffith's mental development scales (Griffiths 1954),The Weschler intelligence scale for children (Weschler 1949)etc.

In Indian context one test which tries to assess cognitive linguistic skills is *Cognitive Linguistic Assessment Protocol for Adults* (Kamath.A.2001).Most of these tests concentrate on one or few cognitive linguistic domain, or tests the global cognitive or global linguistic domains. Norms of these are restricted to western population. Not much substantial work is done in Indian context. The present study therefore is an attempt the move towards this direction in the Indian context. The study was aimed to develop an assessment protocol to assess the cognitive linguistic abilities in Kannada speaking children.

CHAPTER-2
REVIEW OF LITERATURE

Language is the primary medium for communicating thoughts from one person to another. Apart from this, language also has an additional function it influences the way we perceive and think about the world. This interaction between language and thought suggests that a particular person's thoughts dependent on person's linguistic environment. Every man is gifted with a few special skills such as thinking, reasoning, judgment, memory, speech, language communication, reading and writing etc. Scientists from various disciplines such as psychology, speech language pathology, cybernetics, genetics, neurolinguistics etc., are involved in investigating these special faculties and the possible inter relationship that exist among them.

Cognition refers to all the mental processes by which information is transformed, reduced, elaborated, stored, recovered and used (Neisser, 1997). Cognition involves a wide range of mental processes such as attention, pattern recognition, memory, organization of knowledge, language, reasoning, problem solving, classification, concepts and categorization (Best 1999). All of these cognitive processes are interrelated with one another rather then existing in isolation. For example, attention is necessary for higher-level skill acquisition of concept organization; concept organization in turn depends on selective attention to relevant

features and prior experience, hence memory; cognitive mapping is a specific form of memory, and its development overlaps with that of social cognition.

Thus study of cognitive process helps us to learn how we acquire, store, retrieve and use knowledge (Matlin1983). Though studies have suggested the interrelations among cognitive processes the exact relationship of language with other cognitive processes is minimally explored. According to psycholinguists and behaviorists language is the basis of thought (Watson; 1924, Matlin; 1983). However many other researchers maintain that language is modular (Blank; 1979, Yamada; 1983) i.e. it can function independently of other cognitive structures. Nevertheless the exact nature of this relation is not clear and has been a debatable topic since interest in this line of thought was kindled only in late 1980's (Prigatano; 1984, Lesser; 1987, Davis 1989) particularly amongst the groups of speech language pathologists, cognitive psychologists, neurologists and psycholinguists.

Piaget (1969) has proposed a model, which tries to explain the intricate relationship between cognition, and language. According to him intellectual development consists of four periods each with distinctive mental structure. These four stages are as follows:

1. Sensorimotor period (Birth to 2 years)
2. Preoperational period (2 to 7 years)
3. Concrete operational period (7 to 11years)
4. Formal operational period (11 years through adulthood

During the ***sensory motor period*** the child acquires integrated schemes for dealing with objects and comes to understand that objects continue to exist when they no longer in view. The ***concrete operations*** *period* is characterized by the child's development of internalized, reversible operations, which can be applied to attributes of objects to solve problems. The period of ***formal operations***, which an adult may not necessarily complete, is characterized by truly hypothetical thinking as found in formal logical and scientific reasoning. The distinct cognitive structures associated with each stage are considered as the end product of a gradual developmental process. Thus according to Piaget the cognitive development proceeds as children interact with their environment.

Apart from that various other cognitive theories also suggest that normally developing child comes to the learning environment with different types of structural and processing equipment. The relationship of cognitive development to language development has been the area of debate among child development specialists also. Some claim that cognition is both necessary and sufficient for language development. This view point is termed as **"strong cognitive hypothesis"** (Rice 1980a, b). According to strong cognitive hypothesis

- Language depends on cognitive development and
- Cognitive abilities precede linguistic abilities.

In broad-spectrum, children develop through various stages that are defined by different intellectual requirements and accomplishments (Piaget, 1969). Cognitive abilities include attention, perceptions, memory and learning, language and visuospatial perception Different cognitive abilities develop at different ages in our life cycle.

ATTENTION:

"Everyone knows what attention is. It is the taking possession by the mind in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought...It implies withdrawal from some things in order to deal effectively with others."

Willam James,1980.

Attention is the cognitive process of selectively concentrating on one thing while ignoring other things. Examples include listening carefully to what someone is saying while ignoring other conversations in the room (e.g. the cocktail party problem, Cherry, 1953). Attention is the process of stimulus selection (Neisser 1967) or selective perception (Gibson, 1969). Attention is central to the linguistic or cognitive processing. It comprises a variety of cognitive or neural mechanisms that allow an individual to select specific stimuli or thoughts from the enormous range of sensations conveyed to brain from peripheral receptors and available as representation in memory. Of the many cognitive processes associated with the human mind (decision making, emotion, memory etc), attention is considered the most concrete because it is tied so closely to perception.

As such, it is a gateway to the rest of cognition. From the 1920s to the 1950s, the field of attention was relatively inactive. The dominant psychological paradigm at the time was *behaviorism*. This view was defined by an epistemology called *positivism*, which does not permit assumptions about processes that cannot be observed directly (e.g. cognitive processes, gravitational forces in physics). Thus, the cognitive processes that govern attention were not considered legimitate objects of scientific study.

In the 1950s, psychologists renewed their interest in attention when the dominant epistomology shifted from *positivism* to *realism* during what has come to be known as the cognitive revolution. The cognitive revolution admitted unobservable cognitive processes like attention as legitimate objects of scientific study. During this period, the major debate was between *early-selection models* and *late-selection models*. In the early selection models, attention shuts down processing in the unattended ear before the mind can analyze its semantic content. In the late selection models, the content in both ears is analyzed semantically, but the words in the unattended ear cannot access consciousness. This debate has still not been resolved.

In the 1960s, Anne_Treisman began developing the highly influential *Feature integration_theory* (first published under this name in 1980 when it became famous in a paper with G. Gelade). According to this model, attention is responsible for binding different features into consciously experienced wholes. Although this model has received much criticism, it is still widely accepted or held up . Experimental research

has confirmed that attentional mechanisms affect multiple stages or aspects of information processing and are distributed across brain regions, and differ among modalities.Attention can be divided into two subtypes:

- Selective attention
- Sustained attention.

SUSTAINED ATTENTION: it is the ability to maintain a consistent behavioral response during continuous or repetitive activity (Gillis, 1996).

SELECTIVE ATTENTION: it is the ability to select one stimulus over another or to differentially manipulate levels of arousal or alertness to specific stimuli (Gillis, 1996).

Attention is a basic information process that is frequently defined within the context of perception. Developmental trends associated with attention are not clear-cut. Wright and Vlietstra 1975 summarized the development of attention within the context of their ***"search exploration theory".*** According to these authors the preschool children tend to attend to the most salient characteristics of the stimulus, to position cues, and to random items. Between 5 and 7 years of age, children scan a visual array more systematically though scanning is erratic. Around 6 years of age, children can direct attention towards recognized goal. Older children, 10 to 14 years, increase instrumental and instructional learning and recall more central or task relevant information

Attention is considered to be a part of three ongoing processes: attention and perception, attention and memory, and attention and cognition (Pick, Frankel& Hess1975). According to most of the theorists, the processing of global characteristics to more specific attributes occurs with development. This is referred to selective attention (Neisser 1976) or selective perception (Pick 1975) reflecting the interrelationship between attention and perception.

Apart from these studies on the development of attention a number of theories have been proposed to describe these developmental changes in attention. According to Pick et al (1975) attention is a process of selection. And the study of attention is how this selection process occurs. According to them attention is treated not as an isolated function but as an ongoing process that is a part of cognitive process and thought. On the other hand according to Gestalt psychologists or Gestalt theories attention is viewed as an ongoing part of perception. In sharp contrast to these two schools of thought there is another school of thought or theory that is information processing theory which takes into account the cognitive or internal aspects of attention. In general most of the theories state that, the processing of global characteristics to more specific attributes occurs with development

The ability to process language may therefore be limited by attentional capacity available to the individual (Maxim, 1999). Impaired attention can lead to subjects missing out on information in spoken discourse or in written material, which may have impact on their responses and cause communication breakdown (Boyle and Strikowsky-Harvey 1999).

In essence attention becomes the most basic and critical variable for all the other learning processes. Attention is required in learning; it helps in stimulus response associations. It is also used in memory or is correlated with memory in that memory involves the retention or the storage of the information that is attended to. It has been established by many researchers that these attentional abilities when retarded in children may result in communication break down. Researchers have investigated these attentional impairments in children with various developmental and acquired language disorders. Thus it can be suggested that attention is related to language development and it becomes very important for a speech language pathologist to assess attention in children with language disorders.

EVIDENCE FROM CLINICAL POPULATION:

Autism:

Autism is a severely debilitating developmental disorder, characterized by aberrant social skills, deficient language, abnormal attention, stereotyped repetitive behaviors, and often also mental retardation. Peculiar attentional behavior has been reported to be one of the components of the social communication deficits in autism. Individuals with autism show attentional preference to objects over people and a lack of a drive to communicate. Consistent with this, Swettenham, Baron-Cohen, Charman, Cox, Baird, Drew, Rees,& Wheelwright, (1998) found that 20-month-old infants with autistic features made significantly fewer attention shifts than did their controls from

person to person and between a person and an object. These children spend more time looking at objects and less time looking at people. Further, 5-year-old children with autism oriented more poorly to social (both speech and nonspeech) than to nonsocial stimuli.

It has also been found that children with autism have difficulty generalizing learned behaviors from one context to another. Because these children can not identify the relevant information within the complexities of a situation, they can not identify what is important and what is not, creating a further problem in establishing conceptual and perceptual relationships. The ability to establish categories of any kind depends on the ability to discriminate differences as well as how the stimulus is related to one another. Children with autism tend to fixate on irrelevant stimulus in the environment. These deficits inturn contribute to the failure to generalize learning and results in poor scholastic performance (Russell, Mauthner, Sharpe, & Tidswell, 1991; Prior & Hoffman, 1990). Thus it becomes very important for a speech language pathologist to assess these attentional deficits in children with autism. This would further help to frame appropriate goals for intervention for children with autism.

Mental retardation:

In general individuals with mental retardation develop many cognitive skills in a developmental sequence similar to that of nonmentally retarded population (Owens as cited in Bernstein and Tiegerman, 1996). These differences are those which

indicate fundamental processing differences. Research on attention has evaluated the orientation, reacting and discriminating abilities of mentally retarded children.

Orientation refers to the ability to sustain attention over time. In general, individuals with mild retardation exhibit equal or slightly greater ability to sustain attention or orient when compared to their mental age matched peers (Karrer, Nelson and Galbraith, 1979). However individuals with mental retardation have difficulty in identifying and maintaining attention to relevant stimulus dimensions.

Learning disability:

Several investigators have reported of attentional deficits in language disordered children and its effect on normal speech and language development and also scholastic performance. The ability to sustain attention is also mentioned within the educational context (Keogh and Morgolis 1976). Douglas (1974), reported that children with learning disability differ from children without learning problems in their ability to select or allocate the processing capacity or in other terms in sustaining attention. Ross (1976) also suggested learning disability as a developmental lag in selective attention that is the ability to use and sustain attention.

Thus the interaction between language and thought and the cognitive correlates of such an interaction are significant to understand the performance of learning disabled children in academic learning. As mentioned earlier the cognitive processes of attention, memory, perception are related to each other and also to language development. In processing the written language, the learner is confronted with combination of abstract concepts and complex language. Therefore to understand

the reading and writing problems experienced by children with learning disability it becomes very important for a speech language pathologist to understand the process of interaction between these processes and language.

MEMORY:

Memory is one of the most important concepts in learning; if things are not remembered, no learning can take place. Furthermore, memory has served as a battleground for opposing theories and paradigms of learning (e.g., Adams, 1967; Ashcraft, 1989; Bartlett, 1932; Klatzky, 1980; Loftus & Loftus, 1976; Tulving & Donaldson, 1972). Some of the major issues include recall versus recognition, the nature of forgetting (i.e., interference versus decay), the structure of memory, and intentional versus incidental learning. Memory is defined as stored representation and the process of encoding, consolidation and retrieval through which knowledge is acquired and manipulated and learning is an interaction between the world around us and the theory of world in our heads (Chapey, 2001). Contemporary theories of language acquisition emphasize that linguistic development proceeds in concert with cognitive development as a whole. One critical prerequisite to development of language is the ability to perceive and produce speech under temporal constraints (Slobin 1973). From this point of view memory is central to ability to produce and perceive language.

Theories of memory distinguish mainly of two types based on the duration of information stored, it can divided in

Long term memory – long term memory refers to permanent storage of information and has no capacity limits.

Short term memory- short term memory refers to the temporary and limited capacity storage of information, that when possessed on some effortful manner can be learned and retrieved at a later time (Baddeley, 1992).

These long term and short term components of memory play an important role in linguistic development (Klatzky 1980). Long-term memory stores the knowledge an individual accumulates through life; it is capacious and enduring. It is essential to language function, for examples, to store word meaning and grammatical rules. Short –term or working memory, memory holds actively processed verbal information for a short time, in verbatim form. In addition to this storage function, it also provides capacity for a variety of mental processes. In both of these roles it contributes critically to the processing of language. A speaker uses short-term memory to hold the articulatory plan for constituents of the sentences until they can be spoken (Clark & Clark 1977). The comprehender holds the perceived constituents of speech input in short term memory and determines the underlying meaning, and also retains segments of meaning in order to integrate successive sections of an input (Just & Carpenter, 1980). Thus a deficiency in short-term memory might manifest itself in both expressive and receptive aspects of language disorder.

This relationship between short-term memory and language is frequently mentioned in the literature on language acquisition. Systematic increases in chronological age, utterance length, and memory span have been well documented

(Brown 1973; Brown & Fraser, 1963). Similarly Olson (1973) also emphasized the processing contribution of working memory and suggested that the growth in length and comprehension of children's utterances is more then simply an increase in memory span. Thus the ability to comprehend and produce longer and more complex sentences is one manifestation of a more sophisticated ability to organize and process information.

Adults and older children ordinarily "remember better'' than younger children. Various tests of memory are regularly included in intelligence tests and show clear age trends. For example, a memory span test involves presenting the individual with a series of numbers or letters and asking the individual to repeat it back after presentation. According to Miller (1956) the average score for four year olds is about four items whereas 9 years old is about six items, adolescents and adults about seven items. Hence remembering is an active process involving a number of strategic components, and it is virtually impossible to separate these components. Different individuals use different strategies to remember the information received. One process that has played an important role in theories of memory is "rehearsal". There is abundant evidence that younger children are less likely to rehearse and use less efficient rehearsal strategies when they rehearse. These differences in rehearsal affect the short-term remembering. Studies on rehearsal strategies have shown significant differences in children across ages, developmental trends have been found.

Allik and Siegel (1976) studied the rehearsal effect and found that developmental differences were most apparent on the first half (primacy effect), an

effect which is presumably due to use of rehearsal by younger and older subjects. Similarly Ornstein, Naus and Liberty (1975), also found that the kind of rehearsal used by adults and younger subjects is different. Younger subjects (third graders) tended to rehearse just the item most recently presented or minimal combinations, while older subjects (sixth and eighth graders) used a cumulative rehearsal strategy which results in integrated units. Thus an older child is more likely to rehearse and to construct larger chunks by using a cumulative rehearsal strategy. It has been found that children as young as 5 years of age can be taught to rehearse, with a resulting improvement in memory. However children do not transfer the rehearsal strategy to subsequent tasks (Hagen, Jongeward, &Kail, 1975).

Apart from the above mentioned studies the research done by Baddeley and Hitch (1974) provides an understanding of the relationship between memory and language. Baddeley and Hitch (1974) introduced and made popular the multicomponent model of working memory. It consists of two ***"slave systems***" responsible for short-term maintenance of information, and a ***"central executive"*** responsible for the supervision of information integration and for coordinating the slave systems. Slave system consists of *the articulatory loop*- stores phonological information and prevents its decay by silently articulating its contents, thereby refreshing the information in a rehearsal loop. It can, for example, maintain a seven-digit telephone number for as long as one repeats the number to oneself again and again. The other slave system, ***the visuo-spatial sketch pad,*** stores visual and spatial information. It can be used, for example, for constructing and manipulating visual images, and for the representation of mental maps. The sketch pad can be further

broken down into a visual subsystem (dealing with, for instance, shape, colour, and texture), and a spatial subsystem (dealing with location). The central executive is, among other things, responsible for directing attention to relevant information, suppressing irrelevant information and inappropriate actions, and for coordinating cognitive processes when more than one task must be done at the same time.

Baddeley (2000) extended the model by adding a fourth component, the episodic buffer, which holds representations that integrate phonological, visual, and spatial information, and possibly information not covered by the slave systems (e.g., semantic information, musical information). The component is episodic because it is assumed to bind information into a unitary episodic representation. The working memory model advanced by Baddeley and Hitch (1974) has also proved highly successful in characterizing the nature of developmental changes in terms of phonological loop, the components of working memory specialized for processing and maintenance of verbal material.

The cognitive skill approach can be used to map out the cognitive components of phonological memory performance in children. A practical advantage, which the approach offers, is the identification of the core cognitive deficits of children with poor phonological memory abilities. Memory abilities have been shown to be linked with the language aspects including vocabulary development (Gathercole, Willis, Emslie, & Baddeley, 1992; Service 1992), language comprehension (Mann, Shankweiler&Smith, 1984), and reading (Crain, Shankweilar, Macaruso, &Barshalom, 1990).

Various studies have been done to see the developmental changes in memory span in children, and also the developmental changes in the rehearsal strategies used by children across different age spans. Span at 4 years, 2 - 3 items; at 5 years, 3-4; at 11 years, 5; and 12 years, 6 items (a 2-3 fold increase). Hulme, Thomson, N., Muir, C & Lawrence, A. (1994) investigated the effect of word duration on recall span in a cross-sectional study with ages ranging from 4 years old to adults. First, participants' time to articulate pairs of words of one, two and three/four syllables in length were recorded (i.e. speech rate). Second, they completed serial recall tasks using the same words, and a mean score of words correctly recalled was calculated for each word length. The results were clear, there was a linear relationship between the numbers of words recalled (span) and the developmental increase in speech rate. That is, the speed of saying words dictates how much material can be held in temporary storage. There is no positive correlation between articulation rate and memory span below 7 years of age (Gathercole & Adams, 1993). For adults, this correlation is particularly robust.

In contrast Flavell, Beach & Chinsky (1966) failed to find any evidence of overt rehearsal (e.g. whispering, lip movements) in children below 7 years when asked to perform an immediate memory task. Lucy Henry (1991) - found that if recall of auditory material was non-verbal, the word length effect disappeared in 7 year-old. The word length effect could therefore be explained in terms of output delays i.e. long words take longer to say than short-words. Hitch, Halliday, Dodd, and Littler (1989), reported that STM for spoken material was sensitive to word length in children aged 4 years and upward. However, an equivalent effect with pictured items was only found

in children over 8-years-old. This suggests that sub-vocal rehearsal is present from an early age for auditory material but not visual.

Indeed, poor memory skills represent one of the most severe deficits of children with developmental disorder of language (Gathercole & Baddeley, 1990). Measures of working-memory capacity are strongly related to performance in other complex cognitive tasks such as reading comprehension, problem solving, learning a programming language, and with any measures of the intelligence quotient (Conway, Kane, & Engle,2003). Some researchers (Engle 1999) have argued that working memory capacity reflects the efficiency of executive functions, most notably the ability to maintain a few task-relevant representations in the face of distracting irrelevant information. The tasks seem to reflect individual differences in ability to focus and maintain attention, particularly when other events are serving to capture attention. These effects seem to be a function of frontal brain areas (Kane and Engle, 2002).

The identification of the core deficit and its remediation is therefore an important practical issue. Therefore given this information we can conclude that memory plays a basic or critical role in language acquisition and learning process. Memory impairments however would result in poor communicative skills in children thus resulting in communication breakdown. Children with poor memory skills inturn may not be able comprehend and may be not able to produce longer utterance due to limited memory span capabilities. Bearing this in mind, a speech language pathologist plays a vital role in the study of these developmental trends which would further help

in diagnosing and in planning for intervention for children with cognitive linguistic impairment.

EVIDENCE FROM CLINICAL POPULATION:

Autism:

The nature of memory function in autism has been under study for decades. Memory has been characterized as both the cardinal cognitive domain largely responsible for the clinical manifestations of the disorder or as secondary to a more generalized cognitive deficit that transcends memory, such as executive dysfunction. Inconsistency of findings has always been problematic in autism research. This problem is related to the high degree of variability in the autism population, which is the result of developmental differences and differences in cognitive levels among subject groups.

The complexity of the to-be-remembered material appears to be an important factor that influences the memory performance of children with autism. Fein et al. (1996) reported that memory function in autism was characterized by a dissociation between intact memory for material with low levels of structure and impaired memory for material with more complex levels of organization; young children with autism had the least trouble with recall of digits, more trouble with sentences, and the most difficulty for stories.

Visual memory for some types of material has been found to be an area of strength for children with autism but complexity of the stimuli appears to affect memory function in this modality as well. Children with autism have been reported to perform as well as matched controls on a delayed response visual discrimination task (Prior & Chen, 1976); on a delayed match-to-sample visual memory task (Barth, Fein, & Waterhouse, 1995); and on recall of pictures of everyday scenes (de Gelder, Vroomen, & van der Heide, 1991), buildings (Boucher & Lewis, 1992), and shoes (Gepner, de Gelder, & de Schonen, 1996). However, results from other studies indicate that, similar to findings with verbal material, the visual memory of children with autism is susceptible to a lack of response to organizational support and to the influence of complexity of the stimuli, resulting in the stereotyped use of simple patterns or rules regardless of the inherent organization of the stimuli (Frith, 1970b).

Nevertheless verbal working memory has been considered by some investigators to be a core cognitive deficit in autism (Pennington 1997). However, complexity of the stimuli also appears to be an important consideration in this aspect of memory function. Direct measures of verbal working memory, ones that use only a minimal processing load; have failed to confirm a deficit in this area in children with autism (Ozonoff & Strayer, 2001; Russell, 1996; Williams, Goldstein, Carpenter, & Minshew, 2005). Results from studies of spatial working memory in autism are less clear. Children with autism have been reported to be unimpaired in spatial memory (when defined as recall of a location of a picture on a page; Klin, Sparrow, de Bildt, Cicchetti, Cohen, & Volkmar, 1999), in a spatial memory-span task, and in a search task (Ozonoff & Strayer, 2001). However, children with autism have been found to

have a spatial working memory deficit on other behavioral tasks (Williams, Goldstein, Carpenter, & Minshew, 2005).

Mental retardation:

Studies done by Belmont (1967); Ellis, (1963); Merrill, (1985) report a clear cut deficit in memory in children with mental retardation. However they reported that children with mild and moderate retardation are able to retain information within long- term memory although overall recall is slower. According to Spitz, (1966) organizational deficits may result in an over reliance on rote memory by mildly retarded persons. In contrast, profoundly retarded individuals exhibit significant forgetting of learned behavior within only a short interval.

According to studies done by Brown (1974); Ellis (1970); short term memory deficits are more evident in children with mental retardation. Short term memory is particularly affected by a rapid rate of forgetting found in retarded population, especially in the first ten seconds (Ellis 1970).

As mentioned earlier information is retained or transferred to long-term memory through rehearsal or repetition. It has been reported in literature that retarded children do not rehearse information spontaneously (Brown 1974, Ellis 1970). They exhibit “rehearsal deficit”. However they reported that rehearsal in these children occurs when given sufficient time. These memory deficits in children with mental retardation would inturn result in poor sentence recall, poor reading and writing recall. Auditory memory deficits have also been reported in children with Down syndrome

(Marcell & Weeks, 1988). This would result in poor linguistic recall and hence result in communication breakdown. Varnhagen, Das, & Varnhagen, 1987 reported that these children with Down children also exhibit difficulties in vocabulary storage and retrieval.

Down syndrome:

Individuals with Down syndrome tend to have poor verbal short term memory. A typical measure used to measure the verbal short term memory is digit or word span test. Verbal short term memory of individuals with Down syndrome tends to be lower. Kay- Raining Bird and Chapman (1994) found that the modal digit span of group of 45 children and adults with Down syndrome was 4 items, and the mean span for this group was approximately 3.5 digits. Chi, (1976); & found that younger individuals have shorter span than the adults. In contrast to Chapman (1994) study, Vallar & Papagno (1993) reported that not all individuals with Down syndrome will have poor verbal short term memory. Although most of the studies have reported that individuals with Down syndrome show poor verbal short term memory than matched controls. Given this constraint, children do present with a deficit in memory which inturn would effect the language acquisition by them.

Learning disability:

Cohen, (1982); Jorm, (1983); Torgesen, (1985) have reported of short term memory deficits in children with learning disability. These short tem memory deficits for verbal information in children with learning disability resulted because of the

difficulty in using the elaborative encoding strategies as verbal grouping and verbal rehearsal. These difficulties appear to reduce the effectiveness of attention and memory in processing information. These deficits in memory and attention inturn would result in communication breakdown and also poor scholastic performance.

Specific language impairment:

The language impairment of many children with specific language impairment is thought by some to be related in part to some sort of memory deficiency. Ample experimental evidence reveals that children with SLI have deficits in a number of major functions of verbal short term memory. (Ceci, Ringstrom, & Lea, 1981; Curtiss & Tallal, 1991; Graham, 1980; Montgomery, 1995a)

Therefore from the above background information on the disordered population and also the relationship between cognitive processes and language acquisition it becomes very important for a speech language pathologist to assess the cognitive linguistic abilities in children.

PROBLEM SOLVING:

We use problem solving when we are not able to reach a particular goal that is not readily attainable. Problems come in many different forms and there is no single, clearly defined cognitive operation called “problem solving”. Rather problem solving involves a variety of cognitive processes and the importance of any process varies from one problem to another (Metcalfe &Wiebe, 1987).

Problem solving strategy consists of the following steps:

- Identify the problem
- Define and represent the problem
- Explore possible strategies
- Act on the strategies
- Look back and evaluate the effects of your activities.

In another words problem solving involves one to understand it, generate possible solutions, overcome possible obstacles, and evaluate alternatives. Problem solving is the foundation of a young child's learning. It must be valued, promoted, provided for, and sustained in the early childhood classroom. Opportunities for problem solving occur in the everyday context of a child's life. Teachers can use the child's social, cognitive, movement, and emotional experiences to facilitate problem solving and promote strategies useful in the lifelong process of learning. Problem solving involves both creative and critical thinking.

Creative thinking is the heart of problem solving. It is the ability to see a different way to do something, generate new ideas, and use materials in new ways. Central to creative thinking is the willingness to take risks, to experiment, and even to make a mistake. It also includes "fluent" thinking, which is the ability to generate or brainstorm ideas for example imagining all the different ways to get to school, or naming all the things which are red in color. These are good examples of thinking problems that have many right answers. The ability to think fluently has a high correlation to school success later on. Another part of creative thinking is "flexible"

thinking, which is the ability to see many possibilities or to view objects or situations in different ways.

Critical, or logical, thinking is the ability to break an idea into its parts and analyze them. The math skills of sorting and classifying, comparing similarities and differences, are all parts of critical thinking. For example, different ways to sort out blocks by a child, different ways of building a house with blocks.

By exploring social relationships, manipulating objects, and interacting with people, children are able to formulate ideas, try these ideas out, and accept or reject what they learn. Constructing knowledge by making mistakes is part of the natural process of problem solving. Through exploring, then experimenting, trying out a hypothesis, and finally, solving problems, children make learning personal and meaningful. Piaget states that children understand only what they discover or invent themselves (1963). It is this discovery within the problem solving process that is the vehicle for children's learning.

Children should be encouraged to construct their own knowledge when the teacher plans for problem solving; bases the framework for learning in problem solving; and provides time, space, and materials. As opposed to preoperational children, children in the concrete operations stage (7to11 years) are able to take into account another person’s point of view and consider more than one perspective simultaneously, with their thought process being more logical, flexible, and organized than in early childhood. They can also represent transformations as well as static situations. Although they can understand concrete problems, Piaget argues that they

cannot yet contemplate or solve abstract problems, and that they are not yet able to consider all of the logically possible outcomes. Children at this stage would have the ability to pass conservation (numerical), classification, seriation, and spatial reasoning tasks. Persons who reach the formal operation (11 years to adolescence) are capable of thinking logically and abstractly. They can also reason theoretically. Piaget considered this the ultimate stage of development, and stated that although the children would still have to revise their knowledge base, their way of thinking was as powerful as it would get.

Information processing theory provides a framework for the study of problem solving and learning disabilities (Flavell 1977). Information processing is a method by which information is analyzed and synthesized in sequential steps (Neisser, 1976). Information processes involved in problem solving are attention, memory, concept organization, memory, language, and social cognition. These information-processing abilities have been reported to be impaired in children with developmental disabilities like learning disability, ADHD, autism, hearing impaired, etc.

ASSESSMENT OF COGNITIVE LINGUISTIC SKILLS IN CHILDREN:

Cognitive linguistics skills in children in Indian context are not widely explored. There few tests available in western contexts. One test which is assesses the cognitive linguistic skills in adults is Cognitive linguistic assessment protocol for adults Kamath.A (2001)

TESTS AVAILABLE TO ASSESS THE COGNITIVE LINGUISTIC SKILLS IN CHILDREN:

Stanford- Binet test or Stanford – Binet intelligence scale (Binet and Simon 1905)

Bayley scales of infant development (Bayley 1969)

Griffith's mental development scales (Griffiths 1954)

The Weschler intelligence scale for children (Weschler 1949)

The Weschler preschool and primary scale intelligence scale (Weschler 1968)

Reynell- Zinkin scales, part 1 mental development (Reynell, 1979)

The Kaufman Assessment Battery for children (Kaufman & Kaufman 1983)

Cognitive abilities test (CAT) (Robert L; Thorndike & Elizabeth Hagen 1978)

Cognitive linguistic improvement program (Ross-Swain, 1992)

Most of these tests concentrate on one or few cognitive linguistic domain, or test the global cognitive or global linguistic domains. Norms of these are restricted to western population. Not much substantial work is done in Indian context. Therefore considering the above notes the aim of the present study was to develop an assessment protocol to assess the cognitive linguistic abilities in Kannada speaking children.

CHAPTER 3

METHOD

Aim:

The aim of the study was to construct a cognitive linguistic assessment protocol for children.

Material:

As this study aimed to construct a cognitive linguistic assessment protocol for children (4to8 years), the review constituted a vital part and the first step of the study.

Item pooling:

A review about the cognitive linguistic developmental trends observed in children, the different cognitive linguistic assessment tools used by different authors to study disordered population, different assessment formats/protocols, and journal articles and web based search was employed. All these items pooled from literature were classified under different domains Viz. attention/discrimination, memory, problem solving.

Subjects:

Normal children within the age range of 4 years to 8 years were taken up for the study. The subjects were further divided into four subgroups viz., 4 years to 5 years, 5 to 6 years, 6 to 7 years, and 7 to 8 years. Equal number of males and females were considered in all the subgroups. Subjects were sub grouped as given in the table:

Table -1, Demographic data of subjects sampled

SL NO	AGE (In years)	NO. OF MALES	NO. OF FEMALES
1	4-5	3	3
2	5-6	3	3
3	6-7	3	3
4	7-8	3	3

CRITERIA FOR SELECTION OF SUBJECTS:

The following criterion was considered for selection of subjects:

1) The subjects should be able to speak, read and write Kannada.
2) The subjects should not have any significant deficit in hearing sensitivity for speech, and should have normal/ corrected vision.
3) The subjects should be physically fit during the testing period.

PROCEDURE:

The method included three phases:

PHASE I:

This phase included developing an assessment protocol. The cognitive processes most often employed in linguistic communicative tasks were considered for the protocol. This was done based on the nature of cognitive communicative tasks used by various authors in studying the different disorders. Thus Best's (1999), original list consisting of memory, organization of knowledge, language, reasoning, problem solving, the following were taken up as the core cognitive abilities which support language development.

The domains included were as follows:

1) Attention/discrimination
2) Memory
3) Problem solving.

The testing was done on both the sensory modalities i.e. auditory and the visual modality as both these sensory modalities differ in several fundamental ways. Auditory signals tend to be more transient, in contrast the visual stimuli may have

relatively greater permanence. It has also been found that the relative dominance for these modalities differ in children. The whole set of items in all the domains were arranged in a hierarchy from simple to complex in five levels. These hierarchies were structured based on the opinion of the clinical psychologist and were subjected to judgment by a panel of speech language pathologists.

PHASE II:

Following the development of the protocol, a pilot study was undertaken in which this protocol was administered on normal Kannada speaking children with in the age range of 4 years to 8 years. This age range was further divided into subgroups as shown in the table above. Equal number of males and females wee selected for the study.

The subjects selected were taken from the normal schools in Mysore. All the children had Kannada as their mother tongue. They were seated comfortably and were tested in a room with minimum external noise. The testing was carried out in one session, and it took 45 minutes to administer the whole protocol and the child's responses were scored.

SCORING:

Every correct response was given a score of "1" and every wrong response was given a score of "0".The total scores for the each domain were as tabulated below in the table: Table-2:- The total scores of each task under each domain

SL NO	**AUDITORY MODE**	SCORE	**VISUAL MODE**	SCORE
I	***ATTENTION/DISCRIMINATION***			
a)	Digit count test	5	Odd one out test	5
b)	Sound count test	5	Letter cancellation	5
c)	Auditory word discrimination	10	Visual-word discrimination	10
	TOTAL SCORE	20		20
II	***MEMORY***			
a)	Digit forward span	5	Alternate sequence	5
b)	Word recall	5	Picture counting	5
c)	Digit backward span	5	Story sequencing	5
	TOTAL SCORE	15		15
III	***PROBLEM SOLVING***			
a)	Predicting the outcome	10	Association task	5
b)	Predicting the cause	10	Overlapping test	5
c)	Compare and contrast	10	Mazes	5
	TOTAL SCORE	30		15

DOMAIN -I

ATTENTION / DISCRIMINATION:

Two types of attention processes were evaluated, viz., selective attention and sustained attention. The cognitive process of discrimination is contingent on attention and therefore is considered in the same domain.

AUDITORY MODE:

Digit count test:

This task was selected to evaluate the sustained attention. The child had to listen to the set of digits presented auditory and had to count mentally how many times the target digit was read out in the list. The number of units in each level was arranged in such an order that the complexity of the task increased as there was a transition from level I to level V.

Sound count test:

Sustained attention was evaluated in this task as the child had to listen to the set of phonemes presented auditorily and had to count mentally how many times the target phoneme was read out in the list. The number of units in each level was arranged in such an order that the complexity of the task increased as there was a transition from level I to level V.

Auditory word discrimination:

This subtest was incorporated in an attempt to evaluate the discrimination skills in children for the auditory stimulus presented i.e.bisyillabic words. As discrimination is highly dependent on attention this sub test has been included in the same domain of attention. This subtest included the child's ability to discriminate among a pair of word presented auditorly by the examiner (same / different). This is predominantly discrimination task.

VISUAL MODE:

Odd one out test:

This subtest required the child to scan through the visual array of the stimulus and to point to the odd/different stimulus among the set of 4 to 5 pictures presented through flash cards. This task of selecting the odd one out was considered as a task requiring sustained attention. The complexity of the stimulus increases as the presentation proceeds from level I to level V. Each level consisted of three different presentations of the stimulus cards and two correct responses out of the three presented stimuli was considered as the correct response and was scored as "1". Therefore a criterion of two correct responses from the three presented stimuli was set and was scored as 1 or 0 accordingly.

Letter cancellation

A simple letter cancellation task, in which a specified letter of alphabet appeared repeatedly within a random matrix, requires sustained attention in scanning the page and marking each instance of the letter. For that reason cancellation of all the stipulated letters was considered a task requiring sustained attention. The higher levels included the contingent letter cancellation and this task required the fulfillment of the pre requisite contingency before cancellation of the letter. This task was used to evaluate the selective attention. Further as the test level progressed color was added as distracter in contingency letter cancellation task.

Visual word discrimination:

This subtest was included to evaluate the visual discrimination skills in children for the visually presented bisyillabic word pairs. Discrimination deals with the ability to differentiate between stimuli. Attention plays an important role in discrimination. Hence tasks involving discrimination are often employed in testing attentional skills. As discrimination is highly dependent on attention this sub test has been included in the same domain of attention. This subtest included the child's ability to discriminate among ten pair of words presented visually by the examiner (same / different).

DOMAIN II:

MEMORY:

Memory involves the ability to store, recall and process information. Different subtests used to assess memory are:

AUDITORY MODE:

Digit forward span:

Digit span is a common measure of short-term memory, i.e. the number of digits a person can absorb and recall in correct serial order after hearing them or seeing them. As is usual in short-term memory tasks, here the person has to remember a small amount of information for a relatively short time, and the order of recall is important. This sub test involved repeating the set of digits presented auditorly by the clinician. The levels were arranged in hierarchy that is the first level of stimulus presentation consisted of three digits and the second level had four digits and so on till seven digits at level five.

Word recall:

This subtest includes the child to repeat the words presented by the clinician in the same sequence. This subtest also involves the same hierarchical arrangement as mentioned above that is the word were arrange in order of three words to seven words

in each presentation level. The children were asked to repeat the words presented in each level. The numbers of words repeated were noted and a score of “1” was given if they repeated all the words in that level. And score of “0” was given for each incorrect response.

Digit backward span:

This subtest included that subject to repeat back the backward sequence of the digit sequence presented by the examiner. The backward sequence of the digits plays an important role in this test. A score of “1” for the correct sequence and a score of “0” was given for each incorrect sequence.

VISUAL MODE:

Simple alternate sequence:

A sequence or a pattern of items was presented to the child with one blank and the child was asked to fill the gap. The complexity of the task was further increased by adding color as distracter. This subtest also included the child’s attentional and memory skills to fill the gaps. Every correct response was scored “1” and incorrect response was scored as “0”.

Picture counting:

In this task a series of pictures were visually presented and the child had to name all the pictures presented after the stimulus was removed from the visual field by the examiner. The number of items recalled by the child tells about the visual memory

span of the child. As children differ in the modality of learning i.e. visual or auditory, this task would further help the clinician to identify the dominant modality of learning used by the child.

Story sequencing:

This task involves the child to arrange the story cards in a sequence as per the story. Five stories were selected and the children were asked to arrange the story cards as per the story sequence. For the unknown stories the examiner would narrate the story to the child and then ask to arrange the story cards. This task was selected to evaluate the short term memory. A score of "1" for every correct response and a score of "0" was given for every incorrect answer.

DOMAIN III:

PROBLEM SOLVING:

AUDITORY MODE:

Predicting outcome:

Problem solving involves understanding the problem, generating possible solutions, overcoming possible obstacles, and evaluating alternatives. Problem solving is the foundation of a young child's learning. This task involves the child to reason out the situation and to tell the possible outcomes of the situation for example:

"What will you do if you miss your school auto?" the possible answer can be the child saying that I will go with daddy to school or will take another auto.

Thus a score of "1" will be awarded for any relevant or near to relevant answer otherwise a score of "0" will be given for any irrelevant answers. This subtest included a total of ten questions arranged in a hypothetical order from simple to complex situation. Further after the administration of the protocol based on the responses of children from 4 to 8 years the sequence was altered.

Predicting the cause:

This task involves the child to predict the possible cause for the situation given by the clinician. For example,

"You friend does not talk to you, why?" and the possible answer for this can be the child saying that he/she had a fight with him or I hurted my friend that's why he stopped talking to me."

Thus a score of "1" will be awarded for any relevant or near to relevant answer otherwise a score of "0" will be given for any irrelevant answers. This subtest included a total of ten questions arranged in a hypothetical order from simple to complex situation. Further after the administration of the protocol based on the responses of children from 4 to 8 years the sequence was altered, which would be discussed in phase three of the method.

Compare and contrast:

This subtest included the child to compare and contrast between two items presented for example: “dog and cat”. This task thus involves the child’s **Critical, or logical, thinking**, that is ability to break an idea into its parts and analyze them. Thus a score of “1” will be awarded for any relevant or near to relevant answer otherwise a score of “0” will be given for any irrelevant answers. This subtest included a total of ten word pairs arranged in a hypothetical order from simple to complex situation. However the sequence was altered after administering the protocol (phase III).

VISUAL MODE:

Association task:

This task required the child to scan through the picture array and select the most associated items from the picture array. The complexity of the task was increased further by increasing the number of associated items with in the array. Thus this task involves the child’s creative and logical thinking and reasoning and reaching the solution. This task consisted of five levels. And a score of “1” for correct and a score of “0” for each incorrect answer was given.

Overlapping task:

This test also involves the child to look at the picture card in which different pictures overlap and the child has to solve the overlap and has to name the pictures depicted in

the picture card. This subtest also consisted of five levels arranged in hierarchy. And a score of “1” for correct and a score of “0” for each incorrect answer was given.

Mazes:

This task requires the child to solve the maze and reach the destination point showed by the clinician. Two trials were given before administering the test stimulus so as to make the child familiar with the task. The higher levels involved the child to solve the maze and simultaneously make a word with the letters scattered through out the maze. The word made would depict the stimulus at the final point for example: “cat”. A score of “1” for correct and a score of “0” for incorrect response was given. The child was given proper instructions before starting the test.

Analysis:

The scores obtained after the administering of the protocol were totaled for each of the subjects taken for each domain across all the age groups.

The mean scores of the children across the age groups were compared and tabulated. In addition the change in the development of the cognitive linguistic skills across different age groups was represented graphically.

PHASE III:

The items selected in phase two were modified and the hierarchy was altered according to the results of the developmental trends observed. The most answered levels were shifted to the first levels and the least responded levels were shifted as higher levels.

CHAPTER 4
RESULTS AND DISSCUSSION

The aim of the study was to develop a cognitive linguistic assessment protocol that would help to identify the cognitive linguistic milestones, to aid in assessment, identification and diagnosis of cognitive linguistic disabilities and to allow intervention based on a developmental schedule. A protocol was developed specific to the present study in order to study the emergence of cognitive linguistic abilities in normal developing children across age range of 4 to 8 years. Twenty four children grouped into four subgroups were administered the test protocol and the cognitive linguistic abilities were compared across age.

The data obtained was appropriately tabulated and was subjected to qualitative and quantitative analysis. At the outset a descriptive analysis of the performance of all the subjects on each task in all the domains was done. The tasks in each domain were arranged in a pecking order such that with every presentation the complexity of the task increased. Therefore to analysis the levels suitable for a particular age group a criteria was set, such that all the subjects or greater than or equal to 50% of subjects should pass on that particular level, thus indicating that the level is suitable for that age group. In view of that, the performance of all the subjects on each task in each domain was evaluated.

The results are discussed under the following headings:-

1. The performance of children from different age groups on each domain.

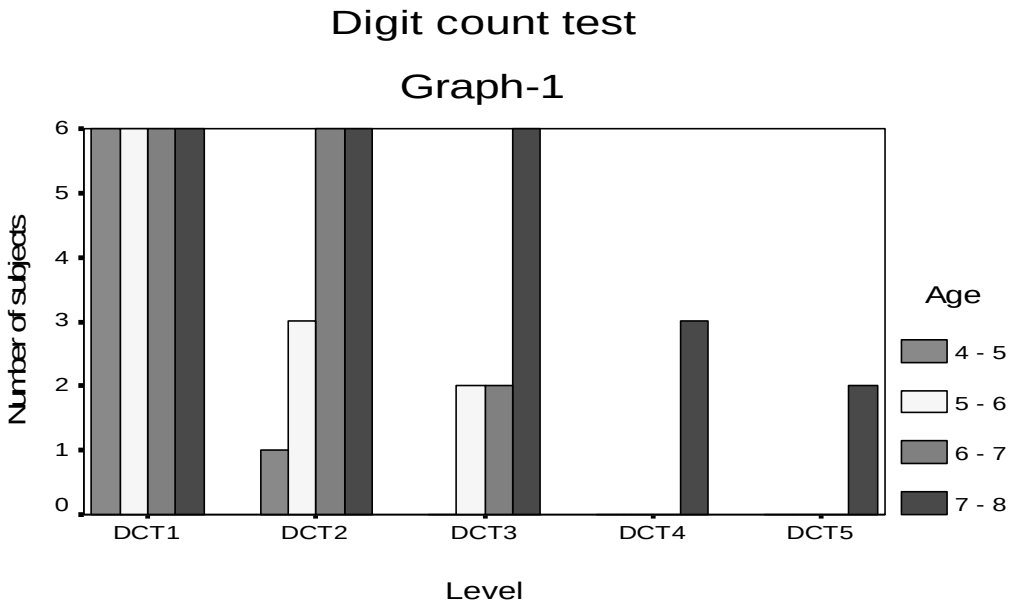
2. The performance of children from different age groups across domains.

I. ATTETTION/ DISCRIMINATION:

Bearing in the mind the discrimination is contingent on attention, the tasks involving the discrimination abilities were considered in the same domain. The performance of subjects on each task was graphically represented.

AUDITORY MODE:

Digit count test:

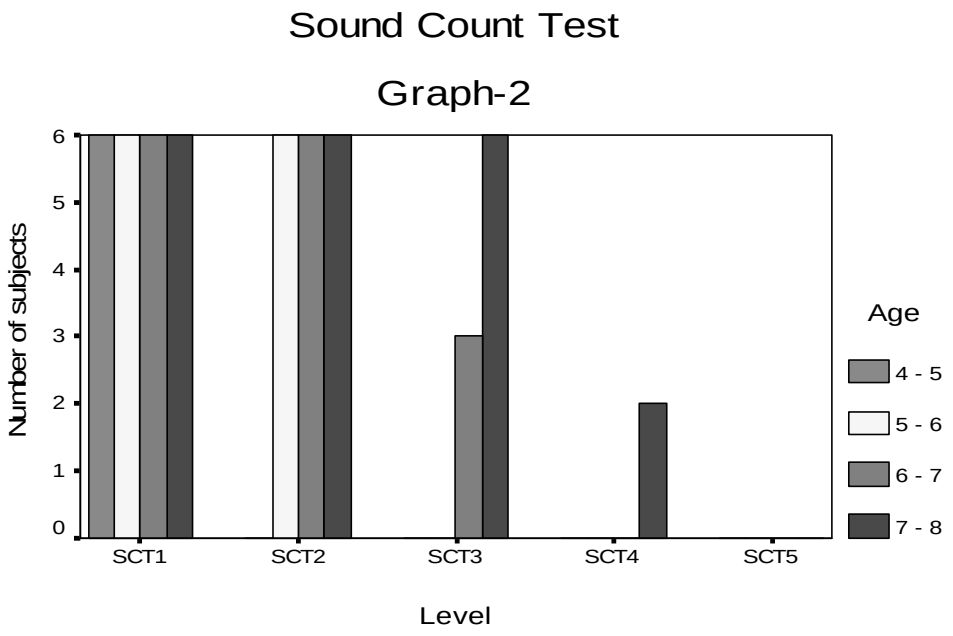


Graph-1, Performance of the subjects from all the four age groups across all the five levels of the task.

As is evident from the graph all the four groups were able to satisfy the level-I of digit count test (DCT-1). However there is a difference observed across different age groups as the complexity of the task increased. As can be seen the first group (4-5 yrs) performance declined as the level advanced from level-I to level-V with none of

the subjects from this age range performing from DCT-3 to DCT-5. Nonetheless few subjects from the 4-5 yrs did perform on DCT-2 but did not meet the criteria set. In contrast the levels attained by the older age groups advanced in steps. 50% of subjects from the fourth group (7-8 yrs) were able to attain the level V of the task. The present findings on the task digit count test reveal that the attentional abilities of children improve as a function of age.

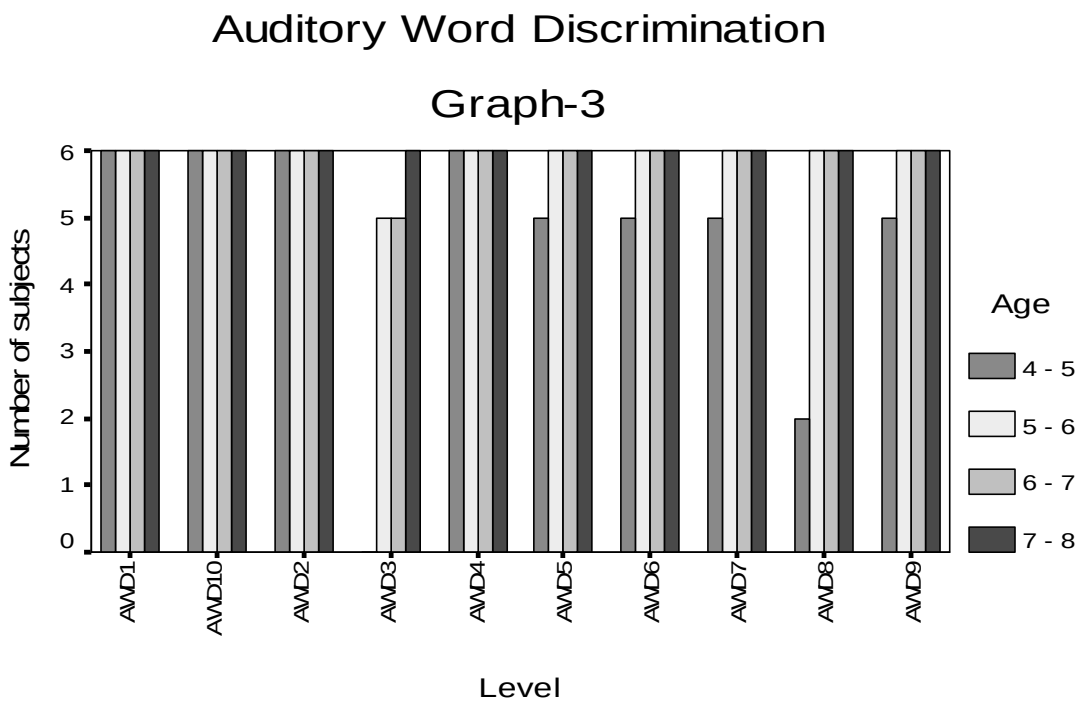
Sound count test:



The graph-2 above represents the total number of subjects from each age group responding across each increasing level of complexity. As is suggested from the graph, all the four groups were able to accomplish the level-I of sound count test and as the levels advanced it was found that there is a change in the number of subjects performing the tasks. As is evident from the graph level-II of SCT was attained by all the three groups expect for the first group (4-5yrs). Conversely it was seen that there

was deterioration in the number of subjects performing on the higher levels. The results of this task are also akin to the results of digit count test.

Auditory word discrimination:

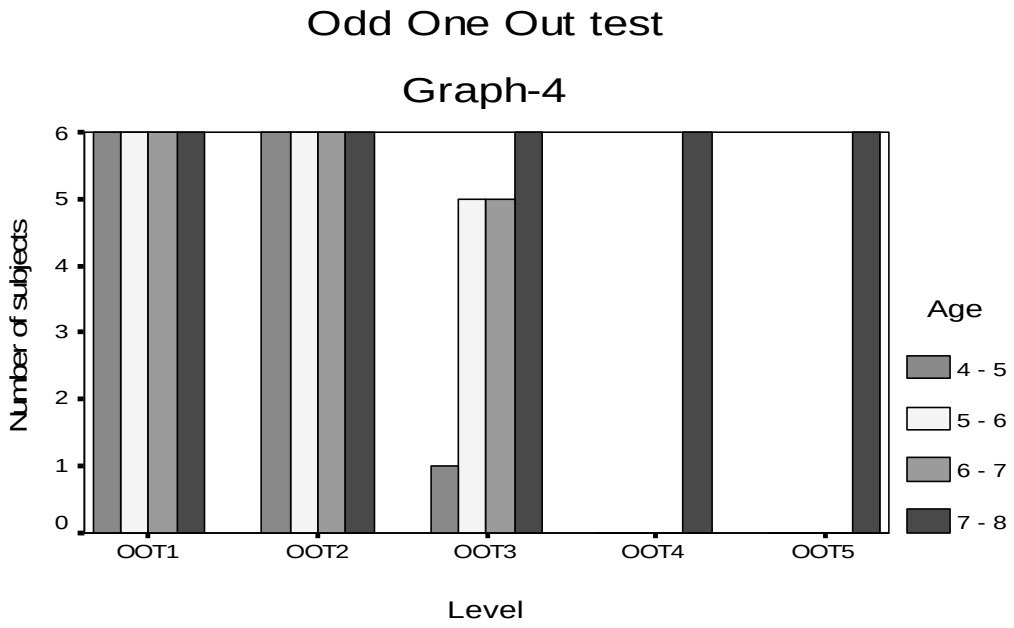


Graph-3, Performance of subjects on auditory word discrimination.

In this task ten word pairs were used to assess the auditory discrimination abilities of children. The complexity of the words was hypothetically arranged. Further after the administering of the test on all the age groups, this word list was modified. It can be seen from the graph-3, that the older children were able to discriminate all the word pairs. In contrast the younger subjects (4-5yrs) there was a difference in performance observed. As is apparent from the graph the performance of these children on AWD-3& AWD-8 did not meet the criteria (>50% or =50%). Henceforth after the administration of the protocol these items were shifted to the last levels in the list. However for all the other items the subjects could meet the criteria.

VISUAL MODE:

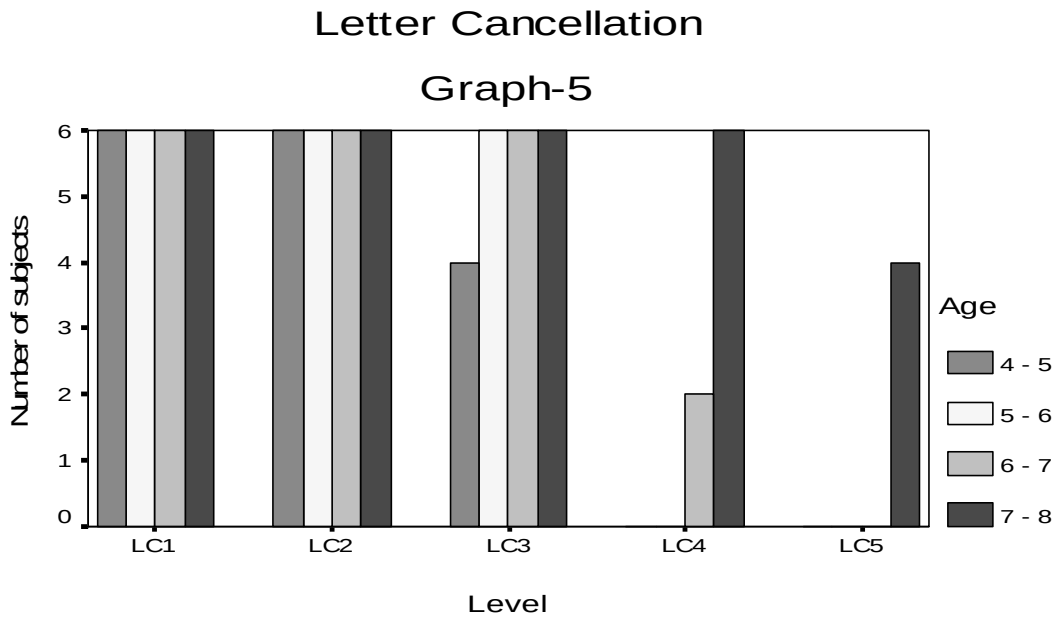
Odd one out test:



Graph-4 performance of subjects on odd one out task

In this task it was found that the first two levels (OOT-1, OOT-2) of the task were attained by all the age four groups. However, drop in the number of subjects performing on the higher tasks was observed as the levels advanced from I to V. it is clearly seen that only 7-8 years old children were able to perform on level-III to level-V.

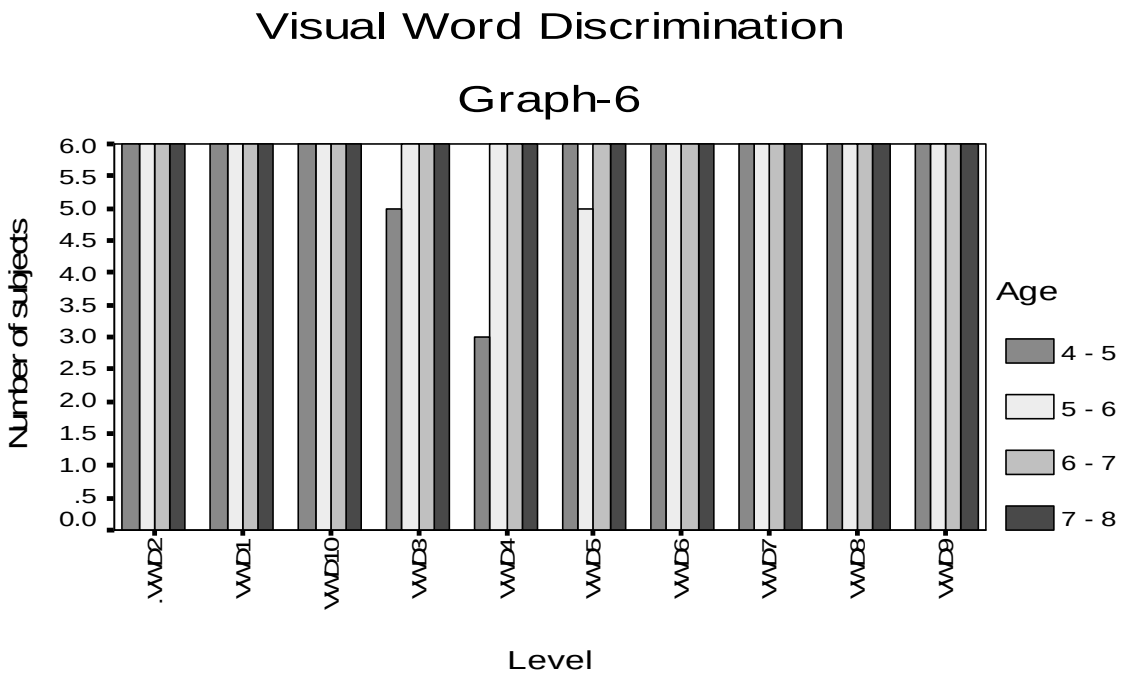
Letter cancellation:



Graph-5 performance of number of subjects on letter cancellation task.

A similar trend was observed in letter cancellation task also. All the four groups met the criteria for the first three levels, following which it was found that only the 7-8 years old could reach the criteria for the higher levels. Thus as the intricacy of the task increased the performance of children degraded.

Visual word discrimination:



In the visual word discrimination task also the performance of all the subjects was better on all the word pairs. Yet it can be seen from the graph that the first age group that is 4-5 years old could not meet the criteria for the word pair VWD-4 and hence this was shifted to the end of the list.

In elaboration, the present findings suggest that the attentional skills develop as a function of age. It is also evident from the results that 100% of children from the first age group that is 4-5 years old were able to achieve the level I of all the tasks used to assess attention. Nonetheless it was found that as the density of the tasks increased the performance trimmed down. It can be suggested that the higher levels involved required greater selective or sustained attention span. And thus as the age increases the attention span of the children also increases which is very well evident from the result.

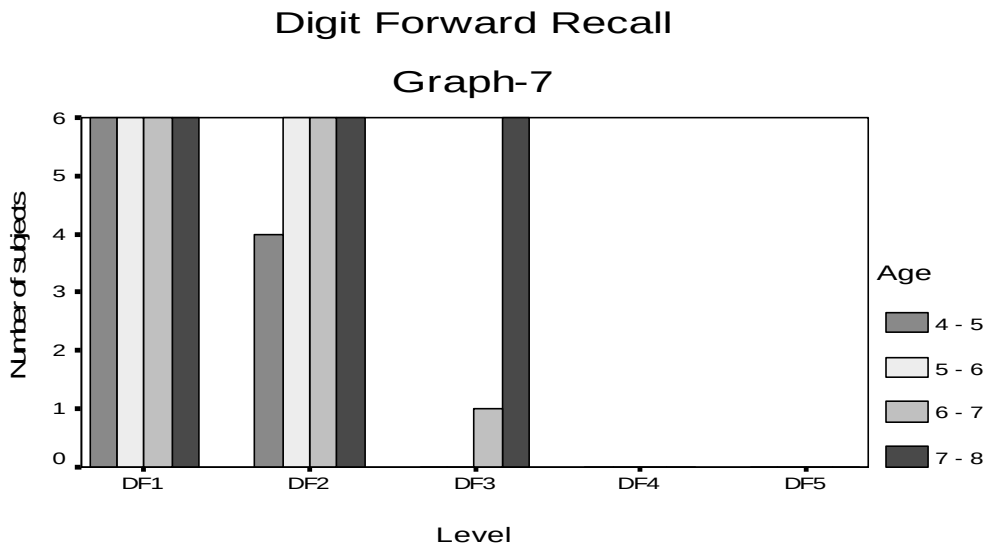
There appears to be considerable overlap in the acquisition of the attentional abilities by children in the current study and one conducted by Wright and Vlietstra (1975) although they differ in the chronological manifestations. According to them as children grow they tend to direct attention towards recognized goal at around the age of six years. Likewise in the present study also it has been found that the performance of children above six years improved on all the tasks as a function of age. These results are also in agreement with a number of theories proposed to describe the development of attention (Pick 1975). According to Pick (1975) and Neisser (1976) the processing of global characteristics to more specific attributes occurs with development. Thus in sum the attentional skills develop as the function of age and thus it is very important for a speech language pathologist to be cognizant of these developmental trends. This would further help in identifying, assessing and also in intervention of attentional deficits in children with language disorder.

II. MEMORY:

The performance of the number of subjects on each of the task involved to assess memory was compared for each task across all the levels.

Auditory mode:

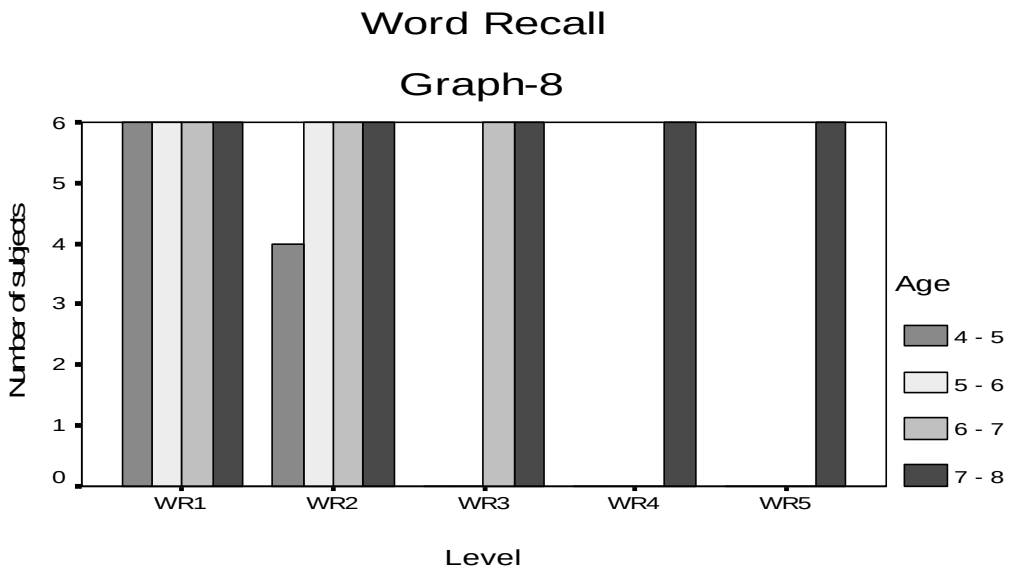
Digit forward recall:



Graph-7 performance of subjects on digit forward span

The graph-7 illustrates the performance of number of subjects on each level of complexity for digit forward recall task. It is evident from the figure that the performance of each age group varied across each level. All the subjects from all the four groups were able to attain the first level of the task. However as the levels advanced the performance declined from level-I to level-II. Only children from 7-8years old were able to attain the level-III. But they also could not attain the higher levels. In contrast the younger children could not reach the level-III thus indicating that the number items recalled improves as the age increases.

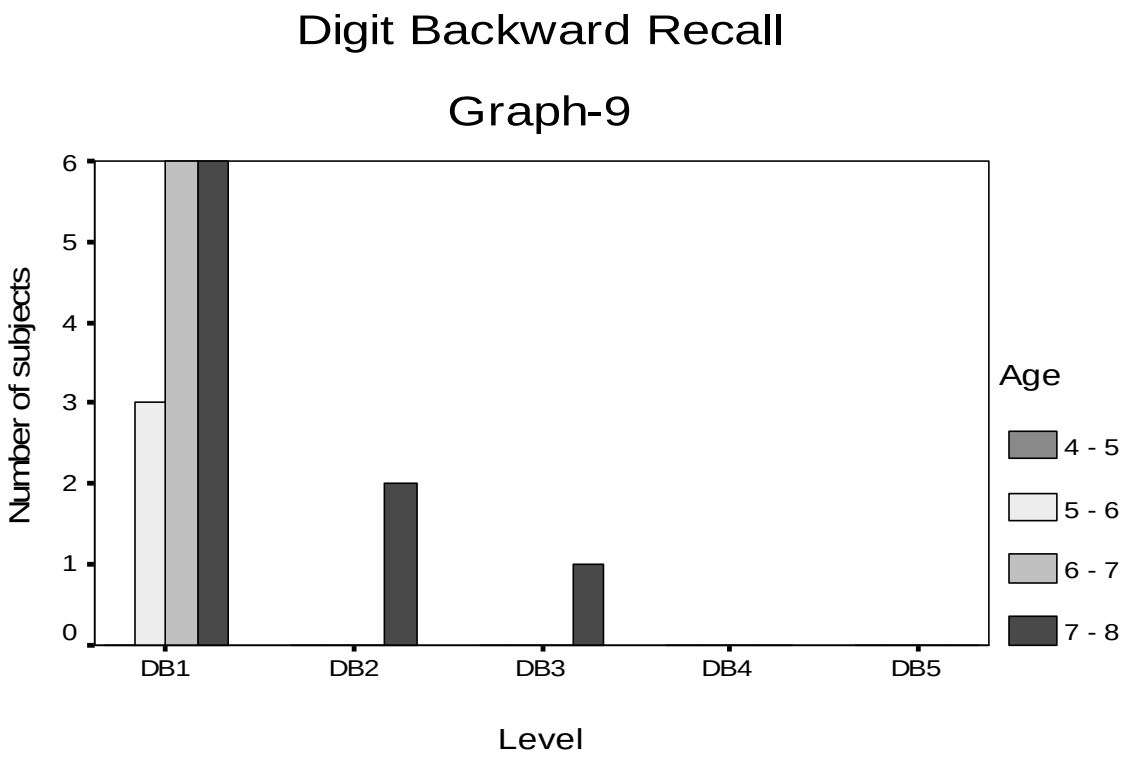
Word recall:



Graph- 8 performance of subjects on word recall

Similarly for the word recall task also it was found that all age groups were able to recall the words at the level-I, but gradually as the number of units increased with each level the performance degraded. Nevertheless only 6-7years& 7-8 years old were able to achieve level-V. The younger age groups were able to recall only till the second level. It was found that as the number of units/words increased the children could not recall the words.

Digit backward recall:

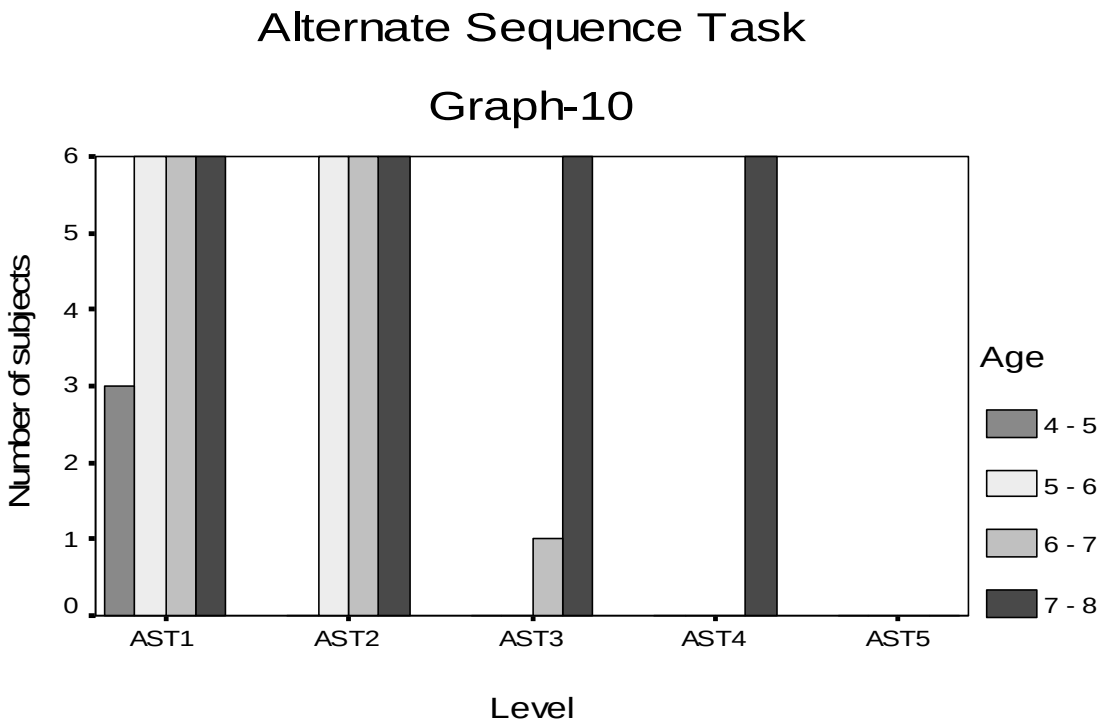


Graph-9 performance of subjects on digit backward span.

In digit back ward recall the overall performance to recall the digits in the reverse sequence was poorer. The subjects were able to recall the digits only in the first level. Though the older children repeated the digits in the level-II and level-III they did not meet the criteria. It can be suggested from these results that the digit backward recall entail higher cognitive skills which improve which an increment in age.

VISUAL MODE:

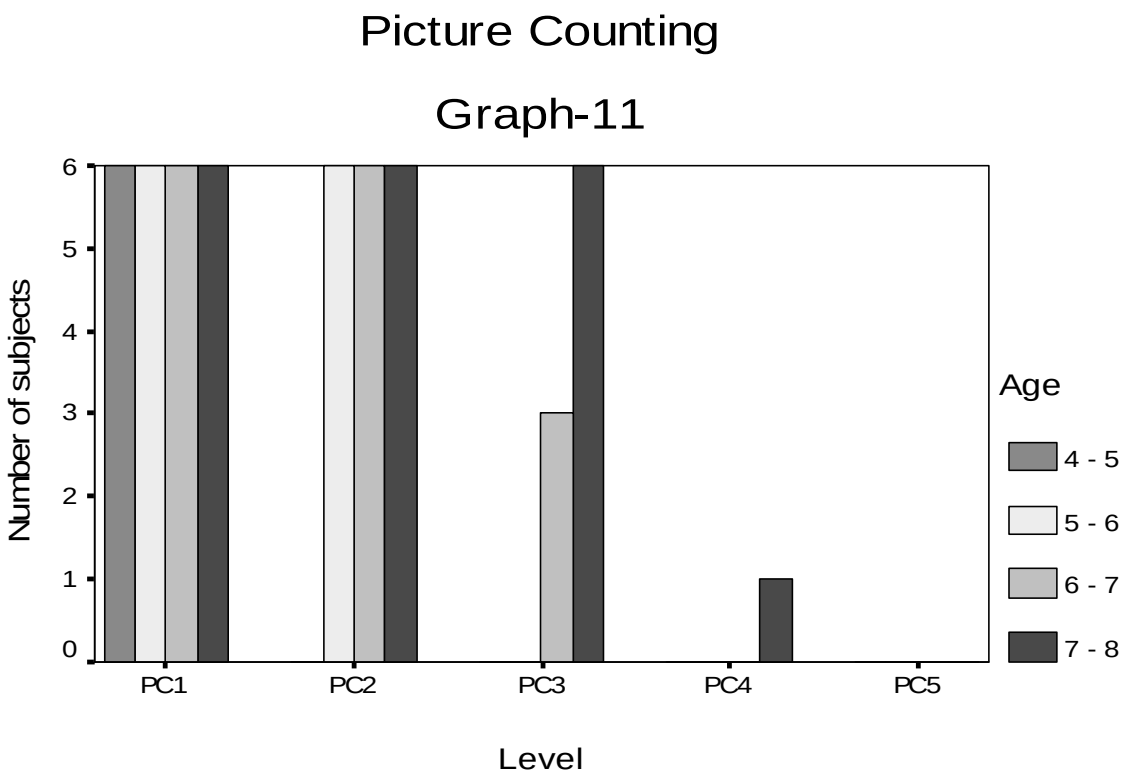
Alternate sequence task:



Graph- 10 performance of subjects on alternate sequence task

This task shows developmental trend as it can be seen from the graphs that at all the children were able to accomplish level-I. Level-II was attained only by children from 5-8years of age. Further as the complexity increased only the older children were able to reach level-IV. However none of the groups reached till level-V.

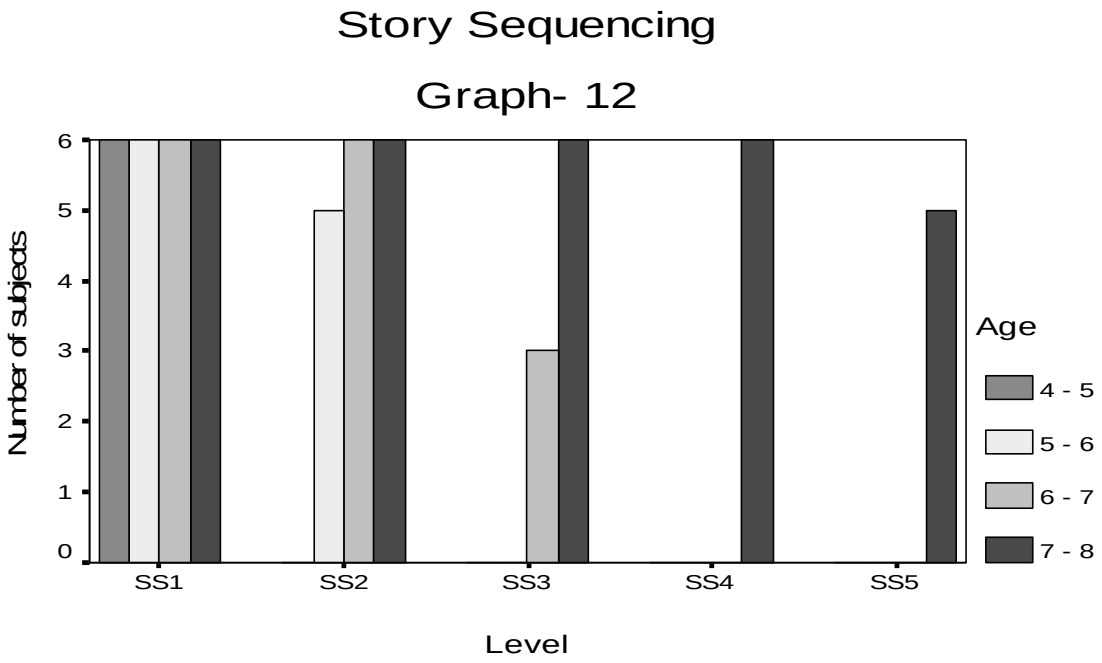
Picture counting:



Graph-11 performance of subjects on picture counting.

The results of picture counting task reveal that the ability to recall the visually presented stimuli improves as the age increase. As the age range increased there was an enhancement in the ability to recall the pictures till level-III. In addition it was also found from the results that there not much of difference in the performance of children from 5-6years and 6-7years old. As is illustrated from the graph these groups do not depict much difference. One possible explanation could be that this age range 5-7 years plays a vital role in language development and it is at this age that children start associating things and so there tends to be better recall due to semantic associations made as a function of vocabulary development.

Story sequencing:



Graph-12 performance of subjects on story sequencing task

Likewise the results of story sequencing task unveil that the ability to retain the story and to arrange the sequence improves as the child grows older. As the age increased it was found that the children were able to sequence the story till the level-V. On the other hand the performance of the younger children worsened as the length of the story increased.

Given this information from the tasks it can be suggested that memory plays an important role in the language development. A systematic increase in chronological age also escorts an increase in memory span. These results are also supported by number of studies done to assess memory span in children (Brown 1973, Brown and Fraser 1963). One information from this study is that the digit span improved with an increment in the age. This finding is in concordance with the Miller

(1956) who also found that the digit span increases as the age increases. According to him the average score for four year old is about 4 items whereas for nine year old it is 6 items and for adults about 7 items. A similar trend was also observed in the current study. The number of items recalled by children improved from 3- 7 units as a function of age with minimum units recall being 3 units by 4-5 years old and 5 units by 7-8 years old.

Another information which can be ensued from the result is the use of the rehearsal strategies by the older children. It has been established by the researchers that there appears to be a developmental difference in the rehearsal strategies used by the children. It was seen that the younger children were able to recall only 3 units and the recall span depreciated as the number of units increased. On the other hand it was noticed that as the age increased the children performed better. One explanation for the relatively good performance of children from older groups can be in the support of the research findings on the rehearsal strategies (Ornstein, Naus, Liberty 1975). It has been established that as children grow older there appears to be an enhancement in the recalling strategies used by them to recall. The younger subjects tend to recall the first item of the list presented recently (Primacy effect) and the older subjects tend to use cumulative rehearsal strategies (sub vocal rehearsal, chunking, mnemonics etc.) which in turn results in integrated units and a better recall. This could be a possible reason for the better performance of older children in the current study.

The results also throw light on the inter relation ship of attention and memory. As can be accomplished from the results of the higher level tasks involve the role of attention to recall the longer strings of digits or words and

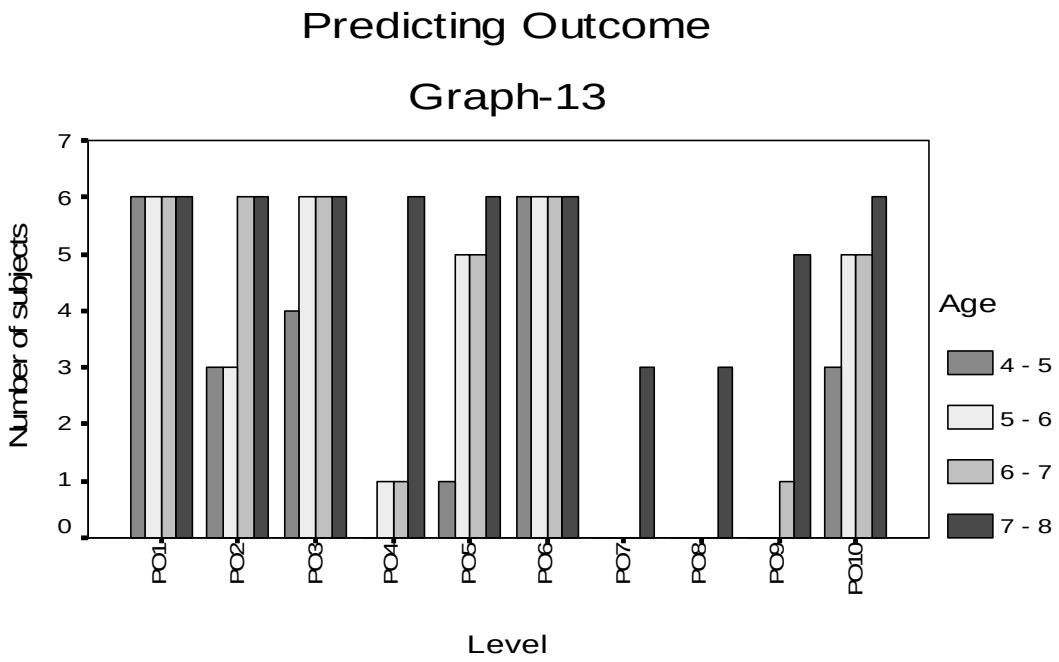
thus development of attention also parallels the development of memory. Therefore these cognitive skills appear to be inter dependent on each other.

It can also be encapsulated from the results on memory task that memory plays an important role in language acquisition. It can be suggested that as the child develops, he is exposed to a rich linguistic environment resulting in improved vocabulary development. Researches have tried to establish a relationship between memory abilities and vocabulary development (Gathercole, Willis, Emslie, & Baddeley, 1992; Service 1992), language comprehension (Mann, Shankweiler&Smith, 1984), and reading (Crain, Shankweilar, Macaruso, &Barshalom, 1990). The memory abilities also tend to be associated with the speech rate according to Hulme (1984). He found that the speech rate increased as the memory span increases. In contrast Gathercole & Adams, 1993 suggest that there is no positive correlation between speech rate and the memory span in children below seven years of age. On the other hand Hitch, Halliday, Dodd, and Littler (1989), reported that STM for spoken material was sensitive to word length in children aged 4 years and upward. Likewise in the current study also it was found that as the length of the items increased the children's recall span reduced thus suggesting that it requires higher chronological age to recall a longer string of words or digits. Hence the recall of longer or complex sentences also involves the individual to store more amount of stimulus in the memory and then to retrieve it back. Thus it can be suggested that memory plays an important role in language development and thus improving the memory skills of children would further enhance the language development.

III. PROBLEM SOLVING:

Auditory mode:

Predicting the out come:

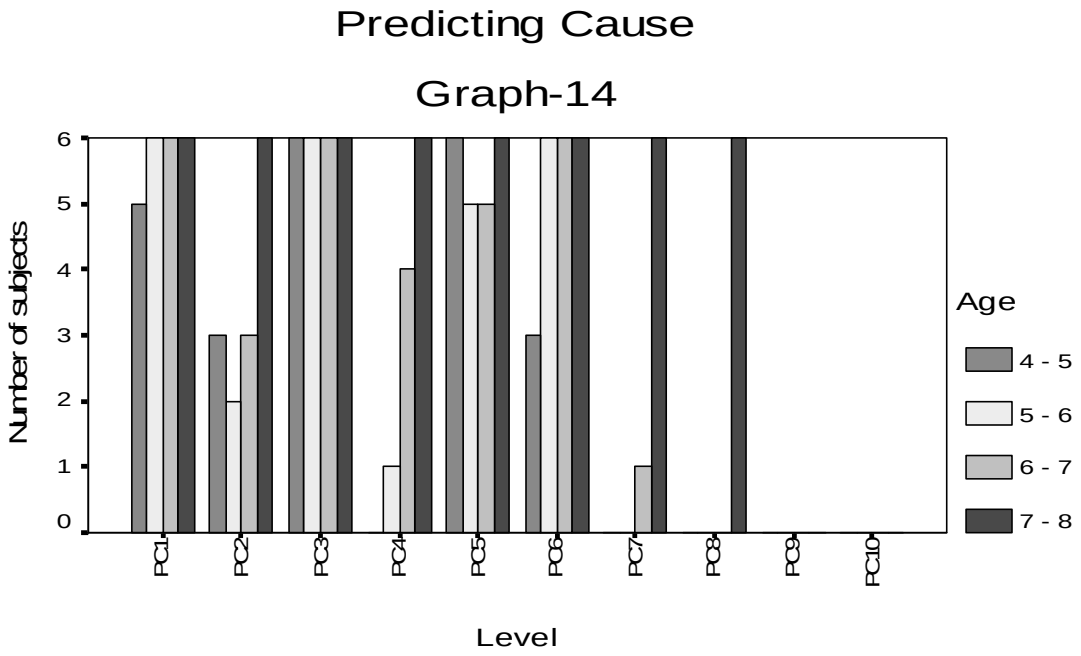


Graph-13 performance of subjects on predicting outcome task.

Predicting the out come task involved the child to think logically and creatively so as to arrive at an outcome for the situation given by the clinician. As is apparent from the graph-13 not all the items were achieved by all the age groups. There was a marked variation in performance of the older children from that of the younger children. The number of items responded correctly were considered in the initial position of the list and the one which were difficult to answer were considered to be the higher level. This modification of the list was done subsequently to the administration of the protocol to all the age groups. The final list consisted of the following sequence of the items: PO1, PO6, PO3, PO10, PO2, PO10, PO4, PO9, PO7,

PO8.The children from 7-8 years were able to attain all the levels of the task. However the performance for the other group differed.

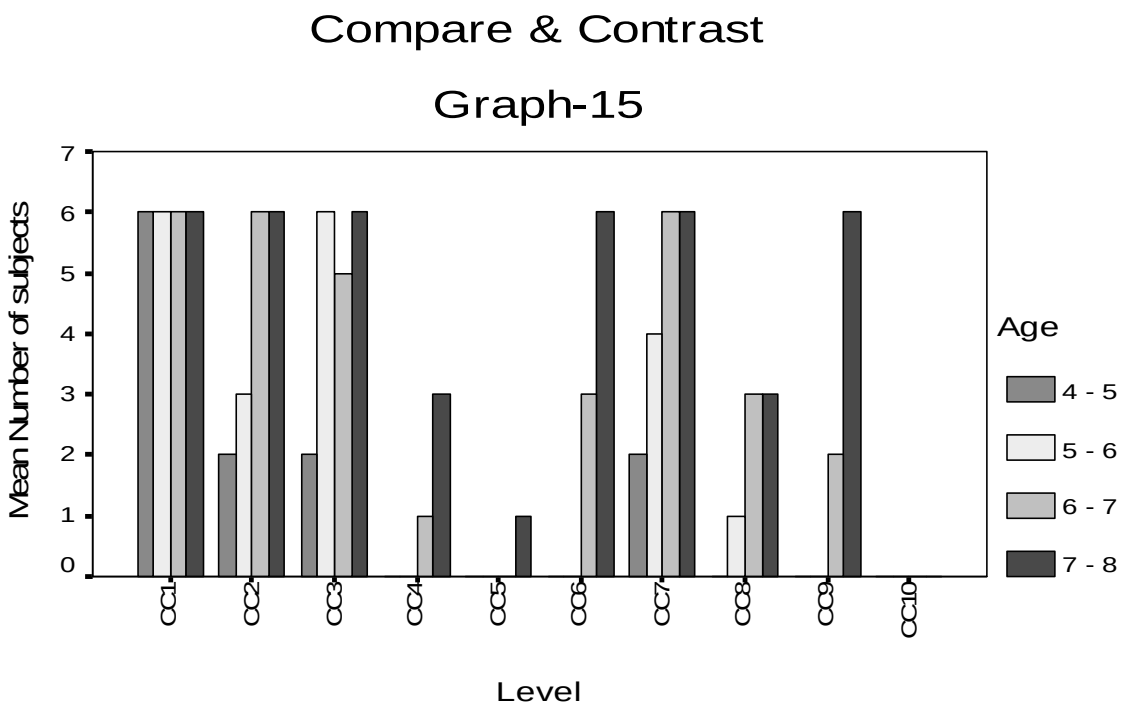
Predicting cause:



Graph-14 performance of subjects on Predicting the cause

Similarly for this task also it was found that the performance of children varied across the items. The items were then arranged in hierarchy accordingly after the test administration to all the age groups. However, it was found that none of the children were able to answer for the last two items, Viz., PO-9, and PO-10. This list was altered subsequent to the administration of test on all the participants and the final sequence of the items was as follows: PC3, PC1, PC5, PC6, PC2, PC4, PC7, PC8, PC9, PC10.

Compare and contrast:

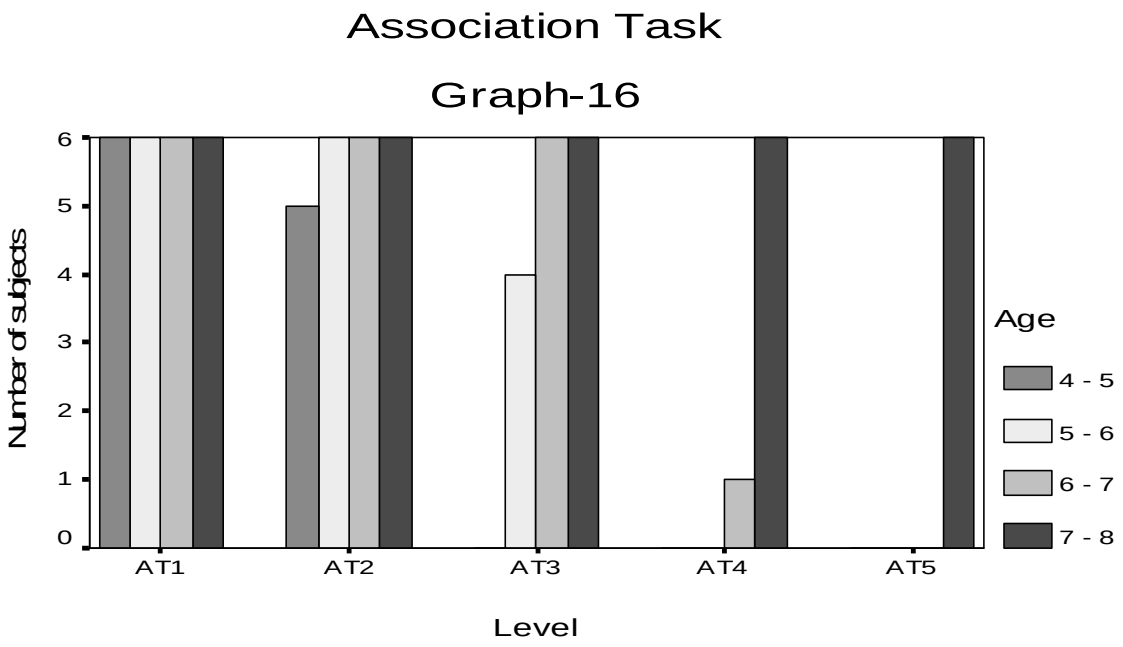


Graph-15 performance of subjects on compare and contrast.

The results of this task also revealed that as the age increases the problem solving abilities would further improve as a function of age. The results reveal that the as the complexity of items involved increased the subjects performed poorer. Only the children from 7-8 years old were able to compare and contrast the nine items of the list. On the other hand the other age groups did not respond to all the items. Thus indicating that problem solving abilities increase as a function of age.

Visual mode:

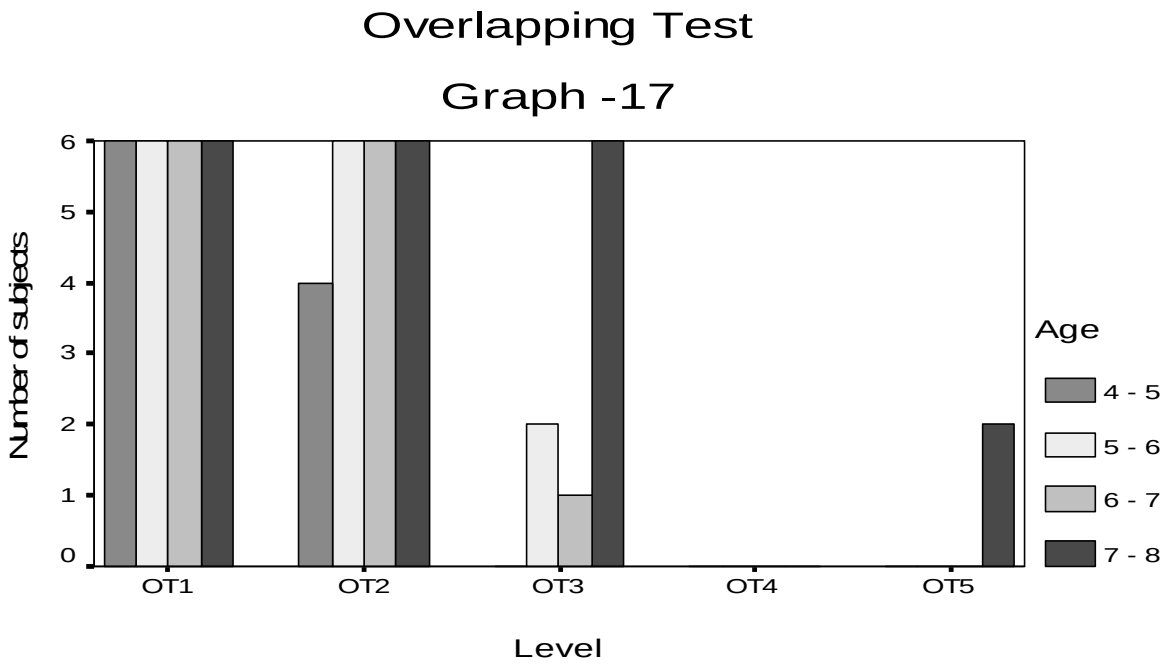
Association task:



Graph-16 performance of subjects on association task

The results of association task reveal that the ability to associate the visually presented stimuli improves as the age increase. As the age range increased there was an enhancement in the ability to associate two or more than two from a picture array till level-III. As is illustrated from the graph the older age group 7-8yrs were able to associate the pictures till level-V. However the younger age groups could not attain the higher levels.

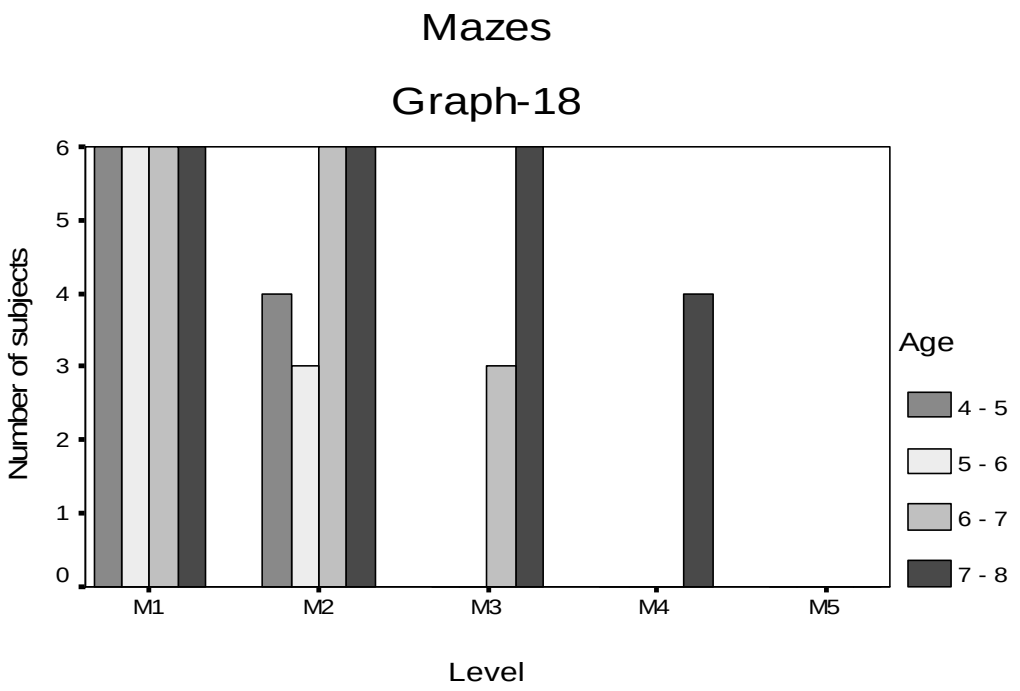
Overlapping test:



Graph-17 performance of subjects on overlapping test.

As can be seen from the graph- 17 all the age group were able to visually identify the overlapping stimuli for the level-I and also for level-II but however as the complexity of the overlap increased it was found that the performance of the younger age groups declined. As is indicated from the graph the children could respond to the OT-4 and hence this was shifted to the last item in the test as per the hierarchy based on the responses obtained. Thus indicating that this ability to visually solve the problem improves as the child gets older.

Mazes:



Graph-18 performance of subjects on mazes.

The figure above illustrates the performance number of subjects on the different levels of the task across the age range. As is evident from the graph the children from 7-8 were able to perform well till the level-IV of the task. In contrast the children from 4-7 years were able to perform only till the level –II of the task. These children were not able to attain the higher levels involving higher problem solving skills or higher cognitive skills.

In essence the results of this domain reveal that the problem solving abilities involving the reasoning, thinking, etc., are attained as a child grows older. The environment to which the child is exposed also plays an important role in the acquisition of these skills. It is very well established that these problem solving

abilities also aid in language development. This inturn would result in better scholastic performance.

Comparison across age groups using one way ANOVA:

In the second stage of analysis one way ANOVA was performed to find out the differences between age groups.

Table-3:- the mean and the standard deviation scores of subjects across age range for all the domains.

Domains	Age(In Years)	Mean	Standard Deviation.
ATTENTION	4-5 Yrs	24.3333	.8165
	5-6 Yrs	31.0000	3.5214
	6-7 Yrs	30.6667	.8165
	7-8 Yrs	37.0000	1.5492
MEMORY	4-5 Yrs	5.6667	.8165
	5-6 Yrs	10.0000	.8944
	6-7 Yrs	11.0000	1.2649
	7-8 Yrs	19.5000	1.3784
PROBLEM SOLVING	4-5 Yrs	15.1667	1.8348
	5-6 Yrs	19.1667	1.4720
	6-7 Yrs	23.3333	.8165
	7-8 Yrs	36.5000	1.3784

The table-3 shows the mean and the standard deviation of the raw scores of the subjects across age range on all the domains. It can be encapsulated from the table that the performance of the subjects improved as the age range increased from 4-5yrs to 7-8 yrs old across all the domains.

In the next stage Duncan's post hoc test was done to see the pair wise difference within each domain.

Attention:

A statistically significant difference was observed at 0.001 level {F (3, 20) =39.821, p< 0.001}.

However there was no significant difference between 5-6 years old and 6-7 years old but the other age groups did show a significant difference.

Memory:

In this domain also there was a statistically significant difference at 0.001 level {F (3, 20) =161.913, p<0.001}. It was observed that there is a significant difference between all the three groups for this domain, thus indicating that the memory skills follow the developmental continuum.

Problem solving:

A statistically significant difference was found for this domain also, at0.001 level {F (3, 20) =254.067, p<0.001}. It can be suggested from these results that there is a difference in the development of these skills as the age advances. Thus it can be interpreted that the cognitive linguistic skills improve in a developmental continuum.

In essence the results of the study suggest that the as the child grows older, there appears to be developmental pattern observed in the cognitive linguistic process like, attention, memory, problem solving. Thus these cognitive linguistic skills also aid in the language acquisition. The obtained results, with respect to the acquisition of cognitive linguistic skills, would be helpful in assessing the cognitive linguistic disabilities in children with language disorders. In this perspective, the present study serves as a preliminary or screening tool to assess the cognitive linguistic impairments in children. In addition the skills enlist a developmental order which would help the speech language pathologist to frame appropriate goal for the intervention of children with cognitive linguistic impairment.

CHAPTER 5

SUMMARY AND CONCLUSION

The cognitive approach to language development gives impetus to multifaceted research on the cognitive prerequisites of language and also to the universality of children's cognitive experience leading to universality in their coding and meaning. There exists a intricate relationship between language and cognition. Therefore it becomes very important for a speech language pathologist to understand this relationship and also be knowledgeable about the cognitive linguistic development in children. Assessment of cognitive linguistic abilities becomes very crucial to identify these deficits and to plan for intervention.

Assessment of cognitive linguistic abilities in children is far from complete. There are not many studies available on cognitive linguistic skills in Indian context. Though plenty of research is available in western context, there are hardly any studies in our subcontinent. Hence this study was of its kind to explore the cognitive linguistic abilities in children in an Indian context.

The aim of the study was to develop a protocol for cognitive linguistic assessment which would help to identify the sequential cognitive linguistic milestones; help in identification and diagnosis of cognitive linguistic disabilities in children and allow intervention based on the developmental schedule. In the first phase, different cognitive domains and tasks were pooled from various studies and also based on the discussion/advice of a clinical psychologist. Thus a protocol with three different domains Viz., attention/discrimination, memory, problem solving was developed.

The items/tasks within each domain were arranged in a hierarchy such that the complexity of the task increased as the presentation of the levels advanced from level-I to level-II. Each domain was assessed in both the auditory and visual modality. After the development of the protocol it was administered across 24 normal developing children from four to eight years of age with Kannada as their mother tongue. Each correct response was scored as '1' and each incorrect response was scored as '0'.

The cognitive linguistic skill of children across different age range was evaluated. The data was tabulated appropriately. Statistical analysis was performed on SPSS (version 10.0) statistical package. The results indicated that the scores in each domain increased linearly with increase in age, thereby indicating a developmental trend.

One-way ANOVA was performed to explore the difference between age groups and also within domain. To explore the difference within each domain Duncan's post hoc test was done to see the pair wise difference. The results indicated that there was no significant difference between children from 5-6 years and 6-7years old in attention. However significant difference between all the age groups was found for the memory and problem solving domains.

The results of this study reveal several points of interest. It was found that the development of cognitive linguistic skills in children tested on this assessment tool follows a developmental trend. The results also suggested that as the complexity of the stimulus advanced there was a decline in the performance of the children. However it was found that as the age increased the performance on the higher levels

was superior. Thus the results indicated that the cognitive linguistic skills follow a developmental continuum.

The third phase of the protocol involved the alteration and modification of the stimulus material based on the responses obtained from the children from four age groups. The mastery of a level or task was explored with criteria of 50 percent or above 50 percent of subjects responding on that level.

The outcome of the study is the development protocol focusing on the chronological emergence of cognitive linguistic skills that can be standardized and thus can be used across a wide variety of clinical population particularly developmental language disorders, thereby aiding in diagnosis and intervention. It can also be used for screening purposes.

LIMITATIONS OF THE STUDY:

1. Small sample size
2. Limited numbers of domains were selected.

SUGGESTION FOR FURTHER RESEARCH:

1. The protocol can be standardized on a large population.
2. Different regional and cultural populations can be compared.
3. Comparison across different clinical population can be done.
4. Age based norms can be developed on large population.
5. Standardization across different clinical populations can be done.
6. The protocol can be used to assess and identify the cognitive linguistic deficits if any in normal children.

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APEENDIX-I

COGNITIVE LINGUISTIC ASSESSMENT PROTOCOL FOR CHILDREN

DOMAIN-I

ATTENTION/DICRIMINATION:

AUDITORY MODE:

1) Digit count test:

Instructions: "I am going to present you some digits in a sequence, you have to listen carefully to them and tell me the number of times you hear the digit "9". Listen carefully!

"ನಾನು ಕೆಲವು ಸಂಖೆಗಳನ್ನು ಹೇಳುತ್ತೇನೆ, ನೀವು ಅವುಗಳಲ್ಲಿ

ಎಶ್ಟಬಾರಿ ಒಂಬತ್ತು ಸಂಖೆಯನ್ನು ಕೀಳುವಿರಿ ಎಂದು ಲೆಕ್ಕ ಹಾಕಿ ಹೇಳಿ."

Level-I *2, 9, 5,* 6,

Level-II 21, 19, 9, 10, 7, 9.

Level-Ill 4, ba, 3, 9, da, tu, 9, di, 6.

Level-IV 9, 19, 29, 9, 15, 69, 8, 9, 7

Level-V 21, 9, 65, 99, 3, 9, 89, 9, 12, 90

2) Sound count test:

Instructions: "I am going to present you some sounds in a sequence, you have to listen carefully to them and tell me the number of times you hear the sound "ba". Listen carefully!

"ನಾನು ಕೆಲವು ಅಕ್ಷರಗಳನ್ನು ಹೇಳುತ್ತೇನೆ, ನೀವು ಅವುಗಳಲ್ಲಿ ಎಶ್ಟಬಾರಿ

'ಬ' ಅಕ್ಷರವನ್ನು ಕೇಳುವಿರಿ ಎಂದು ಲೆಕ್ಕ ಹಾಕಿ ಹೇಳಿ."

Level-I ಮು, ಬ, ಟ

Level-II ಸ, ಲ, ಬ, ರ, ಸ

Level-III ಬ, ಜ, ಲ, ಬ, ಪ, ಬ, ಹ

Level-IV ಟ, ಕ, ಪ, ಪ, ಬ, ನ, ಲ, ರ, ಸ

Level-V ನ, ಟ, ಪ, ಬ, ಹ, ನ, ಬ, ಚೆ, ಲ

3) Auditory word discrimination:

Instructions: "I am going to present you few word pairs you have to listen carefully and tell me if the words in the word pair are same or different"

"ನಾನು ಎರಡು ಸಮಾನವಾಗಿ ಕೇಳಿಸುವ ಶಬ್ದಗಳನ್ನು

ಹೇಳುತ್ತೇನೆ, ನೀವು ಆ ಶಬ್ದಗಳು ಒಂದೇ ರೀತಿಯಾಗಿ ಕೇಳಿಸುತ್ತದೆಯಾ ಹೇಳಿ."

ಓದು–ಊದು

ಇಲಿ–ಇಲಿ

ಹಲ್ಲಿ–ಹಳ್ಳಿ

ಕಾಲು–ಕಾಲು

ಇಲಿ–ಇಳಿ

ಓದು–ಓದು

ಕಾಲು–ಕಾರು

ಬೀಗ–ಬೀಗ

ಬೀಗ–ಬೀಜ

ಹಲ್ಲಿ–ಹಲ್ಲಿ

VISUAL MODE:

1) ***Odd*** *one* ***out*** *test:*

Instructions: "I am will be showing you some set of pictures you have tell me which one of those is a odd one or which one of it is different"

"ನಾನು ಎರಡು ಸಮಾನವಾಗಿ ಇರುವ ಎರಡು ಶಬ್ದಗಳನ್ನು ತೋರಿಸುತ್ತೇನೆ, ಅವು ಸಮಾನವಗಿದೆಯಾ ಅಥವ ಬೇರೆ ಬೇರೆಯಾಗಿದೆಯಾ ಎಂದು ಹೇಳಿ."

NOTE: SEE APPENDIX II FOR ODD ONE OUT TEST

Level-I L-Ia, L-Ib, L-Ic

Level-II L-IIa, L-IIb, L-IIc

Level-Ill L-IIIa, L-IIIb, L-IIIc

Level-IV L-IVa, L-IVb, L-IVc

Level-V L-Va, L-Vb, L-Vc

Letter cancellation:

Instructions: "I will show some letters from each sequence of letters you have to point out to the letter 'i' from that sequence."

"ಇಲ್ಲಿ ಕೊಟ್ಟಿರುವ ಪದಗಳಿಂದ ಇ ಎಂಬ ಪದವನ್ನು ಪ್ರತಿ

ಗೆರೆಯಲೆಲ್ಲಿದೆಯೆಂದು ತೋರಿಸಿ."

Instructions at Level-IV: "now you have to show every red colored 'i' from the sequence.

"ಈಗ ನೀನು ಕೇವಲ ಕೆಂಪು ಬಣ್ಣದಲ್ಲಿ ಬರೆದಿರುವ 'ಇ' ಶಬ್ದವನ್ನು

ತೋರಿಸು."

Instructions at Level -V: "now you have to show every red 'i' preceding every red color "ka".

"ಈಗ ನೀನು ಕೇವಲ ಕೆಂಪು ಬಣ್ಣದಲ್ಲಿ ಬರೆದಿರುವ 'ಇ' ಯಾವುದು

ಕೆಂಪು ಬಣ್ಣದಲ್ಲಿ ಬರೆದಿರುವ 'ಕ' ಮುಂಚೆ ಬಂದರೆ ತೋರಿಸು."

Level-I ಮ ಓ ಎ ಲ ವ ಯ ಮ ವ ಕ ಲ ಸ ಆ

Level-II ಡ ಹ ತ ಗ ಫ ಎ ಶ ಲ ಝು ಇ ಕ ನ

Level-III ಪ ವ ಚ ಎ ಯ ಎ ಟ ಲ ಎ ವ ಬ ಶ

Level–IV ಸ ಳ ಲ ಸ ಬ ಇ ಕ ಫ ರ ಝು ಎ ಕ ತ ಹ

Level-V ಳ ಲ ಇ ಕ ಅ ಯ ರ ಕ ಇ ಕ್ಷ ಯ ಇ ಕ ಗ ಸ ಬ ರ ಇ ಟ ಲ

2) Visual word discrimination:

Instructions: "I am going to show you some word pairs; you have to tell me if these word pairs appear same or different to you"

"ನಾನು ಎರಡು ಸಮಾನವಾಗಿ ಇರುವ ಎರಡು ಶಬ್ದಗಳನ್ನು

ತೋರಿಸುತ್ತೇನೆ, ಅವು ಸಮಾನವಗಿದೆಯಾ ಅಥವ ಬೇರೆ ಬೇರೆಯಾಗಿದೆಯಾ ಎಂದು ಹೇಳಿ."

ದಣಿ–ಧಣಿ

ಕಸ–ಕಸ

ಹಣ–ಹಟ

ನೀನು–ನೀವು

ರಾಶಿ–ರಾಶಿ

ಆಗಸ–ಅಗಲ

ದಾರ–ದಾರ

ಮನ–ಮನ

ಮರ–ಮಠ

ಕಸ–ಕಸ

Level-II ಪೇಪರ್, ಕಾರ್ಡ್, ಪೆನ್ನು, ರಬ್ಬರ್

Level-III ಮರ, ಬಂಡೆ, ಮೊಳೆ, ನೀರು, ಕುರ್ಚಿ

Level- IV ಗಂಟೆ, ವಾಚು, ಚಮಚ, ಸೋಪು, ಮನೆ, ಹಾಲು

Level- V ಹೂವು, ಬ್ರಷ್ಷು, ಸೋಪು, ಕೀ, ಬಾಚಣಿಗೆ, ನಾಯಿ, ಕಾರು

3) Digit Backward:

Instructions: "I am going to present you a sequence of digits you have repeat back in a reverse order"

"ನಾನು ಕೆಲವು ಸಂಖ್ಯೆಗಳನ್ನು ಹೇಳುತ್ತೇನೆ,ನೀವು ಅದನ್ನು ಕೊನೆಯಿಂದ ಮೊದಲಿಗೆ ಹೆಳ್ಬೇಕು."

Level-I 2 - 5 - 7

Level-II 9 - 7 - 1 - 8

Level-III 5 - 4 - 1 - 6 - 9

Level-IV 8 - 3 - 4 - 9 - 7 - 6

Level-V 4 - 2 - 7 - 9 - 3 - 6 - 2

VISUAL MODE:

1) Simple alternate sequencing:

Instructions: "I will be showing you some pictures/ shapes you have to tell what will come next in the blank"

"ನಾನು ಕೆಲವು ಚಿತ್ರಗಳನ್ನು ತೋರಿಸ್ತೇನೆ, ನೀವು ಬಿಟ್ಟ ಚಿತ್ರವನ್ನು

ಹೆಳ್ಬೇಕು."

NOTE:SEE APPENDIX II FOR ALTERNATE SEQUENCING TASK:

Level-I L-I

Level-II L-II

Level-Ill L-III

Level-IV L-IV

Level-V L-V

2) Picture counting:

Instructions: "I am going to show you some pictures in sequence, after I remove them you have to recall and name them back"

"ನಾನು ಕೆಲವು ಚಿತ್ರಗಳನ್ನು ತೋರಿಸ್ತೇನೆ ಆಮೇಲೆ ಅವುಗಳನ್ನು

ತೆಗೆದಮೇಲೆ ನೀವು ಯಾವುದೆಲ್ಲ ಚಿತ್ರಗಳನ್ನು ನೋಡಿದಿರಿಯೆಂದು ಹೆಳ್ಬೇಕು."

NOTE: SEE APPPENDIX II- PICTURE COUNTING

Level-I	LEVEL-I,	la, Ib, Ic
Level-II	LEVEL-II	la, la, Ic, Id
Level-Ill	LEVEL-III	la, la, Ic, Id, Ie
Level-IV	LEVEL-IV	la, la, Ic, Id, Ie, If
Level-V	LEVEL-V	la, la, Ic, Id, Ie, If, Ig

3) Story sequencing:

Instructions: "I am going to show you some story pictures, these cards are all jumbled you have to arrange these cards according to the story."

If the child is not aware of the story the examiner can narrate the short story to him and then ask the child to arrange the cards.

"ನಾನು ಕೆಲವು ಕಥೆಗಳ ಚಿತ್ರಗಳನ್ನು ತೋರಿಸುತ್ತೆನೆ, ಅವು ಒಂದೇ ಸರಣಿಯಲ್ಲಿ ಇಲ್ಲ, ಅದನ್ನು ನೀನು ಕಥೆಯಲ್ಲಿದ್ದ ಹಾಗೆ ಇಡಬೇಕು."

NOTE: SEE APPENDIX II STORY SEQUENCING

Level-I	L-Ia,L-Ib, L-IIc, L-IId,
Level-II	L-IIa, L-IIb,L-IIc, L-IId,
Level-Ill	L-IIIa, L-IIIb, LIIIc, L-IIId, L-IIIe
Level-IV	L-IVa, L-IVb, L-IVc, L-IVd,L-IVe
Level-V	L-Va, L-Vb, L-Vc, L-Vd, L-Ve,L-Vf

DOMAIN-III

PROBLEM SOLVING:

AUDITORY MODE:

1) Predicting outcome:

Instructions: "what will you do if. . . . . .

"ನೀನು ಯೇನುಮಾಡುವೆ ಒಂದುವೇಳೆ:.....

೧. ನೀನು ನಿನ್ನ ಸ್ಕೂಲ್ ಬ್ಯಾಗನ್ನು ಕೆಳೆದುಕೊಂಡರೆ

೨. ನೀನು ಶಾಲೆ ರಿಕ್ಷವನ್ನು ಮಿಸ್ ಆದ್ರೆ

೩. ನೀನು ಒಂದು ಕೋಣೆಯಲ್ಲಿ ಸಿಕ್ಕಿಬಿದ್ರೆ

೪.ಒಂದುವೇಳೆ ಕರೆಂಟು ಆಕ್ಸಾ ತಾಗಿ ಹೊರಟರೆ

೫. ನೀನು ನಿನ್ನ ಮನೆಯ ಕೀಯನ್ನು ಕೆಳೆದುಕೊಂಡರೆ

೬. ನಿನ್ನ ಟೆಲಿಫೋನು ಕೆಲಸ ಮಾಡದಿದ್ರೆ

೭. ನಿನ್ನ ಮನೆಗೆ ಬೆಂಕಿಬಿದ್ರೆ

೮.ನೀನು ನಿನ್ನ ಪುಸ್ತಕಗಳನ್ನು ಶಾಲೆಯಲ್ಲಿ ಮರೆತರೆ

೯. ನೀನು ಕಾಫಿ ಆಥವಾ ತಿಂಡಿಯನ್ನು ನಿನ್ನ ಬಟ್ಟೆ ಮೇಲೆ ಬೀಳಿಸಿದ್ರೆ

೧೦. ನೀನು ಪರೀಕ್ಷೆಯಲ್ಲಿ ಉತ್ತರ್ಗಳಾನ್ನು ಮರೆತರೆ

2) Predicting the cause:

Instructions: "tell me why……..

"ಯಾಕೆ ಎಂದು ಹೇಳು:.....

೧. ನಿನ್ನ ಗೆಳೆಯ/ಗೆಳತಿ ನಿನ್ನ ಜೊತೆ ಮಾತಾಡಲ್ಲ

೨. ನೀನು ಮಳೆಯಲ್ಲಿ ನೆನಿತಿಯಾ

೩. ನಿನ್ನ ಬಟ್ಟೆ ನಿನಗೆ ಹಾಕಲು ಟೈಟಾಗುತ್ತೆ

೪. ನಿನ್ನ ಗಾಡಿ ಓಡಲು ಶುರುವಾಗಲ್ಲ

೫. ನಿನ್ನ ಗಿಡ ಸತ್ತುಹೋಗುತ್ತೆ

೬. ನಿನ್ನ ಕೀಯಿಂದ ಲೊಕ್ ತೆರಿಯಲು ಆಗಲ್ಲ

೭. ನಿನಗೆ ಬೋರ್ಡ್ ನೋಡ್ಕೊಂಡು ಓದಕ್ಕೆ ಕಶ್ಟ ಆಗುತ್ತೆ

೮. ನಿನ್ನ ಕಾರಿನ ಚಕ್ರ ಚಟ್ಟೆಯಾಗಿದೆ ಮತ್ತೆ ಕಾರು ಮುಂದೆ ಹೋಗಲ್ಲ

೯. ಅಡಿಗೆ ಮನೆ ಹೊಗೆಯಿಂದ ತುಂಬಿದೆ

೧೦.ನಿನಗೆ ಉಸಿರಾಡಲು ಆಗಲ್ಲ

3) Compare and Contrast:

Instructions: "I will tell you two word pairs you have compare and contrast between those both at least by one or two features"

"ನಾನು ಎರಡು ಪದಗಳನ್ನು ಕೊಡುತ್ತೇನೆ, ನೀನು ಈ ಪದಗಳಲ್ಲಿ ಸಮಾನತೆ ಮತ್ತು ವ್ಯತ್ಯಾಸವನ್ನು ಹೇಳ್ಬೇಕು:"

೧. ಬೆಕ್ಕು ಮತ್ತು ನಾಯಿ

೨. ಹಾಲು ಮತ್ತು ಕಾಫಿ

೩. ಗೋಳಿ ಮತ್ತು ಬಾಲು

೪. ಫೊಟೊ ಮತ್ತೆ ಚಲನಚಿತ್ರ

೫. ಅಪಾರ್ಟ್ಮೆಂಟ್ ಮತ್ತು ಮನೆ

೬. ಕೋಣೆ ಮತ್ತು ಮನೆ

೭. ಪೆನ್ಸಿಲ್ ಮತ್ತು ಪೆನ್

೮. ಸ್ಟೊವ್ ಮತ್ತು ಫ್ರಿಡ್ಜ್

೯. ಬಾಲು ಮತ್ತು ಬೆಲೂನು

೧೦. ನ್ಯೂಸ್ ಪೇಪರ್ ಮತ್ತು ಕಥೆ ಪುಸ್ತಕ

VISUAL MODE:

1) Association task:

Instructions: "I am going to show you a picture array from that you have to show me two pictures which are closely associated to each other."

The number of association increases from level-I to level-II.

"ನಾನು ಕೆಲವು ಚಿತ್ರಗಳನ್ನು ತೋರಿಸುತ್ತೇನೆ, ಅವುಗಳಲ್ಲಿ ಹೊಂದಿಸುವ ಚಿತ್ರಗಳನ್ನು ತೋರಿಸ್ಬೇಕು. ಉದಾ: ಕುರ್ಚಿ ಮತ್ತು ಟೇಬಲ್"

NOTE: APPENDIX II FOR ASSOCIATION TASK

Level-I	A.T I
Level-II	A.T II
Level-Ill	A.T III
Level-IV	A.T IV
Level-V	A.T V

2) Overlapping test:

Instructions: "I am going to show you some pictures which are overlapping, you have to identify the pictures and name them"

"ನಾನು ಕೆಲವು ಚಿತ್ರಗಳನ್ನು ತೋರಿಸುತ್ತೇನೆ, ಅವುಗಳು ಒಂದರ ಮೆಲೆ ಒಂದು ಇವೆ ಆದರೆ ನೀನು ಅದರಲ್ಲಿ ಯಾವ ಯಾವ ಚಿತ್ರಗಳು ಇದೆಯೆಂದು ಹೆಳ್ಬೇಕು."

Level-I	OT-I
Level-II	OT-II
Level-Ill	OT-III
Level-IV	OT-IV
Level-V	OT-V

3) Mazes:

Instructions: "I will show you some mazes you have to start from one point and come to the final point with out touching the lines"

" ನನ್ನು ಕೆಲವು ಚಿತ್ರಗಳನ್ನು ತೋರಿಸುತ್ತೇನೆ, ಅವುಗಳಲ್ಲಿ ನೀನು ಒಂದು ಸ್ತಳದಿಂದ ಇನೊಂದು ಸ್ತಳಕ್ಕೆ ಗೆರೆಗಳನ್ನು ಮುಟ್ಟದೆ ತಲುಪಬೇಕು."

At level-IV: "you have to join the letters scattered in the maze and make a word which represents the animal at the end point."

"* ಈ ಚಿತ್ರದಲ್ಲಿ ಹಲವು ಅಕ್ಷರಗಳಿವೆ, ನೀನು ಅವುಗಳನ್ನು ಜೋಡಿಸಿ ಕೆಳಗಿರುವ ಚಿತ್ರವನ್ನು ಹೆಸರಿಸು."

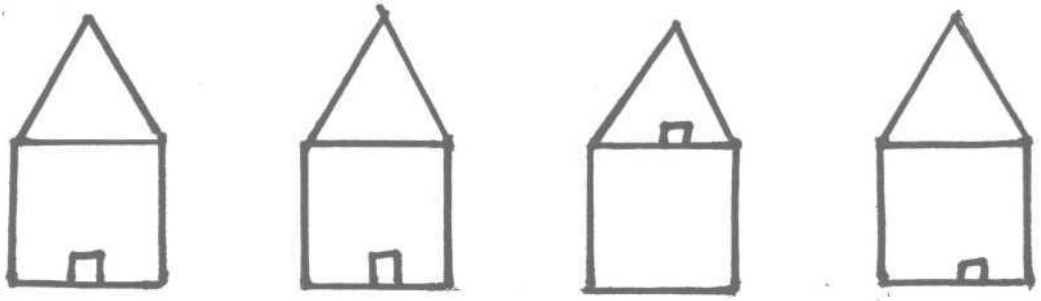
At level-V you have to join the same colored letters scattered in the maze and make a word which represents the animal at the end point.

* ಈ ಚಿತ್ರದಲ್ಲಿ ಹಲವು ಬಣ್ಣದ ಅಕ್ಷರಗಳಿವೆ, ನೀನು ಅವುಗಳನ್ನು ಜೋಡಿಸಿ ಕೆಳಗಿರುವ ಚಿತ್ರವನ್ನು ಹೆಸರಿಸು.

LEVEL-I	M-I
LEVEL-II	M-II
LEVEL-III	M-III
LEVEL-IV	M-IV
LEVEL-V	M-V

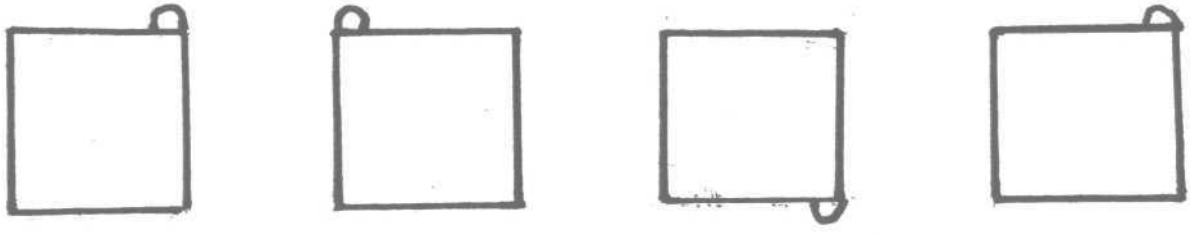
APPENDIX-II

1) ODD ONE OUT:



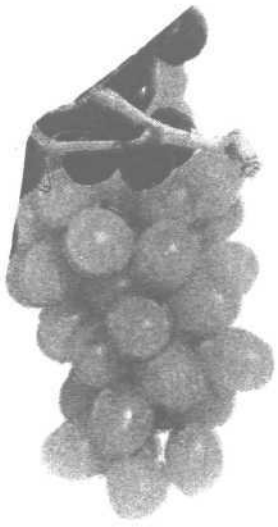
L-Ia

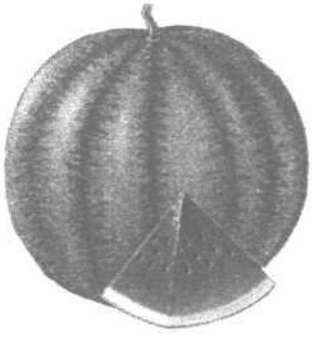
L-Ib



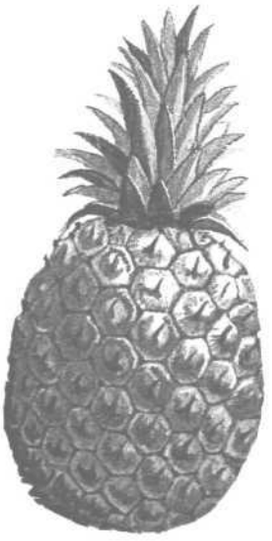
L-Ic

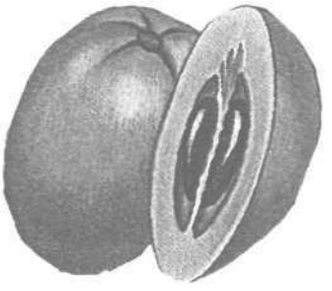
L-II(a)



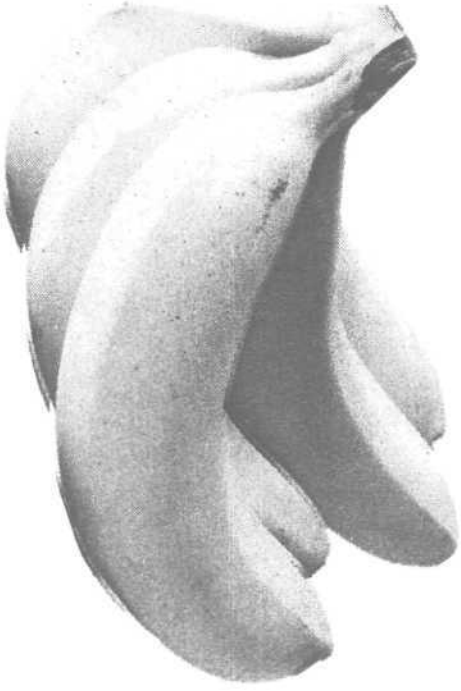


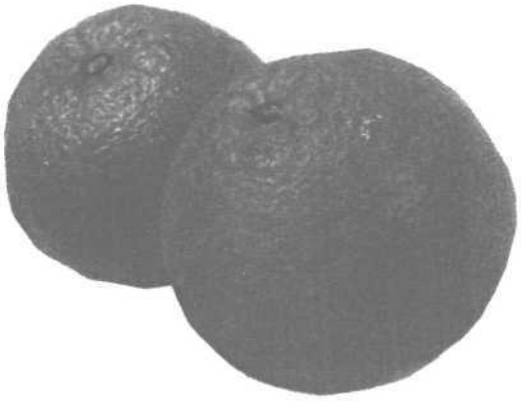
L - II(b)



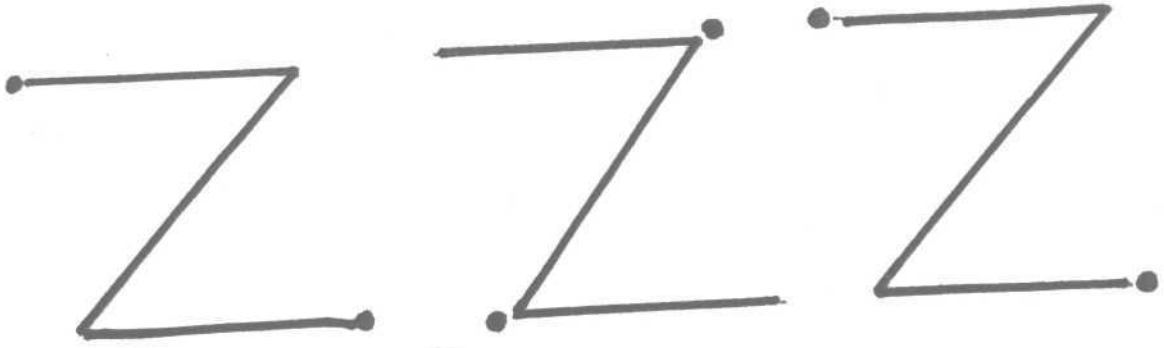


L-III(c)

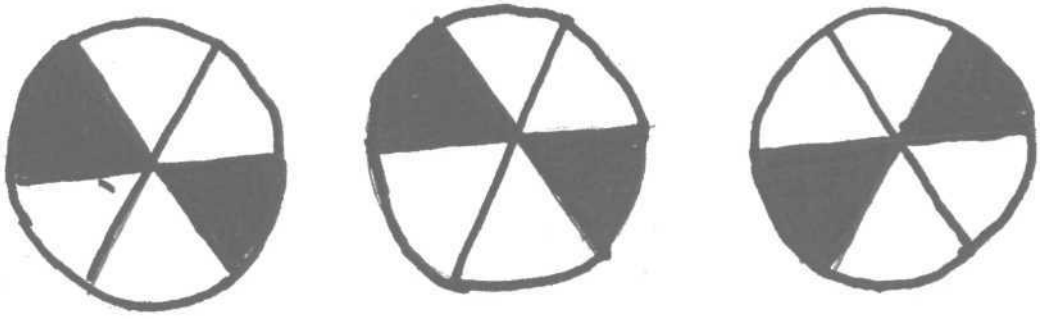




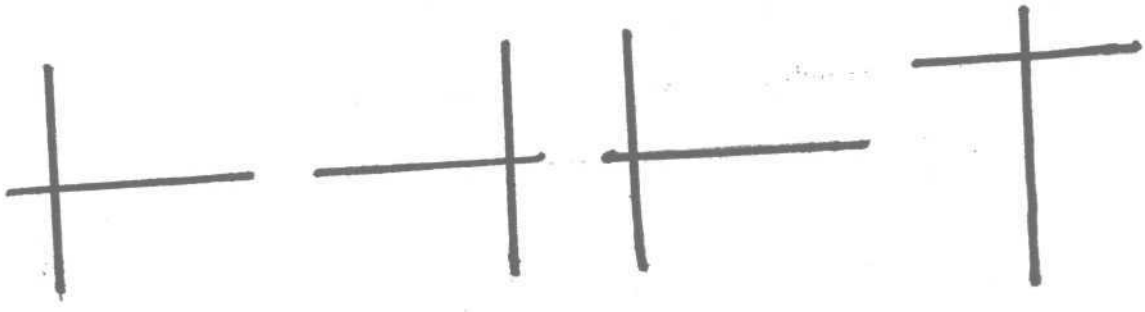
L-III



L-III(a)



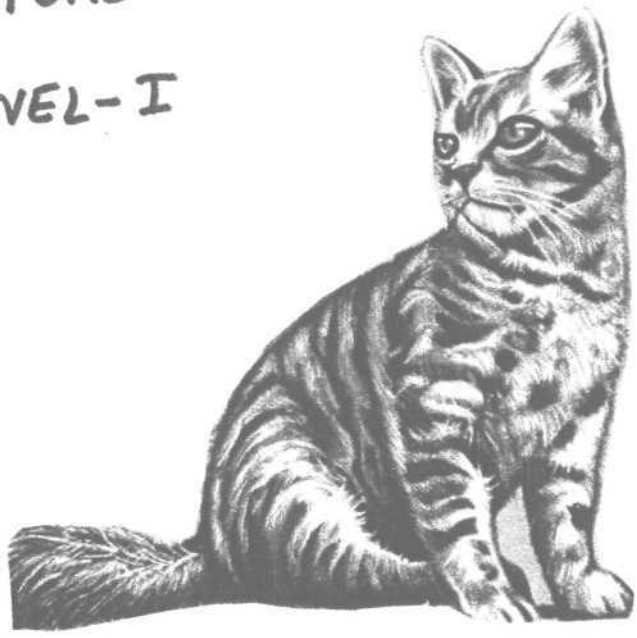
L-III(b)



L-III(c)

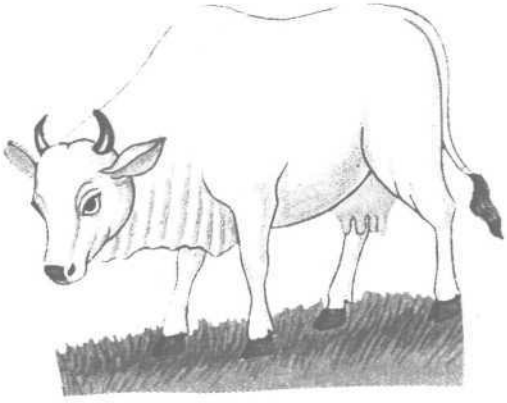
PICTURE COUNTING

LEVEL-I



I(a)

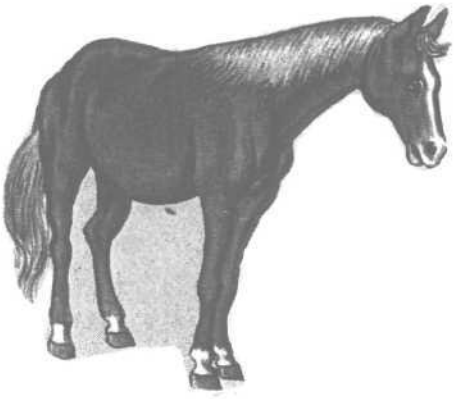
I(b)



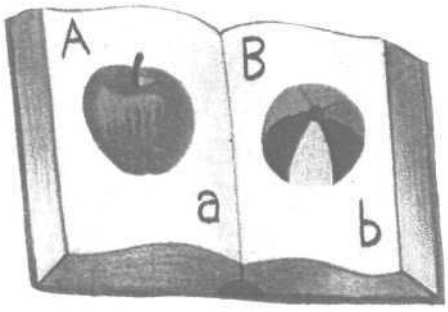
I(c)

LEVEL-II

II(a)



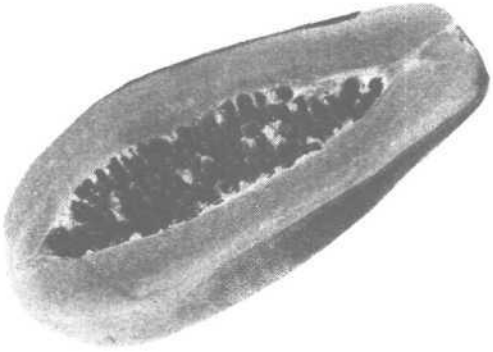
II (b)



II(c)

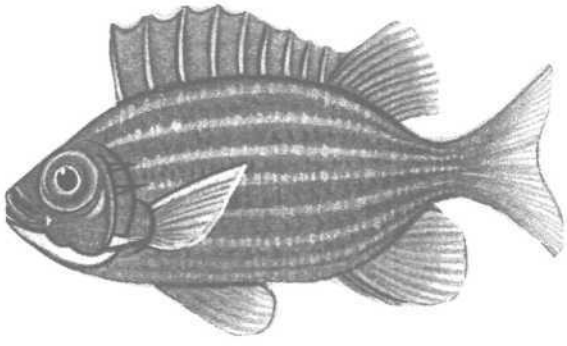
II(d)

LEVEL-III

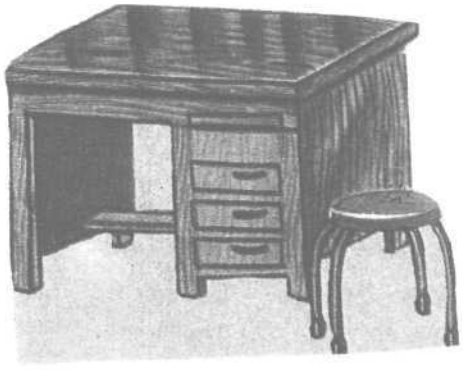


III(a)

III(b)



III(c)



III(d)

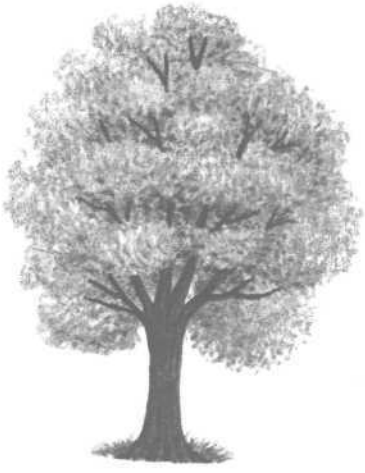
III(e)

LEVEL - IV

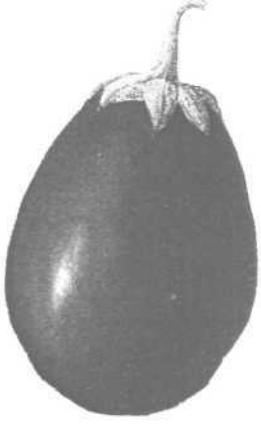
IV(a)

IV(b)

IV(c)



IV(d)



IV(e)

IV(f)

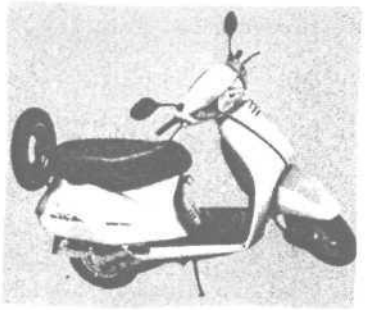
LEVEL-V

V(a)

V(b)

V(c)

V(d)



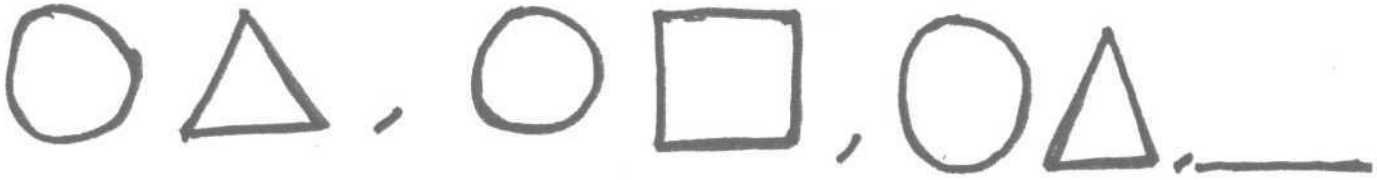
V(e)

V(f)

V(g)

ALTERNATE SEQUENCING:

L-I



L-II

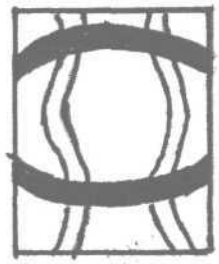
L-III

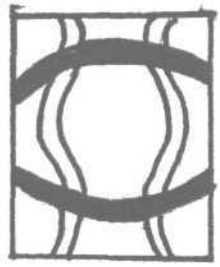
ಒ - IV

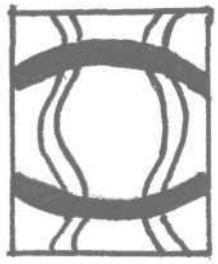
ಕ ಗ, ಕ ಗ ಜ್, ಕ ಗ ಜ್ :—

ಒ - V

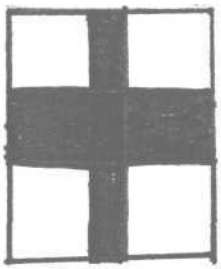
L - IV (a)

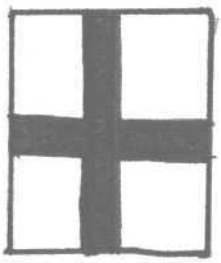


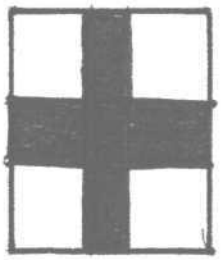


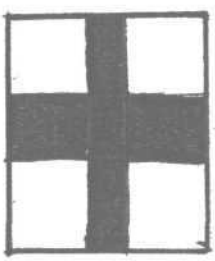


L-IV(b)

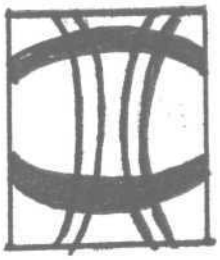


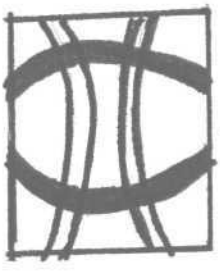




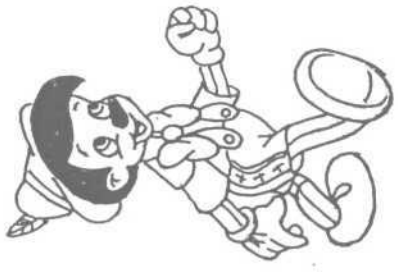


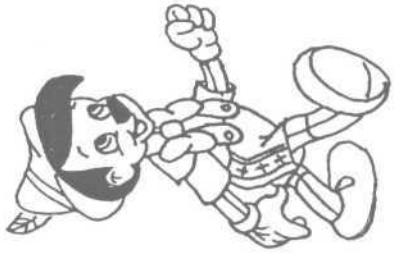
L - IV (c)

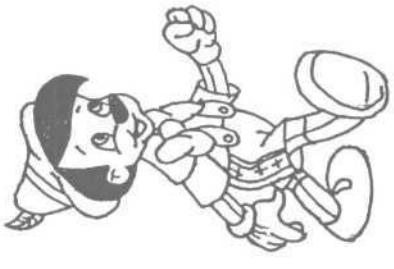




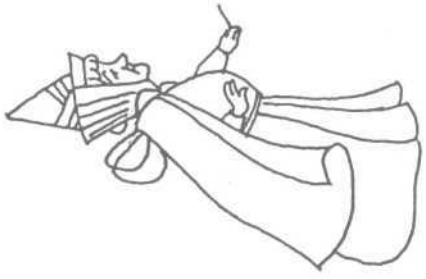
L - V(a)

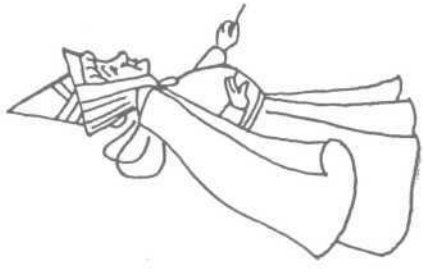






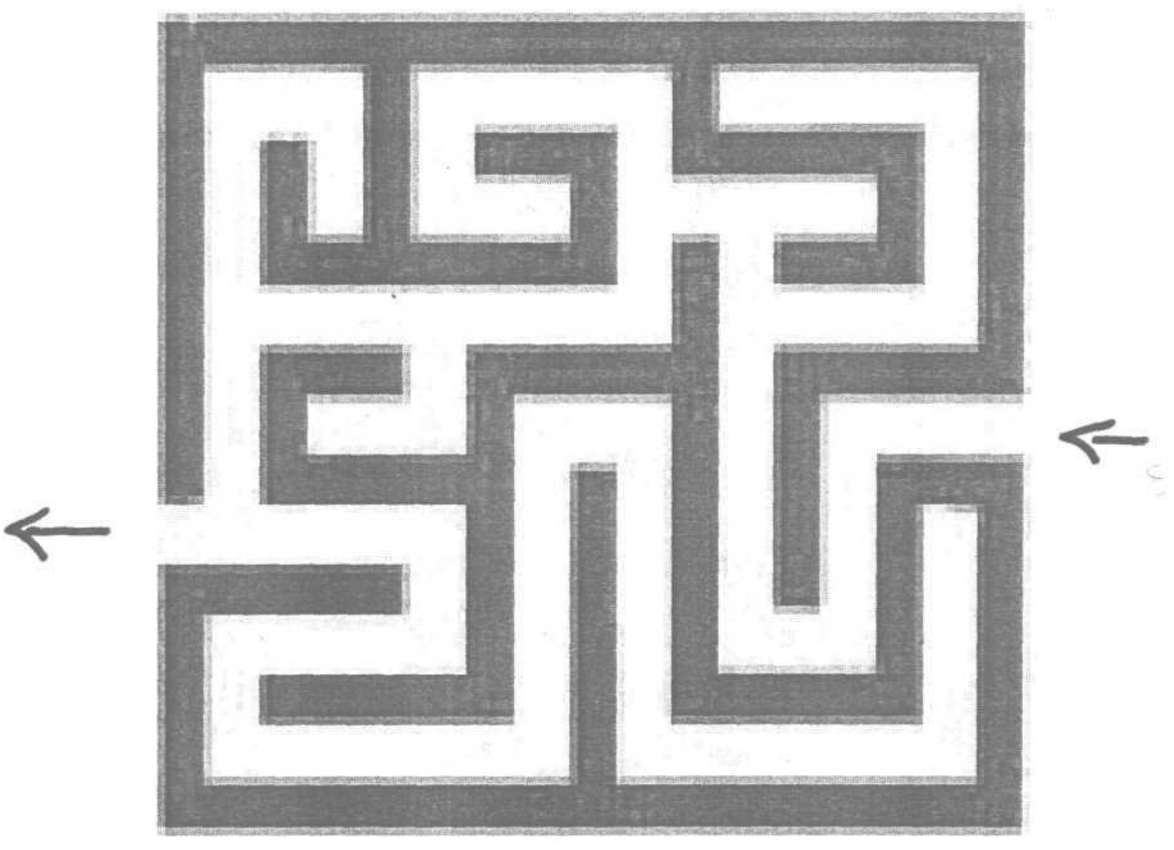
L - V(b)



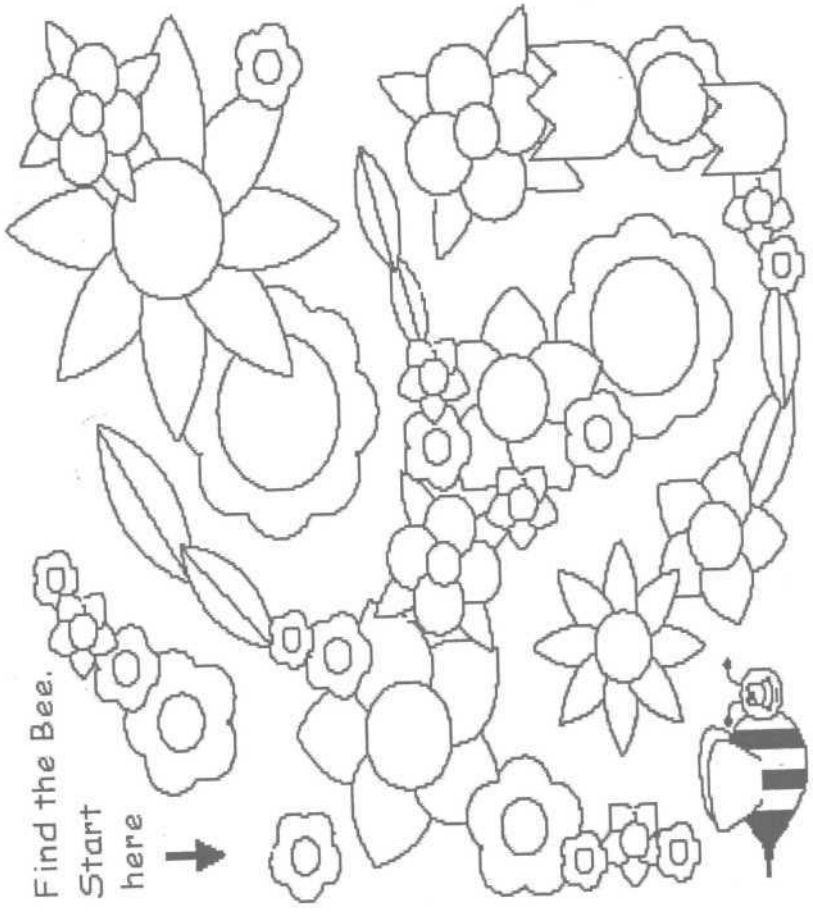


L-V(c)

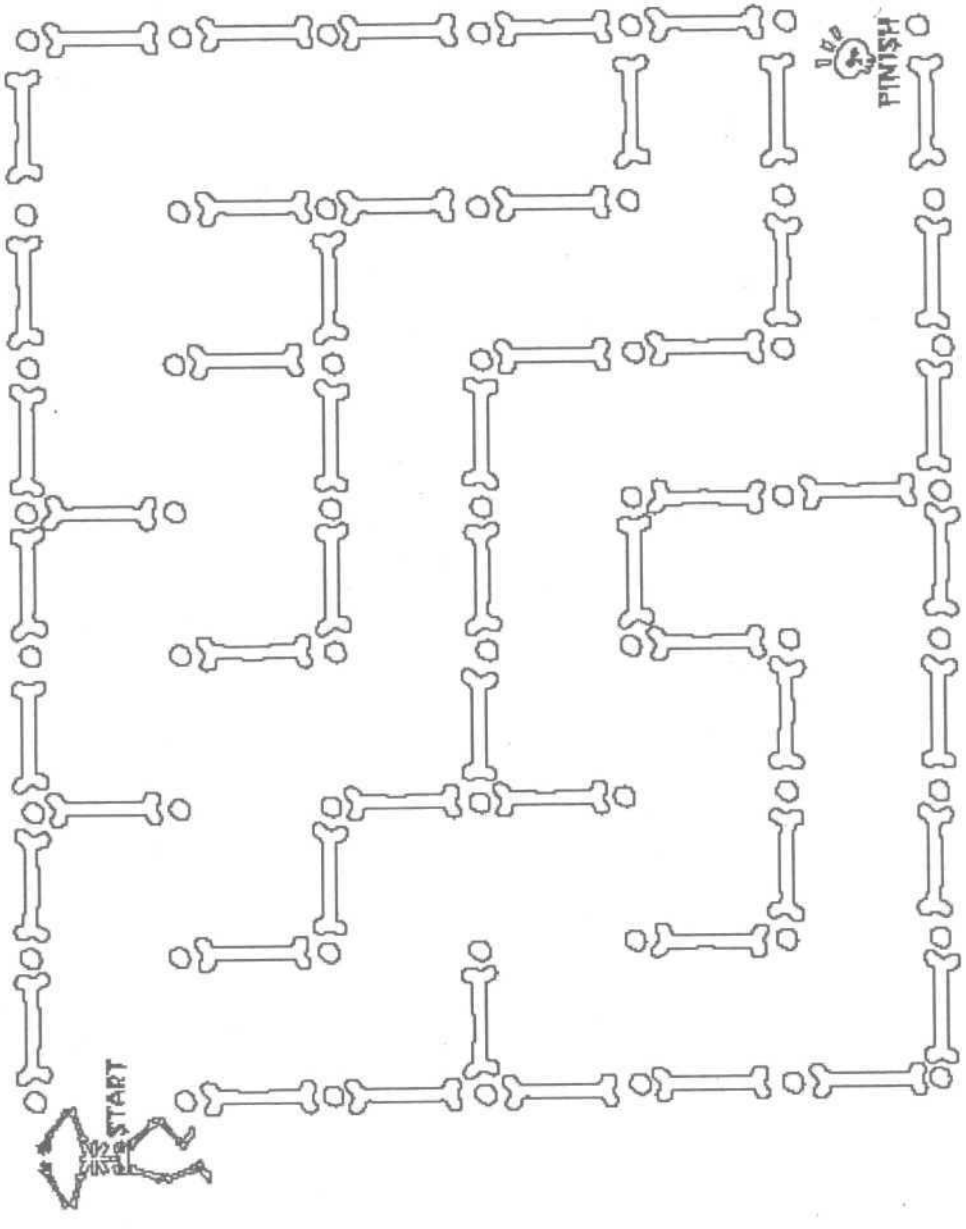
MAZES- LEVEL-I



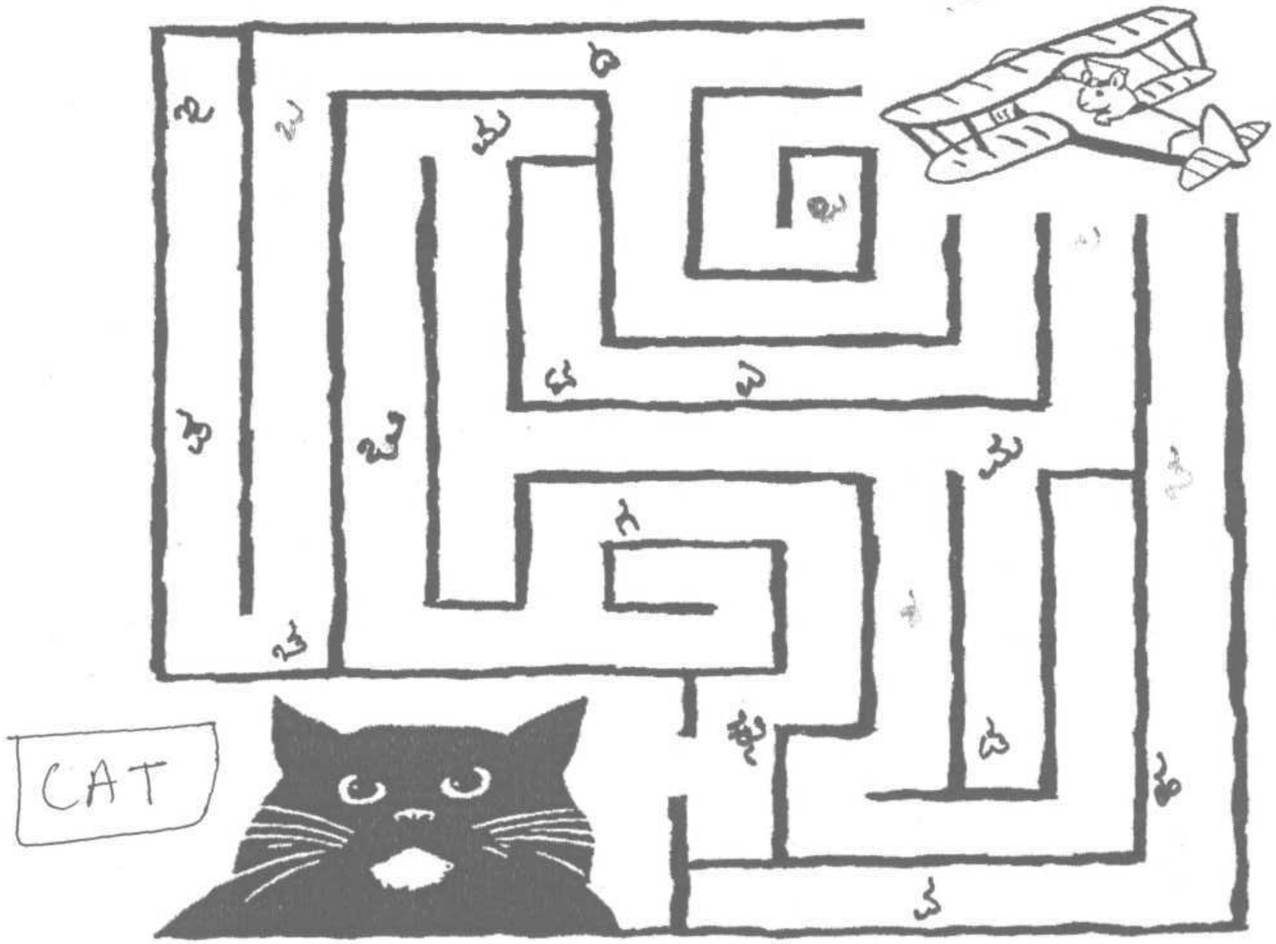
LEVEL - II



LEVEL-III



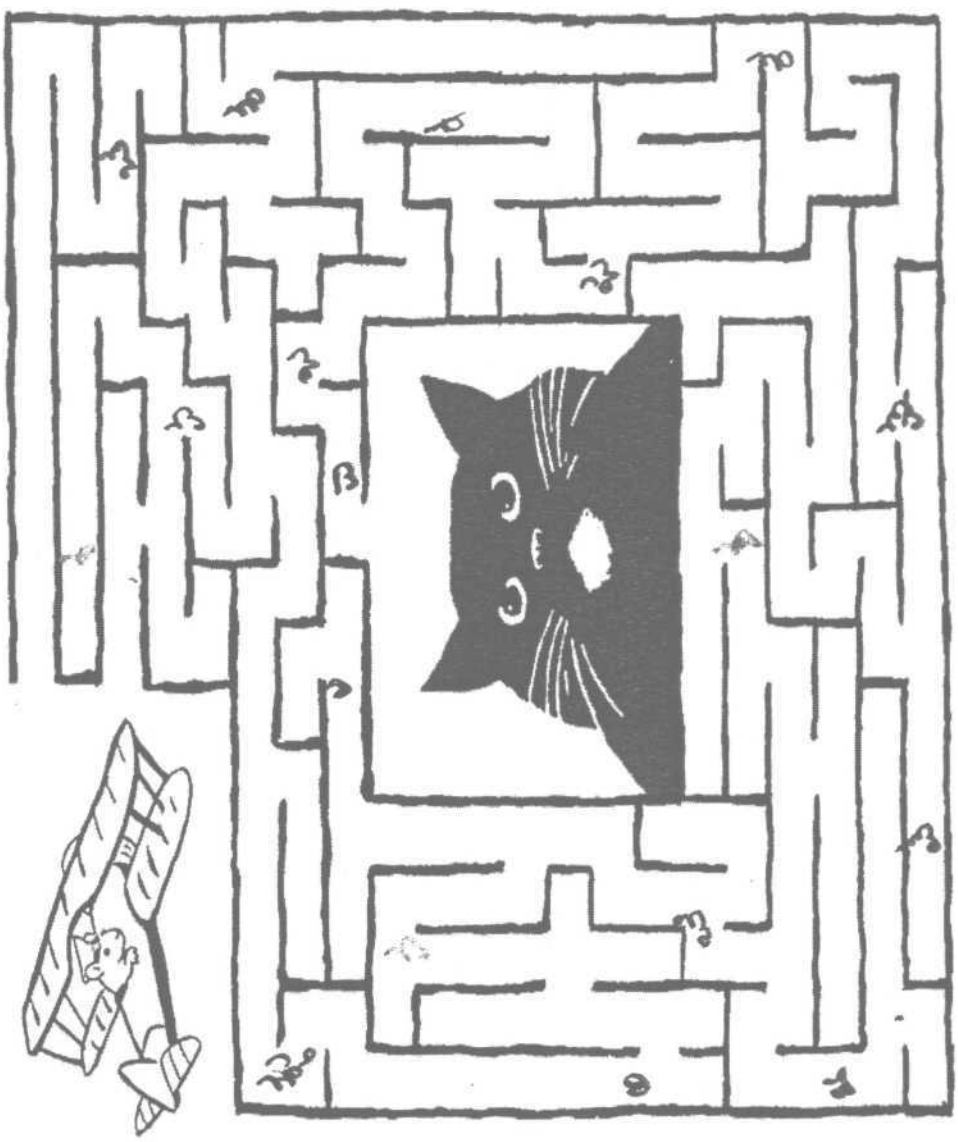
Help Captain Limburger find Kat Kong!



LEVEL-IV

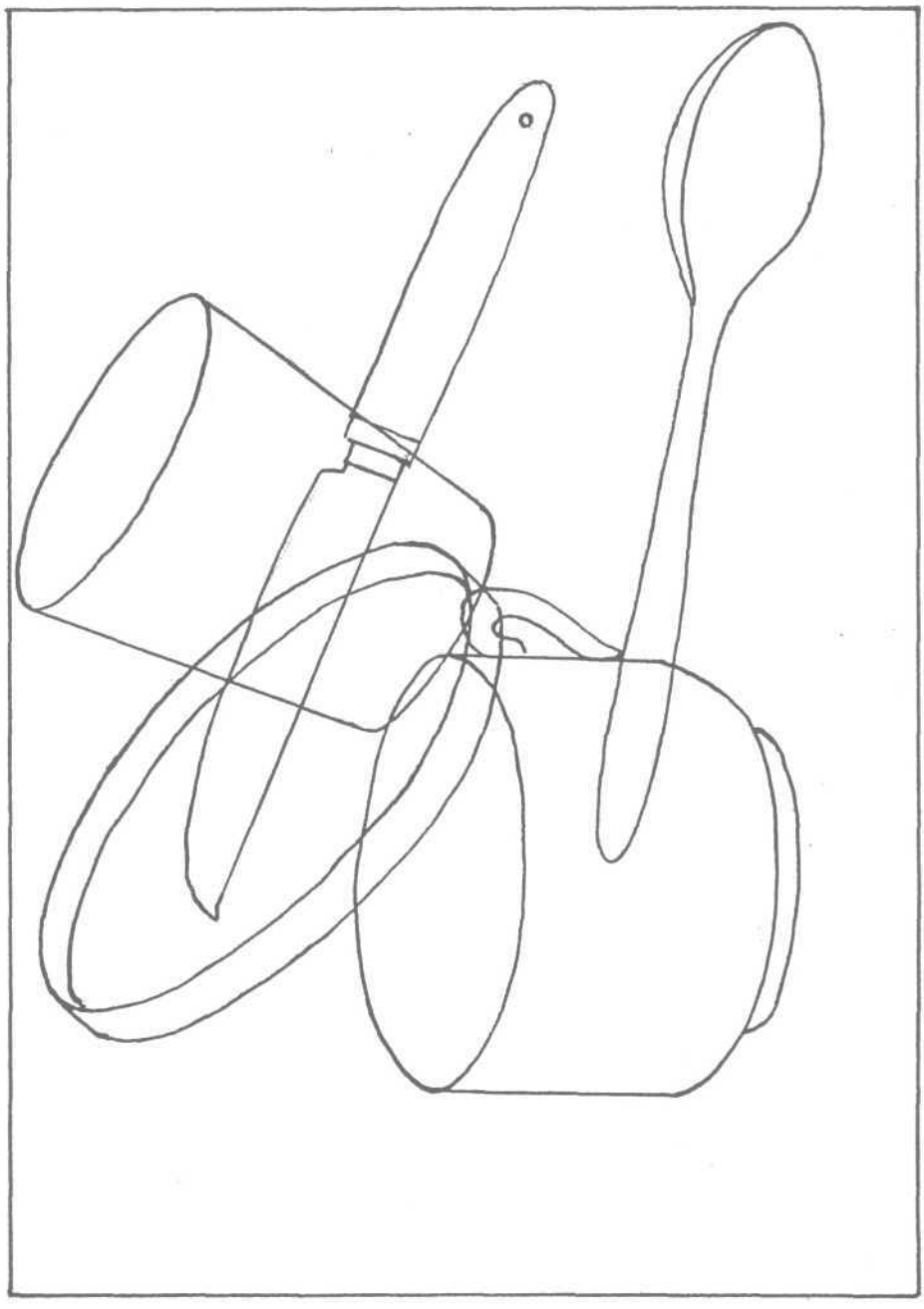
LEVEL - V

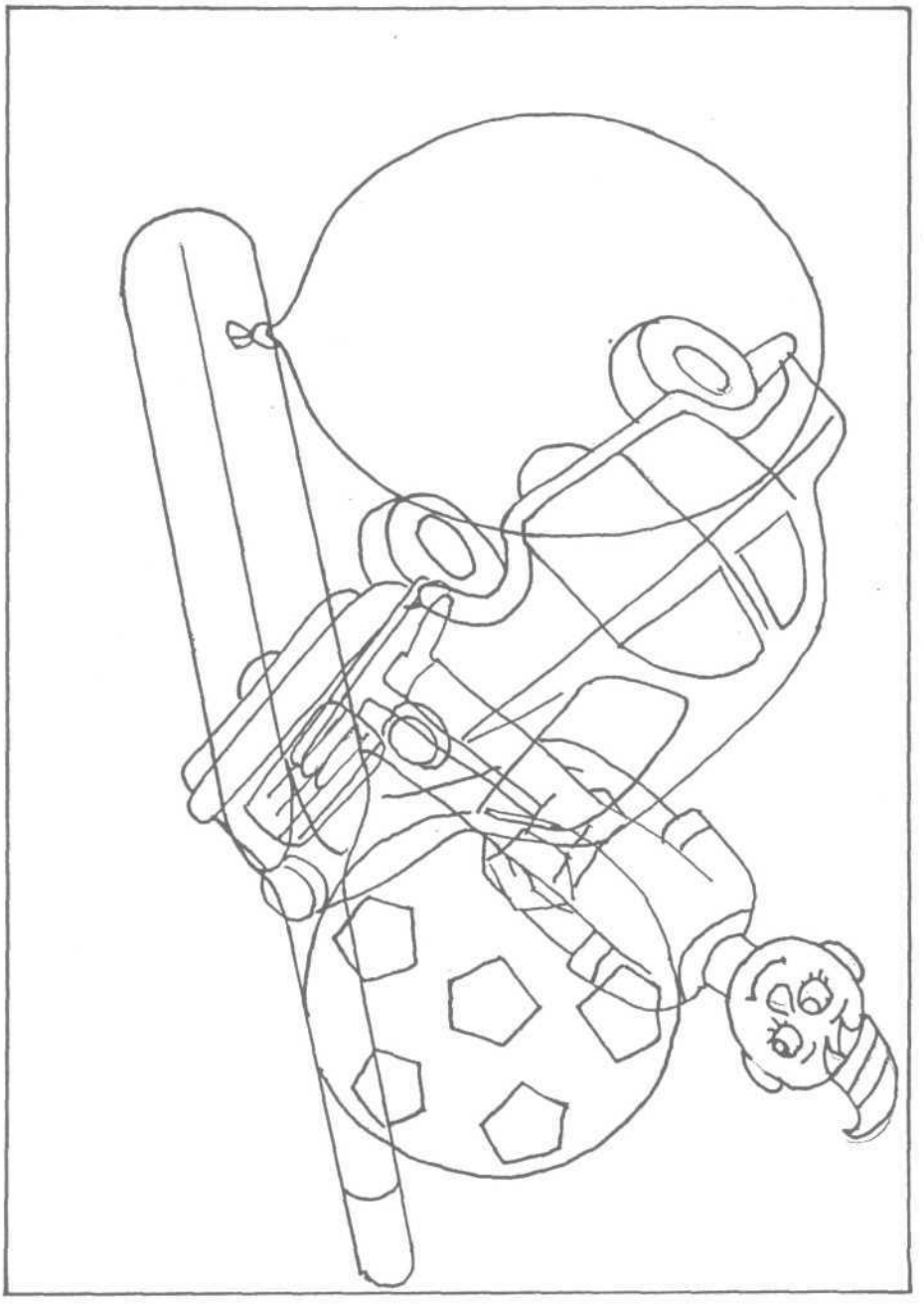
Help Captain Limburger find Kat Kong!



OVERLAPPING FIGURE TEST

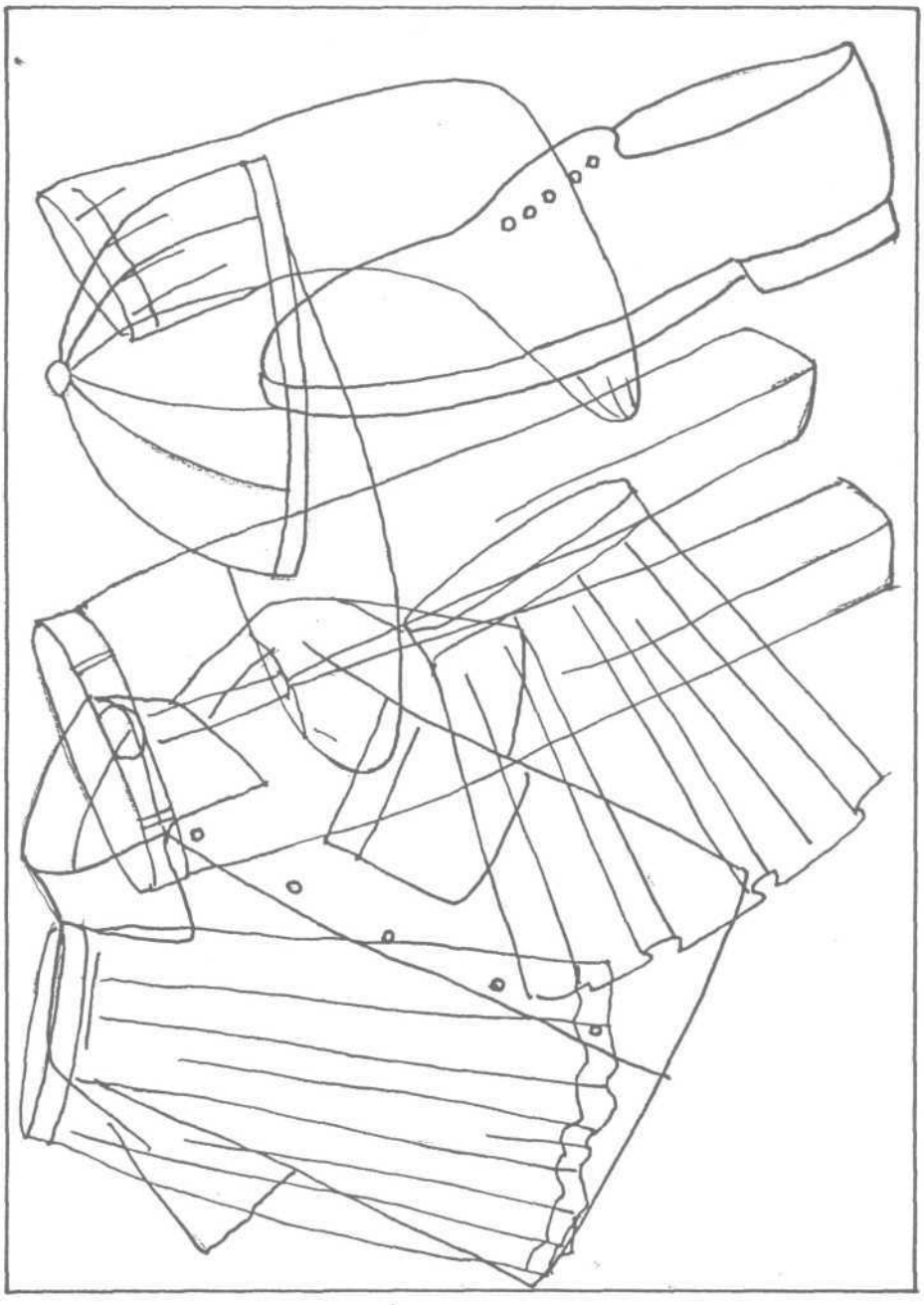
L-I





II-7

L-III



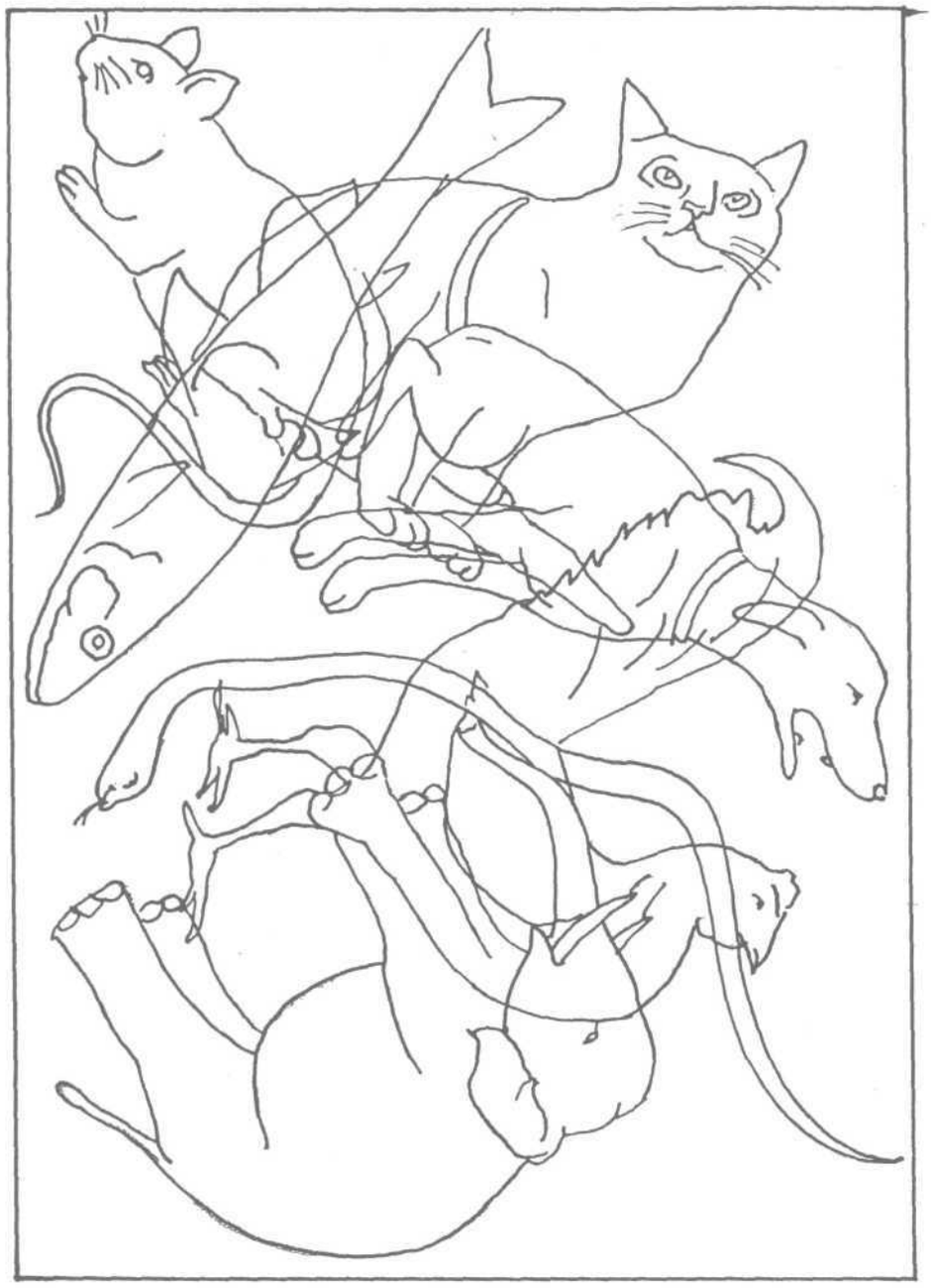
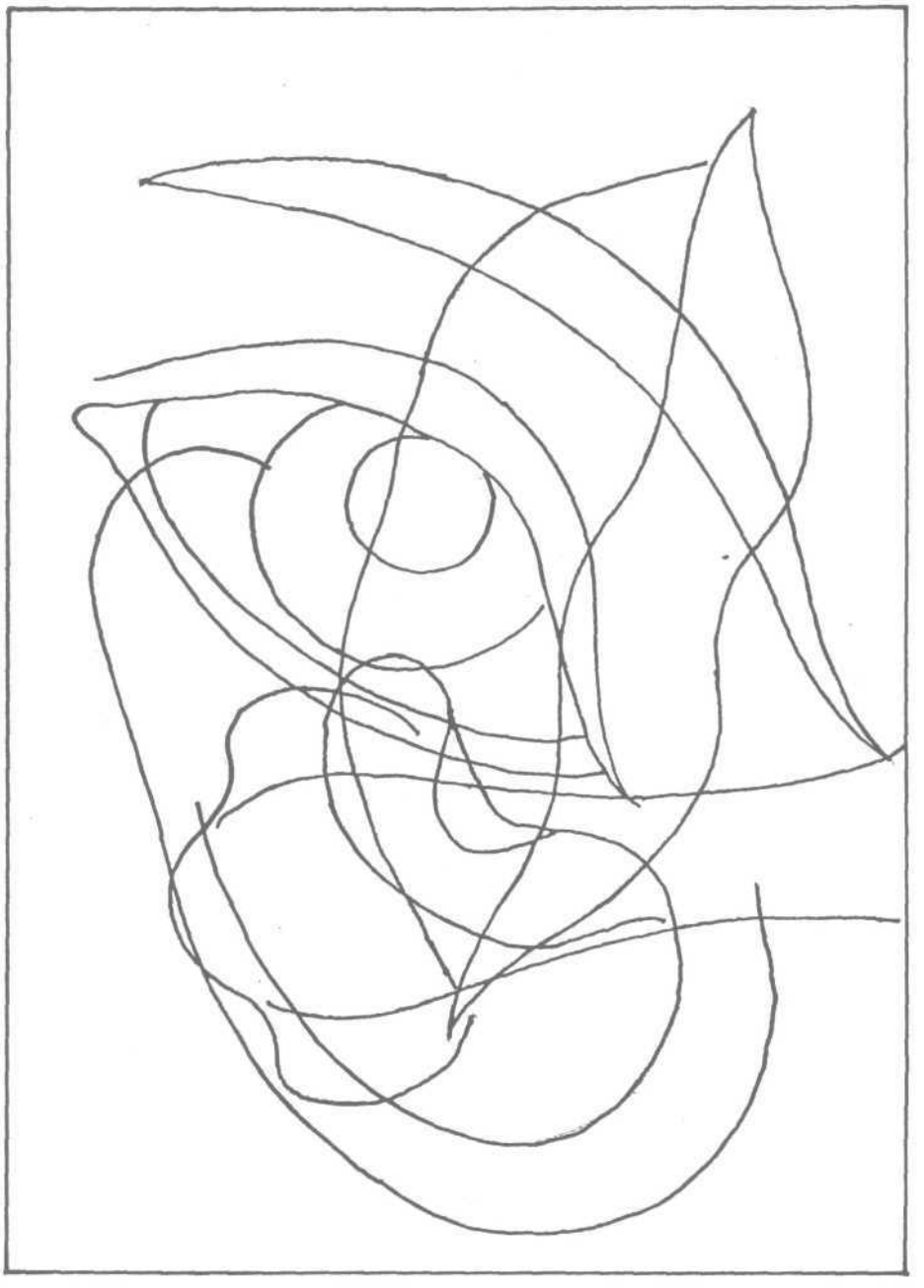
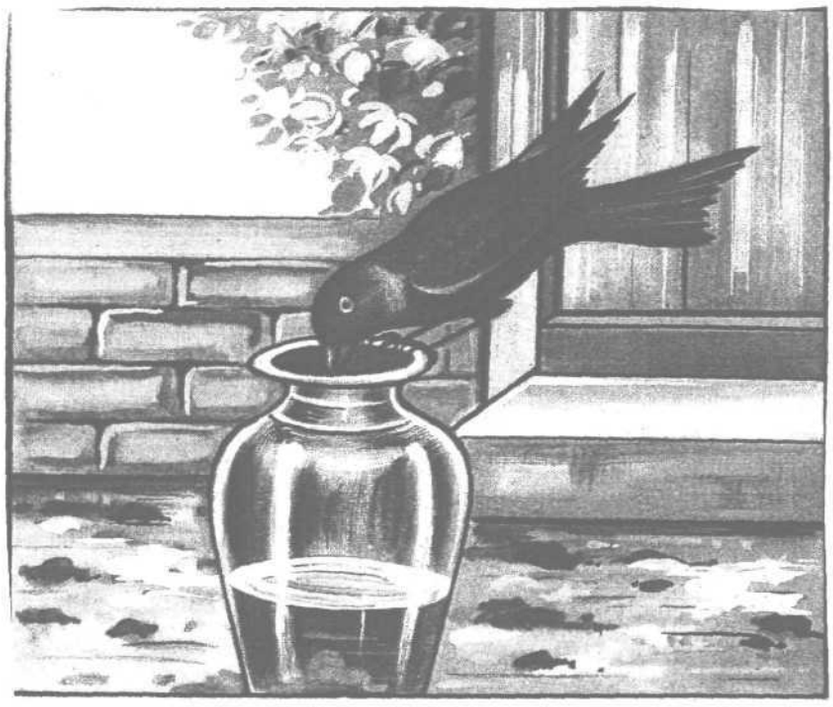


그림-7



A-7

STORY SEQUENCING

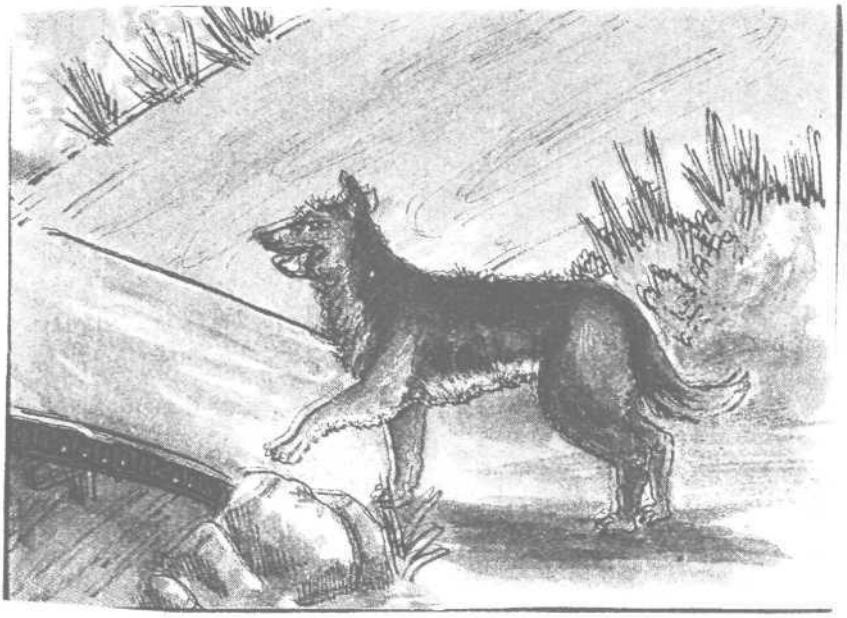


L-I a

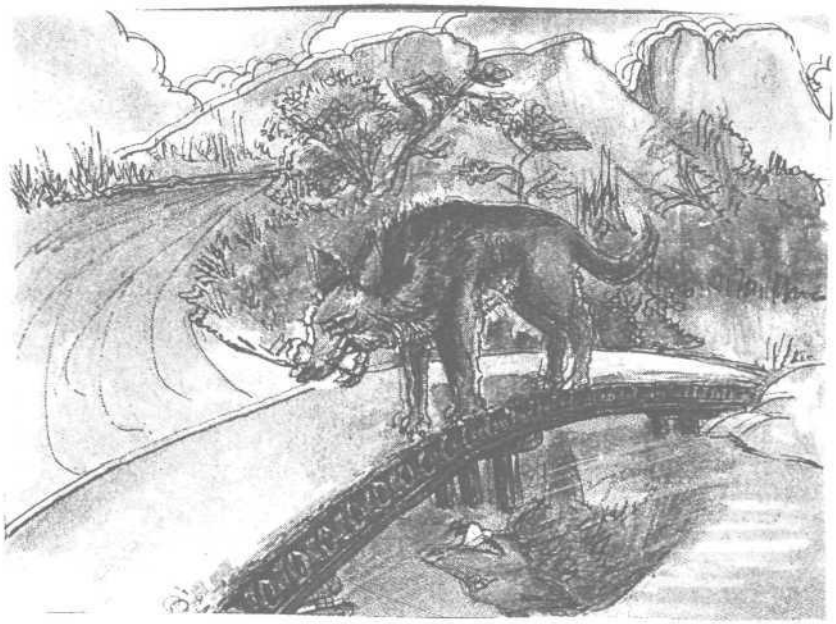
L - I b

L-Ic

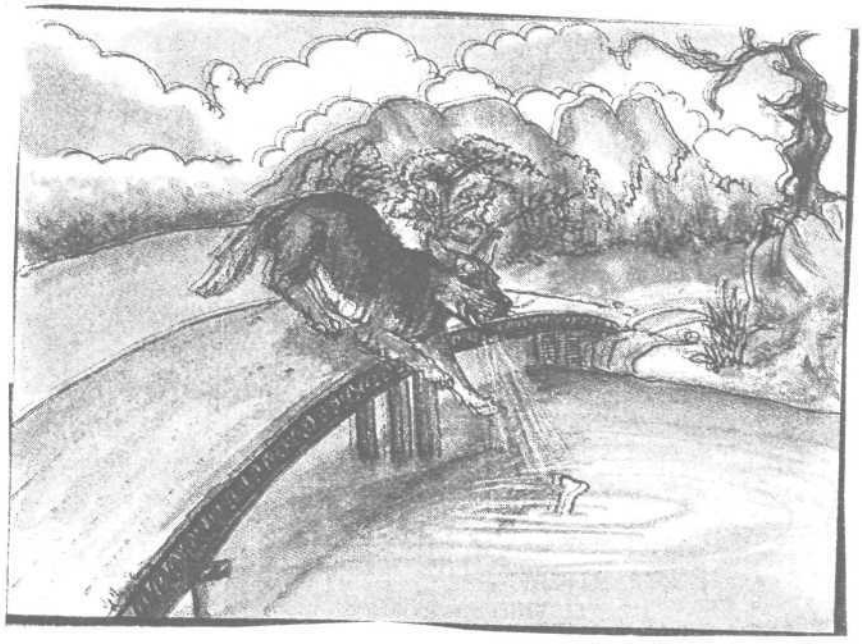
L-Id



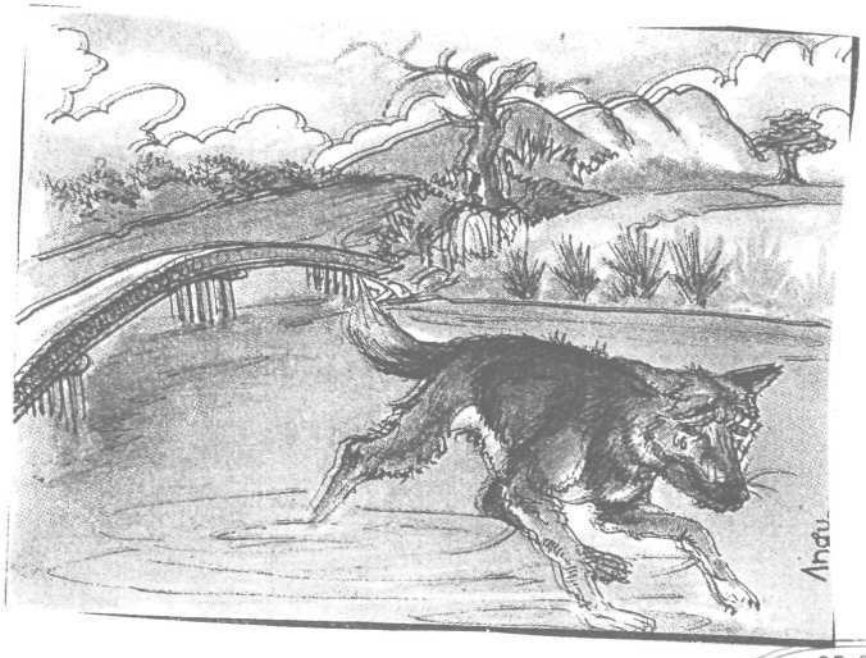
L-II a



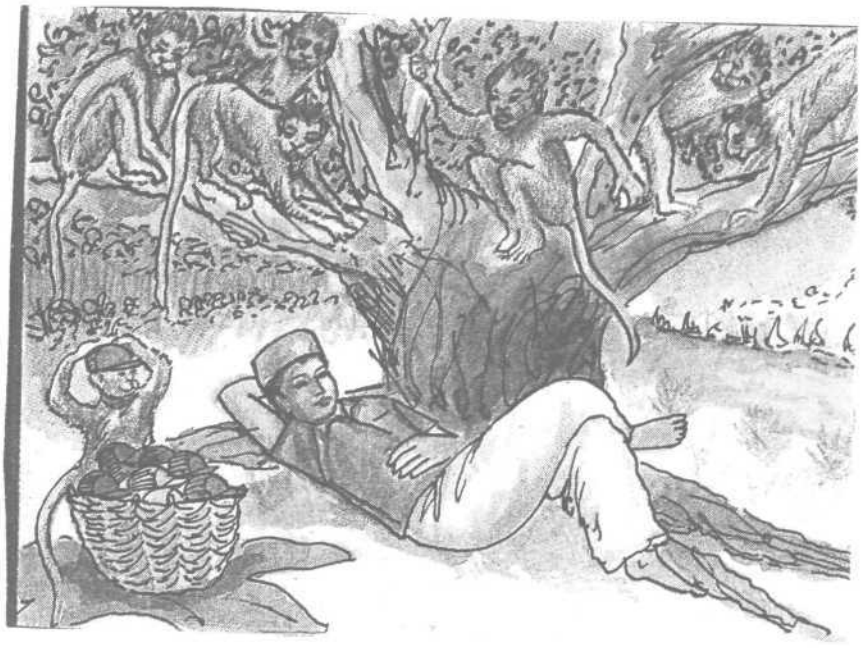
L-II b



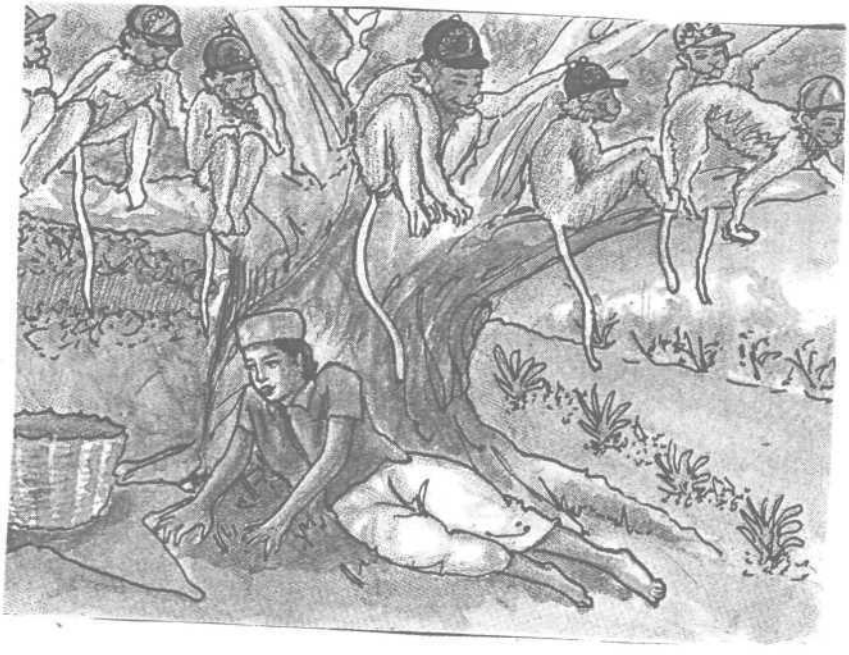
L-II c



L-II d



L-III a



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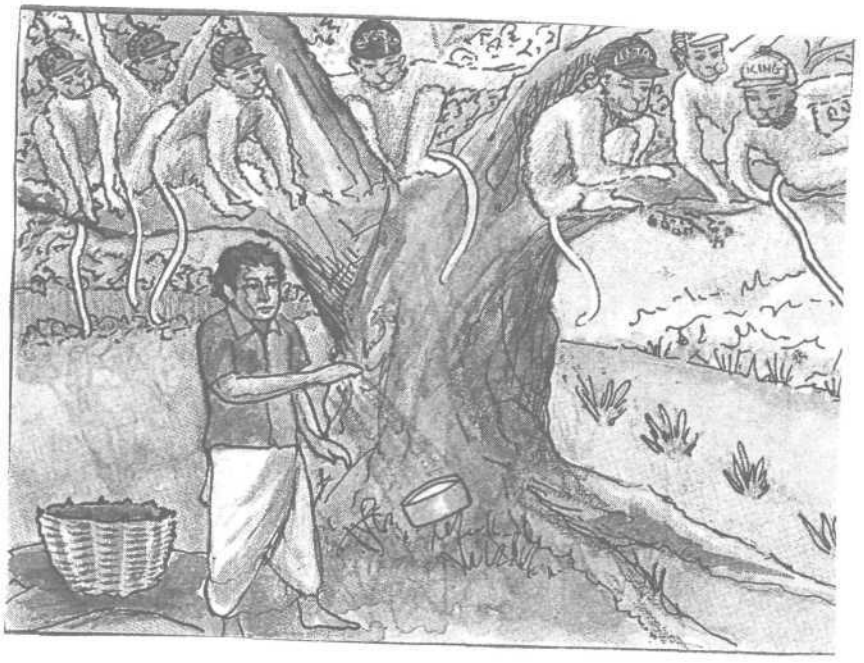

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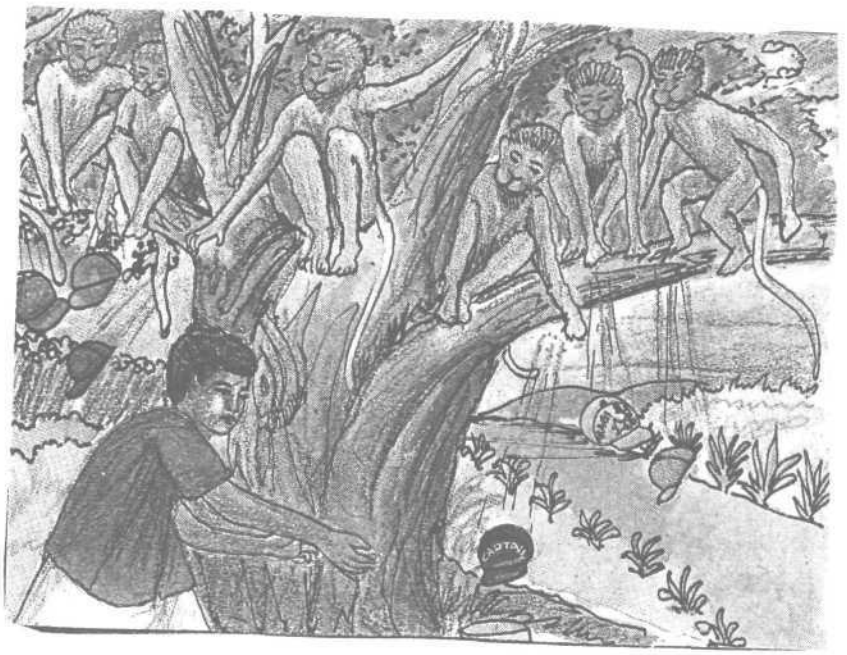

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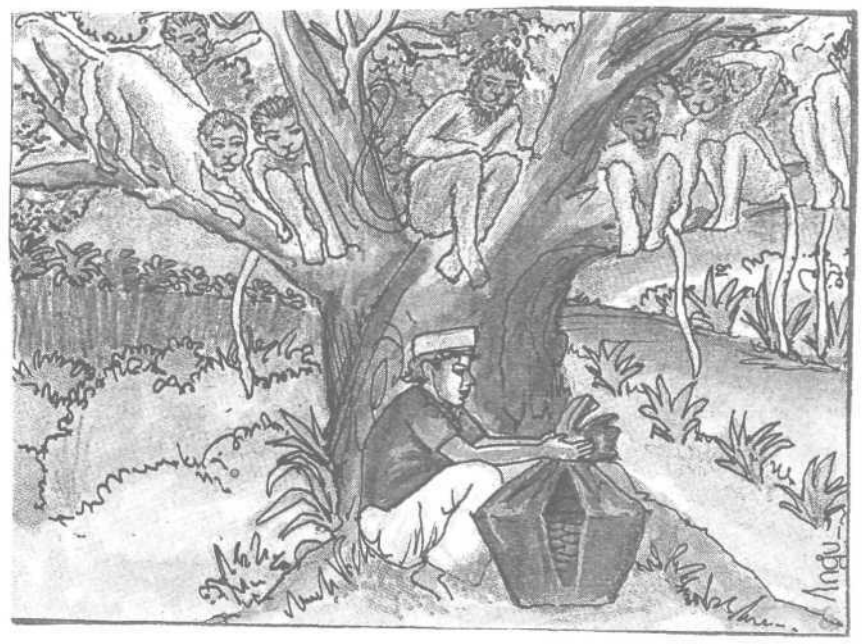
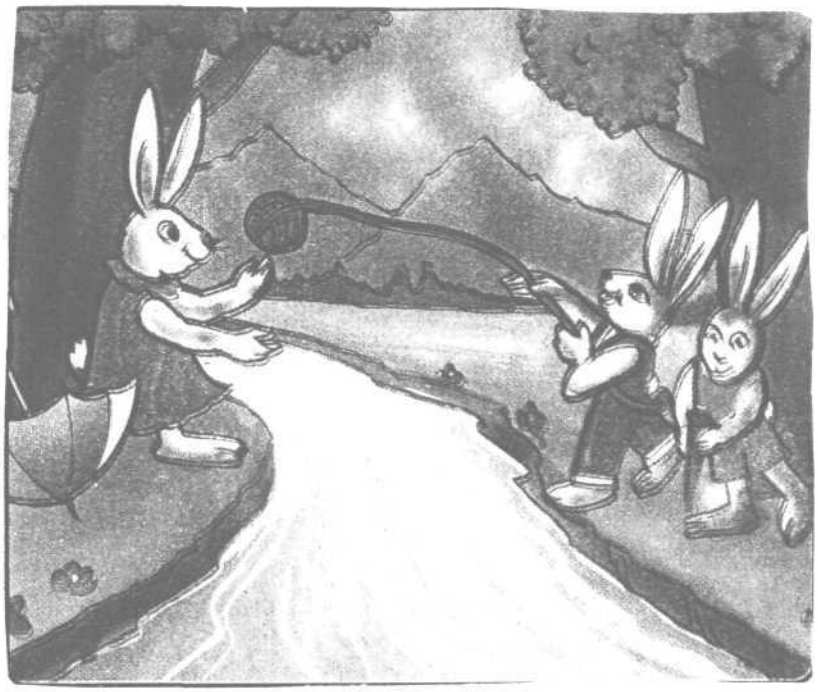


L - III e

L-IV a

L-IV b



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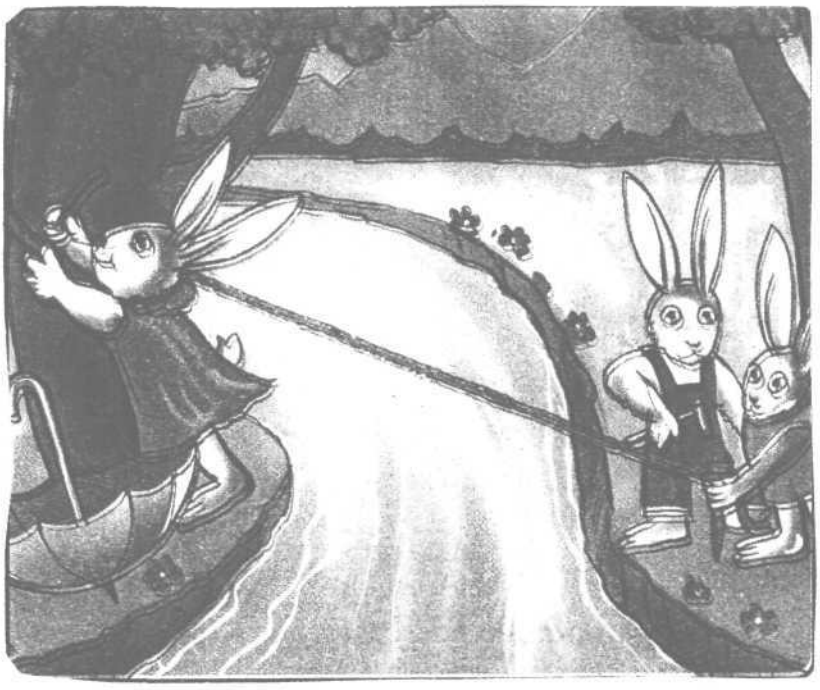

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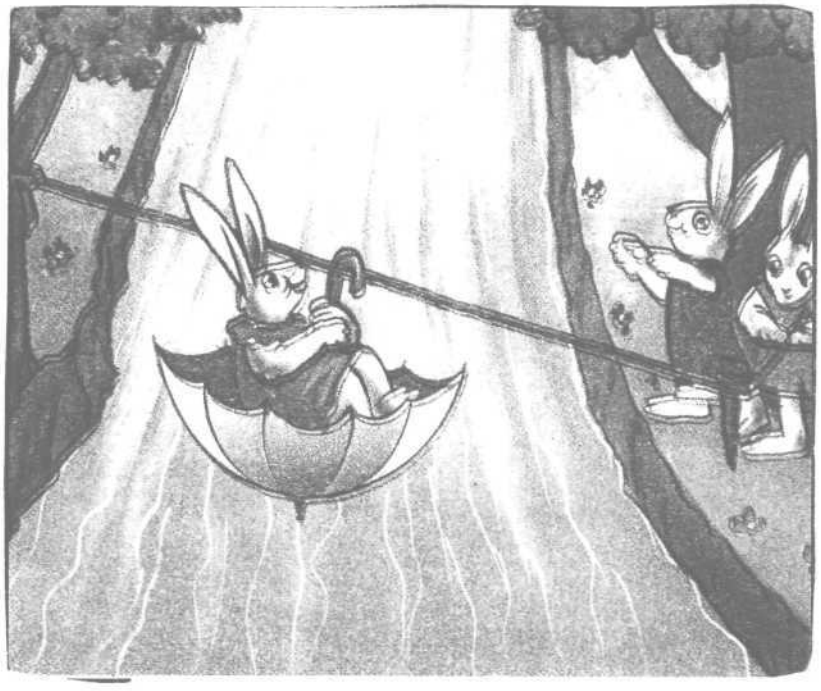

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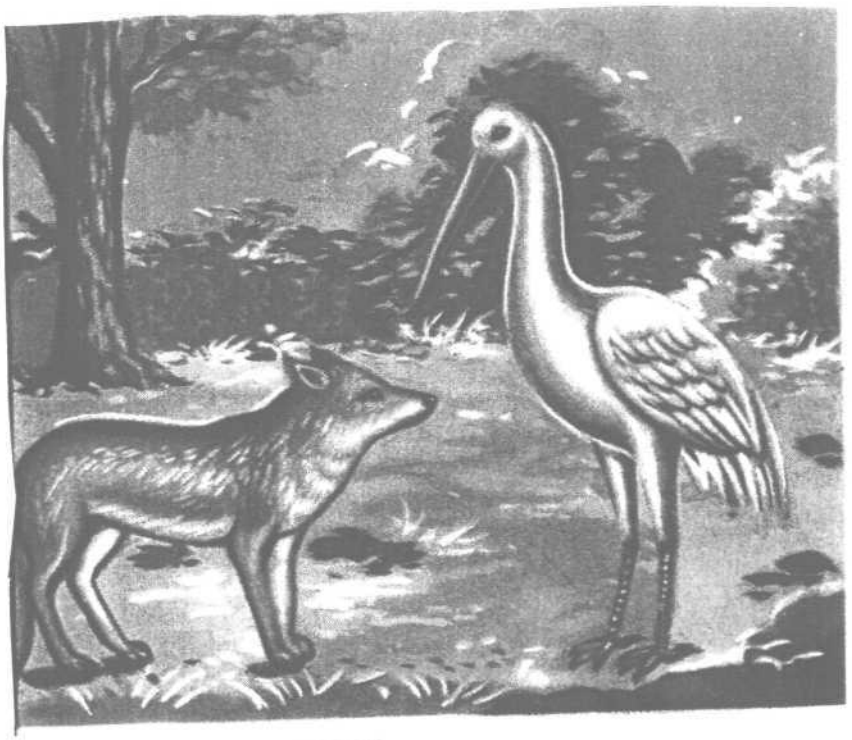

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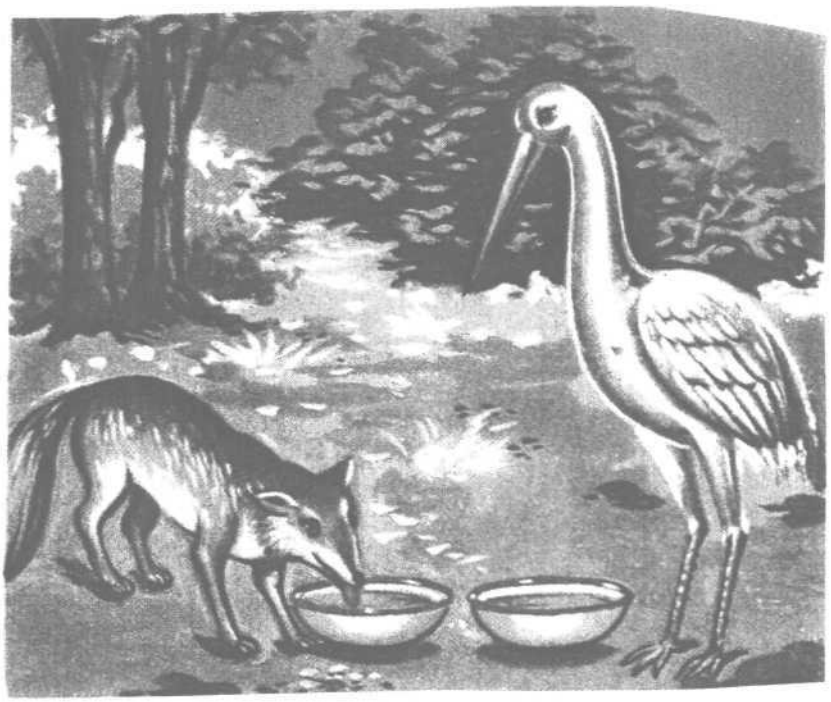

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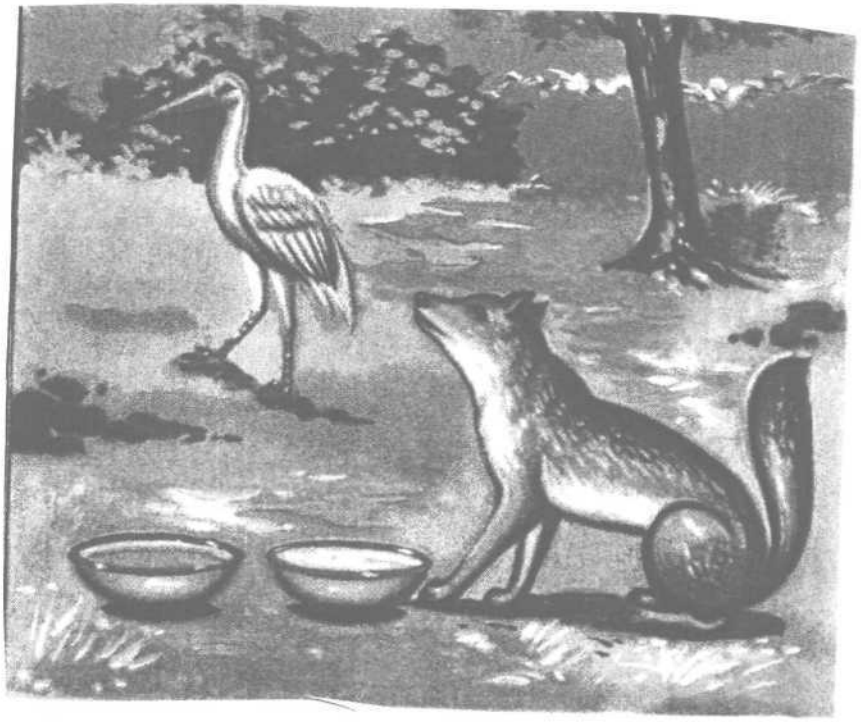

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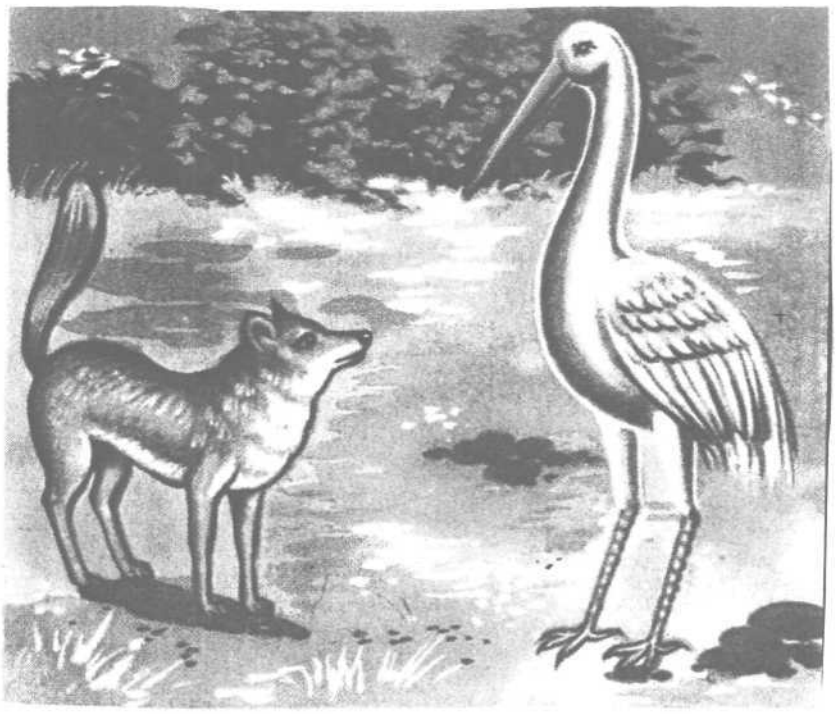
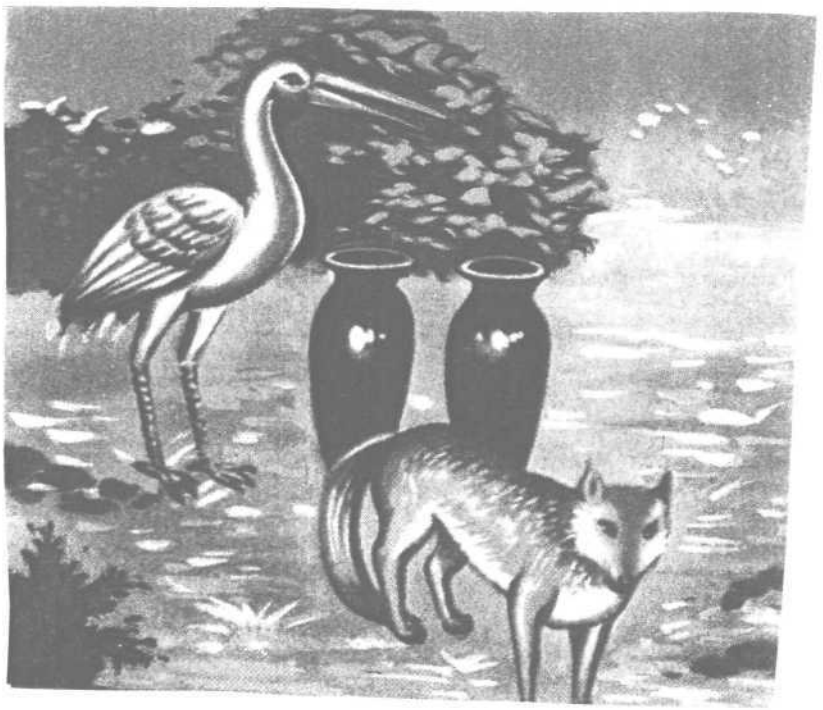


L-V d

L-V e



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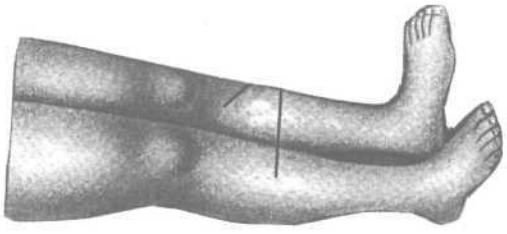

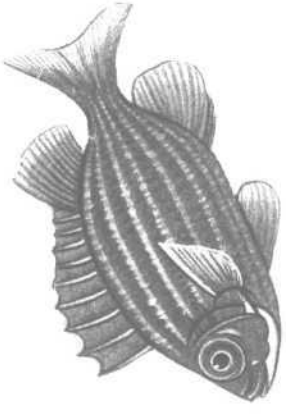

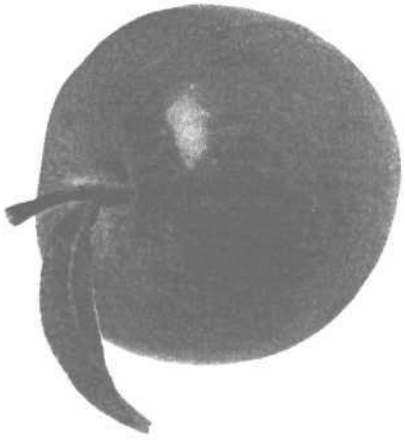

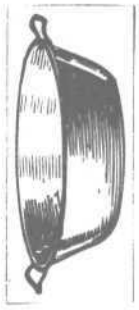

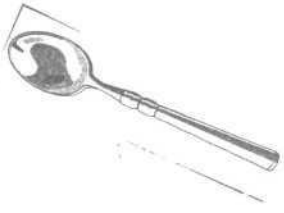

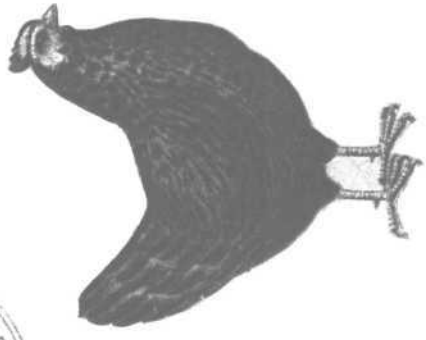

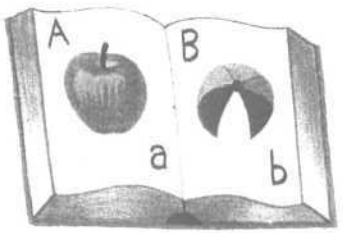
A
B
a
b