EFFECTS OF LOGOGRAPHIC AND PHONOLOGICAL SKILLS ON READING IN TYPICALLY DEVELOPING CHILDREN

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CERTIFICATE

This is to certify that this dissertation entitled ***“Effects of Logographic and phonological skills on reading in typically developing children”*** is a bonafide work submitted in part fulfilment for the degree of Master of Science (Speech Language Pathology) of the student Registration No: 10SLP001. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award of any diploma or degree.

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CERTIFICATE

This is to certify that this dissertation entitled ***"Effects of Logographic and phonological skills on reading in typically developing children"*** has been prepared under my supervision and 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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DECLARATION

This is to certify that this master's dissertation entitled ***"Effects of Logographic and phonological skills on reading in typically developing children"*** is the result of my own study under the guidance of Dr.K.C.Shyamala, Professor in Language Pathology, Department of Speech and Language Pathology, All India Institute of Speech and Hearing, Mysore, and has not been submitted earlier to any other university for the award of any diploma or degree.

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INTRODUCTION

For a child in the developmental stages of learning to read, there emerges an initial stage in which child reads a small set of words (sight vocabulary). The ability to read this small group of words may be acquired through learning or acquired spontaneously through their own observations of pairings of particular printed words and particular pronunciations. Logographic strategy might be thought to capitalize on basic and impressive memory skills the child brings with him while starting to learn to read. Salient graphic features may act as important cues in the process of instant recognition of familiar words. Letter order is largely ignored and phonological factors are entirely secondary. The child pronounces the word after she recognizes it and usually refuses to respond in case it is not recognized. However he/she will be prepared to guess based on pragmatic and contextual cues. The alphabetic principle is the idea that written spellings systematically represent spoken words. Purely alphabetic languages have one symbol for each phoneme, and learning to read an alphabetic system requires analysis of words into phonemes. It is easy to see why children have difficulty with phonics if they do not understand that words consist of phonemes.

The alphabetic principle includes these components:

1. Words are made of individual sounds.
2. Words are made of individual letters.
3. Letters can be reliably matched to sounds that can be blended together to identify words for reading.
4. Word sounds can be separately and reliably matched to letters for spelling.
5. Sequence of letters represents the sound sequence.

6. Changing the letter changes the sound and creates a new word.
7. Changing the sound changes the letter and makes a new word.

Case studies of children as young as 2 years indicate some of them to have established sight vocabularies of up to some hundreds of words (Fowler, 1962). Soderbergh (1971) reported that her 3 year old child acquired a sight vocabulary of 120 words within 3 months. Smith (1971) said this may be an exceptional case but this sort of achievement may eventually be common among 4 and 5 year olds.

Marsh, Friedman, Welch, & Desberg (1981) believed that the first letter of a word to be an important cue for word recognition and have suggested this to be one way in which Logographic strategy may be viable for quite advanced reading. Considering analysis of written word, Frith (1985) hypothesizes that the child selects graphic features salient to him and uses them as critical identifiers. In her theory, development of reading is divided into 3 phases identified with 3 strategies, readily related to components in current models of skilled reading. These are:

1. **Logographic skills**: characterized by instant recognition of familiar words. It can be related to *word form analysis.*
2. **Alphabetic skills**: knowledge and use of individual phonemes and graphemes and their correspondences. It can be related to *grapheme to phoneme skills*.
3. **Orthographic skills**: instant analysis of words into orthographic units without phonological conversion. It is distinguished from logographic skills by being analytic in a systematic way and non-visual. It is distinguished from alphabetic skills by operating in bigger units and by being non-phonological. It can be related to *word component analysis.*

The above 3 strategies can be related to the models of skilled reading (Morten & Patterson,1980; Shallice,Warrington and Mccarthy,1983) e.g. word form analysis might be derived from early logographic skills ;grapheme to phoneme skills would need to have been constructed out of alphabetic knowledge ;word component analysis traced to orthographic skill acquisition.

Frith (1985) found the 3 phases model to be unsatisfactory for a number of specific variables (for instance major division of literacy skills into input and output components ,word recognition i.e. reading and word production i.e. writing) that are all performance aspects of literacy skills was not considered. Hence she redesigned the model with the hypothesis that normal reading and writing development proceeds out of step (Frith,1979, 1980). In this model, each phase is divided into 2 steps with either reading or writing as the pacemaker of the strategy that identifies the phase. The theory states that at each phase, there is a first step involving a divergence between the strategies used for reading and writing, then a step involving convergence. Developmental progress is envisaged as an alternating shift of balance between reading and writing. Reading is the pacemaker for the logographic and orthographic strategy and writing for alphabetic strategy.

The 6 step model includes

Step	Reading	Writing
1a	Logographic 1	(Symbolic)
1b	Logographic 2	Logographic 2
2a	Logographic 3	Alphabetic 2
2b	Alphabetic 2	Alphabetic 2
3a	Orthographic 1	Alphabetic 2
3b	Orthographic 2	Orthographic 2

(Note: The division into steps allows a differentiation in terms of level of skill in a particular strategy, here symbolized by number subscripts. Thus level 1 would imply the skill to be present in a very basic form; level 2(more advanced and so on). Thus it implies that only when logographic skill reaches level-2 in reading to be adopted for writing.

Based on the ideas proposed by many authors (Marsh, Friedman, Welch and Desberg, (1981); Seymour and Mcgregor (1984) ; Frith (1985).they proposed the acquisition of reading skills in children to proceed through 4 broad phases that include

1. Sight vocabulary phase (Whole word reading)
2. Discrimination –net phase (Word recognition using fragmentary cues)
3. Phonological recoding phase (Reading using phonics procedure)
4. Orthographic phase (Phase in which words are spelled rather than the way they sound)

Informal studies of a 4 year old child, Alice (Harris & Coltheart, 1986) who was in the sight vocabulary phase of reading, indicated that she could read about 30 words, some of which she had been taught to read whilst others had simply been ‘picked up’. E.g. Harrods, read from sides of buses and shopping bags while unfamiliar words could not be read at all.

Also, Marsh et al (1981) and Seymour and Elder (1985) investigated if the child uses fragmentary cues to read. Their study demonstrated that when the child was asked to read single words or non-words aloud, the response produced was virtually always a choice from amongst the set of words already known. It would appear that quantity of information from the printed stimulus that was needed to select an item from reading vocabulary would be very small. Seymour and Elder (1985) found that the child may simply use word length. One child read television as children as according to him it is a long word. For black, the child read any letter string containing ‘k’ (like, lake etc). The child read smaller as yellow as both had two visually distinct ‘l’s. This seemed to indicate that the children knew which of the spoken words that are familiar to them are the ones they have been taught to read and which are the ones they have not. Thus, if in the Logographic and discrimination net phase, words are being treated as visual wholes and identified when their overall visual forms are familiar, the zigzag or vertical representation should have catastrophic effects on reading.

Though these studies indicate the existence of a sight vocabulary phase the question of whether it is a phase universally demonstrated by all children and if a child who does not pass through this phase will evidence some form of developmental dyslexia, are aspects to be investigated. There are lines of evidence indicating that normal learning to read does not depend crucially upon logographic phase. Frith (1972) found that whether a child is good or bad at rote learning, visual to word associations does not influence how rapidly progress has been made in learning to read by the age of 8. This conclusion is an evidence against the view that sight vocabulary phase is one the child must pass through normally if reading acquisition is to proceed at a normal rate.

Based on the early observations of Read (1971, 1975, 1986). First spelling attempts based on phonetic categories from speech production and perception that differ from those used by (skilled) adult spellers.

Five distinct stages of spelling:

I. Precommunicative
II. Semiphonetic
III. Phonetic
IV. Transitional
V. Correct.

- **Pre-communicative Stage.**

1. Random selection of letter strings.
2. Complete lack of letter-sound or letter name knowledge. E.G. BTRSS for "monster" or 1MMPMPMPH for "chirp".

- **Semi-phonetic Stage.**

1. Partial mapping of phonetic content.
2. First understanding of letter-sound correspondence concept.
3. Evidence of a letter-name strategy. E.G. R for "are", U for "you", or LEFT for "elephant".

- **Phonetic Stage.**

1. Phonological segmentation of speech sounds in spoken words.
2. Surface sound features are represented.
3. Complete lack of knowledge of orthographic conventions.

E.G. IFU LEV AT THRD STRET IWEL KOM TO YOR HAWS THE ED

"If you live at Third Street I will come to your house. The End."

- **Transitional Stage.**

1. Compliance with basic conventions of English orthography, such as appearance of vowels in every syllable. E.G. EGUL for "eagle" rather than EGL as in phonetic stage.
2. Evidence of a developing orthographic strategy. Shift from phonological to morphological and orthographic spellings. E.G. EIGHTEE for "eighty" instead of ATE as in phonetic stage.

- **Correct Spelling Stage.**

1. Developed a knowledge of environmental factors, such as position in the word, stress, morphemic boundaries etc.
2. Extended knowledge of word structure, such as prefixes, suffixes, compound words etc.
3. Increased accuracy with using silent consonant and in doubling consonants.
4. Complete visual orthographic descriptions of words.

Ehri's 4 sub-stages of Alphabetic stage (1985)

PRE-ALPHABETIC STAGE

This is so called because it occurs prior to any alphabetic knowledge, in other words, identification does not involve making any letter-to-sound connections. Instead connections are made between some visual features (called cues by Ehri) of the word and their pronunciation or semantic representation. She gives the example of words as part of advertising logos being identified purely by the surrounding context.

If a letter were altered, it would not necessarily be noticed, as the child is using few salient letter features. The lack of an alphabetic connection is clearly indicated when children identify the word using context and no alphabet as when they read CREST as 'brush teeth'. Frith called this phase the 'logographic' phase, and Ehri changed the label to 'pre-alphabetic' as she thought 'logographic' sounded as if beginning readers read words like mature readers. Unfortunately, giving it this label is akin to calling it 'not the alphabetic phase' and gives no indication of its functionality, except of course that whatever it is comes before the alphabetic phase.

PARTIAL ALPHABETIC STAGE

In this phase the reader uses a combination of reading some letters in the words and using these to attempt a pronunciation; the first and final letters are usually the most important within this phase. Ehri coined the term 'phonetic cue reading' to characterise the phase. These efforts at generating pronunciations in combination with the visual appearance of the word are stored in memory to be activated on the next encounter.

Ehri and Wilce (1985) were able to distinguish readers who were in either of these phases by teaching them words that were either alphabetically similar or dissimilar to the original (e.g. LFT versus WcB for the word 'elephant'). ('WcB' in this example is not only alphabetically dissimilar but was designed also to be more visually distinctive compared to itsalphabetically similar counterpart 'LFT'.) Those in the partial alphabetic phase found it easier to learn words with letters congruent to their pronunciation, whereas the prealphabetic readers had the same level of difficulty with both.

In subsequent experimental work (obviously not discussed here by Ehri), Stuart, Masterson and Dixon (2000) pre-screened 5-year-old beginning readers into those with or without phonological awareness and alphabetical knowledge and proceeded over the coming months to expose them to a set of words with feedback. The children were not different in age or in visual memory. The children with phonological knowledge were much better at remembering these words and calculation of the effect size between the two groups to be very large, at d51.47 after 36 exposures and d51.02 after a delayed recall of one month. Furthermore, there was a significant correlation of 0.79 between visual memory and performance after 36 exposures for the non-phonological group compared to low negative correlation of 0.11 for the phonological group. Within the frame of these first two phases, this suggests a strong element of using visual features of words for the children still in the first phase, contrasting with greater reliance on phonological information for children within the second phase. Furthermore, phonological coding proved to be much more potent in helping children to remember the words (as shown by the large effect sizes) and concurs with previous work by Ehri and Wilce (1985) and by Mason (1980). Ehri explains this difference in memorability in terms of the alphabetic system assisting retrieving connections between written words and their pronunciations in contrast to a less systematic method based on visual connections.

FULL ALPHABETIC STAGE

The reader is now able to form alphabetic connections, but not just alphabetic ones. The developing reader can also map graphemes to phonemes of ‘sight words’. Sight words are defined here in terms of words that have been read several times. Readers with this full alphabetic skill are able to achieve more accuracy in their recognition, as they are now processing the constituent letters. These readers are also able to read new words by blending the generated pronunciations. Ehri discusses the way that during this phase there is an integral development towards using ‘sight word reading’ over decoding individual letters. Children in this phase adopt strategies to handle such words, for example by noting silent letters (e.g. the s in ‘island’).

CONSOLIDATED ALPHABETIC STAGE

This is equivalent to Frith’s orthographic stage. With continuing practice at reading in this final phase, recurring letter patterns become consolidated or unitized. Ehri discusses the advantages of this process for reducing memory load, for example, the word ‘chest’ might be processed only as two units ‘ch’ ‘-est’ in the consolidated phase compared with four (ch, e, s, t) in the full alphabetic phase.

Many researcher’s gave their own possible classifications or stages that in process of reading. Thus further research has to be done to validate the presence of various stages of reading.

NEED FOR THE PRESENT STUDY

The ability to read in children may be acquired through teaching or spontaneously through their own observations of experimenting with particular printed words and particular pronunciations, thus involved in a whole lot inventing and re-inventing their ability to read and write. On one hand, English is a language which follows the alphabetic principle of orthography, languages other than English are considered non-alphabetic languages. English is a language which does not follow exact one-one correspondences of its phonemes and graphemes. English being an alphabetic language, includes multiple variations of several sound letter correspondences making reading and writing more challenging and thus making phonemic awareness training all the more crucial to learn adequate literacy skills.

On the other hand, Indian languages are considered more syllabic or semi-syllabic languages, with better phoneme-grapheme correspondences. English being a global language learnt all over the world, is considered a language of high academic status. However, there is a dearth of literature which talks about models discussing the development of English literacy skills in children (like the Marsh's model, Frith's model, etc. However, these studies have been conducted in those children whose native language has been English and learning to read and write in English itself. Facts and figures still need to be known as to what happens when a child with a different language background learns to read and write in another language.

This phenomenon (of different stages and phases of reading) of how difficult or how easy it is for Indian children following semi-syllabic script (Kannada) but learning literacy skills in an alphabetic script (English) need to be understood.

OBJECTIVES OF THE PRESENT STUDY

The aims of the study will be to:

- Explore the logographic skills in Bilingual (Kannada and English) children during the developmental process of learning to read.
- To determine whether the logographic skills are seen in the age groups considered for the study.
- To study, whether the logographic stage of reading terminates during one age-group or occur in combination with the alphabetic stage (Frith, 1985) for the effective reading and in which group this combination is more predominant.
- To explore the logographic and or phonological skills in Indian children during the process of reading and to identify the strategy most predominant in these children.
- To investigate the pattern of transition between these two phases (Logographic phase and phonological phase) if both are seen to exist and which correlates closely with academic excellence.

REVIEW OF LITERATURE

Reading is an important skill that needs to be developed in children. Not only is it necessary for survival in the world of schools and (later on) universities, but in adult life as well. The ability to learn about new subjects and find helpful information on anything from health problems and consumer protection to more academic research into science or the arts depends on the ability to read.

Futurologists used to predict the death of the printed word but, ironically, Internet has made reading more and more a part of people's daily lives. The paperless society is a myth. The computer's ability to process and analyze data means that endless variations on reports and other types of documents can be and are generated. Internet, itself an enormous new source of information and recreation, is based on the humble written word. To effectively utilize the web and judge the authenticity and value of what is found there, both reading and critical thinking skills are of prime importance.

The more children read, the better they become at reading. It's as simple as that. The more enjoyable the things they read are, the more they'll stick with them and develop the reading skills that they'll need for full access to information in their adult lives. Reading should be viewed as a pleasurable activity - as a source of entertaining tales and useful and interesting factual information.

The more young children are read to, the greater their interest in mastering reading. Reading out loud exposes children to proper grammar and phrasing. It enhances the development of their spoken language skills, their ability to express themselves verbally.

Reading, by way of books, magazines or websites, exposes kids to new vocabulary. Even when they don't understand every new word, they absorb something from the context that may deepen their understanding of it the next time the word is encountered. When parents read aloud to children, the children also hear correct pronunciation as they see the words on the page, even if they can't yet read the words on their own.

The phonological forms of spoken words bear an arbitrary relationship to their meanings. For example, there is no reason why a chair should be called /tʃɛr/ as opposed to something else. Indeed, a chair is called a /ˈsija/ in Spanish. (For an explanation of the phonetic symbols used here, see International Phonetic Association, 1999). Learners of spoken languages must memorize the arbitrary phonological forms that are associated with the concepts of chair, dog, and so on. There are no meaningful or systematic links that they can use to motivate the associations between the phonological and semantic forms. The situation is different for learners of most written languages. In alphabetic and syllabic writing systems, written words are linked in systematic ways to their pronunciations. For example, the spelling *chair* is related to the phonological form /tʃɛr/ by virtue of spelling–sound correspondences that hold across many English words. The spelling is motivated rather than arbitrary for those who know that *ch* corresponds to /tʃ/ in words such as *chip* and that *air* corresponds to /ɛr/ in words such as *pair*. Becoming a good reader involves learning about the spelling–sound mappings of the language. Skilled readers reveal their knowledge of these links when they pronounce a previously unseen word like *glair* on first exposure or when they hesitate on a word like *choir*, which deviates from the typical spelling-to-sound mappings of the language.

We know that skilled readers benefit from the systematic links between letters and pronunciations that exist in alphabetic writing systems, but we know less about how and when children begin to do this. According to several influential views of literacy development (e.g., Byrne, 1992; Ehri, 1998; Frith, 1985), children typically learn their first words in a *logographic* or *prealphabetic* way. Rather than using systematic links between letters and sounds, children identify each printed word based on salient visual characteristics. For example, a child may recognize *dog* by virtue of the "tail" at one end of the printed word. This approach to word identification is quite limited. Logographic learners often confuse printed words with one another, and they tend to forget them quickly. According to these influential theories of literacy development, literacy learning begins to surge only when children start to take advantage of alphabetic links between printed and spoken words.

Ehri and Wilce (1985) found evidence for a prealphabetic approach among children who they classified as prereaders when they taught U.S. 5 year olds to read two sets of printed items. The items in one set contained letters that corresponded to the sounds in the words' pronunciations. In this condition, for example, MSK was presented as a spelling for *mask*. The items in the other set violated conventional letter–sound correspondences but were more visually distinctive. In this condition, for example, UHE was taught as *giraffe*. Children had up to 10 trials to learn the pronunciations of the items in each set. Children who could read no more than one word from a list of simple words such as *look*, *it*, and *stop* performed better on the arbitrary but visually distinctive spellings than on the phonetically motivated spellings. According to the researchers, these children were relying on a logographic approach to link print and speech.

The results of Ehri and Wilce (1985) suggest that young children start out by using a logographic approach to learn about print. A potential problem with this conclusion, however, stems from the fact that the nature of the spelling–sound links was confounded with the visual characteristics of the print in Ehri and Wilce's study. The phonetically motivated spellings looked less distinctive than the arbitrary ones. Thus, it is not clear whether prereaders' failure to perform better on the phonetically motivated spellings than the arbitrary ones reflects a failure to use alphabetic mappings or a preference for spellings that are visually distinctive. If pre-readers approach print logographically, they should perform no better on alphabetically motivated spellings than on arbitrary spellings when the two types of spellings are similar in appearance.

Abreu and Cardoso-Martins (1998) found similar results among Portuguese-speaking pre-readers who had little knowledge about letters, although children with more letter knowledge performed differently (see also Cardoso-Martins, Resende, & Rodrigues, 2002). In the study by Ehri and Wilce, as in studies by Rack, Hulme, Snowling, and Wightman (1994), and Laing and Hulme (1999), children who could read at least a few words aloud learned phonetically motivated items more easily than arbitrary or less well motivated items.

In 1987, Mythra tested preschoolers across ages in 3 groups from 2 years to 5 ½ years, measuring their responses for 4 stimuli; popular printed advertisements of 47 products, their corresponding logos, written forms of the same words and written words that resembled the product names. Her study revealed that Indian children pass through the logographic phase while learning to read in kindergarten.

Baddeley et al. (1988) hypothesized that the phonological loop component of working memory is integral to the process of word learning. Word learners, both second language learners and children learning their first language, must associate a novel phonological string with a meaningful concept. P.V.'s ability to associate two known words was possible because their familiarity placed minimal demands on her impaired phonological storage capacity. However, her impaired ability to recall longer non-words paired with her intact phonological processing reflected limited phonological storage. Longer non-words were simply at or beyond her memory.

Bastien-Toniazzo and Jullien (2001) support the importance of the logographic phase in learning to read. The same visual imaging system that assists recall of symbols to be associated with words may be critical in the association of sounds to printed letters of the alphabet. It is likely that young children who easily recall novel letters and can pair them with words are those who are more likely to recall images of letters and can pair them with corresponding sounds. Engaging verbal working memory to associate abstract symbols with words, as is done when children read a logographic sign (for example, McDonald's is associated with two golden arches), is an important component of pre-reading skills. In this study, approximately thirty pre-readers at the preschool level took part in an investigation to determine if there was a relationship between learning names of symbols (logographics) and subsequent learning sounds of letters.

Bowman and Treiman (2002, Experiment 3) tested children who had a mean age of 4 years 7 months and who could not read any simple words on a screening test. Overall, the children performed better in the phonetically motivated conditions than the arbitrary conditions. For the VCC motivated condition, where the name of the first printed consonant letter was heard in the corresponding spoken word (e.g., *LK–elk*), the superiority for the motivated condition over the arbitrary condition was statistically significant. This superiority was smaller and not statistically reliable for the CVC items, where the name of the second consonant letter was heard (e.g., FL–*fell*). The children in the Bowman and Treiman study, like most U.S. children of this age, knew the names of a number of letters. They used this knowledge, apparently, to rationalize spelling–pronunciation pairs such as *LK–elk*, in which the letter name occurred in the initial position of the word. Letter names at the ends of words were less helpful, reflecting children's greater attention to the beginnings of words than to the ends.

The results suggest that young children who cannot recognize simple words can go beyond a logographic approach to reading when learning words that contain consonant letter name cues in salient positions.

Berninger et al., (1990). Monitored 42 US first-graders on:

(i) Visual language (recognition memory for words & letters)

(ii) Oral language (vocabulary; phoneme segmentation & deletion)

(iii) Reading (lexical decision & word naming)

(iv) Spelling (written reproduction after seeing a word)

Results revealed that the visual language skills emerged at the end of kindergarten predicted reading and spelling only at the start of the year. Also suggests early reading and spelling are logographic in nature then shift to alphabetic processing. No evidence to suggest logographic

Reading drives development of logographic spelling.

STUDIES RELATED TO NON WORD REPETITION TASK

From the perspective that word learning initially involves learning unfamiliar phonological forms, which in turn relies on phonological short-term memory, a non-word repetition task seems well-suited to measure these phonological memory abilities (Gathercole & Baddeley, 1989, 1990; Hoff et al. 2008). Hoff (2008) confirmed the validity of a non-word repetition task as a means to assess phonological memory in young children. A non-word repetition task reflects the encoding, storage and retrieval of phonological representations in short-term memory (de Bree, 2007). These representations consist of information about each speech sound of the stored word. Gathercole (2006) states that the ability to repeat non-words is highly dependent on phonological storage capacity and that both word learning and non-word repetition require phonological storage.

Considering the discrepancy in real word and non-word repetition accuracy, which has been observed in 24-month-old children (Hoff, 2008), it seems essential to discuss the underlying processes. In the Levelt-model (1999) for word production the process from intention to sound wave is divided into several steps. Some important steps in word production are those of lexical selection and phonological encoding followed by phonetic encoding and articulation. The difference between the tasks of repeating real words and non-words lies in the routes through the production model that can be taken. In both real- and non-word repetition the word-to-be-repeated, i.e. the perceived word, passes through phonological memory. A familiar, real word will find a match in the lexicon and subsequently all the intermediate steps up to articulation will be taken. This is called the lexical route. A non-word on the other hand cannot follow this lexical route, because there is no matching form in the lexicon. Rather, information from phonological memory goes straight to phonetic encoding and articulation. This is called the non-lexical route. By definition, then, the repetition of non-words does not involve lexical access, and the speaker can therefore not make use of this source of information (Den Ouden, 2002). This dual route system, which distinguishes between lexical and non-lexical speech production, can be used to measure the functioning of the phonological memory. Of course the repetition of both types of words relies on this memory. However, while the repetition of familiar words can be facilitated by access to information in the lexicon, the accuracy of the repetition of non-words solely relies on information stored in and retrieved from phonological memory.

In typically developing children, the ability to repeat non-word accurately is closely and specifically related to one particular aspect of language learning: vocabulary acquisition. The association was first established in a longitudinal study of children aged between 4 and 8 years, who were tested at four points in time on measures of receptive vocabulary knowledge, non-word repetition, and nonverbal reasoning ability (Gathercole & Baddeley, 1989; Gathercole, Willis, Emslie, & Baddeley, 1992). The non-word repetition set constructed for the purposes of this study consisted of 40 stimuli such as *prindle*, *frescovent*, and *stopograttic*, which ranged in length from one to four syllables. Repetition attempts were scored as incorrect if any phonological errors were made. Vocabulary and non-word repetition scores were highly correlated with one another at ages 4, 5, and 6 years (r = .52–.56, $p < .001$ in each case), even after the possible confounding factors of variation in age and nonverbal ability were taken into account. Indeed, within samples of children sampled within a school year age band, nonword repetition scores are typically independent of such measures of general cognitive ability (Gathercole, Willis, Emslie, & Baddeley, 1994).

Comparably close and specific associations between non-word repetition and vocabulary knowledge have since been demonstrated in many other studies of the acquisition of vocabulary of both the native language (e.g., Avons,Wragg, Cupples, & Lovegrove, 1998; Gathercole & Baddeley, 1989; Gathercole, Hitch, Service, & Martin, 1997; Michas & Henry, 1994) and foreign languages (Masoura & Gathercole, 1999, 2005; Service, 1992; Service & Kohonen, 1995).

Experimental analogs of natural vocabulary acquisition such as paired-associate learning have reinforced these conclusions, and provided a valuable means of exploring the nature of the association between non-word repetition and word learning that controls exposure to the novel stimuli. Using these methods, it has been established that children with relatively low non-word repetition scores are slower to learn the novel phonological forms of new words, such as the name *Sommel* of an unfamiliar toy monster (Gathercole & Baddeley, 1990a), of the label *foltano* paired with a description of a *noisy dancing fish* (Gathercole et al.,1997), or of the word *coracle* defined by the features *is a round boat, was used for fishing,* and *can be carried on your back* (Michas&Henry, 1994). The link between word learning and nonword repetition is restricted however to the learning of the sound form of the new word.When the stimulus items to be learned either consist of familiar (e.g., *Michael* rather than *Sommel*) rather than unfamiliar phonological structures (Gathercole & Baddeley, 1990a; Gathercole et al., 1997), or the novel phonological form is used as a cue to elicit associated semantic information rather than vice versa (Gathercole et al., 1997), the statistical association with non-word repetition scores is eliminated.

It is argued here that one major constraint on non-word repetition is the availability of accurate phonological representations to guide the production of an utterance matching the phonological input. The capacity to store a non-word on any single occasion is not the product of a single factor: it is influenced by the quality and persistence of the phonological representations that are characteristic of an individual, by the impact of learning conditions on phonological storage, and by prior factors affecting the initial construction of the phonological representation. Phonological storage is conceived here in terms that correspond closely to the phonological short-term store in Baddeley's (1986) model of the phonological loop. Auditory linguistic inputs are automatically represented in the store, where they are subject to rapid time-based decay. The decay of the representations can be off-set by a sub-vocal rehearsal process that boosts their activation levels. Rehearsal is a volitional strategy that is closely associated with covert articulatory processes and that does not typically emerge until after 7 years of age (see Gathercole & Hitch, 1993, for a review).

The phonological loop is conventionally assessed using serial recall tasks in which verbal items are presented at a regular pace for immediate recall in the original input sequence. A measure of phonological loop capacity is provided by the span procedure in which the sequence length is increased until the point at which recall errors are made; memory span is the longest length at which the individual can accurately recall a sequence. Memory span is usually measured using digit names or short familiar words as the memory stimuli (e.g., Pickering & Gathercole, 2001).

Although the phonological loop is considered to be a storage device that is distinct from stored lexical phonological knowledge, it does not operate in isolation from more permanent knowledge representations. Immediate memory performance is strongly influenced by the lexical characteristics of the memory stimuli: in particular, serial recall is superior for words than nonwords (e.g., Hulme, Maughan, & Brown, 1991), and for words with high than low frequencies of occurrence in the language (Hulme et al., 1997).

The repetition of nonwords necessarily requires the storage of its constituent phonological segments in the short-term store, and that the quality of this storage varies markedly between individuals (Gathercole & Baddeley, 1989; Gathercole et al., 1992, 1994). A key assumption was that because nonwords do not activate lexical representations, their phonological representations are not reintegrated. Thus, non-word repetition may provide a purer assessment of phonological storage quality than serial recall measures using lexical stimuli as memory items, because lexically based reconstruction processes cannot compensate for deficits in basic phonological storage when non-words are used.

The hypothesis that non-word repetition is limited by phonological storage capacity is supported by close associations between non-word repetition and serial recall scores, across many participant populations. Non-word repetition and digit span are highly correlated with one another in typically developing samples of children, and also in normal adult populations (see Gathercole et al., 1994, for review). Poor non-word repetition performance also invariably accompanies verbal short-term memory deficits identified on the basis of very poor memory span scores: low repetition scores are typical both of individuals with developmental impairments of short-term memory

(Baddeley & Wilson, 1993; Butterworth, Campbell, & Howard, 1986) and of neuropsychological patients with damage to the left hemisphere resulting in profound deficits in verbal storage (e.g., Baddeley, Papagno, & Vallar, 1988; Trojano & Grossi, 1995).

NWR tasks are often used to measure phonological STM. Children are asked to repeat a series of nonsense words that typically increase in difficulty (i.e., length) as the task progresses. Non-words are used instead of real words because non-words minimize the role of long-term memory, and consequently, children must make greater use of their phonological STMs. It is, however, important to note that long-term memory is not completely absent in NWR tasks. Edwards, Beckman, and Munson (2004) and Munson, Kurtz, and Windsor (2005) report that children are more accurate with high frequency sequences (i.e., phoneme pairings) than with low frequency pairings, suggesting that non-words that closely resemble known words are easier to reproduce than non-words that differ more drastically from real words.

Given the emphasis placed on phonological STM in language learning, many researchers (e.g., Dollaghan & Campbell, 1998; Laing & Kamhi, 2003; Gallon, Harris, & van der Lily, 2007; Girbau & Schwartz, 2007; Thordardottir, 2008) advocate for measures of phonological STM, such as NWR tasks, to be used to assess children‟s language learning skills (e.g., to determine if children have a language learning difficulty). NWR tasks have been shown to have clinical value (i.e., they are useful assessments for language learning difficulties) across a number of different first language (L1) backgrounds (e.g., Girbau & Schwartz, 2007 on Spanish; Rispens & Parriger, 2010 on Dutch; Sahlen, Reuterskiöld-Wagner, Nettlebladt, & Radeborg, 1999 on Swedish). The ability of NWR tasks to separate typical from atypical language development supports the idea that children with language learning difficulties (e.g., specific language impairment) have a deficit in their phonological STM (e.g., Gathercole, 2006).

The typically developing children perform better on short syllable length non –words than longer syllable length non –words because of the limited capacity nature of the short term memory (Gathercole & Baddely,1989; Gathercole 2006).

In recent years, researchers have begun to examine linguistic processes in various populations by having listeners repeat nonsense words. In these tasks, listeners hear a made-up word modeled after their native language, e.g. shrib, and are asked to repeat it back immediately. This non-word repetition task (NRT) has gained a great deal of acceptance in recent years for two main reasons. First, the NRT was adopted because it correlates so well with standardized vocabulary measures in typical populations. Children who are better able to repeat non-words after a single presentation tend to be the same children who score higher on standardized vocabulary measures. This is surely related to underlying components common to both tasks. To repeat successfully a non-word, a repeater must create an acoustic representation robust enough to support subsequent articulation. Similarly, upon hearing a novel word, a learner must create an acoustic representation robust enough to link to its real-world referent. Second, the NRT was adopted because it is quite sensitive to a wide variety of language disorders. Successful repetition of a nonword involves speech perception, phonological encoding (or segmenting the acoustic signal into speech units that can be stored in memory), phonological assembly (or formulating a motor plan that assembles the relevant speech units), and articulation. Further, it requires a robust representation of underlying speech units, and sufficient memory both to temporarily store and operate on the novel phonological string. A deficit in any of these component skills results in less accurate repetition. Indeed, NRTs have been used to explore deficits experienced by children with articulation disorders (Yoss and Darley 1974), children with reading difficulties (for a review, see Brady 1997), children with specific language impairments (SLI, e.g. Dollaghan and Campbell 1998), children with Williams syndrome (Grant et al. 1996, 1997), children with Down's syndrome (Comblain 1999, Laws 1998), children with higher levels of lead exposure (Campbell et al. 2001), children with cochlear implants (Carter et al. 2002), children with fluency disorders (Hakim and Ratner 2004), and adults with acquired aphasia (e.g. McCarthy and Warrington 1984). In addition, the NRT has been adapted for speakers of many languages, including Dutch (Van Bon and Van der Pijl 1997), Finnish (Service 1992), Swedish (Sahle´n et al. 1999a, b), Spanish (Cuetos et al. 1996), French (LeFoll et al. 1995), Italian (D'Amico 2000), Brazilian Portuguese (Santos and Bueno 2003), Greek (Maridaki-Kassotaki 2002), Cantonese (Ho and Lai 1999) and Japanese (Saito 1995). Thus, the NRT has gained wide acceptance for describing language performance in many populations.

While many recent studies have used an NRT explicitly as a measure of phonological memory (e.g. Montgomery 2004), there really is no consensus as to what the NRT actually measures. It has been used to measure the process of lexical access (e.g. Rubenstein et al. 1970), speech production (e.g. McCarthy and Warrington 1984), motor planning abilities (e.g. Yoss and Darley 1974), phonological processing, including phonological segmentation and assembly (e.g. Snowling 1981), and phonological memory (e.g. Gathercole and Baddeley 1989). Besides these supporting skills, repetition accuracy also relies on stored lexical knowledge, even though early versions treated it as a content-free language measure. NRTs were originally used to circumvent any word familiarity or frequency effects that would surely affect the repetition of real words. However, more recent evidence has shown that long-term lexical knowledge contributes to non-word repetition, over and above the phonological and memory processes already implicated. Indeed, repeating a non-word taps a number of underlying skills, which makes interpreting results problematic. When testing adult patients with acquired aphasia, it is reasonable to assume that they had intact linguistic systems before suffering lesions. Therefore, their representations of the underlying speech units are not in question even though their ability to process or manipulate these units may be compromised. However, when testing young children, this assumption cannot be made because these abilities develop simultaneously, along with the underlying acoustic representations. Difficulties with any or all supporting skills will result in reduced repetition accuracy.

NRT to examine the relationship between phonological memory, phonological sensitivity and language development in children with NL (Adams and Gathercole 1995, 1996, 2000, Gathercole 1995, Gathercole and Adams 1993, 1994, Gathercole and Baddeley 1989, Gathercole et al. 1997, 1999, 1991a, b, 1992). They reasoned that children who have more memory resources to retain novel phonological strings for immediate repetition will experience more success with language acquisition. They therefore conducted a number of multiple regression studies to provide evidence for correlations between language outcome measures and phonological memory, as measured by the NRT. Over these many studies, Gathercole and colleagues have consistently reported significant correlations between (1) non-word repetition accuracy and other measures of phonological memory (e.g. digit span), and (2) phonological memory, as measured by non-word repetition, and other areas of language (e.g. receptive vocabulary or syntax).

STUDIES ON RHYME AWARENESS IN CHILDREN

Children who are better at detecting and manipulating syllables, rhymes, or phonemes are quicker to learn to read, and this relation is present even after variability in reading skill due to factors such as IQ, receptive vocabulary, memory skills, and social class is partialed out (Bryant et al., 1990; Wagner & Torgesen, 1987; Wagner et al., 1994).

Yopp (1988) found evidence for two highly correlated processing factors in kindergarten children: a simple phonological sensitivity factor that included measures involving the manipulation of phonemes and detection of rhyme and a factor for tasks that required holding a sound in memory while performing an operation. In contrast, Hoien, Lundberg, Stanovich, and Bjaalid (1995) found separate factors for phoneme sensitivity, syllabic sensitivity, and rhyme sensitivity in both Norwegian preschool children (mean age 83 months) and first-grade children (mean age 94 months), and scores on all three factors independently predicted reading abilities for the older group of children. However, it is difficult to interpret the results of Hoien et al. in the context of developing phonological sensitivity because of the age of the children, the fact that scores on several measures were near ceiling, and the fact that only one task defined the rhyme sensitivity and syllabic sensitivity factors.

Flushberg (1982) found age-related performance differences on a forced-choice rhyme matching task with preschool-age children.

Chaney (1992) administered several phonological sensitivity tasks (i.e., rhyme matching, sentence segmenting, phoneme blending) to 43 three-year-old children but did not report the relations between performance on the different tasks; however, a composite phonological variable was correlated with both age and language scores. Using confirmatory factory analysis with a group of 105 four- and five-year-old children, Wagner et al. (1987) found that measures of syllabic sensitivity (i.e., syllable counting, syllable elision, and syllable blending) were related to rhyme tasks and to phonological memory tasks independently of general cognitive ability.

Snowling (2001) gave 3- and 4- year-old children a rhyme matching task in which distracters were matched for global phonological similarity to the target.(e.g., *House* : Mouse, horse, *bell* : Shell, Boll). They reported that approximately 30% of the 3- year-olds , 60 % of the young 4- year-olds , and the 75 % of the 4.5-year-olds scored above chance in matching rimes, even though many of the distracters (e.g., <u>Horse </u>) were as phonologically similar to the targets (e.g., <u>House</u>). As the correct rime choices (e.g., <u>Mouse</u>).

Studies of phonological awareness have used a wide range of methods to explore phonological skills in the preschool years .For example, children as young as 3 years can be asked to correct speech errors made by a hand puppet (“sie” for “pie”) , to complete nursery rhymes (“jack and jill went up the-“[hill]), or to select the odd word out of a group of 3 rhyming words (Oddity detection) :Pin, win, <u>sit, </u>see Chaney, 1992; Bradley and Bryant, (1983); Bryant, Bradley, Maclean & Crosland (1989); Ho and Bryant (1987). Young children perform at above chance level on such tasks. For example, Bryant .et.al.(1989) found the 3 –year-olds scored on average 48 % correct in the rhyme oddity task (Chance = 33 %) . Bradley and Bryant (1983) found that 4 year olds were 57 % correct at detecting sound oddity when words differed in alliteration. (Onset detection, e.g., Sun, sock, rag), and 75 % correct at detecting sound oddity when words differed in rhyme (cot, hat, pot). Chaney (1992) reported that 88 % of her 43 3 –year-olds could correct the puppet who mispronounced words .this was essentially an onset detection task ("Pie" mispronounced as "sie" , demonstrating that when single phonemes are onset, children can be aware of phoneme-sized units even prior to schooling). Bryant.et.al(1989) reported that only one of the 64 3-year olds in their study knew none of the 5 nursery rhymes being tested. On average, the children knew about half of the nursery rhymes (they were scored 1 for partially completing the rhymes and 2 for fully completing them making a total possible score of 10 , the mean score for the group was 4.5).

Similar results have been reported for the preschoolers in other European languages. However, as schooling typically begins later in school languages, these children are usually older when they are tested in nursery school. For example, Wimmer, Landerl and Schneider(1994) gave 138 german preschoolers aged 6 years the oddity task, comparing rhyme and alliteration (Onset oddity). The children scored 44 % correct in the onset task and 73 % correct in the rhyme task. In Greek , Porpodas (1999) studied Greek children who had just entered school (7 year olds) , giving them the oddity tasks Overall performance (Presented added across onset and rime) was 89% correct. For Norwegian , a study of 128 preschoolers by Hoien , Lundberg , Stanovich & Bjaalid (1995) measured rhyme awareness using a matching task. The children who were aged on average 6 years

11 months, were asked to select a match from a choice of 3 pictures to rhyme with a target picture. Performance by the group averaged 91 % correct. Hence phonological awareness prior to schooling is well- developed at the larger grain sizes of onset and rime.

STUDIES RELATED TO PHONOLOGICAL AWARENESS

Phonemic awareness refers to the ability to recognize the smallest units of sound within words. A phoneme is the smallest unit of sound within a word. It includes the ability to separate individual sounds within words, to hear sound patterns in speech (Liberman, et al., 1974; Bryant & Bradley, 1985; Adams, 1990; Munro & Munro, 1993; Whipp, 1994), and with experience, to identify individual letters and spelling patterns (Adams, 1990).

Many studies have shown a connection between phonemic awareness and reading difficulties.

As phonemic awareness develops, children tend to focus on larger clusters and whole words. This leads to the use of higher level orthographic knowledge in reading.

Phonemic awareness thus deals with awareness that words, and even word clusters, are made up of smaller units of sound which, when blended together in particular sequences, make up different words (Munro & Munro, 1993; Whipp, 1994). Phonemic span refers to the number of sounds, rather than the number of letters in a word. The ability to segment words into individual sounds may be influenced by the phonemic span of the word. The amount of attention which needs to be applied to the task increases as phonemic span increases (Munro, 1994).

Many children with reading difficulties have problems associated with phonemic awareness skills (Bradley & Bryant, 1983; Stanovich, 1986; Adams, 1990; Whipp, 1994). This is strongly supported by Stanovich's (1991) investigations which suggested that up to 90% of children identified as having reading difficulties, show difficulties in the area of phonemic awareness. Adults with reading problems may also have difficulties with phonemic awareness (Tunmer, 1985).

Phonemic awareness in pre-school children is evidenced by their awareness of individual words and their ability to rhyme and alliterate. Children become more aware of the individual sounds in speech as their reading progresses. This leads to the development of the ability to segment words into onset and rime, and finally into single sounds (Munro & Munro, 1993). The types of word-based activities that help to develop phonemic awareness skills consist of rhyming activities, initial and final sound identification, whole word segmentation, deletion of sounds and substitution of sounds within words. These activities easily fit into everyday classroom language activities, often taking the form of games.

There is a reciprocal relationship between reading acquisition and phonemic awareness. It seems that as reading ability improves, so does phonemic awareness, and as phonemic awareness improves, reading ability also improves (Bradley & Bryant, 1983; Stanovich, 1986; Munro & Munro, 1993; Whipp, 1994; Yopp, 1988, 1992).

There are three distinct stages in the acquisition of phonemic awareness. The first is implicit awareness, which includes rhyming tasks. The second is simple awareness, which includes segmenting, blending, phonemic counting and isolating sounds within words. The third is compound awareness, which includes tasks such as sound deletion and sound substitution (Yopp, 1988; Lechner, Gerber & Routh, 1990; Munro & Munro, 1993).

Rhyming is considered to be one of the first indicators of phonemic awareness in young children (Bradley & Bryant, 1983; Adams, 1990; Munro & Munro, 1993; Byrne, 1991; Goswami, 1993; Whipp, 1994). In the early stages, phonemic awareness is evident in children's response to patterns in speech through activities such as action rhymes and songs. These experiences help to build the children's phonemic awareness knowledge and the relationship of sounds within words. Activities include rhyming games, rhyming, counting syllables, counting sounds in words, clapping games, nursery rhymes, predicting words that rhyme in stories, sorting pictures into rhyming pairs, and rhyming in poetry (Adams, 1990; Munro & Munro, 1993; Whipp, 1994).

Training children in rhyming and alliteration improves their ability to read and spell (Bradley & Bryant, 1983). Bryant (Byrne, 1991) conducted a study which indicated that the knowledge of nursery rhymes at the age of three, predicted the reading success of the children three years later. This indicated that the sensitivity to rhyming and phonemic structure helps children to read. Furthermore, Bradley and Bryant (1983) carried out a study where children considered at risk of reading difficulties were trained to categorize words by rhyme and alliteration. This led to the improvement the child’s ability to read.

Rhyming skills are considered to be the earliest of skills to develop in children (Stanovich, 1986; Yopp, 1988). This was supported by the findings of this study. A number of researchers also stated that onset/rime segmentation preceded full segmentation in order of difficulty. This was supported by this study and the work of Yopp (1988), Vandervelden and Seigel (1995) and Goswami (1993). Also verified was Vandervelden & Seigel's (1995) premise that onset/rime segmentation is one of the first stages in the development of segmentation skills. There are questions to be addressed concerning the nature of the rhyming task used in the phonological awareness battery, and its suitability for this population. In typically developing children, the ability to recognize rhyme emerges between three and four years of age, with most children scoring at ceiling levels in tests of rhyme once they start school (Bryant, MacLean, Bradley & Crossland, 1990; Lonigan et al., 1998; Warrick et al., 1993).

METHODOLOGY

The study includes 20 pre-school children in each of the three groups in the age range of 3-4years (Play group); 4-5years (LKG group) and 5-6 years (UKG group).

1.1 Participation selection criteria

1) The participants of 3 groups had to be Kannada-English bilinguals, with kannada as their mother tongue and English as their medium of instruction in school.

2) The participants had to be screened using the WHO Ten disability checklist (Singhi, Kumar , Malhi & Kumar,R,2007) for any Sensory, Motor or Cognitive impairments, Delayed acquisition of motor and verbal skills, Communication difficulties and presence of other ailments.

3) The participants of all 3 Groups had to belong to the middle or upper middle socio-economic classes.

4) The participants of all 3 groups had to have adequate exposure to the media.

1.2 Materials

Tools used in the study and their purposes

S.No	Test/Stimulus, Author, Year	Purpose of the Current study
1.	• Children's Test of Non-word repetition (Gathercole and Baddeley,1994)	• To assess the phonological awareness(phonolo working memory) of the children through Non repetition task

2.	• Rhyme Oddity Task	• To assess the phonological awareness of the chil through rhyme awareness task

1.3 Stimulus preparation

Step 1 : A list of 50 pictures depicting 50 different products, regularly advertized on TV was selected.

Step 2: Two post graduate students of Speech Language Pathology were asked to rate the appropriateness on a 3 point rating scale (highly appropriate, appropriate or inappropriate) of the 50 different products ,in terms of the case of identifying those products for typical children just below 6years of age. Only products those were rated by both the judges as “highly appropriate “were shortlisted .Out of 42 products that were rated “highly appropriate” by both judges,30 products were pseudo-randomly selected for the final list of target item.

Step 3: The selected final list of target items were divide into 3 different formats namely

1. Picture +Word format (PW).
2. Logo format (L)

3. Word in a changed format.

Step 4: The Picture + Word format (PW) format comprised of a representation of the original advertisement, depicting both the original logo and other features associated with the advertisement such as actors, the product etc. There were 30 such items. Ex: For the item “BOURNVITA ” (Product name), the picture clipping of its advertisement was shown.

Step 5: The Logo (L) format comprised of the name of the product alone in the original printed form. There were 30 such items. Ex: The clipping of the item name “BOURNVITA” was shown alone from the advertisement.

Step 6: In Word in changed format (W), the name of product was presented in Times New Roman font against a white background. There were 30 such items.

Step 7: The standardized Children’s test of non-word repetition (Gathercole & baddeley,1994) comprising 15 low complexity 2 syllable,3 syllable and 4 syllable non words was used to assess the phonological working memory in children.

Step 8 : Rhyme oddity task: In this task 2 of the 3 words in each set rhymed (e.g., fish, dish, *book*; sail, *boot* ,*nail*).This consisted of 2 practice trials and 10 test trials.

1.4. Stimulus Characteristics

Colored pictures of all the products selected as targets were taken in the "bmp" format and resized within a range of 5 inches X 5 inches and 6 inches X 6 inches. The words presented in the block letters in "Times New Roman" format, sized 100.

1.5. Instrumentation

The stimuli were programmed using the DMDX software. The pictures were presented on a HP L1506 monitor using DMDX experimental software. The check vocal software was used for analysis of the recorded naming response.

1.6. Procedure

2. The participants were seated in a quiet room with adequate lighting.
3. The participants were tested using 30 words and 60 picture stimuli i.e. in total 90 stimuli presented on a HP L1506 monitor using DMDX experimental software. The stimuli were grouped under 3 separate formats: Logo task (L), Picture + Word format (PW) and Word in the changed format (W).
4. The children were instructed to say the name of the items presented which were recorded using a microphone.
5. Each item was presented for 2000 milliseconds with an inter-stimulus interval of 1000 milliseconds.
6. The children were instructed to respond as fast as possible by naming the item as

the stimulus appeared on the screen. All the children were tested individually.

7. Before beginning the actual test, all the children were trained for the task using a different set of stimuli, consisting of 4 pictures and 2 words as sample training items. This was done to familiarize the children with the actual task. The responses of the training items were not considered for coding the final responses.
8. In the Non word repetition task, children were asked to repeat 15 (5 each) bi, tri and Quadra-syllabic non-words which was presented by the examiner.

9. Rhyme oddity task: In this task 2 of the 3 words in each set rhymed (e.g., fish, dish, *book*; sail, *boot*, *nail*). Children were presented with 3 pictured cards that were named by the examiner. Children were asked to select one not rhyming with (or that "did not sound the same as", or was "different than") the other two. This consisted of 2 practice trials and 10 test trials that were administered to all children. The position of the odd word across trials was randomly determined and was the same for all children.

1.7. Analysis

- 1.7.a.Logographic skill analysis

The obtained data from all the participants on the naming task was stored. The recorded responses from the DMDX software were analyzed using the check vocal software. The software provided the option of recording the response in a time window of 5000 ms, starting from the onset of the presentation of the picture of the target word. The onset of each of the named response (correct/wrong) was marked through visual inspection of the waveform and /or spectrogram, which was noted as the reaction time. The marking was followed by judgment regarding the correctness of the responses. The responses were judged either correct, wrong or no responses.

The responses were considered ‘correct’ if any of the following conditions were satisfied.

1. The target was named correctly.
2. The target was named correctly, but with articulatory errors.
3. The target word was named correctly after an incorrect response.

The responses were judged ‘no response: in all instances when the participants did not respond or when some unrelated vocal expressions were recorded.

Thus the overall data was analyzed for the reaction time and accuracy

The measured reaction times and accuracy of all the items for each participant were noted and grouped according to the 3 formats **[**Reaction time for Logo (L) task- RTLOGO, Reaction time for Picture + word (PW) task- RTPW, Reaction time for word in the changed format (W)- RTW, Accuracy for Logo task (L)- ACCLOGO, Accuracy for Picture + word task (PW)- ACCPW, Accuracy for word in the changed format task (W)- ACCW**].**

The reaction times of the correct response within each of the 3 formats were averaged and mean values were obtained. The mean values across the 3 formats for all the participants were entered in the SPSS software for statistical analysis.

The mean values were used to obtain descriptive statistical information (group mean and group deviation) across 3 groups in all 3 formats [Logo (L),Picture + word (PW) and Word in the changed format(W)]

1.7.b. Phonological skill analysis

A)Analysis of non word repetition task

The measured accuracy of non-word repetition across syllable length for each participant were noted and grouped according to 3 conditions in non-word repetition task. [2 syllable non-word repetition-ACC2, 3 syllable non word repetition- ACC3, 4syllable non-word repetition- ACC4].The accuracy within each of the 3 conditions was averaged and mean values were obtained. The mean values were used to obtain descriptive statistics information across 3 groups in all 3 conditions.

The percentage of phonemes correct(PVC-Percentage of vowel correct & PCC-Percentage of consonant correct) for each participant were noted and overall mean score of percentage of vowels correct (PVC) and percentage of consonant correct (PCC) across syllable length [PCC2 - Percentage correct consonants at 2 syllable non-words, PCC3 - Percentage correct consonants at 3 syllable non-words & PCC4- Percentage correct consonants at 4 syllable non-words, PVC2 - Percentage correct vowels at 2 syllable non-words, PVC3 - Percentage correct vowels at 3 syllable non-words PVC4 - Percentage correct vowels at 4 syllable non-words] for each participants were noted. The percentages of phonemes correct for each participant was analyzed and mean values were obtained. The mean value were used to obtain descriptive statistical information (group mean and group standard deviation) across 3 groups in all 6 conditions (PVC2, PCC2, PVC3, PCC3, PVC4, PCC4)

B) Analysis of Rhyme oddity task

The measured accuracy of rhyme detection in the rhyme oddity task for each participant was noted. The accuracy rates were averaged and mean value was obtained. The mean value was used to obtain descriptive statistical information (group mean and group standard deviation) across 3 groups.

The analyzed data would be subjected to suitable statistical procedures comparing across conditions and groups.

1. Mixed ANOVA was done to compare the reaction times of 3 groups of subjects for 3 tasks [Logo task (L), Picture + word task (PW), Word in the changed format (w)].
2. Post –hoc Duncan test for the homogenous set was administered to compare 3 groups within 3 separate tasks.
3. Pair-wise comparison of the 3 tasks within 3 groups using repeated measure ANOVA.
4. Paired t test for the comparison of PCC and PVC within groups (PVC2-PCC2, PVC3-PCC3 & PVC4-PCC4).

Results & Discussion

The emergence of logographic skills were explored in Bilingual (Kannada and English) children were during the developmental process of learning to read and also to investigate the pattern of transition between 2 phases (Logographic phase and phonological phase) if both are seen to exist and which correlates closely with academic excellence. Mixed ANOVA , Multivariate analysis of variance (MANOVA) and Repeated measure ANOVA were used for the purpose.

Descriptive statistics were obtained using the SPSS Software. The mixed ANOVA was done to compare the reaction times of the 3 groups of subjects for the 3 separate tasks i.e. Logo (L), Picture + Word (P+W) and Word in the changed format (W) .The results showed that there is a significant difference {$F(2,57) = 95.446$} at 0.05 level of significance between 3 groups and also the 3 separate tasks are significantly different at 0.05 level of significance from each other. The results are depicted in the below table.

Table 4.1 : *Mean and Standard Deviation of reaction times for Logo task (RTLOGO), Picture + word task (RTPW) and Word in the changed format task (RTW) for Group1 ,Group 2 & Group 3.*

	Subject	**Mean (msec)**	**Std. Deviation**	**N**
RT LOGO	Group 1	2161.236	400.023	20
	Group 2	1492.167	459.418	20
	Group 3	975.22	176.920	20
	TOTAL	1542.87	607.699	60
RT PW	Group 1	1619.057	235.700	20
	Group 2	1294.983	351.448	20
	Group 3	865.939	161.544	20
	TOTAL	1259.993	403.517	60
RT W	Group 1	3131.161	648.194	20
	Group 2	2058.720	647.938	20
	Group 3	1102.380	238.857	20
	TOTAL	2097.420	993.607	60

*$p < 0.05$ level of significance

4.1.Comparison of 3 groups within each task using MANOVA

The MANOVA test was administered to compare the groups within each task i.e. in all 3 conditions of Logo presentation, Picture + word presentation and the Presentation of word in the changed format and the reaction time measurements were made.

4.2.a. Comparing 3 groups in the Logo task using MANOVA (post –hoc Duncan test) for the homogenous sets.

The 3 groups were compared for their performances in the reaction time measurement in the logo task using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference {F (2, 57) =52.73} at 0.05 level of significance in the Logo task between the 3 groups. The results are tabulated in the below table.

Table 4.2a Comparison of reaction time for Logo task across Group1, Group 2 & Group 3 using Post- hoc Duncan test.

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	975.2275*		
Group 2	20		1492.1670*	
Group 3	20			2161.236*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.2b Comparing 3 groups in the Picture + word task using the post –hoc Duncan test for the homogenous sets.

The 3 groups were compared for their performances in the reaction time measurement in the Picture+ word task using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference {F (2,57)= 41.73} at 0.05 level of significance. The results are tabulated in the table 3.2b as below.

Table 4.2b Comparison of reaction time for Picture + word task across Group1, Group 2 & Group 3 using Post- hoc Duncan test.

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	865.939*		
Group 2	20		1294.983*	
Group 3	20			1619.236*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.2c Comparing 3 groups in the Word task (word in the changed format) using the post –hoc Duncan test for the homogenous sets.

The 3 groups were compared for their performances in the reaction time measurement in the Word task (word in the changed format) using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference {F (2, 57)=68.901} at 0.05 level of significance . The results are tabulated in the table 3.2b as below.

Table 4.2c *Comparison of reaction time for Word in the changed format task across Group1, Group 2 & Group 3 using Post- hoc Duncan test.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	1102.380*		
Group 2	20		2058.72*	
Group 3	20			3131.161*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.3. Pair-wise comparison across tasks in group 1

Pair-wise comparison of the 3 tasks (Logo, Picture + word and word in the changed format) for reaction time measurement was done using repeated measure ANOVA for group 1. The results showed a significant difference {$F(2,38)=60.56$ }at 0.05 level of significance.

4.4. Pair-wise comparison across tasks in group 2

Pair-wise comparison of the 3 tasks (Logo, Picture + word and Word in the changed format) for reaction time measurement in group 2 using repeated measure ANOVA . The pair-wise comparison of the 3 tasks for the reaction time measurement in group 2 showed the significant difference {$F (2,38) = 25.53$} at 0.05 level of significance.

4.5. Pair-wise comparison across tasks in group 3

Pair-wise comparison of the 3 tasks (Logo, Picture + word and word in the changed format) for reaction time measurement in group 3 using repeated measure ANOVA .

The pair-wise comparison of the 3 tasks for the reaction time measurement in group 3 showed the significant difference {F (2, 38) = 12.30} between P + W (Picture +Word) and W (Word in the changed format) at 0.05 level of significance. Whereas there was no significant difference in the other two pairs.

Figure 2: Comparison of group performances for reaction time measurements in the Picture + word task (P+W)

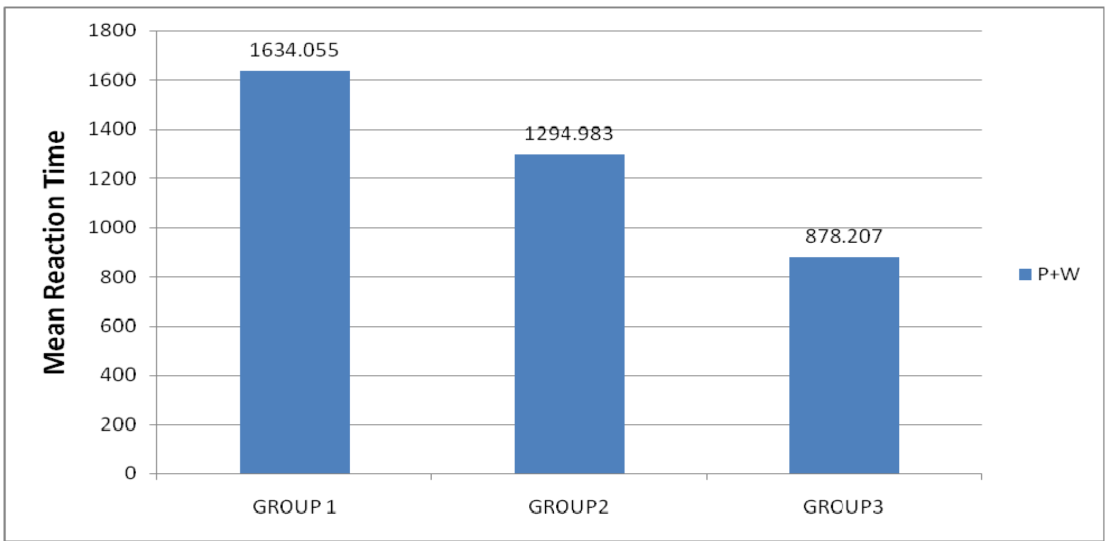

Fig.2. Mean value of reaction time in Picture + word task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the reaction time measurements in Picture + word task (P+W) was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years)

Figure 3 : Comparison of group performances for reaction time measurements in Logo task & Word in the changed format task

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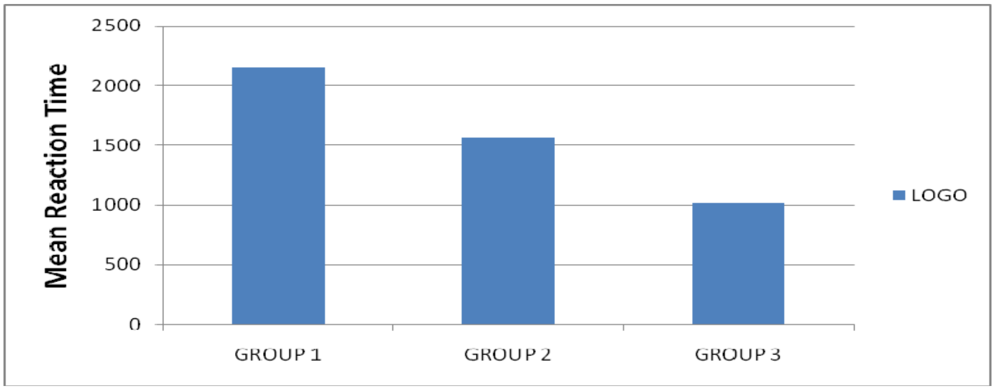

Fig.3. Mean value of reaction time in Logo task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the reaction time measurements in Logo task (L) was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years).

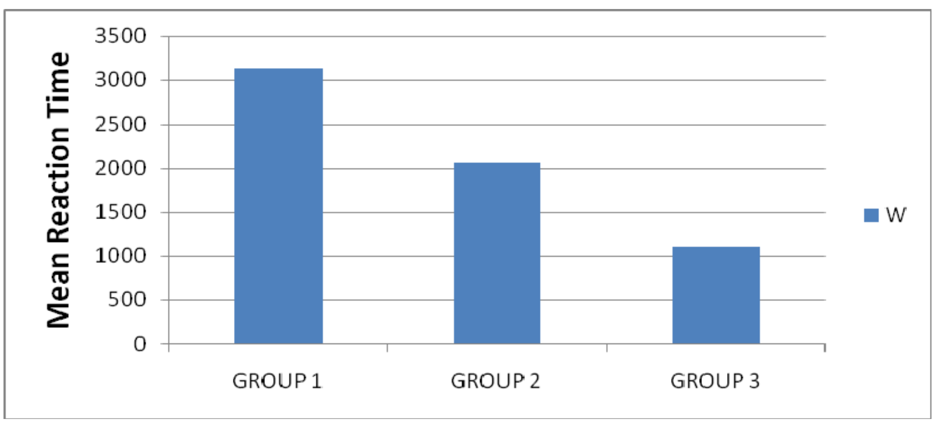

Fig.4. Mean value of reaction time in Word in the changed format task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the reaction time measurements in 'Word in the changed format' task (W) was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years).

Figure 5 :Comparison of overall group performance in the reaction time measurements in all 3 tasks [Picture + word task (PW), Logo task (L) & Word in the changed format task (W)].

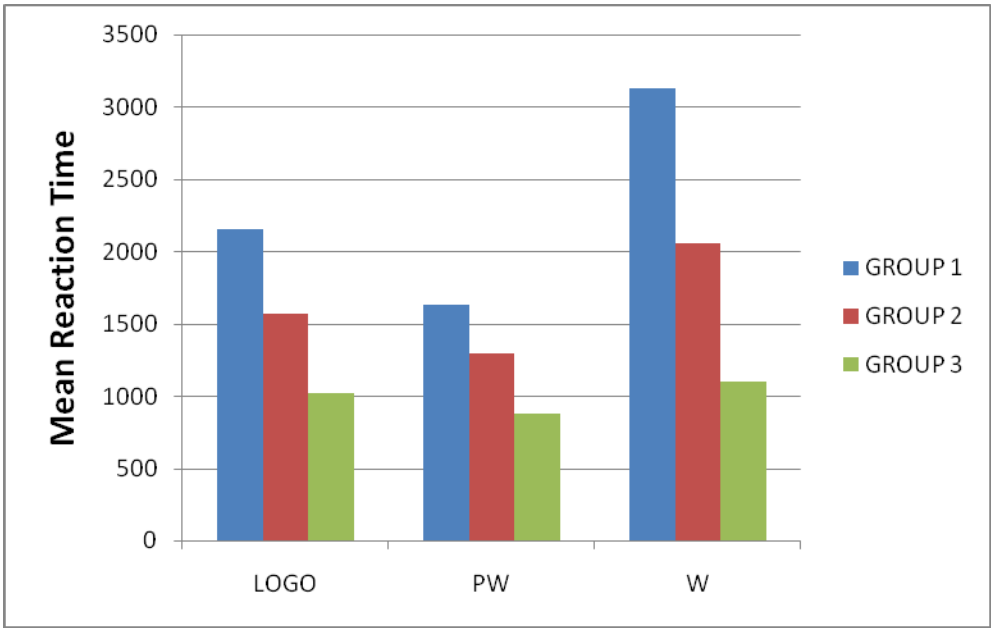

Fig.5. Mean value of reaction time in Picture + word (PW), Logo & Word in the changed format task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the reaction time measurements in Picture + word (PW), Logo (L) & Word in the changed format task (W) was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age-3.5 years).

In the Current study as shown in the fig .3.4., the Mean group performances for the reaction time was found to be longer for Group 1 (Mean age; 3-4 yrs) & Group 2 (Mean age ; 4-5 yrs) when compared to Group 3 in all 3 tasks {Picture + word task (PW), Logo task (L) & 'Word in the changed format' task (W)}.

Also Group 2 performed faster compared to Group 1 in the reaction time measurement and Group 3 performed tasks much faster than the other 2 age groups.

The Mean reaction time for Picture + word (PW) task for all 3 groups [Group 1, Group 2 & Group 3] was shorter (Quick response) compared to Logo task & 'Word in the changed format' task'.The results obtained largely indicate that the stimuli used for Picture + word task comprised of representation of the original advertisement, depicting both the logo and other features associated with the advertisement such as actor, the product etc. Thus in this task, the maximum possible cues like color, shapes, objects & scenes map on to the semantic level from which a name or speech output can be selected rapidly. E.g. the stimulus item "Vicks" that was presented as a part of the Picture + word format ,showing the mother and son together and the bottle with the Vicks label, the child gets the maximum cues by looking at the picture and this possibly resulted in the fast elicitation of the response "Vicks". The results of the current study are in consonance in part with some of the existing evidence. Thus the obtained results are in agreement with the findings of Seymour (1973, 1979) where he explains "Pictorial channel" of the memory system which is responsible for the processing of the pictures and whenever the child sees the picture the channel gets activated and helps in fast pictorial processing.

The Mean reaction time for the Logo task (L) which is the second format of stimuli was longer when compared to Picture + word task in all 3 groups (Group 1, Group 2 & Group 3) as shown in the Fig.3.4. The obtained result may be due to the fact that the stimuli used for the 'Logo task (L)' comprised of the name of the product alone i.e. the multiple features like the actor, shape & scenes pertaining to the particular product was not presented .

The mean reaction time for the 'Word in the changed format' task was longer when compared to Picture + word task and Logo task (L) in all 3 groups (Group 1, Group 2 &

Group 3). This result may be due to the fact that the stimuli used for this task comprised of the name of the product in Times new roman font against the white background. In this format the maximal cues or the features that helped in the quick elicitation of responses in both Picture + word task & Logo task was absent and as the client has to depend solely on the alphabetic strategy which has not fully developed in few groups (Preferably Group 1 & Group 2) wherein the letters has to be reliably matched to sounds that can be blended together to identify words for reading and thus the response was delayed . The results of the present study are in consonance with Fraise (1996) where he demonstrated that logo shape “0” is named more rapidly as “oh” or “zero” within a symbol set than as “Circle “ within a shape set.

4.6.Comparison of group performances for Accuracy measurements using mixed ANOVA.

The mixed ANOVA was done to compare the accuracy of the 3 groups of subjects for the 3 separate tasks i.e. Logo (L), Picture + Word (P+W) and Word in the changed format (W) .The results showed that there is a significant difference {$F(2,57)=546.64$] at 0.05 level of significance and interaction between 3 groups and also the 3 separate tasks are significantly different at 0.05 level of significance from each other. The results are depicted in the table 3.7 as below.

Table 4.6. *Mean and Standard Deviation of accuracy for Logo task (ACCLOGO), Picture + word task (ACCPW) and Word in the changed format task (ACCW) for Group1 ,Group 2 & Group 3*

	Subject	**Mean**	**Std. Deviation**	**N**
ACC LOGO	Group 1	7.150	1.755	20
	Group 2	10.500	2.236	20
	Group 3	25.100	1.832	20
	TOTAL	14.25	8.089	60
ACC PW	Group 1	10.650	1.755	20
	Group 2	15.300	3.435	20
	Group 3	25.950	1.503	20
	TOTAL	17.300	6.872	60
ACC W	Group 1	3.050	1.503	20
	Group 2	6.350	1.386	20
	Group 3	19.900	2.511	20
	TOTAL	9.766	7.578	60

*p< 0.05 level of significance

4.7.Comparison of 3 groups within each task using MANOVA

The MANOVA test was administered to compare the groups within each task i.e. in all 3 conditions of Logo presentation, Picture + word presentation and the presentation of word in the changed format and was checked for the accuracy.

4.7a *Comparison of 3 groups for Logo task using the post –hoc Duncan test for the homogenous sets.*

The 3 groups were compared for their accuracy in the logo task using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference {F (2, 57) = 477.806} at 0.05 level of significance. The results are tabulated in the table 3..8a as below.

Table 4.7a *Comparison of accuracy for Logo task (ACCLOGO) across Group1, Group 2 & Group 3 using Post- hoc Duncan test.*

Subjects	N	Subset		
		1	2	3
Group 1	20	7.1500*		
Group 2	20		10.5000*	
Group 3	20			25.1000*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

The 3 groups were compared for their accuracy in the Picture + Logo task using the Duncan test for the homogenous sets. The test revealed the significant difference {F (2,57=215.33} at 0.05 level of significance in the Picture+ Logo task between the 3 groups. The results are tabulated in the below table 4.7b.

Table 4.7 b. *Comparison of accuracy for Picture+ task (ACCPW) across Group1, Group 2 & Group 3 using Post- hoc Duncan test*

Subjects	N	Subset		
Group 1	20	10.6500*		
Group 2	20		15.3000*	
Group 3	20			25.9500*
		1.000	1.000	1.000

*p< 0.05 level of significance

4.7c *Comparing 3 groups in the Word in a changed format (W) task using the post –hoc Duncan test for the homogenous sets.*

The 3 groups were compared for their accuracy in word in a changed format (W) task using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference {F (2,57)= 456.09} at 0.05 level of significance in the word in a changed format (W) task between the 3 groups. The results are tabulated in the below table 4.7c.

Table 4.7c *Comparison of accuracy for Word task (ACCW) across Group1, Group 2 & Group 3 using Post- hoc Duncan test*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	3.0500*		
Group 2	20		6.350*	
Group 3	20			19.90*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.8.Pair-wise comparison across tasks for group 1

Pair-wise comparison of the 3 tasks (Logo, Picture + word and word in the changed format) for accuracy in group 1 using repeated measure ANOVA in group 1. The pair-wise comparison of the 3 tasks for the accuracy in group 1 showed the significant difference {F(2,38)=217.62} at 0.05 level of significance.

4.9.Pair-wise comparison across tasks for group 2.

Pair-wise comparison of the 3 tasks (Logo, Picture +word and word in the changed format) for accuracy in group 2 using repeated measure ANOVA . The pair-wise comparison of the 3 tasks for the accuracy in group 2 showed the significant difference {F (2,38)=107.69} at 0.05 level of significance.

4.10..Pair-wise comparison across tasks for group 3.

Pair-wise comparison of the 3 tasks (Logo, Picture +word and word in the changed format) for accuracy in group 3 using repeated measure ANOVA . The pair-wise comparison of the 3 tasks for the accuracy in group 3 showed the significant difference {F(2,38)=116.08} at 0.05 level of significance.

Figure 6 : Comparison of group performances for Accuracy measurements in the Picture + word task.

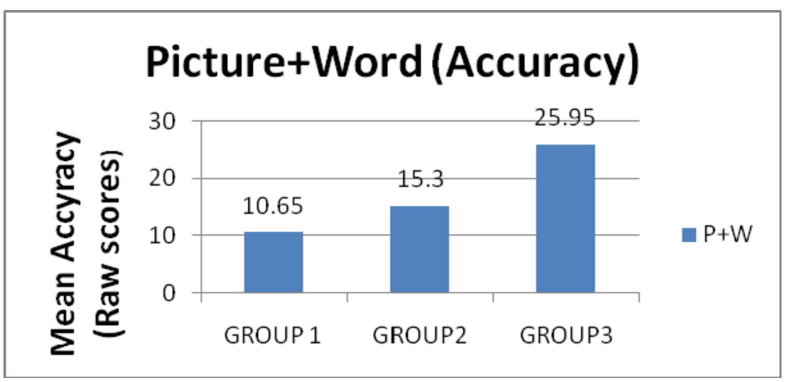

Fig.6. Mean value of accuracy in Picture + word task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the accuracy measurements in Picture + word (PW) task was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years).

Figure 7 : Comparison of group performances for Accuracy measurements in the Logo task.

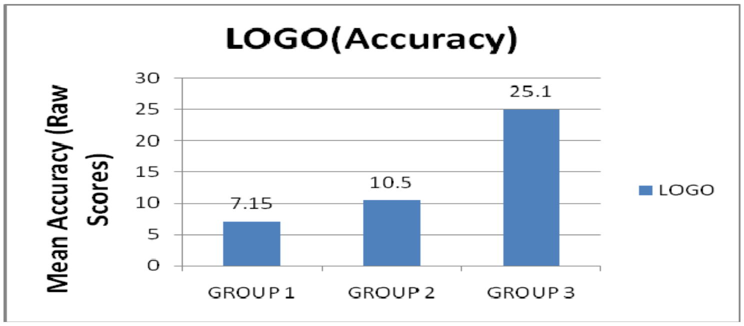

Fig.7. Mean value of accuracy in Logo (L) task for Group 1, Group 2 & Group 3.

As depicted in the above figure, accuracy in Logo (L) task was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years).

Figure 8 : Comparison of group performances for accuracy measurements in the ‘ Word in the changed format’ task.

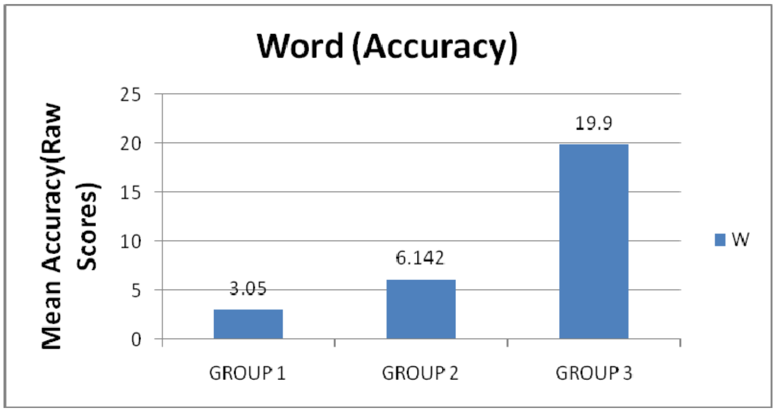

Fig.8. Mean value of reaction time in Word in the changed format task for Group 1, Group 2 & Group 3.

As depicted in the above figure, the reaction time measurements in ‘Word in the changed format’ task (W) was better in Group 3 (Mean age -5.5 years) followed by Group 2 (Mean age – 4.5 years) and then by Group 1 (Mean age- 3.5 years).

Figure 9 : Comparison of overall group performances for Accuracy measurements in 3 tasks [Picture + word task (PW), Logo task (L) & Word in the changed format task (W)].

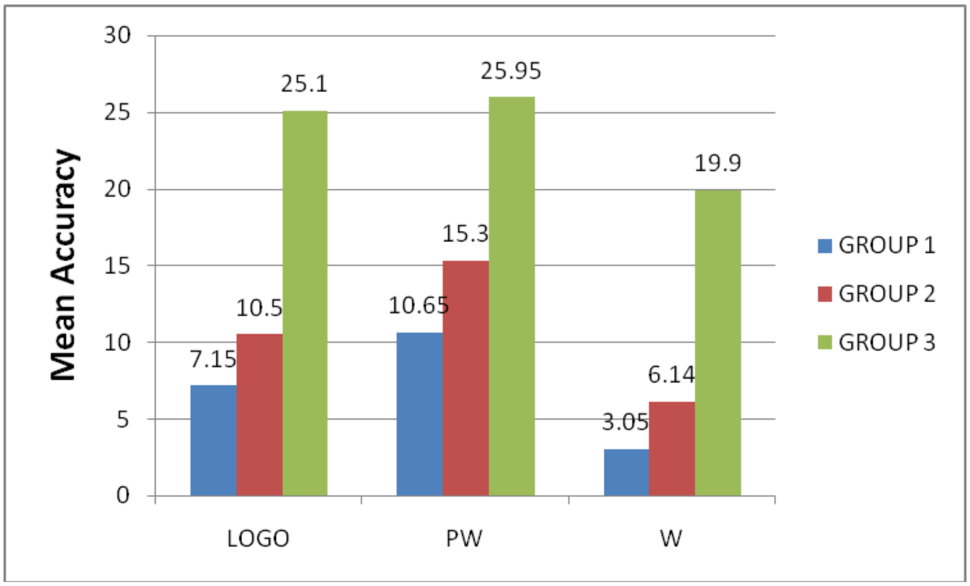

Fig.9. Mean value of accuracy in Picture + word (PW), Logo & Word in the changed format task for Group 1, Group 2 & Group 3.

Overall Children performed better on the Picture + word task [Mean accuracy - 17.30, SD-6.87] followed by Logo task [Mean accuracy -14.25, SD-8.08] in the accuracy measurements. The mean accuracy level was the lowest in the word task [Mean accuracy -9.76, SD-7.57].

The current study found that the accuracy level was maximum in the Picture + word task as the stimuli used in this task presented the maximum available cues that represented the original advertisement comprising the actor ,original logo & other cues like scenes, color etc related to the advertisement. The obtained results are in consonance with the findings of Mythra jagadish (1987) where the Picture + word format was one amongst the 4 formats [Other 3 formats included Logo format (L), Word format (W) & Word with distracter format (W with D)] which were used in the assessment of logographic skill. The maximum accuracy level was obtained for Picture + word format when compared to the other 3 formats.

The accuracy performance for the Logo (L) task in all 3 groups [Group 1,Group 2 & Group 3] was more accurate when compared to the performance in the 'Word in the changed format' task. In the Fig. it depicts Group 1 (3-4 years) performing comparatively better in the logo task [Mean accuracy-7.15, SD-] than Word task [Mean accuracy-3.05, SD-].

The obtained results revealed the fact that the Group 1 (Mean age : 3.5 years) was relying more on the logographic strategy than the alphabetic strategy which comprises of the constitutional letters forming a word. Thus the logographic strategy takes the upper-hand in Group 1 .Thus the obtained result is in consonance with the findings of Mythra jagadish (1987) where she concluded that the children of age group 2.6 - 3.6 years solely dependent on the logographic strategy while the alphabetic strategy is yet to emerge in this population. In group 1 (Mean age:3.5 years), though minimal responses were obtained in the word task and this performance can be attributed to the letters in the word acting as a logographic identifier but not the usage of alphabetic strategy which was not present in this group. E.g. With the stimulus item "Oreo" which was presented in the word task, few children identified the word where the initial letter 'O' or the final letter 'O' possibly acted as the logographic identifier while the usage of the alphabetic strategy in this group is questionable. The obtained results are in consonance with the several influential views of literacy development (Byrne, 1992; Ehri, 1998; Frith, 1985), where they support the view that children typically learn their first words in a logographic or pre-alphabetic way. The result is also in consonance with Marsh, Friedman, Welch & Desberg (1981) Where they believe that the first letter of a word to be an important cue for word recognition and have suggested this to be one way in which logographic strategy may be viable for quite advanced reading.

In Group 2 (Mean age- 4.5 years) the similar results were obtained where the accuracy level in the Logo task [Mean score-10.5 , SD-2.23] is better than the Word task [Mean accuracy-6.35, SD-1.38] and was much higher compared to Group 1 (Mean age-3.5 years).The obtained results suggests the usage of Logographic strategy in the child which is paving the way for the beginning of formation of connection between written words and pronunciation based on the alphabet. This is not in agreement with Mythra jagadish (1987) where she concluded that children of age group (3.6- 4.6 years) did not performed at all in the word task and the statistical analysis was not carried out for the same reason .Instead, this age group performed only in the Picture + word task and Logographic task.

In Group 3 (5-6 years) the accuracy level in the Logo task (L) was much higher [Mean accuracy-25.1, SD-1.83] compared to Group 1 (Mean age: 3.5 years) & Group 2 (Mean age- 4.5 years) thus there is a significant increase in the number of familiar items at around 5-6 years of age. The overall comparison of group performances in Logo task (L) demonstrates some amount of logographic reading right from 3 years of age with the significant increase around 5-6 years of age .This significant increment can be attributed to the fact that the logographic strategy begin to be coupled with alphabetic strategy at 4 years of age E.g. the item “Vicks”; Group 1 (Mean age -3.5 years) and Group 2 (Mean age 4.5 years) responded to the item in Format 1 (Picture + word task) & Format 2 (Logo task) and some children in Group 3 (Mean age 5.5 years) responded to all 3 formats .This in-turn indicates the developmental trend in the acquisition of reading skills. The results are in consonance with the Mythra jagadish (1987) where she explains that Indian children pass Logographic phase quite early. Also according to several influential views of literacy development (Byrne, 1992; Ehri, 1998; Frith, 1985), children typically learn the first words in a logographic or pre-alphabetic way. Bastein-Toniazzo & Julian (2001) supported the importance of logographic phase in learning to read. Also Berninger (1990) suggested early reading and spelling are logographic in nature.

Comparison of group performances for word task were made and some findings were noted.

Group 1 (Mean age- 3.5 years): The Children of this group relied more on the Logographic strategy than the alphabetic strategy which comprises of constitutional letters forming a word.

Group 2 (Mean age-4.5 years) : The Children of this group read smaller 3-4 letter words like POGO , JOY , OREO , LAYS & LUX etc. This group of children begins to form connections between written words and pronunciation based on the alphabet. They often confused with similarly spelled words i.e. they read DOVE as DOLL ,CLOSE-UP as CLAP , OREO as ON, REEBOK as RUN, BUBBALO as BOOK etc. This may be due to the fact that the connection are only made for some letter and sounds often 1st and last letters of the word. This findings are in consonance with Savage , Stuart & Hill (1992) where they explained confusion with similar spelled words in preschoolers. This is also in agreement with Ehri (1995) where she explains that the connections are only made for some letters and sounds , often 1st and last letters of a word (Easiest to detect).

Group 3 (Mean age 5.5 years) : This group's performance evidenced complex connections between letter in spelling and phonemes in pronunciation . The confusion between similarly spelled words was minimized. Thus the obtained results are in consonance with Ehri (2005) where she explains " Full- Alphabetic phase " which involves children assigning letter to the sound they hear in the order in which they are pronounced.

Thus summarizing the group performances in the word task :

1) Performance in Group 1 (Mean age-3.5 years) in the present study reflected Ehri's (1995, 2005) Pre-Alphabetic phase.
2) Performance in Group 2 (Mean age- 4.5 years) in the present study reflected Ehri's (1995, 2005) Partial-Alphabetic phase.
3) Performance in Group 3 (Mean age-5.5 years) in the present study reflected Ehri's (1995, 2005) Full-Alphabetic phase.

4.11: Comparison of group performances for accuracy measurements using mixed ANOVA.

The mixed ANOVA was done to compare the accuracy of the same 3 groups of subjects for the 3 separate tasks i.e. 2 syllable, 3 syllable and 4 syllable non-word repetition respectively .The results showed that there is a significant difference {$F(2,57)=105.45$} at 0.05 level of significance between 3 groups and also the 3 separate tasks are significantly different{F(2,57)=24.34} at 0.05 level of significance from each other. The results are depicted in the below table 4.11

Table 4.11. *Mean and Standard Deviation of accuracy for 2 syllable non- word repetition (ACC2), 3 syllable non-word repetition (ACC3) and 3 syllable non word repetition (ACC4) for Group1 ,Group 2 & Group 3*

	Subject	**Mean**	**Std. Deviation**	**N**
ACC 2	Group 1	4.500	0.688	20
	Group 2	4.900	0.307	20
	Group 3	5.000	0.000	20
	TOTAL	4.800	0.480	60
ACC 3	Group 1	4.300	0.801	20
	Group 2	4.550	0.686	20
	Group 3	4.750	0.454	20
	TOTAL	4.533	0.675	60
ACC 4	Group 1	3.300	0.470	20
	Group 2	3.800	0.615	20
	Group 3	4.700	0.470	20
	TOTAL	3.933	0.778	60

$p < 0.05$ level of significance

4.12.Comparison of 3 groups within each task using MANOVA

The MANOVA test was administered to compare the groups within each task i.e. in all 3 conditions of 2 syllable, 3 syllable and 4 syllable non word repetition tasks.

4.12 a. Comparison of accuracy of in the 2 syllable repetition task using the post –hoc Duncan test for the homogenous sets.

The 3 groups were compared for their accuracy in the 2 syllable non word repetition task using the post-hoc Duncan test for the homogenous sets. The test revealed the significant difference at 0.05 level of significance {F (2,57)=7.389} in the 2 syllable non word task between the 3 groups. The results are tabulated in the below table 4.12a.

Table 4.12 a. *Comparison of accuracy of 2 syllable repetition task (ACC2) across 3 groups using the post –hoc Duncan test for the homogenous set.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	4.500*		
Group 2	20		4.900*	
Group 3	20			5.000*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.12. b) Comparison of 3 groups in the 3 syllable repetition task using the post –hoc Duncan test for the homogenous sets.

The 3 groups were compared for their accuracy in the 3 syllable non word repetition task using the post-hoc Duncan test for the homogenous sets. The test revealed that there is no significant difference in the 3 syllable non word task between the 3 groups.

4.12.c) Comparison of 3 groups in the 4 syllable repetition task using the post –hoc Duncan test for the homogenous sets.

The 3 groups were compared for their accuracy in the 3 syllable non word repetition task using the post-hoc Duncan test for the homogenous sets. The test revealed that there significant difference at 0.05 level of significance {F (2,57)=2.69} in the 4 syllable non word task between the 3 groups. The results are tabulated in the below table 4.12c.

Table 4.12.c. *Comparison of accuracy of 4 syllable repetition task(ACC4) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	4.500*		
Group 2	20		4.900*	
Group 3	20			5.000*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

4.13.*Pair wise comparison for accuracy across tasks (ACC2, ACC3 &ACC4) in group 1.*

Pair-wise comparison of the 3 tasks (2syllable, 3 syllable and 4syllable non word repetition task) for accuracy in group 1 using repeated measure ANOVA . The pair-wise comparison of the 3 tasks for the accuracy in group 1 showed the following results.

There is a significant difference at 0.05 level of significance {F (2,57)=36.69} in the pair ACC2-ACC3 in the group 1 . There is no significant difference between ACC3-ACC4 and ACC2-ACC4.

4.14 .Pair wise comparison for accuracy across tasks (ACC2, ACC3 &ACC4) in group 2.

Pair-wise comparison of the 3 tasks (2syllable, 3 syllable and 4syllable non word repetition task) for accuracy in group 2 using repeated measure ANOVA .

The pair-wise comparison of the 3 tasks for the accuracy in group 2 showed the following results .There is no significant difference {F (2,38)=21.69} in the pair ACC3-ACC4 in the group 1. There is a significant difference {F (2,38)=17.69} at 0.05 level of significance between ACC2-ACC3 and ACC2-ACC4.

4.15. Pair wise comparison for accuracy across tasks (ACC2, ACC3 &ACC4) in group 3

.Pair-wise comparison of the 3 tasks (2syllable, 3 syllable and 4syllable non word repetition task) for accuracy in group 3 using repeated measure ANOVA .The pair-wise comparison of the 3 tasks for the accuracy in group 3 showed the following results .There is no significant difference between ACC2-ACC3 and ACC3-ACC4 in the group 3. There is a significant difference at 0.05 level of significance in the pair ACC2 - ACC4.

Figure 10 : Comparison of group performances for accuracy measurements in 3 tasks [ACC2-Accuracy of 2 syllable non word repetition,ACC3-Accuracy of 3 syllable non-word repetition,ACC4-Accuracy of 4 syllable non-word repetition].

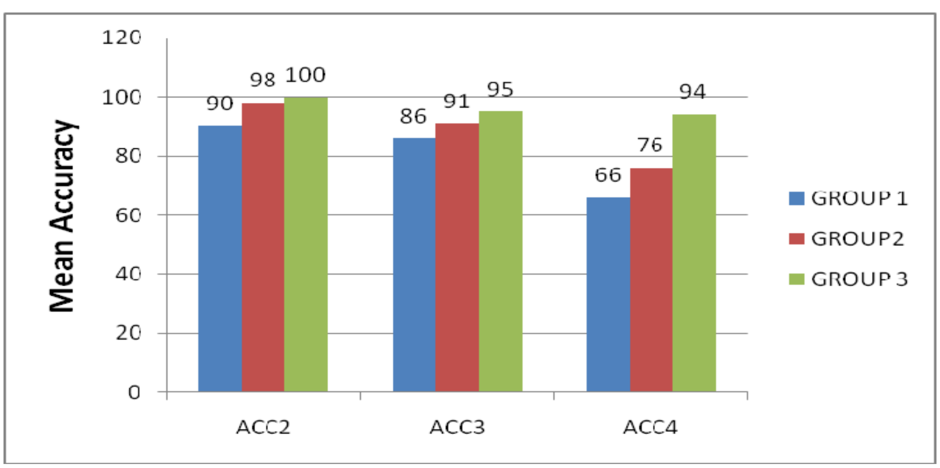

Fig.10. Mean value of accuracy in 2 syllable,3 syllable & 4 syllable non- words repetition across Group 1, Group 2 & Group 3.

The Mean percentage of accuracy for 3 groups [Group 1 (3-4 yrs) , Group 2 (4-5 yrs) & Group 3 (5-6 yrs)] across the syllable length indicates the accuracy of the responses was better for non-words of shorter length compared to longer non- words. The Mean percentage of accuracy for 2 syllable, 3 syllable and 4 syllable non – words were 96 % , 90.66% and 78.66 % respectively as shown in the above figure . Thus the results indicated that the 3 groups [Group 1 , Group 2 & Group 3] performed significantly different on the 4-syllable non-words compared to 2-syllable and 3-syllable length non-words .The obtained results are in agreement with previous studies which reported that the typically developing children perform better on the shorter syllable length non-word than longer syllable length non-words because of the limited capacity nature of phonological short term memory (e.g., Gathercole and Baddely, 1989 ; Gathercole, 2006). Also Baddely explained that the longer non-words are simply beyond the memory span of the children and because the non-words comprise of unfamiliar phonological string the central executive function is also at or beyond the capacity.

4.16.Comparison among groups for Rhyme oddity task using 1-way ANOVA

One way ANOVA test was administered to compare the groups for the rhyme oddity task. The 3 groups were compared for their accuracy using the post hoc Duncan test for the homogenous set. The results revealed that there is a significant difference {F (2,57)=107.69} at 0.05 level of significance for all the 3 groups. The results are tabulated below table 4.16.

Table 4.16.*Comparison among groups for Rhyme oddity task using 1-way ANOVA*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	2.9500*		
Group 2	20		4.2000*	
Group 3	20			6.9000*
Sig.		1.000	1.000	1.000

*p< 0.05 level of significance

Figure 11 : Comparison of group performances for accuracy measurements in Rhyme Oddity task (RHY).

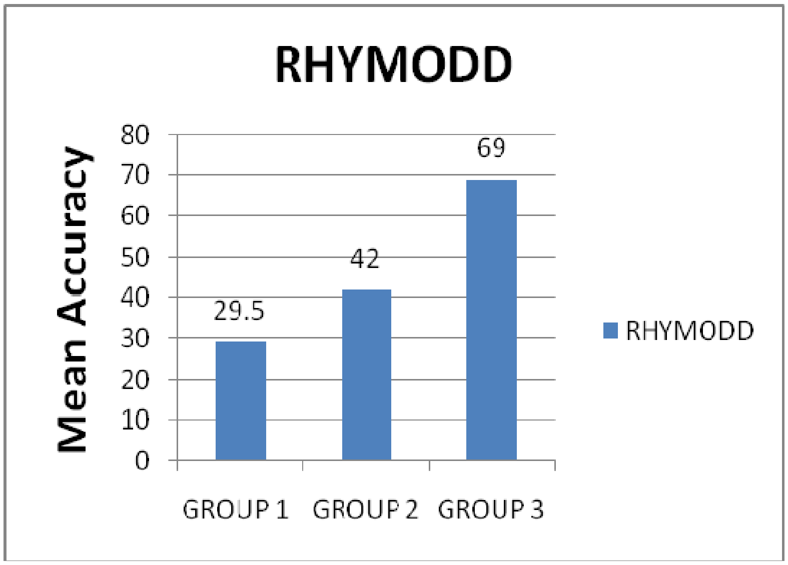

Fig.11. Mean value of accuracy in Rhyme Oddity task for Group 1, Group 2 & Group 3.

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The Mean accuracy in the Rhyme Oddity task evidenced the developmental trend in the Rhyme awareness in the 3 groups (Group 1 ,Group 2 & Group 3).The fig.2. Showed the significant increment in the performance level in Group 2 (Mean age- 4.5 yrs) and Group 3 (Mean age- 5.5 yrs). The current study views the age range from 3-6 years as the critical age for the development of rhyme awareness which indirectly taps the phonological awareness in the preschool children. Thus the results are in consonance with Chaney (1992), Bradley & Bryant (1983), Goslan (1989), Ho & Bryant (1997) where they found those preschoolers of age range 3-6 years performed significantly better in the Rhyme oddity task.

4.4. The mixed ANOVA was done to compare subtypes of PCC and PVC i.e. the results revealed that there is a significant difference at 0.05 level of significance {F (2,38)=10.69} between the subtypes of PCC and PVC. All 3 groups are significantly different at 0.05 level of significance. There is an interaction between syllable number (2syllable v/s 3syllable v/s 4 syllable) and subjects. There is an interaction between PCC subtypes and PVC subtypes between the groups. There is an interaction between syllable number (2syllable v/s 3syllable v/s 4 syllable) and subtypes (PVC v/s PCC).The results are tabulated in the below table 4.17.

Table 4.17 : *Mean and Standard Deviation of percentage of syllables correct for 2 syllable,3 syllable & 3 syllable non –word repetition task for Group1 ,Group 2 & Group 3.*

	Subject	**Mean**	**Std. Deviation**	**N**
PVC 2	Group 1	96.500	4.893	20
	Group 2	100.00	0.000	20
	Group 3	100.00	0.000	20
	TOTAL	98.833	3.2373	60
PCC 2	Group 1	92.685	9.827	20
	Group 2	98.845	3.768	20

	Group 3 TOTAL	100.00 97.176	0.000 6.794	20 60
PVC 3	Group 1 Group 2 Group 3 TOTAL	97.500 98.750 99.687 98.645	3.739 2.564 1.397 2.840	20 20 20 60
PCC 3	Group 1 Group 2 Group 3 TOTAL	91.635 95.810 98.040 95.161	10.138 7.212 3.756 7.846	20 20 20 60
PVC 4	Group 1 Group 2 Group 3 TOTAL	89.960 98.080 99.520 95.853	4.857 2.871 1.477 5.382	20 20 20 60
PCC4	Group 1 Group 2 Group 3 TOTAL	81.280 88.595 96.335 88.738	6.380 7.457 4.345 8.689	20 20 20 60

$p < 0.05$ level of significance

4.18. The MANOVA test was administered to compare the groups using 6 variables i.e. PVC2, PCC2, PVC3, PCC3 , PVC4 and PCC4 respectively. There is a significant difference at 0.05 level of significance {$F (2,57)=8.69$} between 3 groups in all six variable conditions that is mentioned as above. The results in each variable condition are as follows.

Table 4.18a. . *Comparison of Percentage of vowels correct in 2 syllable non word repetition task (PVC2) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	96.500*		
Group 2	20		100	

Group 3	20			100
Sig.		1.000	1.000	1.000

Table 4.18b. *Comparison of Percentage of consonants correct in 2 syllable non word repetition task (PVC2) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	96.685*		
Group 2	20		98.845	
Group 3	20			100
Sig.		1.000	1.000	0.550

*p< 0.05 level of significance

Table 4.18c. *Comparison of Percentage of vowels correct in 3 syllable non word repetition task (PVC3) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	97.500*		
Group 2	20		98.750	
Group 3	20			99.687*
Sig.		1.000	0.154	0.284

*p< 0.05 level of significance

Table 4.18d. *Comparison of Percentage of vowels correct in 2 syllable non word repetition task (PCC3) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	91.630*		
Group 2	20		95.810	
Group 3	20			98.040*
Sig.		1.000	0.084	0.351

*p< 0.05 level of significance

Table 4.18e. *Comparison of Percentage of vowels correct in 4 syllable non word repetition task (PVC4) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3

Group 1	20	89.96*		
Group 2	20		98.08	
Group 3	20			99.520
Sig.		1.000	1.000	0.182

*p< 0.05 level of significance

Table 4.18f. *Comparison of Percentage of consonants correct in 4 syllable non word repetition task (PCC4) across 3 groups using the post –hoc Duncan test for the homogenous sets.*

Subjects	**N**	**Subset**		
		1	2	3
Group 1	20	81.285*		
Group 2	20		88.595*	
Group 3	20			96.335*
Sig.		1.000	1.000	0.182

*p< 0.05 level of significance

4.19. ***Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within group 1.***

Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within groups using repeated measure ANOVA within group 1.There is a significant difference {t-2.42, df-19} at 0.05 level of significance between the pairs PCC2-PCC4 .

4.20.Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within group 2.

Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within groups using repeated measure ANOVA in group 2. Within group 2, there is a significant {t-1.32, df-19} difference at 0.05 level of significance between the pairs PCC2-PCC4.

4.21. Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within group 3.

Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within groups using repeated measure ANOVA in group 3. Within group 3, there is a significant difference {t-5.99, df-19} at 0.05 level of significance between the pairs PCC2-PCC4.

4.22 .Pair -wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within group 1.

Pair-wise comparison of the 3 subtasks of PVC (PVC2, PVC3 &PVC4) within groups using repeated measure ANOVA within group 1.There is a significant difference {t-1.42, df-19} at 0.05 level of significance between the pairs PVC2-PVC4 and PVC3-PVC4 .

4.23 .Pair-wise comparison of the 3 subtasks of PCC (PCC2, PCC3 &PCC4) within group 2.

Pair-wise comparison of the 3 subtasks of PVC (PVC2, PVC3 &PVC4) within groups using repeated measure ANOVA within group 1.There is a significant difference at 0.05 {t-3.32, df-19} level of significance between the pairs PVC2-PVC4 .

*4.24.**Pair-wise comparison of the 3 subtasks of PVC (PVC2, PVC3 &PVC4) within groups** using repeated measure ANOVA in group 3. Within group 3 there is no significant difference between the pairs .*

Paired t-test for the comparison of PCC and PVC within groups.

The pairs that were considered for the paired t-test was PVC2-PCC2, PVC3-PCC3 & PVC4-PCC4. The results are tabulated below for each group.

4.25.Paired t test for group 1

The test result within group 1 reveals that all the pairs are significantly different {t-2.42, df-19} at 0.05 level of significance. The result for group 1 is tabulated below.

Table 4.25.Paired t- test for group 1

GROUP 1

Pairs	t	df	Sig.(2 tailed)
PVC2-PCC2	2.819*	19	0.011
PVC3-PCC3	3.441*	19	0.003
PVC4-PCC4	6.612*	19	0.000

*p< 0.05 level of significance

5.1.Paired t- test for group 2

The test result within group 2 reveals that there is a significant difference {t-5.42, df-19} at 0.05 level of significance between PVC3-PCC3 and PVC4-PCC4 pairs .The results for group 2 is tabulated below.

Table 4.26. Paired t- test for group 2

GROUP 2

Pairs	t	df	Sig.(2 tailed)
PVC2-PCC2	1.371	19	0.186
PVC3-PCC3*	2.601	19	0.018
PVC4-PCC4*	5.993	19	0.000

*p< 0.05 level of significance

5.2. Paired t- test for group 3

The test result within group 3 reveals that there is a significant difference {t-6.12, df-19} at 0.05 level of significance between PVC4-PCC4. The result for group 3 is tabulated below.

Table 4.27.Paired t- test for group 3

GROUP 3

Pairs	t	df	Sig.(2 tailed)
PVC2-PCC2	1.686	19	0.058
PVC3-PCC3	1.993	19	0.061
PVC4-PCC4*	3.371	19	0.003

*p< 0.05 level of significance

Figure 12 : Comparison of group performances for mean percentage of vowel correct (PVC)

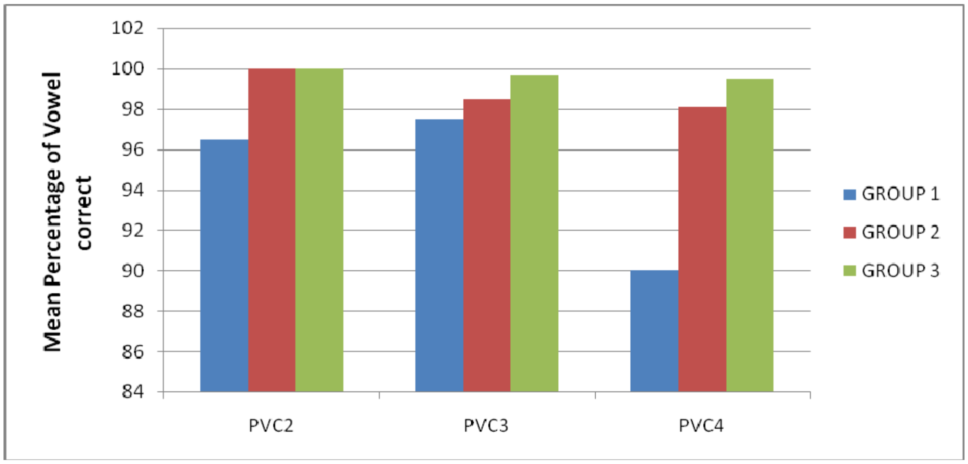

Fig 12. Note : PVC2 (Percentage of vowels correct in 2 syllable non-word repetition), PVC3(Percentage of vowels correct in 3 syllable non-word repetition), PVC4 (Percentage of vowels correct in 4 syllable non-word repetition).

Figure 13: Comparison of group performances for mean percentage of vowel correct (PVC) & Mean percentage of consonant correct (PCC).

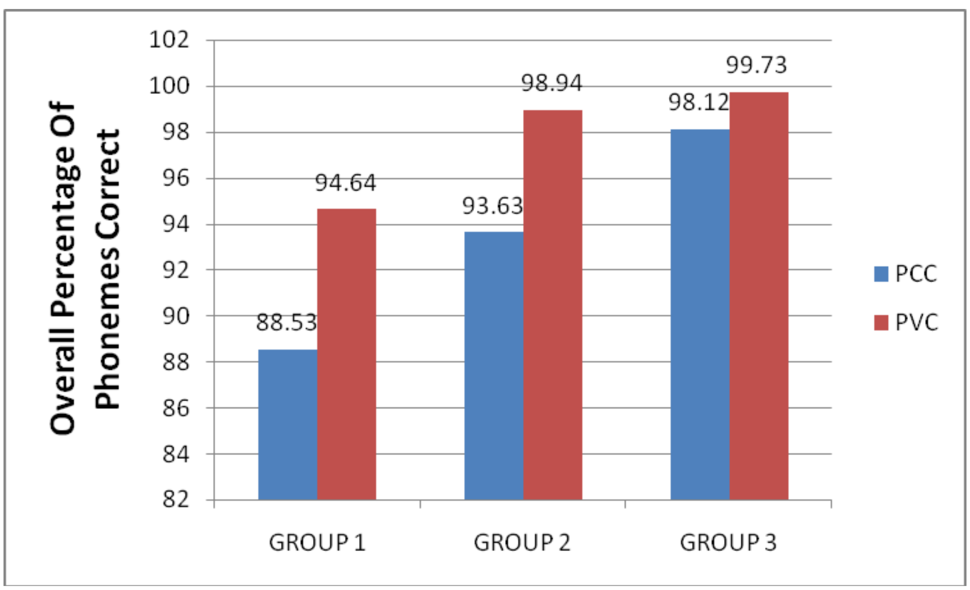

Fig 13. Note : PCC (Percentage of consonants correct), PVC (Percentage of vowels correct)

Figure 14 : Comparison of group performances for Mean Percentage of Consonant correct (PCC).

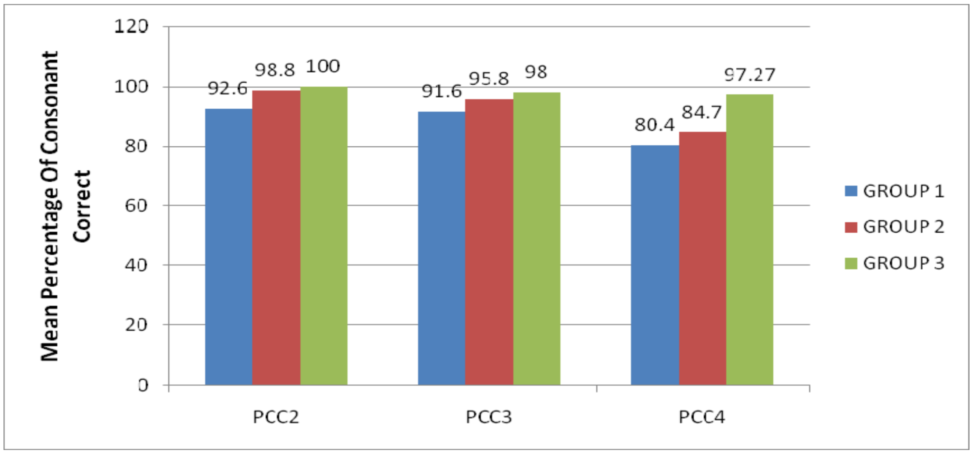

Fig 14. Note: PCC2 (Percentage of consonants correct in 2 syllable non-word repetition), PCC3 (Percentage of consonants correct in 3 syllable non-word repetition), PCC4 (Percentage of consonants correct in 4 syllable non-word repetition).

Figure 15 : Comparison of group performances for Mean Percentage of phonemes corrects (PPC).

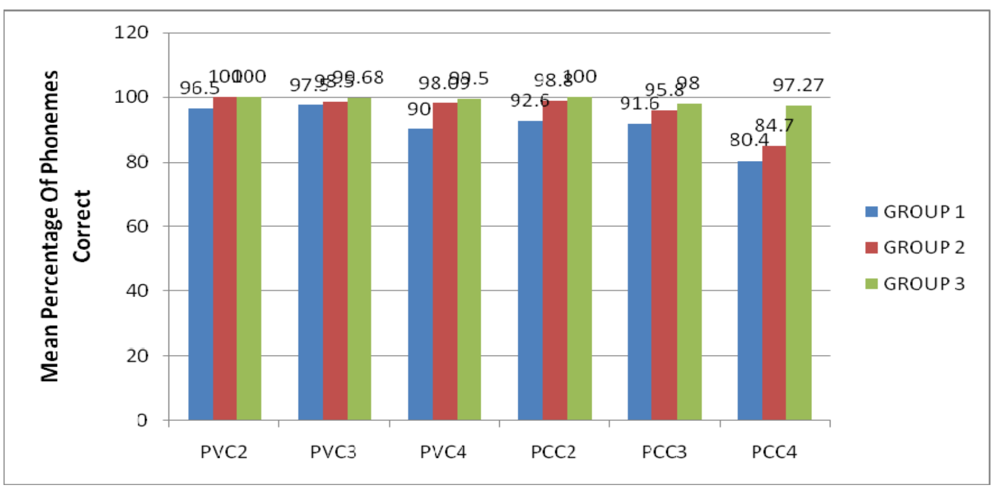

Fig.15. Note: PVC2 (Percentage of vowels correct in 2 syllable non-word repetition), PVC3(Percentage of vowels correct in 3 syllable non-word repetition), PVC4 (Percentage of vowels correct in 4 syllable non-word repetition), PCC2 (Percentage of consonants correct in 2 syllable non-word repetition), PCC3 (Percentage of consonants correct in 3 syllable non-word repetition), PCC4 (Percentage of consonants correct in 4 syllable non-word repetition).

The overall mean Percentage of vowels correct (PVC) and Percentage of consonant correct (PCC) was higher in Group 3 (5-6 years) compared to Group 1 (3-4 years) and Group 2 (4- 5 years). The mean scores for Group 1 (Overall Mean PCC =88.53 ; Overall Mean PVC= 94.64) , Group 2 (Overall Mean PCC=93.63 ; Overall Mean PVC= 98.94) & Group 3 (Overall Mean PCC= 98.12 ; Overall Mean PVC= 99.73). The mean value of PVC and PCC at 4 – syllable non- words was less compared to PVC and PCC for two & three syllable length non-words in all groups which indicated the errors increased from shorter syllable length to the longer syllable length non–words.

The overall percentage of phonemes correct (Overall PVC + Overall PCC) revealed that Group 1(3-4 yrs), Group 2 (4-5 yrs) & Group 3 (5-6 yrs) had more difficulty in repeating the consonants than vowels i.e. there was a significant improvement in the percentage of vowels correct (PVC) when compared to percentage of consonants correct (PCC) from Group 1 – Group 3.Thus the results of the present study is in consonance with the study done by Girbau & Schwartz (2008). They concluded that vowels are preferably preserved in the phonological working memory task in children with SLI and children with typical language development. The results of the current study is not in agreement with Shylaja, Amulya.P.Rao. & Swapna.N. (2012) where they evidenced the statement that typically developing children obtained similar scores on both the PVC (Percentage of vowels correct) and PCC (Percentage of consonant correct).

Figure 16 : Comparison of group performances for accuracy measurements in NWR task (Non word repetition task) V/S Rhyme Oddity task.

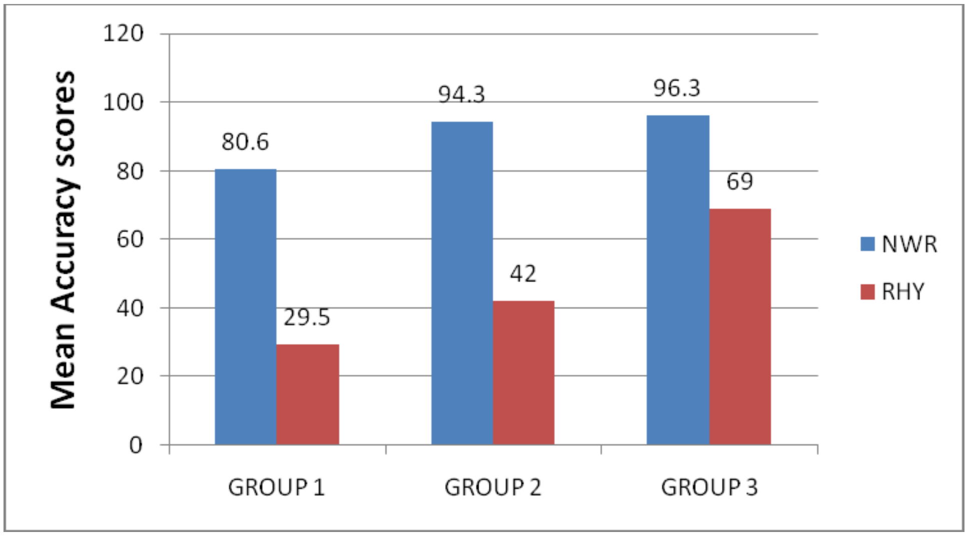

Fig.16 .Mean Accuracy scores for Phonological skill assessment (Non- word repetition task v/s Rhyme oddity task) across 3 groups.

As depicted in the above figure, the Mean accuracy scores for Non word repetition task are significantly better when compared to Rhyme oddity task.

In the current study the performances in the NWR (Non- Word repetition task) in all 3 groups was significantly better compared to Rhyme oddity task where both the tasks were used for the phonological skill assessment. The non- word repetition task is the measure of phonological working memory which involves phonological encoding or the segmentation of the acoustic signal into the speech unit that can be stored in memory. Whereas the Rhyme oddity task is the measure of phonological sensitivity as opposed to phonological working memory which gives information about the phonological awareness that refers to the child's ability to detect and manipulate component sounds in words. Thus current findings explains the phonological sensitivity (Measured through Rhyme Oddity task) that gives information about phonological awareness is much complex task and are lately acquired compared to NWR task which gives information about phonological working memory in preschool children (Age range 3-6 years). Thus the present study is in consonance with Gathercole (1991) , Helm (2002) & Swanson and Howell (2001) where they conclude that phonological working memory scores were much higher than than the Rhyme oddity scores in pre-school children.

Figure 17 : Comparison of group performances for accuracy measurements in Phonological skill assessment (N

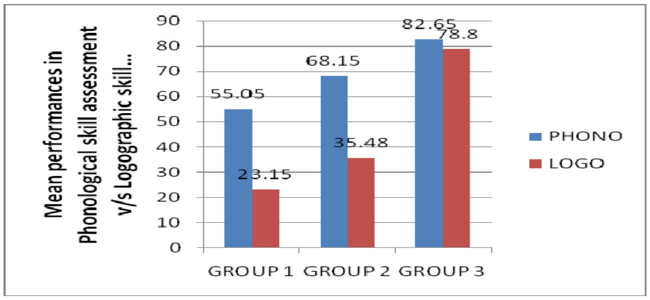

Fig.17. Mean Accuracy in Phonological skill tasks v/s Logographic skill tasks.

Figure 18: Comparison of Logographic skills and Phonological skills in GR123 (Group 1 + Group 2 + Group3).

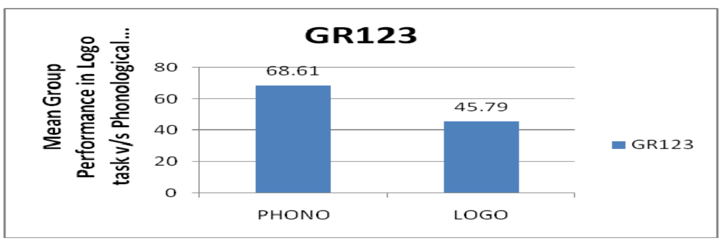

Fig 18 : Comparison of logographic skills and phonological skills in GR123 (Group 1 + Group 2 + Group 3).

As depicted in the above figure, the performance level in all 3 groups was higher in Phonological tasks when compared to Logographic tasks.

The current study attempted to explore the pattern of transition between the 2 phase (Logographic skills and Phonological skills).The results revealed that both the phases seems to exist in all 3 age groups (Group 1 , Group 2 & Group 3) .The Maximum performance was exhibited by the Group 3 (5-6 yrs) followed by Group 2 (4- 5 years) and then Group 1 (3-4 yrs) in both logographic and phonological skills indicating the developmental trend.

The Group 1 and Group 2 performances in both the phases revealed no close correlation, whereas in Group 3 there was a close correlation between phonological and logographic phase i.e. this group outperformed both in logographic phase and phonological phase of testing.

The performance of Group 3 in the word task was better compared to other 2 groups yielding the information about developmental trends in reading. In this group 3, children's performance evidenced complex connections between letter in spelling and phonemes in pronunciation were formed. The confusion between similarly spelled words was minimized. Thus the obtained results are in consonance with Ehri (2005) where she explains " Full- Alphabetic phase " which involves children assigning letter to the sound they hear in the order in which they are pronounced. Thus the phonological skills which is in close correlation with the logographic skills closely correlate with the academic excellence particularly in the age group of 5-6 years where the full alphabetic knowledge has been acquired.

The objectives and the findings of the current study are listed below:

Objective 1 : To explore the logographic skills in Bilingual (Kannada and English) children during the developmental process of learning to read.

Result 1 : The Bilingual (Kannada and English) children do demonstrate Logographic reading skills , as evident from their responses in the Format 2 [Logo task (L)] used in the logographic skill assessment.

Objective 2 : To determine whether the logographic skills are seen in one of the age groups considered for the study.

Result 2 : Logographic skills do not pertain rigidly to any one of the three age groups considered . But , the children in all 3 groups [Group 1(Mean age 3.5 yrs), Group 2 (Mean age 4.5 yrs) & Group 3 (Mean age 5.5 yrs)] demonstrated logographic reading skills though the extent varies in each.

Objective 3 : To study, whether the logographic stage of reading terminates during one age-group or occur in combination with the alphabetic stage (Frith, 1985) for the effective reading and in which group this combination is more predominant.

Result 3 : The overall comparison of group performances in Logo task (L) demonstrates some amount of logographic reading right from 3 years of age with the significant increase around 5-6 years of age .This significant increment can be attributed to the fact that the logographic strategy begin to be coupled with alphabetic strategy at 4 years of age.

Objective 4 : To determine whether the reading skills of children show a developmental trend .

Result 4: The increased Performance level from Group 1 – Group 3 in all 3 tasks [Picture + word task (PW), Logo task (L) & Word task (W)] strongly indicate developmental trend.

Objective 5 : To explore any feature in words be identified which seem to facilitate logographic reading.

Result 5 : No specific word feature (s) could be identified due to large and varied set of items used in the study but accurate responses were more for items in the food than other house –hold articles category.

Objective 6 : To explore the logographic and or phonological skills in Indian children during the process of reading and to identify the strategy most predominant in these children.

Result 6 : Both the Logographic skills and phonological skills exist in all 3 groups (Group 1 ,Group 2 & Group 3) . The Maximum performance was exhibited by the Group 3 (Mean age : 5.5yrs) followed by Group 2 (Mean age : 4.5 yrs) and then the Group 1 (3.5 yrs) in both logographic and phonological skills indicating the developmental trend.

Objective 7 : To investigate the pattern of transition between these two phases (Logographic phase and phonological phase) if both are seen to exist and which correlates closely with academic excellence.

Result 7 : The results revealed that the phonological skills which is in close correlation with the Logographic skills closely correlate with the academic excellence particularly in the age group of 5-6 years where the full alphabetic phase has been acquired (Ehri , 1995, 2005).

Summary and Conclusion

The ability to read in children may be acquired through teaching or spontaneously through their own observations of experimenting with particular printed words and particular pronunciations, thus involved in a whole lot inventing and re-inventing their ability to read and write. On one hand, English is a language which follows the alphabetic principle of orthography, languages other than English are considered non-alphabetic languages. English is a language which does not follow exact one-one correspondences of its phonemes and graphemes. English being an alphabetic language, includes multiple variations of several sound letter correspondences making reading and writing more challenging and thus making phonemic awareness training all the more crucial to learn adequate literacy skills.

On the other hand, Indian languages are considered more syllabic or semi-syllabic languages, with better phoneme-grapheme correspondences. English being a global language learnt all over the world, is considered a language of high academic status. However, there is a dearth of literature which stress about models discussing the development of English literacy skills in children (like the Marsh’s model, Frith’s model, etc. However, these studies have been conducted in those children whose native language has been English and learning to read and write in English itself. Facts and figures still need to be known as to what happens when a child with a different language background learns to read and write in another language. This phenomenon (of different stages and phases of reading) of how difficult or how easy it is for Indian children following semi-syllabic script (Kannada) but learning literacy skills in an alphabetic script (English) need to be examined and understood.

The aims of the study was to explore the logographic skills in Bilingual (Kannada and English) children during the developmental process of learning to read and to study, whether the logographic stage of reading terminates during one age-group or occur in combination with the alphabetic stage (Frith, 1985) for the effective reading and in which group this combination is more predominant. This study also aimed at investigating the pattern of transition between these two phases (Logographic phase and phonological phase) if both are seen to exist and which correlates closely with academic excellence.

The study included 20 pre-school children in each of the three groups in the age range of 3-4years (Play group); 4-5years (LKG group) and 5-6 years (UKG group). The participants of 3 groups were Kannada-English bilinguals, with kannada as their mother tongue and English as their medium of instruction in school. The participants of all 3 Groups belonged to the middle or upper middle socio-economic classes and had adequate exposure to the media.

The tasks that were carried out in the present study mainly involved phonological skill assessment and Logographic skill assessment. The logographic skill assessment involved 3 separate tasks i.e. Picture + word task (PW) , Logo task (L) and "Word in the changed format" (W) task. The Phonological skill assessment involved 2 tasks i.e. Non-word repetition task (NWR) and Rhyme oddity task (RHY).

The Picture + Word format (PW) format comprised of a representation of the original advertisement, depicting both the original logo and other features associated with the advertisement such as actors, the product etc. The Logo (L) format comprised of the name of the product alone in the original printed form. Word in changed format (W), the name of product was presented in Times New Roman font against a white background.

The reaction time measurements and Accuracy measurements were accounted for the Logographic skill assessment.

In the Phonological skill assessment, the measured accuracy of non-word repetition across syllable length for each participant were noted and grouped according to 3 conditions in non-word repetition task. The percentage of phonemes correct(PVC- Percentage of vowel correct & PCC- Percentage of consonant correct) for each participant were noted and overall mean score of percentage of vowels correct (PVC) and percentage of consonant correct (PCC) across syllable length for each participants were noted. The measured accuracy of rhyme detection in the rhyme oddity task for each participant was noted.

The analyzed data was subjected to suitable statistical procedures comparing across conditions and groups.

Results of the study revealed the following :

- ✓ The Bilingual (Kannada and English) children do demonstrate Logographic reading skills , as evident from their responses in the Format 2 [Logo task (L)] used in the logographic skill assessment.
- ✓ Logographic skills do not pertain rigidly to any one of the three age groups considered . But , the children in all 3 groups [Group 1(Mean age 3.5 yrs), Group 2 (Mean age 4.5 yrs) & Group 3 (Mean age 5.5 yrs)] demonstrated logographic reading skills though the extent varies in each.
- ✓ The overall comparison of group performances in Logo task (L) demonstrates some amount of logographic reading right from 3 years of age with the significant increase around 5-6 years of age .This significant increment can be

attributed to the fact that the logographic strategy begin to be coupled with alphabetic strategy at 4 years of age.

- ✓ The increased Performance level from Group 1 – Group 3 in all 3 tasks [Picture + word task (PW), Logo task (L) & Word task (W)] strongly indicate developmental trend.
- ✓ No specific word feature (s) could be identified due to large and varied set of items used in the study but accurate responses were more for items in the food than other house –hold articles category.
- ✓ Both the Logographic skills and phonological skills exist in all 3 groups (Group 1 ,Group 2 & Group 3) . The Maximum performance was exhibited by the Group 3 (Mean age : 5.5yrs) followed by Group 2 (Mean age : 4.5 yrs) and then the Group 1 (3.5 yrs) in both logographic and phonological skills indicating the developmental trend.
- ✓ The results revealed that the phonological skills which is in close correlation with the Logographic skills closely correlate with the academic excellence particularly in the age group of 5-6 years where the full alphabetic phase has been acquired (Ehri , 1995, 2005).

To summarize, the present study investigated logographic and phonological skills in children and study their effect on reading in normal children . The study revealed a developmental pattern amongst all the three grades, and a hierarchy of reading skills was significantly evident. In this hierarchy, development of better logographic skills in the earlier age (3-5 years) was noted and trend towards phonological skills was observed in the later age (5-6 years) where the full alphabetic phase also emerged in the this age group closely correlating with the academic excellence .

Implications of the study:

- It is evident that, logographic skill is crucial for children in their early stages of reading, though phonological skills still seem to be emerging. Thus, assessing children on logographic skills as part of the emergent literacy protocol in young children will help professionals in early identification of children at risk for reading failures/ dyslexia.
- The research will also help professionals understand that during any intervention program for children with dyslexia, word form analysis strategies need to be kept in mind and adopted accordingly while working on reading skills.

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