Novel word learning in monolinguals versus simultaneous and sequential bilinguals

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This work of mine
is dedicated to
Dad, Dad you mean
the world to me..
My brother, Anna
your a true
inspiration, Latha
Akka, Shyam our
hero, Jaishree
Akka & the queen
of our home
Nethra.

CERTIFICATE

This is to certify that this dissertation entitled '**Novel word leaning in monolinguals versus simultaneous and sequential bilinguals'** is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech - Language Pathology) of the student with Register No. 09SLP008. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that the dissertation entitled **"Novel word learning in monolinguals versus simultaneous and sequential bilinguals"** has been carried out under my supervision and guidance. It is also certified that this has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Guide

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CHAPTER 1

INTRODUCTION

The phenomenon of bilingualism is so widely prevalent and multifaceted that it is, indeed very difficult to define bilingualism covering all aspects. Different authors have adopted different views on bilingualism. Bloomfield (1933) defined it as a native like control of two languages, Haugen (1953) as the ability to produce complete meaningful utterances in other language. According to Mackey (1970) it is the behavioral pattern of mutually modifying linguistic practices, varying in degree, function, alteration and inferences. Bilingualism is also defined as the ability of an individual to express himself in a second language, adhering faithfully to the concepts and structure proper to this purpose, instead of paraphrasing something expressed in his native language.

Bilinguals have been classified based on the age of acquisition of the second language as early and late bilinguals. Early bilinguals are further sub divided into simultaneous and successive/sequential bilinguals. Simultaneous bilinguals (or bilingual first language learners) learn both their languages at the same time and essentially from birth. In contrast, sequential bilinguals learn one language first and then learn the second language. DeHouwer (1995) asserts that three years of age should be treated as the cutoff age for determining a child as being a simultaneous bilingual. McLaughlin, (1978) states that a child would be a simultaneous bilingual if (s)he has had at least an head start of acquiring a second language by his/her third year of birth. Whereas a sequential bilingual is one who starts acquiring a second language only after he/she enters school (Genessee, 2004).

Attempts have been made to initiate teaching in a second language to make a child a bilingual. Researchers have tried to determine the appropriate age to initiate the teaching of second language. Collier (1988) asserted that children between eight and twelve years are the most proficient second language learners. DeGroot (2000) states that the acquisition of a new language results in changes in bilingual memory. If this is true, then the age of acquisition would have an influence on the specific changes in memory. Alternatively, the existing studies fail to offer evidence to suggest that age itself as an impediment to acquire a second language. Other important issues in bilingualism apart from the age of acquisition include where the languages are spoken (e.g., home, school, community), who speaks to the child in each language, which languages are spoken (e.g., French and English), how similar the languages are that are spoken (e.g., French and English are more similar than French and Chinese), and the relative status each language holds in society (i.e., if English and French are valued equally in the community) in addition to the frequency of exposure to language/s. Children will understand and speak a language they hear and use often, better than a language they hear and use infrequently (Pearson, Fernandez, Lewedag, & Oller, 1997).

In view of the above factors, studies have reported that there are differences between monolingual and bilingual groups in cognitive and linguistic tasks. In the early 1900s, there were claims that teaching a child a second language could suppress intellectual function and cause emotional problems (Hakuta, 1986). On the contrary, there are studies to support the view that speaking two languages does not tax either the cognitive or the linguistic system; rather bilingualism confers advantages upon children with respect to various cognitive and linguistic abilities. As early as 1962, the results obtained by Peal and Lambert had suggested that there are no detrimental effects of bilingualism and there may even be some cognitive advantages. Certain authors (Kormi-Nouri, Moniri & Nilsson, 2003) reported that bilinguals are better in cognitive linguistic tasks such as memory, divergent thinking, problem solving, visual memory etc. compared to monolinguals.

There has been an explosion of studies in the recent years which state that bilinguals have an advantage compared to monolinguals (Bialystok, 2001). Carlson and Meltzoff (2008) stated that bilingualism accelerates the executive control in children. Bialystok (2001) also found superior working memory abilities in bilinguals. But there has been sparse data to throw light upon the different types of learning strategies employed by simultaneous and sequential bilinguals and how it varies from that of a monolingual. There have been even fewer studies investigating the effect of bilingualism on conceptualization ability.

Recent research comparing bilingual and monolingual adults on their ability to learn new words consistently suggests that bilingual adults tested in their native language outperform monolingual adults on word-learning tasks. It appears that word-learning performance in bilingual children may be less contingent on latent vocabulary knowledge than in monolingual children (Kan and Kohnert, 2008; Wilkinson and Mazzitelli, 2003). In addition to word learning, the conceptual system of two individuals who speak different languages and participate in different culture may differ in particular domains where concepts are encoded i.e either lexically, morphosyntactically or on other parameters (Pavlenko, 2005). Ervin-Tripp (2000) states that the structure of a bilingual's cognitive system is modified as a result of this experience and cannot be simply matched to that of a monolingual's cognitive system. Alternatively, the strategies employed by a monolingual cannot be solely attributed to the presence and absence of bilingualism as varying socio economic status may also have a bearing on the nature, characteristics and experiences of a bilingual that would influence the cognitive structure and function (Kharkhurin 2008). Kaushanskaya and Marian (2009a) examined word-learning performance in monolingual speakers, English-Spanish bilinguals, and English-Mandarin bilinguals, and found that both bilingual groups outperformed the monolingual group. Another study by Kaushanskaya and Marian (2009b) examined the effects of bilingualism on the ability of adults to resolve cross-linguistic inconsistencies during novel word-learning. English monolinguals and English-Spanish bilinguals learned novel words that overlapped with English orthographically, but diverged from English phonologically. Native language orthographic information presented during learning interfered with encoding of novel words in monolinguals, but not in bilinguals. These findings indicate that knowledge of two languages may shield bilinguals from native-language interference during novel word-learning.

In the recent past, fast mapping in bilinguals has attracted attention in the area of research. Ledenberg (2000) described fast mapping as a form of rapid word learning in which the individual is given an explicit reference for each new word. Vocabulary is a cross linguistically variable domain, and the availability of vocabulary in the case of an individual speaker as mentioned earlier, depends on various factors like exposure to language, his/her education, socio-economic status, native language/dialect, IQ and sex (Mallikarjun 2002). Eisenstein, (1990) suggested the possibility of age at which a learner is exposed to L2 learning may be correlated with overall vocabulary acquisition. A few other studies have supported the idea that new vocabulary learning is more lexically mediated during the earlier stages of learning than during the later stages (Kroll and de Groot, 1997). Chen and Leng (1989) evaluated the role of L1 lexical mediation and concept mediation in the learning of new vocabulary. They found that the children (mean age seven years old) used more concept mediation than older late L2 learners (of mean age 20 years). Bronson (2000) has stated that as the ability for strategy use develops, there would be approach to L2 vocabulary learning may also differ. Kan and Kohnert (2008) investigated the ability of young monolingual children to fast-map new word forms and concluded that there was a strong association with age and existing vocabulary knowledge. But a later study by the same authors in a bilingual population concluded that the fast mapping performance was not related to age or existing vocabulary knowledge. The bilinguals and monolinguals who have different learning histories respond differently to novel word learning tasks.

Processing-based measures, such as word-learning, help to index language ability in bilinguals (Pena, Iglesias, & Lidz, 2001) because these tasks reflect a child's general ability to process linguistic information but do not rely on extant linguistic knowledge. Therefore, bilinguals with poor language knowledge due to low proficiency should perform just as well on word-learning tasks as monolinguals, and better than bilinguals who experience language deficits. However, little is known about the effects of bilingualism on word-learning. Studies that contrast word learning in simultaneous bilingual children (exposed to two languages from birth), sequential bilingual children, and monolingual children are necessary to identify the timeline and the mechanisms that underlie the development of the bilingual advantage for word learning. The finding that bilingualism facilitates word-learning performance has implications for the use of word-learning tasks to index language function in bilingual clients. If typically developing bilinguals perform at higher rates than typically developing monolinguals, then the expectations for bilingual clients with a suspected language difficulty may also need to be modified.

There are several methods to examine the word learning behavior in children and/or adults who are second language learners. One of the prevalent methods in the current literature is use of priming to study lexical access in either monolinguals or bilinguals. The most prevalent techniques in priming studies are those of cross translation and lexical decision tasks. Few authors claim that conceptual priming which is considered as an implicit memory task, would give an insight into the conceptual organization in a bilingual which may vary according to the kind of conceptual basis that he/she has established during the process of development. Conceptual priming consists of three tasks namely free association task, category verification task and category exemplar production task. According to data from a large normative sample (Nelson, McEvoy, & Schreiber, 1998) for free association task, each associate was produced as the first associate to its cue word by about 20% of participants.

The phenomenon of priming in free association is discussed with reference to two classes of explanations. The first class attributes facilitation to target response priming. According to this explanation, the presentation of a word increases its response strength (Storms, 1958) or accessibility. The future processing of a studied word may be facilitated by lowering the threshold (Morton, 1969) or increasing the activation level

(Diamond and Rozin, 1984). An important feature of this explanation is that the effect of studying a word on free association performance is located entirely at the target word. Thus, studying a target word would be expected to result in an increase of the probability of generating the target word to all cues to which it is generated without prior study. A second class of explanation attributes priming to the strengthening of cue–target associations at the time of study. This account assumes that the presentation of a word will not only result in activation of the word itself, but also in the activation and retrieval of associated words from memory. It further assumes that information relating the presented word and the associated words retrieved from memory is stored and that this storage is necessary to obtain priming (Humphreys, Bain, & Pike, 1989). Thus, according to Humphreys et al., (1989) when the word ‘sand’ is presented for study, participants will think of the word ‘beach’ and store the association ‘beach-sand’ in memory. On a later free association test, the probability of generating ‘sand’ to the cue ‘beach’ will be enhanced because the association ‘beach-sand’ has been strengthened. A study by Zeelenberg, Shiffrin & Raaijmakers (1999) also supports the claims for cue-target strengthening as the result of priming. They hypothesize that under instructions to associate to the target, participants would be more likely to generate the test cue and that this provided an opportunity of cue–target strengthening.

If this is the case when the subjects are administered the task in English they would / may generate the cue in the working language i.e. English. Thus the reaction time from a simultaneous bilingual child is hypothesized to be much lesser than that of a sequential bilingual child who accesses the concepts using a strategy different from that of a simultaneous learner and a monolingual child is hypothesized to be more similar in processing to a simultaneous learner than a sequential. In addition to the reaction time measure the types of words generated also help to provide an insight into the architecture of the conceptual basis of bilinguals.

Thus studying the patterns of word learning strategies employed by simultaneous and sequential bilinguals versus monolinguals is likely to yield interesting results. A follow up on the same population using a priming task to evaluate why there is/ is not a variation in the learning strategies for novel word acquisition would enhance our knowledge towards the understanding on the process employed in novel word acquisition and what are the unique patterns of learning by that is brought about by the changes induced due to the age of second language introduction.

1.1 Need for the study

Learning new linguistic forms in a multilingual environment is a challenging task, and its analysis can improve our understanding of how lexical representations are created and stored. While the claim that age influences learning strategies seem consistent with a wide range of studies, the details of this effect are far from clear. This is the first study of its kind which may give an insight into the effect of age of L2 acquisition and the learning strategies employed. In the Indian context where a child gets exposed to a number of languages even before s(he) enters school, it is necessary to know the effect of such exposure on the child's lexical system and the learning strategies employed by them. India is a country where people, in their everyday life, are often exposed to novel words in languages in which they have low proficiency. It is thus imperative to attain some understanding of the strategies that come into play and the effect of exposure to languages on the conceptual basis of word learning in monolingual, sequential bilingual and simultaneous bilingual children.

1.2 Objectives of the study

The objectives of the study are twofold.

- To analyze the learning strategies employed by

1. Bilingual and predominantly monolingual children
2. Simultaneous and sequential bilingual children

- To device a method to differentiate simultaneous and sequential bilingual children

CHAPTER 2

REVIEW OF LITERATURE

Language can be defined as a socially shared code or conventional system for representing concepts through the use of arbitrary symbols and rule-governed combination of symbols (Owens, 2000). The term cognition refers to a faculty for the processing of information, applying knowledge, and changing preferences. Cognition involves a wide range of mental processes such as attention, pattern recognition, memory, organization of knowledge, language, reasoning, problem solving, classification, concept and categorization (Best, 1999). These cognitive processes are those by which sensory input is transformed, reduced, elaborated, stored, recovered and used (Ulric Neisser, 1967) The cognitive processes are interrelated with one another rather than existing in isolation. Cognition and language are closely related, and there are bidirectional connections between cognitive development and language development. There have been various discussions regarding the dependence of cognition on language and vice versa. However, in general, a close interaction between children's cognitive capacity and the influence of language specific input from the very beginning of linguistic development has been reported.

Based on studies it is now accepted that cognition is affected by the process of learning one or more languages. The term bilingual, on the surface means knowledge of two languages. That is, there are very few people in the world who do not know at least a few words in languages other than the maternal variety. Children who have the ability to communicate in two languages i.e. bilingual children are different from monolingual children in many ways. Bilingualism has two possible cognitive outcomes. One is that the very knowledge and use of two languages affects cognition, regardless of the languages involved, for e.g. increased metalinguistic awareness (Bialystok, 2001). Another outcome is that the learning of two languages affects cognition because of the characteristics of the language involved, and how the languages code a given aspect of the world.

Researchers have proposed certain key variables to be considered in defining a bilingual person which include age and manner of acquisition, proficiency level in specific languages, domains of language usage and self identification and attitude. Deciding whether or not a person is bilingual is further complicated when the person is a child who is in the period of language acquisition.

2.1 Classification of bilinguals

Researchers classify bilinguals in different ways. One sort of classification is based on the following variables (Weinreich, 1953).

1. Age of acquisition
2. Proficiency
3. Context of development

1. Age of acquisition

- Early bilinguals: Early bilinguals refers to individuals who have learnt two languages early in childhood before the age of six years. Early bilinguals can be further divided into simultaneous and sequential bilinguals.

If a child learns two languages at the same time, that is termed simultaneous acquisition. If s(he) acquires one language, and having mastered that language, learns a second language, then it is termed as successive or sequential acquisition. McLaughlin (1978) set the cutoff point at which one language has been established at three years of age. The child who is introduced to a second language before three years will be regarded as acquiring the two languages simultaneously. Whereas a child introduced to a second language after three years will be considered to have had one language established and to acquire the second successively, as a second language.

- Late bilinguals: Late bilingual refers to individuals who have become bilingual later in their childhood or in the adolescent period i.e after the age of twelve years.

2. Proficiency

- Balanced bilingual: Balanced bilingual refers to individuals whose mastery of two languages is or almost equivalent.
- Dominant bilingual: Dominant bilingual refers to individuals with greater proficiency in one of his or her languages and uses it significantly higher than the other language.
- Passive bilingual: Passive bilingual refers to individuals who understands a second language, in either its spoken or its written form, or both, but does not necessarily speak or write it.

3. Context of development

- Coordinate bilingual: Coordinate bilingual refers to individuals who have learnt two languages in separate contexts. They have two semantic systems and two linguistic codes.
- Compound bilingual: Compound bilingual refers to individuals who have learnt two languages at the same time in the same context. They have one semantic system but two linguistic codes.

- Subordinate bilingual: Subordinate bilingual refers to individuals who exhibit interference in his or her language by reducing the patterns of the second language to those of the first.

Thirumalai and Chengappa (1986) have characterized bilingualism in different ways as given below:

1. How the language of a bilingual context are kept separately or fused together.
2. Sequence of learning the languages in a bilingual context.
3. Whether the languages of a bilingual context are acquired under formal, instructional conditions or informal, non-instructional set up.
4. An appreciation as to which of the language of a bilingual context is dominant in the individual use of languages.

There are literally as many definitions and varieties of bilingualism as the number of researchers in the field. Different researchers have sought to examine the questions and issues related to bilingualism from their own theoretical and methodological perspectives with specific problems and contexts. Therefore, it is difficult to provide a satisfactory definition of bilingualism.

2.2 Relationship between bilingualism, cognition and language

Bilingualism has been studied less extensively than monolinguals due to various methodological issues. Various studies reported that there are differences between monolingual and bilingual group in cognitive and linguistic tasks. In the early 1900s, there were claims that teaching a child a second language could suppress intellectual function and cause emotional problems (Hakuta, 1986). The typical view of a bilingual child prior to 1960s was that bilingualism was a disease and that it was a mental burden causing intellectual fatigue. Jensen (1962a, b) reviewed over 200 studies and found evidence of negative intellectual and academic consequences of bilingualism. Other review up to 1960's also showed negative consequences of bilingualism on development of intelligence, cognition and personality. Reduced vocabulary has also been found to be an accompaniment of bilingualism, whether the bilinguals show quite high levels of language processing (Ben-Zeev, 1972; Rosenblum and Pinker, 1983) or lower levels (Ben-Zeev, 1975). Other research suggested that bilingual children, because they appeared to have limited linguistic abilities, were retarded in verbal intelligence, if not in overall intelligence. Tsushima and Hogan (1975) found the performance of Japanese-English bilinguals in grades four and five in verbal and academic skills lower compared to their monolinguals matched on nonverbal ability. The findings of the early studies showed that bilingualism can adversely affect, to different degrees, cognitive skills particularly in the areas of verbal intelligence and scholastic achievement. Few studies found no differences between monolingual and bilingual groups in cognitive-linguistic abilities (Rosenblum and Pinker, 1983). Children with native competency in one language only, normally their mother tongue but with a much less command of the other language, showed neither positive nor negative cognitive effects i.e. their performance did not differ from that of monolingual children (Toukomma and Skutnabb-Kangas, 1977). On the contrary, there are studies that support the view that speaking two languages does not tax either the cognitive or the linguistic system; rather bilingualism confers advantages upon children with respect to various cognitive and linguistic abilities.

"Bilingualism is one of the experiences capable of influencing cognitive function and, to some extent, cognitive structure. How much bilingualism is necessary, what type of bilingualism is required, and what particular language pairs maximize these influences are all questions that are still waiting to be explored" (cited from Bialystok, 2009, Pg: 9). The results obtained by Peal and Lambert (1962) suggested that there are no detrimental effects of bilingualism and there may even be some cognitive advantages. Peal and Lambert's study had a major impact on at least two aspects of childhood bilingualism. First it sparked a new interest in the study of childhood bilingualism among psychologists and educators. Second it provided one of the major justifications for the establishment of bilingual education programs during the late 1960's and early 1970's. Balkan (1970) provided support to the Peal and Lambert (1962) findings by conducting a study on French-English balanced bilinguals and French monolinguals. 11-16 years old subjects were matched on nonverbal intelligence and socio-economic class. The bilingual group performed significantly better than the monolingual group on scholastic aptitude tests, reasoning, numeracy and also on tests of cognitive flexibility (verbal and perceptual plasticity) seeking to assess the capacity to restructure given elements and to discover new organization of given elements structured differently. The bilingual sample was further divided into two groups- one that had learned both French and English before the age of four and the other including children who had become bilinguals after the age of four. The superiority of the early bilinguals over the monolinguals was much more pronounced than that of the later bilinguals.

In support of this premise, Cummins and Gulutsan (1974) study that was a replication of Peal and Lambert (1962) study in Western Canada may be cited for evidence. Cummins and Gulutsan (1974) selected balanced bilinguals matched with a monolingual control group on socioeconomic status, gender and age and showed that bilinguals performed better than the controls on verbal and nonverbal ability measures and on verbal originality measure of divergent thinking. Kessler and Quinn (1987) reported that bilingual children outperformed the monolinguals in the ability to perform scientific hypothesis in a problem solving setting and on semantic and syntactic measures. This was perceived as an indication of enhanced linguistic and cognitive creativity related to their bilingual proficiency.

Ben-Zeev (1977) compared two groups of 5-8 year old middle class Hebrew-English bilinguals, Hebrew monolinguals and English monolinguals respectively on WISC IQ subtests such as similarities, digit span, picture completion and picture arrangement tasks. In spite of lower vocabulary level, bilinguals showed more advanced processing of verbal material, more discriminating perceptual distinctions, more propensities to search for structure in perceptual situations, and more capacity to reorganize their perceptions in response to feedback. She concluded that exposure to two languages causes children to develop a mental facility for seeking out the rules and for determining which are required by the circumstances. Ben-Zeev (1977) studied Hebrew-English and Spanish-English bilingual children and concluded that bilinguals process the semantic information more deeply than monolinguals and showed greater cognitive flexibility and was capable of more complex analytical strategies in their approach to language operations.

In contrast to the negative effects of bilingualism found for vocabulary size and rapid lexical retrieval in (Ben-Zeev, 1972; Rosenblum and Pinker, 1983) bilingualism has an advantageous effect on the function of executive control. The main processes in the executive system are inhibition, shifting of mental sets (task switching or cognitive flexibility). Bilingual children have been found to perform better on metalinguistic tasks that require controlled attention and inhibition, but not on comparable tasks that were based on knowledge of grammar (Bialystok, 1988). This study demonstrated that this distinction between tasks that depend on selective attention and comparable tasks that do not involve these processes were also effective in identifying problems that were solved better by bilinguals in nonverbal domains (Bialystok and Majumder, 1998). Hence more attention was given to the nonverbal advantage that the bilinguals may possess. This is also supported by the earlier findings (Zelazo, Frye and Rapus, 1996) that the bilingual children develop the ability to solve problems that contain conflicting or misleading cues at an earlier age than the monolinguals. This is explained on the basis of the ability to shift criteria for the sorting decision and to attend to the new feature while the irrelevant feature remains salient which is an aspect of executive control. In several studies, it has been found that bilingual children master this problem earlier than monolinguals (Bialystok, 1999; Bialystok and Martin, 2004).

Bilinguals are also good updating information in working memory (Miyake, Friedman, Emerson, Witzki, & Howerter, 2000). Bilingualism creates certain advantages in terms of cognitive abilities. It extends the individuals capabilities and promotes mental processing in aspects such as problem solving, thinking, flexibility and creativity (Kormi-Nouri et al., 2003). Bilingual advantage has been demonstrated in other tasks such as theory of mind (Goetz, 2003; Bialystok and Senman, 2004), and reversing ambiguous figures (Bialystok and Shapero, 2005). Carlson and Meltzoff (2008) administered nine executive function tasks to children, which helped to isolate the specific aspects of executive control tasks that are more advanced for the bilingual children. The results revealed that bilingual children were simply not faster, or smarter, or more developmentally advanced; instead, they performed better than the other two groups on tasks that presented conflict for competing options that needed to be resolved for a correct response. The above report simulates the situation in which two competing language systems create a conflict for selection in bilingual speech production.

Bilinguals have been shown to perform the Simon task more easily than monolinguals and produce shorter reaction times for both congruent and incongruent trials. This difference has been shown for children (Martin-Rhee and Bialystok, 2008), young adults (Bialystok, 2006), and middle-aged and older adults (Bialystok, Craik, Klein & Viswanathan, 2004). Costa, Hernandez & Sebastian-Galles (2008) tested Catalan–Spanish bilinguals and Spanish monolinguals on the attentional network task (ANT), a version of the flanker task developed by Fan, McCandliss, Sommer, Raz, & Posner, (2002). In addition to the measure of conflict resolution as the response time difference between congruent and incongruent trials, the ANT also provided measures of overall speed of responding from the benefit provided by an alerting cue, and switch costs from the slower response times on switch than on non-switch trials. The results indicated that the bilinguals responded faster overall and showed a smaller conflict effect, a greater benefit from the alerting cue, and smaller switch costs. Bialystok (2008) demonstrated that bilinguals are better than monolinguals in using the Stroop task which is an important task demonstrating executive control and conflict resolution.

Individuals speaking a second language have been shown to have increased density of grey matter in the left inferior parietal cortex, a change that is more pronounced in early bilinguals and those with greater proficiency in the second language (Mechelli, Crinion, Noppeney, O'Doherty, Ashburner, Frackowiak, & Price., 2004). This region has been shown to be responsible to vocabulary acquisition in monolinguals and bilinguals as well as producing enlargements in slightly different areas depending on the two languages of the bilingual (Green, Crinion & Price, 2007). Furthermore, the combined effect of stimulating experience across the lifespan translates into cognitive reserve, a concept describing the protective effects of experience against cognitive decline with aging (Stern, 2002; Fratiglioni, Paillard-Borg & Winblad, 2004; Kramer, Bherer, Colcombe, Dong & Greenough, 2004; Staff, Murray, Deary & Whalley, 2004; Valenzuela and Sachdev, 2006).

There are not only advantages and disadvantages for both bilinguals and monolinguals but a few issues are not different between the two groups. In a study of free recall which is an evidence of verbal memory, Fernandes, Craik, Bialystok & Kreuger, (2007) showed that bilinguals recalled fewer words at both languages and under all conditions when compared to monolinguals. The author stated that if memory is equivalent but bilinguals are disadvantaged by the verbal task, then it would be expected that they would perform more poorly than monolinguals. So it would be more appropriate to test both the groups across tasks that depend on a memory that is either nonverbal, or requires the involvement of executive control, or both. Bialystok and Feng, (in press) tested monolinguals and bilinguals in tasks that require working memory such as recalling increasingly long strings of animal names to listen either to increasing strings of words and re-order them alphabetically or to two-digit numbers and re-order them in ascending sequence. Neither of the two tasks were solved differently by participants in the two language groups. The results of these two tasks provide no evidence that short-term or working memory is enhanced in bilinguals, in spite of it being part of the executive function. However, in both cases, the material to be held in mind for the short-term memory task, and re-ordered in the working memory task was verbal, a domain that was generally compromised for bilinguals.

Consequent to the above reports, research has, since then, been directed towards analyzing working memory using nonverbal material. Petrides and Milner, (1982) used a self ordered pointing task in which participants viewed a 12-page booklet, each page containing 12 abstract drawings, and had to update a mental list of these images by pointing to a different drawing on each page without repetition. Working memory was calculated as the number of repetitions errors committed. Though older participants made more errors than younger ones, there were no effects of language group at either age. Milner, (1971) used a Corsi blocks test in which 10 wooden blocks are spread out in a random array. The experimenter touches a sequence of blocks and the participant's task is to reproduce the sequence in either the same (forward span) or reverse (backward span) order. There were no differences in either age or language group for the forward span data task, but the more difficult backward span task was performed significantly better by younger adults, and among the young adults, by the bilinguals. A nonverbal task was developed that could be adapted for use with both children (Feng, Diamond & Bialystok,

2007) and adults (Bialystok and Feng, in preparation) and included conditions that varied in their demands for executive control. For both children and adults, the monolinguals and bilinguals achieved the same recall scores in the simple conditions, but as the executive control demands increased making the working memory component more difficult, the bilinguals maintained their performance level better than the monolinguals and outperformed them on such conditions. The difference was not in memory ability, or in short-term or simple working memory as both groups performed the same on these conditions; rather, the difference in this case, the monolinguals declined more from their earlier performance than the bilinguals did.

All the above findings of bilingual's advantage, disadvantage and indifference across various tasks can be justified using a single explanation, which is the central conflict created by the joint activation of the two competing language systems. Evidence from neuroimaging studies support the claim that frontal regions are activated when bilinguals are switching or selecting languages (Price, Green and von Studnitz, 1999; Fabbro, Skrap and Aglioti, 2000; Hernandez, Dapretto, Mazziotta and Bookheimer, 2001; Rodriguez-Fornells et al., 2005). This constant conflict both compromises lexical access because each selection is more effortful and enhances executive control through its continuous involvement in language production. On its own, there is little impact on memory, but to the extent that memory performance relies on either linguistic processing, which is disadvantaged, or executive processing, which is advantaged, monolinguals and bilinguals perform differently from each other.

The architecture underlying the processes affected by bilingualism can be demonstrated using a model put forth by Abutalebi and Green (2007). This described evidence for a series of connections between prefrontal cortex, anterior cingulate cortex, inferior parietal region, and basal ganglia, all of which are implicated in language production for bilinguals. The extensiveness of these networks in which linguistic and nonlinguistic processing are controlled by networks of activation means that experiences like bilingualism affect the entire network, allowing the impact of the experience to be felt broadly over a wide range of processes, including nonverbal ones. The organization of this network is such that the occurrence of a conflict for selection in language production signals the need to involve the systems normally specialized for conflict resolution, namely dorsolateral prefrontal cortex and anterior cingulate gyrus. Because this conflict occurs during language production, the inferior parietal cortex, in particular Broca's area, is also involved. All these cortical areas are connected through the subcortical structures in the basal ganglia, in particular, the caudate nucleus which is also responsible for conflict resolution. The outcome of this configuration is that bilinguals are resolving verbal conflict with activation in two areas that monolinguals use to resolve nonverbal conflict, namely, dorsolateral prefrontal cortex and caudate nucleus, as well as involving Broca's area. Then arised the question about the areas used by bilinguals to resolve nonverbal conflict.

Bialystok et al. (2005) studied monolingual and bilingual young adults performing a Simon task (nonverbal conflict task) using magnetoencephalography (MEG) and found that fast reaction time for monolinguals was related to activation of dorsolateral prefrontal cortex, the usual finding in the literature, but fast reaction time for bilinguals was related to activation of Broca's area. Thus, it appears that bilinguals have both more resources (Broca's area) and more efficient resources (other frontal regions) for performing tasks that are based on nonverbal conflict. The irony was that a linguistic experience appears to have its greatest benefit for nonlinguistic processing and its greatest cost for language production.

Although bilingualism is inevitably accompanied by the joint activation of both language systems, thereby creating the conflict that is the course of these cascading effects, there is one situation in which that may not be strictly the case. The most visible evidence of joint activation and conflict for selection by bilinguals is in code switching. Often, bilinguals insert a word or phrase from the other language having either intentionally or unintentionally chosen the non-target form. The choice is necessary because only one of the two forms can be produced at one time. However, this pressure to select is not as compelling for speech-sign bilinguals; in this case, code-blending replaces code-switching because some combination of the form from each language can be produced simultaneously (Emmorey, Borinstein, Thompson & Gollan, 2008). Thus, the difference between individuals who are bilinguals in two spoken languages and those who are bilingual in a spoken and signed language, all else being equal, is the extent to which speech production in one of the languages is accompanied by conflict and pressure to select one of them from competing activated alternatives. Therefore, a comparison of speech- speech bilinguals and speech–sign bilinguals should indicate the role of this competition on the pressure for selection in bilingual language production on cognitive performance.

Luk, Pyers, Emmorey & Bialystok, (2007) used 15 monolingual, 15 bilingual, and 15 speech–sign bilinguals with a mean age of 48 years and administered a flanker task. The bilinguals were faster than the monolinguals on both the congruent and incongruent trials, but the speech–sign bilinguals performed exactly the same as the monolinguals on both trial types. This pattern supports the interpretation that the conflict for selection between two active languages is central to the enhancement of executive control found in bilinguals.

The presence of highly integrated architecture of the cognitive system means that activities emanating from one domain, such as language, have consequences throughout the network. Such generalized effects are not easily reconcilable with modular views of cognition in which specific knowledge representations and dedicated processes are responsible for performance. Instead, there are strong interactions across knowledge representations and control processes that define broad domains of expertise that are not confined to a single source but reflect the interaction of experience and ability (Craik and Bialystok, 2006).

2.2.a Indian studies regarding the effect of bilingualism on cognition and language

Few studies were done in the Indian context also. A research project was undertaken by South worth in 1979 in Trivandrum with a sample of 1300 children including monolingual Malayalam speakers and other language mother tongue group (e.g. Tamil, Konkani speakers). They investigated the academic performance of monolinguals versus bilinguals. The study was balanced on the basis of detailed interviews and household surveys for parental education and socioeconomic status, history of language use, language use at home and language attitude etc. The results indicated that classroom performance of bilinguals is slightly better than monolinguals on the whole across all grades (1 to 9) and all five levels of socioeconomic categories.

Mohanty and Babu (1983) administered a metalinguistic ability test and a measure of nonverbal intelligence on 180 monolingual and balanced bilingual children from the same grades. 30 monolinguals and 30 bilinguals were included in each grade. The SES was controlled by taking all the subjects from low SES families. The findings of the study showed that even when the difference between the bilinguals and monolinguals in nonverbal intelligence was not significant, the two groups differed in the metalinguistic scores, i.e. bilinguals show an advantage in their metalinguistic task performance.

A study by Rajsudhakar and Shyamala (2008) showed that bilingual adults and elderly outperformed monolinguals in cognitive linguistic task (attention, memory and problem solving) which indicates a cognitive linguistic advantage of bilinguals over monolinguals.

Chitra (2008) studied the lexical organization in bilinguals and monolinguals using a free association task and concluded that in young children as young as 6 years, associated words syntagmatically and children of 8 years associated words paradigmatically. The spurt in growth of the organization occurs maximally at the age of 7 years, where the children are transiting from the pre-operational stage to concrete stage in Piaget’s cognitive theory. It is during this age that the organization of mental lexicon develops at a fast rate and the network begins to get strengthened by environmental exposure and the child's experience with words.

Stephen, Sindhupriya, Mathur & Swapna (2009) evaluated the cognitive linguistic performance in bilingual and monolingual children. The results revealed that bilingual children performed superior to the monolingual children on cognitive linguistic tasks including attention/discrimination, memory and problem solving.

Sangeetha 2011 (ongoing) evaluated the cognitive linguistic performance of simultaneous bilingual children in comparison to sequential bilingual children in the age range of six to eight years of age by administering CLIP battery. She concluded that in all the domains simultaneous and sequential bilinguals performed in similar manner except the problem solving domain where the simultaneous outperformed the sequential bilinguals.

Ritchie (ongoing) 2011 determined the difference in retrieval reaction time of nouns and verbs between the L1 (Konkani) and L2 (English) of simultaneous and sequential bilinguals. He determined the effect of different semantic categories of nouns on their retrieval reaction time in L1 (Konkani) and L2 (English) in simultaneous and sequential bilinguals. The results revealed that sequential bilinguals exhibit significantly better performance in the various aspects related to the linguistic processing and the information processing associated with word retrieval.

Thus from the review of various western and Indian studies we can conclude that bilingualism induces more awareness of language and more fluency, flexibility and elaboration in thinking than a monolingual. Studies indicate that bilingual children, relative to monolingual controls, show definite advantages on measures of cognitive flexibility, creativity and divergent thought. The issue of word learning strategies employed by bilinguals, the types of bilinguals i.e simultaneous and sequential bilinguals and monolinguals has not been studied adequately. The need to study this target population is because of the diverse pattern of the lexical semantic development in them. A brief discussion of this issue follows.

2.3 Lexical-Semantic development in monolingual children

Lexical acquisition begins as early as five to seven months months of age (Juscyk and Austin, 1995; Saffran, Aslin & Newport, 1996). At eight months, children recognize about 15 words, and at 10-14 months they typically speak their first words (Fenson, 1994). It is observed that children's early lexicon is characterized by a large proportion of nominals (words for objects and people) (Gentner, 1982; Gentner and Boroditsky, 2001; Nelson, 1973). After this, there is an increase in the proportion of verbs and other predicates (Bates, Brethelon & Snyder, 1988). The first mapping between word and referents emerge gradually, but many children show a burst in rate of word learning at 16-19 months, after they have approximated 50 words in their productive lexicon (Benedict, 1979; Goldfield and Reznick, 1990).

As pre-schoolers, the process of storing the first associations for words was called as "fast mapping"(Carey, 1978). Pre-schoolers acquire, on an average, 9-10 words a day, or as many as 5000 words by age six years (Beck and McKeown, 1991). Although these initial maps of word meaning are made quickly, they are refined with multiple exposures to the word. This refinement is a process called as "extended" or "slow mapping" (Carey, 1978). It involves increased accuracy of extensions, increased elaboration of meaning, and development of a semantic network. One of the most important behaviors in child's maturing semantic domain is their ability to relate words to each other with increasing flexibility. Words become associated through contexts that overlap in a physical or conceptual way.

Several models have been proposed to understand the cognitive processing in children. Two such models which talk about how words get organized as well as associated with each other are reviewed in the following section.

2.3.a Hierarchical Semantic Network Model (Collins and Quillian 1969)

This model assumes that concepts are stored in a hierarchical structure, with properties stored together with a concept following the principle of 'cognitive economy'. Cognitive economy refers to the fact that properties of concepts are stored at the highest possible level in the hierarchy and not re-represented at lower levels. According to this model, activation would radiate outward through the network from each node until each individual unit's activation would mutually affect one another. When the activation of two nodes overlap, then the two are related. If the nodes have a close semantic relation, they should be in proximity to each other in the network and responses would be faster because spreading activation will have less distance to cover. The authors proposed three levels in a hierarchical nature:

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

2.3.b Spreading Activation Model of Semantic Memory (Collins and Loft us, 1975)

The spreading activation model is an improvement on the hierarchical conceptualization of semantic information. This model assumes that the words are arranged in networks of nodes, but not hierarchically. All information is represented at the node level. Associated concepts, for example, "red" and "rose" are associated by links between the nodes. The closer the relationship between concepts, the shorter is the link. Spreading activation refers to the idea that finding one concept in the network will also activate concepts linked to it. The activation of one node spreads out to related concepts like a sound wave ripples outward from its source in all direction at once. The link between the target word and its association become weaker as the spreading continues to expand. Models of semantic memory also offer explanations for the nature of organization of vocabulary by way of word associations. Organization of vocabulary has been characterized in several ways. Organizational shifts are reported to occur at different age levels; yet there are no clear-cut age boundaries at which these changes emerge.

The first shift is known as the thematic-taxonomic shift. This is an early change in children's word associations, where there is a shift from thematic to taxonomic organization. Thematic organization is based on associations that relate words to some integrated context in which they are experienced as a whole. For example, when asked to think of words that "go with" wagon, children exhibiting thematic associations might respond with "the sidewalk", "my playhouse". Here the experience associated with playing with the wagon has provided the theme that pulls these words together into a cohesive collection. In contrast, taxonomic organization is based on associations or classifications in which items share features that define them as a class. For example, taxonomic responses to words "wagon" would probably include such items as 'my truck", "daddy's car", "a bus". Children begin to build hierarchies of taxonomic relations, at age 2 years (Clarke, 1995). There are notable increases in taxonomic knowledge between ages 3 and 5 years (Anglin, 1977). The thematic-to taxonomic shift is thought to result from the fast expansion of vocabulary and world knowledge characteristic of middle childhood.

A second and parallel developmental shift that occurs in children is termed as the syntagmatic-paradigmatic shift. At the age of five, most children respond to a word stimulus with a word that follows in a syntactic sequence. By age of nine, most children respond with a word from the same form class or paradigm. A predominance of paradigmatic over syntagmatic responses is indicative of a more developed semantic system, as this pattern is typical of mature language users (Lippman. 1971).

In summary, the lexical-semantic development in monolingual children is a complex phenomenon that encompasses the relationship between words and their semantic role. There is significant development in both of these dimensions, which is evident in children from their pre-school period. As the semantic system of the child develops, words get organized in a hierarchical manner and the shift in their vocabulary becomes more evident.

2.4 Lexical-semantic development in bilingual children

Lexical development in monolingual children has received considerable empirical attention in the recent years, leading to significant advances in our understanding of language learning in this population. In contrast, very little is known about the lexical-semantic system of preschool age children who learn a single language from birth LI, and begin to learn a second language (L2) during this very dynamic period of communication development. Language acquisition in a bilingual child is equally complex phenomenon. Bilingual children are similar to their monolingual peers in terms of lexical-semantic organization of vocabulary. In fact, bilingual children perform much better than monolingual children on a number of other cognitive tasks. Bilingual children are more aware of the arbitrariness of words as symbols than monolinguals. They are more adept at identifying grammatical and semantic errors, and they have greater phonological awareness. Hence studies concluded that the bilingual children outperformed their monolingual peers due to their enhanced mental flexibility and strong concept formation skills.

A small number of studies have looked at the lexical-semantic development in two languages spoken by bilingual school aged children (Davidson, Kline, & Snow, 1986; Cummins, Swain, Nakajima, Handscomb, Green, & Tran, 1984). These important studies tapped the metalinguistic production skills in two languages (French-English, Vietnamese-English) of bilingual children and collectively documented significant LI/L2 transfer effects.

Learning a second language during childhood is not a simple additive process, but rather one that involves complex interactions between LI, L2, and the developing child (Kohnert, 2004). Only a handful of studies have directly investigated skills in both the LI and L2 of preschool children learning two languages sequentially. Despite relatively consistent results across studies with respect to growth in L2, findings diverge sharply for LI. Results from one set of studies clearly indicate that LI is vulnerable and subject to rapid backsliding when L2 is systematically introduced during the preschool period (Leseman, 2000; Schaerlackens, Zink, & Verheyden, 1995; Wong-Fillmore, 1991).

In addition to considering lexical skills separately in LI as well as L2, a number of studies point to the importance of measuring the collective or composite language system of developing bilinguals. Recent research on the comparison of the two lexical systems in bilingual children, have shown that a significant portion of lexical-semantic information is unique to one of the child's two languages (Marchman & Martinez-Sussman. 2002; Pearson, Fernandez, & Oiler, 1995, 1995). That is, the child has some concepts that are lexicalized only in one of their two languages, and others that are lexicalized only in the other language. Composite vocabulary scores for typically developing bilingual children are comparable to those of their monolingual peers (Pearson et al.. 1993).

Studies of bilingual children's lexical semantic knowledge can provide much-needed information about the simultaneous development of two linguistic systems. Furthermore, such studies may shed light on the driving forces of lexical-semantic development, which may be the general developmental factors (e.g.. age/cognitive maturity, schooling, or reading acquisition), or specific linguistic factors (e.g.. proficiency or exposure in a certain language).

Over the past couple of decades, much of the research conducted in bilingual domain has been concerned with the organization of a bilingual's two languages. Models of bilingual lexical organization distinguish between two levels of representation: one lexical with two language specific stores and one conceptual comprising a single store.

2.4.a Revised Hierarchical Memory Models (RHM- Kroll and Stewart, 1990, 1994)

In this model, bilingual memory is conceived as represented in separate but interconnected lexicons. These two structures represent the bilinguals first (LI) and second language (L2) lexicons. This model's (Figure no:1) most critical assumptions are that the lexical links differ in strength; the words in each language are linked to a general concept and to each other. The L*2* lexicon is connected to the LI lexicon by strong links and the LI is connected to the L2 lexicon by weak links that are sensitive to semantic processing. Because bilinguals seldom translate from their LI to their L2 languages, they develop a weak link from the LI to their L2 and it does not develop as well as the active L2 to LI lexical links. In addition to the connections between the two lexicons, bilingual memory is thought to be composed of a conceptual store. The conceptual store is connected to both the LI and L2 lexicons. However, the connections between the LI lexicon and the conceptual store are strong and direct; whereas, the connections between the L2 lexicon and the conceptual store are weak. Thus, the subject's LI is more likely to access the conceptual store directly (conceptually mediate) than the subject's L2. In other words, when exposed to an LI concept, the bilingual is more likely to access the conceptual store because of his/her LI. Because the lexical link from the bilingual's L2 to LI lexicon is stronger and faster, the bilingual would most likely utilize these links to access the conceptual store. In this way, the link from the conceptual system to the bilingual's L2 lexicon remains weaker. The RHM model assumes that both lexical and conceptual links are active in bilingual memory but the strength of those links differs as a function of fluency in L2 and the relative dominance of LI and L2. Thus, an asymmetry was hypothesized that L2 to LI translation should be faster than LI to L2 translation and also less sensitive to the effects of semantic factors.

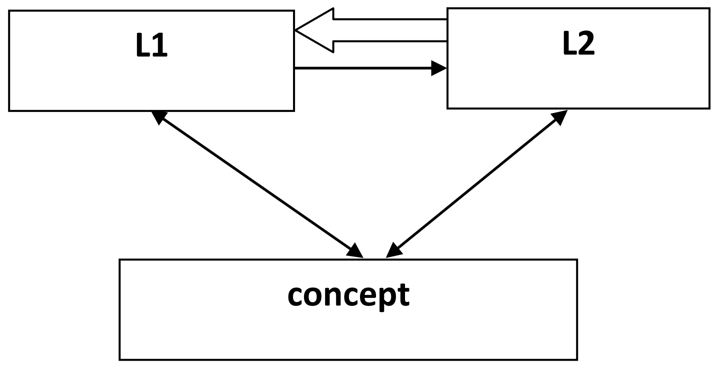


Figure 1: Revised Hierarchical Memory Model

2.4.b Word Association Model (Potter, So, Von Eckhardt and Feldman, 1984)

This model (Figure no:2) assumes that the second language (L2) gains access to concepts only through first language (LI) mediation. The links between LI and L2 are the lexical links and links between LI and the concepts are denoted as the conceptual links. This model predicts that translation from LI to L2 will be faster than picture naming in L2 because translation relies on the lexical links and can thus by pass conceptual access. Thus according to this model, cross-language processing exploits the links at the lexical level.

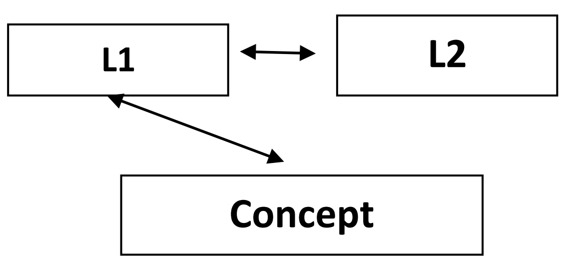


Figure 2: Word Association Model

If lexical-semantic organization is shaped by general cognitive factors that transcend the boundaries of language, we may expect to see parallel development in each of a bilingual person's two languages and in individuals learning one or two languages. If, however, linguistic/experiential factors dictate lexical-semantic organization, we may expect differences in rate or pattern of development between monolinguals and bilinguals and between bilingual’s two languages.

2.4.c Concept mediation model: (Potter and So, 1984)

This model (Figure no:3) proposes that each language has independent access to a common concept representation. This may be true in case of bilinguals with equal mastery of both L1 and L2.

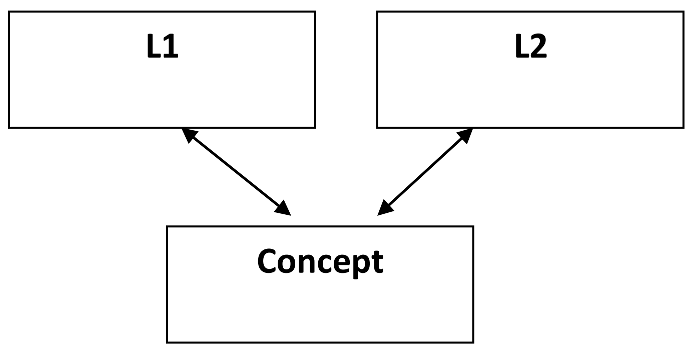


Figure 3: Concept mediation model

2.5. Stages of lexical semantic development in children:

In the exploration of bilingual mental lexicon, that is the lexical-semantic organization, a number of tasks have been employed. These are tasks of priming (cross-language priming), translation tasks and word association tasks. In research on bilingual vocabulary, the word association task has been explored as an elicitation tool with the belief that word associations reflect fundamental characteristics of the relations between words in the mental lexicon. The results of these studies have been analyzed and compared to monolingual baseline data in order to describe and explore lexical and cognitive development as well as the structure of the mental lexicon of a bilingual speaker.

One of the points of reference in word association studies is the notion of a syntagmatic-paradigmatic shift. Recent studies on bilingual children adults using word association tasks have also shown a shift from syntagmatic to paradigmatic relation (Soderman 1993; Namei 2004). This indicates that the first and second language mental lexicons are not as different from each other (Mcara 1984). Namei (2004) argues that the syntagmatic-paradigmatic shift in the first and second language is not an organizational characteristic of the whole mental lexicon but a developmental feature of every individual word, indicating increased lexical knowledge. These findings are also supported by Chitra (2008) in the Indian context.

To date, studies comparing bilingual and monolingual children's semantic organization have yielded mixed results. In a 3-year longitudinal investigation, Lambert and Tucker (1972) compared percentages and speed of generating paradigmatic word associations (the more mature type of association responses) between English-French bilingual children and monolingual control groups (English-speaking, French-speaking) at the end of each year of French immersion. The bilingual children produced generally comparable or, in some cases, higher percentages of paradigmatic responses than the control children. Depending on the year and the group of comparison, the bilingual children demonstrated faster, comparable, or slower response times than the monolingual children. Additionally, Ben-Zeev (1977) found that although Hebrew English bilingual children generated a similar number of paradigmatic responses as monolingual controls, but, they responded more slowly.

Cunningham (1990) examined the word association data of two groups of Irish-English bilingual children. One group was based in an English-medium school and was receiving input in Irish only during Irish lessons, and the other of which was based in an Irish-medium school receiving input in Irish throughout the school day. The findings of this study revealed that L2 learners who had received more input produced fewer "clang" associates and more 'paradigmatic" associates than did learners with less experience of the target language. These results were similar to those obtained by Soderman (1989, 1983). Recent L2 association studies document the fact that a syntagmatic-paradigmatic shift occurs in the associations of non-native speakers as well (Soderman l993; Namei 2004). This indicates that the LI and L2 mental lexicons are not as different from each other as previously believed (Meara, 1984).

Namei (2004) compared 100 Persian-Swedish bilingual subjects with 100 native speakers of Swedish and Persian on a word association task. The elicitation instrument was the Kent-Rosanoff association list (1910), and the subject's task was to give a single-word response to each stimulus word. The results showed that phonologically based associations occur in both the LI and the L2 as a function of the degree of word knowledge. Phonologically based organization is a primary acquisition feature of every individual word, and it is not abandoned even during the advanced stages of language proficiency, whether in the LI or the L2. It was found that words that are barely known may elicit phonologically based associations, those that are partially known may have a strong syntactic organization, and well-known words are connected to other words mainly on a semantic basis. The author argues that the syntagmatic paradigmatic shift in the LI and L2 is not an organizational characteristic of the whole mental lexicon but a developmental feature of every individual word, indicating increased lexical knowledge. The results from the word association studies show that the first language (LI) mental lexicon is organized mainly on a semantic basis, while the organization of the second language (L2) mental lexicon in the early stages of development is phonologically based, indicating a less profound lexical knowledge.

To summarize, according to Namei (2004), development in word knowledge is reflected in the overall organizational features of words in the mental lexicon: barely familiar words are form-based, moderately known words are syntagmatic, fairly well-known words are paradigmatic, and well known words are paradigmatic or late syntagmatic (Entwisle 1966; Wolter, 2001).

Various theoretical explanations have been provided for word associations in children. The most basic theory of the production of word associations is that of associative pairing in language use. This theory proposes that responses are associated with stimulus words in a word association task because they have been frequently experienced together in the past. Alternatively, one theory which rejects the above view that the syntagmatic-paradigmatic shift is based on syntactic learning was proposed by McNeill (1966). He proposed that the word associations in children are based on semantic principles, and children under the age of 7 years show insufficient learning of the semantic feature of words.

In summary, above review illustrates that the syntagmatic-paradigmatic shift is observed most predominantly in high-frequency adjectives, whereas nouns tend to be paradigmatic even at early stages, and verbs are more strongly syntagmatic (Nelson, 1977). These patterns are replicated in Miller and Fellbaum's (1991) study, where they conclude that central sense relations differ for different word classes. For example, an understanding of paradigmatic relations (i.e., synonymy, antonymy) is central in the acquisition of adjectives, which may facilitate an earlier and more complete shift from syntagmatic to paradigmatic responding for adjectives versus other word classes.

Wolter (2001) notes that it takes a great deal of lexical knowledge to be able to relate a response sequentially (i.e. syntagmatically) to the prompt word. Soderman (1993) argues that a paradigmatic response may not necessarily represent the highest level of lexical knowledge, and that there may not be such a marked shift from syntagmatic to paradigmatic responses as has been claimed for decades. Both studies point to native-speaker informants who showed an extremely strong preference for syntagmatic responses (Wolter 2001), or who did not show a clear preference for either syntagmatic or paradigmatic responses (Soderman 1993).

Nissen and Henriksen (2006) challenged the concept of syntagmatic-paradigmatie shift. Contrary to previous research which suggests that the LI adult mental lexicon appears to be predominantly paradigmatically structured (Schmitt 2000). These authors claimed that a surprising majority of syntagmatic responses in the LI test. The authors have discussed the influence of word class on test results in terms of the acquisition and semantic organization of nouns, verbs and adjectives. This study suggests that the lexical-semantic organization in bilinguals might be different from that of monolinguals in terms of cognitive processing.

The issue of word class influence on test results has not been thoroughly explored in the discussion of L2 associative behavior despite critical discussions in recent word association studies of the nature of syntagmatic and paradigmatic responses and of the syntagmatic-paradigmatic shift (Soderman 1993; Wolter 2001).

The contradictory results found in the literature may be due to the methodological issues related to the word association task itself. It may be that the prime word provided to the participants itself was related to the stimuli to be presented in a syntagmatic/paradigmatic manner and hence primed such kind of responses. There have been other types of priming varieties which structure the procedure in a much more systematic manner which enable effective interpretation of the obtained results. Conceptual priming, an implicit memory paradigm is one such task. This has three varieties of tasks, free association, category verification and category exemplar production. Free association task involves the presentation of study list bidirectionally associated with the stimuli before the initiation of the experiment. Followed by which the participant is asked to produce any word associated to the stimuli presented. According to Nelson, McEvoy, & Schreiber, 1998 the probability of the study word being produced as the first associate is 20%. This will also reflect the working of the lexical semantic network unique to every person and the way it operates.

All the above studies discussed i.e word association tasks, linguistic tasks and cognitive tasks are explored in bilinguals and monolinguals. Enough importance has not been given to types of bilinguals (simultaneous and sequential) and the patterns of performance exhibited by them on all the above mentioned tasks. The following review elaborates the course of development in simultaneous and sequential bilinguals and their performance on various tasks cognitive linguistic tasks.

2.6 Simultaneous and sequential bilinguals

Based on the age when the child gets exposed to the second language they can be categorized as simultaneous or sequential bilingual. A child who has had a head start of acquiring the second language before three years of age will be categorized as being a simultaneous bilingual, where a child who is typically exposed to only one language till the age of three years and later starts acquiring another language will be considered a sequential bilingual based on the guidelines given by McLaughlin (1978). This condition of dual language input in case of a simultaneous bilingual may be the result of the community the child lives in, the socioeconomic status and other factors which results in simultaneous bilingualism or first language bilingualism (Swain, 1972).

Simultaneous acquisition of two or more languages can indeed be qualified as an instance of multiple first language acquisition. The development of each of the bilingual's languages proceeds in the same way and leads to the same kind of grammatical competence as in their respective monolingual children. Bilingual development is not qualitatively different from monolingual acquisition whereas the qualitative similarities and differences are in terms of grammatical development. Simultaneous bilingual children acquire structure shared by both languages at approximately the same rate and in the same sequence (Kessler, 1971). Bilinguals initially develop a single mental system for the two or more languages they acquire; such a fusion of grammatical systems might be difficult to disentangle. Bilinguals might encounter difficulties, at least initially, in separating the lexicons and the grammatical systems of the languages which they are learning is that their language use normally exhibits a certain amount of mixing. However, as early as the 1970s, researchers agreed that children growing up with more than one language eventually succeed in separating their languages, without much effort or specific pedagogical support.

From studies of developmental bilingualism, a picture emerges that consistently identifies at least two stages by which children become bilingual: the first, an undifferentiated or single-language system; the second, differentiation into two distinct systems. Infants who experience dual language input from the onset of language development or before the first language system is in place appear to form one single language system comprised of elements of both languages. As bilingual children develop, they gradually begin to differentiate between the two language systems. The precise age at which this may occur varies as input conditions, language balance and other linguistic and social variables interact. Bilingual children learn to identify a specific language with a specific person or even age group and with specific situations.

The role of age and maturation in simultaneous versus sequential bilingual development are questioned by researchers. Simultaneous acquisition of two or more languages can be characterized as an instance of first language development in each of the child's languages. The question, however, as to whether the same is also true for children acquiring two languages successively is more controversial i.e, it addresses the issue of age and maturation in language development. The crucial issue on which this controversy hinges is whether the language making capacity is available indefinitely or whether it becomes accessible as a result of neuronal maturation and remains accessible only during a limited age period. If the latter view is correct, it follows that, if the onset of acquisition of another language occurs after such a critical period, the prediction is that there will be qualitative differences in the course of acquisition as well as in the grammatical knowledge ultimately attained, as compared to simultaneously acquired languages or monolingual first language acquisition. Importantly, the existence of a critical period for language development has significant implications not only for the acquisition of bilingualism but also for situations in which children do not have access to the appropriate linguistic environment from birth onwards. Lenneberg (1967) in his critical period hypothesis claimed that the native competence cannot be attained by mere exposure if the onset of acquisition happens after a certain age. But the hypothesis does not specify a point of development at which the optimal age for language acquisition ends. According to typology of bilingualism based on critical period hypothesis, successive acquisition of bilingualism during early childhood, i.e. when a child is exposed to one or more languages within the critical period, should be qualified in the same way as that of simultaneous bilinguals. In other words, multiple first language competence should be attainable if the child is exposed to more than one language before the beginning of the offset phase of the critical period. Some authors, however, have claimed, in contradiction to this prediction, that successive acquisition of bilingualism will necessarily result in substantial differences as compared to those cases in which children are exposed to their languages from birth. More linguistic and neuropsychological research is required to verify the role of age and maturation in bilingual development.

Following the critical period hypothesis, the addition of one language or more after the optimal age, as in adult second language acquisition, implies that the human language making faculty is no longer available to the learner, at least not in the same way as during early childhood. This doesn't mean that language acquisition is not possible any more. Rather, it suggests that learners have resort to other cognitive capacities in order to develop a knowledge system about the language. In cases of successive acquisition of bilingualism, the language making capacity of an individual has already been activated at least once, subsequent language acquisition might, in principle, draw on this previously acquired knowledge and could thus proceed as in those instances which happen during the critical age period. By comparing simultaneous with successive acquisition of bilingualism, it becomes plausible that the differences are caused by factors related to the age of the learners. It can be suggested that successive acquisition of bilingualism results in qualitative differences as compared to monolingual as well as bilingual first language development, if the onset of acquisition falls into an age period after the optimal age for language learning. As successive acquisition of bilingualism in childhood, exposure to another language during later childhood, i.e. approximately between ages five and ten, can indeed be considered as child L2, resembling more adult L2 than bilingual L1 development. If however, bilingual acquisition begins during early childhood, e.g. before the age of five, it seems to be essentially identical to simultaneous acquisition of two first language from since birth.

Results of studies using hemodynamic as well as electrophysiological methods confirm the importance of age of acquisition for the functional specialization of language in the brain. Functional neuronal imaging experiments e.g. fMRI, suggest a common anatomical substrate and common pattern of activation for both languages acquire during early infancy; late bilinguals, on the other hand, exhibit spatial separation of the languages in the brain. Interestingly, it has been suggested that an increasing activation of the right hemisphere can be observed if the onset of acquisition of a language happens after the age of four. In sum, although much more research is needed, especially with bilinguals who acquired their languages simultaneously since birth or successively during early childhood, evidence complied by behavioral as well as by neurophysiological investigations emphasize the role of maturation and age for the successive acquisition of bilingualism. Only if the second language is acquired during early infancy is it likely to result in a native like competence, much as in the simultaneous acquisition of bilingualism since birth.

What has been said so far refers to simultaneous acquisition of bilingualism from birth. With respect to the successive acquisition of bilingualism, the picture is much less clear. There is good evidence speaking in favor of the critical period hypothesis according to which the acquisition of a further language beyond the optimal age range will lead to substantial differences in the course of acquisition as well as in the grammatical knowledge ultimately attained.

Individual case studies by linguists (Leopold (1939, 1947, 1949a, 1949b; Ronjat, 1913) had concluded that early bilingualism was advantageous to children's cognitive and linguistic development i.e simultaneous acquisition of two languages. Leopold

(1961), based on observations of his bilingually raised daughter, suggested that bilingualism promoted an early separation of the word sound from the meaning (a noticeable looseness of the link between the phonetic word and its meaning).

Ianco-Worrall (1972) tested Leopold’s observations in a group of English-Afrikaan bilingual children who had been raised in one person one language environment versus two comparable English monolingual and Afrikaan monolinguals. Results revealed that bilinguals outranked monolinguals in choosing words along a semantic rather than a phonetic dimension. Bilingual children who had been raised in one person one language environment reach a stage of senlatitic development 2-3 years earlier than monolingual children.

Brain and Yu (1980) investigated the cognitive consequences of raising children according to Ronjat’s (1913) one person one language principle on German-French, English-French, and Chinese-English bilinguals with monolinguals from the respective languages on the use of language as a self directive tool in cognitive tasks. Results showed that, at about age 4, children raised bilingually in one person- one language environment were better able to use both overt and covert language as a guide and control in their cognitive functioning. The data favored younger bilingual children though it did not reach statistical significance.

Leseman (2000) researched about vocabulary development in Turkish and Dutch of second and third generation immigrant children from low-income families in the Netherlands. The primary home language was Turkish (L1) but the children attended a Dutch (L2) preschool program beginning at age 3;0. Performance on receptive and expressive vocabulary measures indicated significant and positive growth in Dutch. In contrast, performance in L1 did not change and, over time, lagged behind that of monolingual Turkish peers who did not attend preschool.

Similar findings of reduced L1 skills alongside positive gains in L2 for preschool children were found by Schaerlaekens, Zink & Verheyden (1995). This study investigated vocabulary skills in 3–5-year-old children who spoke French as L1 and attended a Dutch preschool (L2). In this study, both L1 and L2 had high social status and families represented the range of income levels. Nonetheless, outcomes were similar. Specifically, Schaerlaekens et al. reported a 40% increase in L2 scores between the ages of 3 and 5 years, alongside a 30% decrease in L1.

Two other studies, however, provide powerful support for the notion that early introduction of L2 need not result in a regression of L1 (Rodrıguez, Dıaz, Duran, & Espinosa, 1995; Winsler, Dıaz, Espinosa & Rodrıguez, 1999). In these studies, children from low income Spanish-speaking families attended bilingual preschool programs, five full days per week. Instructional activities were in both Spanish (L1) and English (L2). Performance on standardized language measures in Spanish and English were compared with that of a control group of children who did not attend preschool. On all measures, both between-group and longitudinal, there were significant positive gains in L1 and L2 for children attending the bilingual preschool. Discrepant findings across studies may be traced to differences in the populations studied and in the range of educational programs children attended, as well as to fundamental differences in data collection procedures.

Kohnert and Hernandez (1999) conducted a study of picture naming in single language and alternating language conditions in sequential bilinguals with the mean age of 10 years. It was evident that older participants were faster and more accurate in picture naming than were younger participants, in both Spanish and English. There were obvious developmental effects on lexical production that continued through adolescence (German, 1994; Kail, 1991). They also found clear evidence for the positive effect of L2 experience on lexical production (independent of age of acquisition, as this was held constant across all age groups). The youngest children in the study (5–7 years old with less than 2 years of systematic L2 experience) were more accurate in Spanish (L1) than in English (L2). However, across middle childhood, L1 skills began to plateau, whereas L2 skills continued to improve. This difference in growth trajectories for L1 and L2 resulted in a shift in language dominance so that by adolescence (14–16 years old with an average of 10 years of systematic L2 experience), picture naming was faster and more accurate in English. During middle childhood (8- to 10-year-old and 11- to 13-year-old groups), L1 and L2 skills appeared to be relatively "balanced" in the overall analyses. More detailed analyses, revealed that this crosslinguistic balance during middle childhood was tenuous, with scales differentially tipped to Spanish or English by processing condition (mixed vs. blocked) and dependent variable (accuracy vs. RT). For example, the 8- to 10-year-old group (with an average of 4 years of formal experience with English at the time of testing) named more items in Spanish during the blocked single-language processing condition but were faster in naming items in English. With the increased cognitive demands associated with the mixed-language condition, however, this pattern reversed so that English was at a relative advantage for accuracy, but now at a disadvantage for speeded access.

Kohnert (2004) carried out a one year follow up study on the same population to document developmental changes. Results revealed consistency with the previous cross-sectional study (Kohnert, 1998), which documented a steeper growth trajectory in English than in Spanish, culminating in a shift from L1 to L2 dominance by adolescence (with approximately 10 years of L2 experience). Results for change in L1 are more equivocal—indicating some gains across development (as indicated by greater accuracy in older children), some losses (as indicated by slight decline in overall naming accuracy), and some plateaus in skills (as indicated by RT data). Current findings also clearly indicate that changes in cognitive-linguistic skills are evident within relatively short periods of time (e.g., 12 months) and on very basic- level processing tasks (e.g., naming pictures of familiar objects).

Kan and Kohnert (2005) used picture-naming and picture-identification tasks to measure expressive and receptive vocabulary in children aged 3;4 to 5;2 in the US who were learning Hmong (L1) and English (L2). For all participants, Hmong was the home language, English and Hmong were used in the preschool setting, and English was the majority language of the broader community. For older preschool children, Kan and Kohnert (2005) found evidence of a plateau or stabilization of lexical development in Hmong (L1). In contrast to this lack of growth in Hmong vocabulary, there were significant gains in English (L2) vocabulary.

McLaughlin (1978) reported code switching as one of the major aspects of cognitive side of bilingualism. Harini (2010) studied code mixing and code switching in simultaneous and sequential children. The results revealed that code mixing and code switching were more prevalent in successive group than simultaneous which could be probably due to unequal mastery of languages.

The review on simultaneous and sequential bilinguals in various tasks have found similar results for L2 but diversely varying results for L1 across various tasks. Thus exploring the word learning abilities in this population for both L1 and L1 may provide interesting insights regarding the word learning strategies in them.

2.7 Word learning

Learning to talk is a relatively orderly process, not all children acquire all language ability in the same order and at identical speed. There is individual variation. The acquisition of words typically follows the trend of reception followed by expression. In receptive vocabulary, children comprehend first words at about eight to nine months of age (Benedict, 1979). At about 13 months of age, children comprehend about 50 words (Benedict, 1979). By six years of age their comprehension vocabulary is between 20,000 and 24,000 words, and by 12 years of age it is 50,000 words or more (Owens, 2001). The size of a child's vocabulary depends, in part, on the experiences and words to which the child is exposed (Rescorla, Ali, and Christine, 2001), which after the early years leads to considerable variability in vocabulary composition as well as size. Children express as many as approximately 10 words at the age of 15 months. By 18 months the expressive vocabulary is around 50 words which are increased to 150 words at the age of 20 months. By 2 yrs of age children express 120-300 words and by the 3 years of age the size of the vocabulary is increased to 1000 words. Approximately 1600 words are expressed by children at the age of 4. And by 6 years of age children utter about 2600 to 7000 words. (Dale, Bates, Reznick, & Morisset (1989), Owens (2001), Reich (1986) and Rescorla et al. (2001). There are several ways in which young children are believed to be so good at learning (Rice Buhr & Nemeth 1990).

One way is with a process known as “fast mapping” (Dollaghan, 1985; Heibeck and Markman 1987) or quick incidental learning (Rice 1990). The ability to learn and retain new words with only minimal exposure is known as fast mapping (Carey & Bartlett, 1978; Heibeck & Markman, 1987). Fast mapping is hypothesized to be the initial step in lexical acquisition, in which a listener rapidly constructs a representation of an unfamiliar word on the basis of a single exposure to it. This initial representation might contain information on the semantic, phonological, or syntactic characteristic of the new lexical item, as well as nonlinguistic information related to the situation in which it was encountered (Dollaghan, 1987). The preliminary representation that is fast mapped into memory may well be incomplete and/or inaccurate. However, once some sort of representation has been created, the listener can access and update it in response to additional information gained in subsequent encounters with the new word. According to Carey (1978), only a small portion of information concerning the novel word is mapped into the long term memory. Although little is stored on the long term basis, fast mapping does facilitate the later lexical acquisition. This initial representation makes the subsequent word recognition more quickly (McClelland and Rumelhart, 1986). Over repeated experiences with the word, full knowledge of its meaning will be achieved.

Fast mapping was invoked in efforts to account for the rapid rate at which normal preschool children add words to their vocabularies (Carey, 1978), and several studies halve documented the fast mapping facility of normal preschoolers (Carey and Bartlett. 1978; Dollaghan, 1985). Despite limitations of basic attentional and memory processes, and only rudimentary social-pragmatic skills, the average toddler typically accrues a lexicon of more than 500 words before the age of 3 years (Fenson, Dale, Reznick, Bates, Thal & Pethick 1994). Fast mapping has been demonstrated in infants as young as 17 months of age (Halberda, 2003) and 30-month-old infants have been shown to fast map as many as six novel names within a single experimental session (Golinkoff, Hirsh-Pasek Bailey & Wenger 1992). Many investigators regard children's success at fast mapping as especially remarkable, considering that they lack the conceptual requirements believed to be essential to support the appropriate interpretation of words (Gillette, Gleitman, Gleitman, & Lederer, 1999). Numerous studies have examined the fast mapping phenomenon in preschoolers in the past few years. Researchers like Carey and Bartlett (1978), Schwartz and Leonard (1984), Dollaghan (1985, 1987), Ross, Nelson & Wetstone (1986), Heibeck and Markman (1987), Bates, Bretherton & Snyder (1988) found that children are capable of mapping various aspects of a novel word. It includes its referent, colour, texture, function, semantic category, location, action performed on referent as well as its phonological and syntactic characteristics. These all reflect that children do comprehend the word after the initial mapping stage, rather than just recognize the word.

Carey and Bartlett (1987) studied how 3 year old children learn about a word when presented in an ambiguous context, as opposed to concentrated teaching. Carey (1987) proposed that children learn the meaning of a word in two separate phases: (a) a fast mapping phase, in which the child establishes an initial link between word and referent, and (b) a subsequent, slow mapping phase. In the fast mapping phase, the child has only partial knowledge of the meaning of the word, whereas in the second phase of acquisition, the initial word representation becomes supplemented through additional experience, eventually coming to resemble the adult meaning. In this study they used an unfamiliar name (chromium) to refer to an unfamiliar color (olive green), and then asked a group of four-year-old children to select an object from among a set, upon hearing a sentence explicitly, asking for the object of the new color, as in: bring the chromium tray, not the blue one. Children were generally good at performing this "referent selection" task. In a production task performed six weeks later, when children had to use the name of the new color, they showed signs of having learned something about the new color name, but were not successful at producing it. On the basis of these findings, Carey and Bartlett suggest that fast mapping and word learning are two distinct, yet related, processes.

Extending Carey and Bartlett's work, much research was concentrated on providing an explanation for fast mapping, and on examining its role in word learning. These studies showed that children are generally good at referent selection, given a novel target. However, there is not consistent evidence regarding whether children actually learn the novel word from one or a few such exposures (retention). The experiments of Golinkoff et al. (1992) and Halberda (2006) infants showed signs of nearly-perfect retention of the fast-mapped words, those in the studies reported by Horst and Samuelson (2008) did not.

A typical fast mapping task occurs in two phases. First is the exposure phase, where the child hears a novel word form and sees its corresponding referent. Followed by the probe phase where the child is asked either to name the new object (expressive probe) or to identify the object that corresponds to the new word said by the examiner (receptive probe). Exposure and probe phases are typically embedded in developmentally appropriate activities, such as packing or unpacking a picnic basket using a combination of novel and familiar objects (Ellis Weismer & Evans, 2002) or in user friendly computer activities (Alt and Plante, 2006). The traditional fast mapping task is administered without specific feedback or teaching, over a very short period of time.

Building on Carey's (1987) classical work, numerous studies have focused on possible constraints or biases that guide children to interpret words in particular ways. In these experiments, the children are typically exposed to nonostensive learning in an ambiguous context (Golinkof et al., 1994; Heibeck and Markman, 1987). Evey and Merriman (1998) presented 24-month-olds with stimuli of two simple line drawings of a cake and a novel object and told them to "find the dax." Within this context, fast mapping was assumed as occurring when children attached the new word to the previously unnamed object.

There have been other studies employing the method of fast mapping but focuses not on how children disambiguate the meaning of words but, rather, how general processes of learning and memory support lexical acquisition for example, the number of exposures it takes to learn a new word (Houston-Price, Plunkett, & Harris, 2005) or the kind of information learned and retained in memory (Chapman, Kay-Raining Bird & Schwartz 1990, Markson and Bloom, 1997). In many of these tasks, infants are taught words ostensively using basic associative mechanisms (i.e) through the direct pairing of an auditory label and visual object (Schafer and Plunkett, 1998; Woodward, Markman, & Fitzsimmons 1994).

Lederberg, Preszbindowski & Spencer (2000) suggested that ostensive learning is especially suitable for children with small vocabularies who may otherwise be unable to demonstrate fast mapping. They examined the fast mapping skills of deaf preschoolers in two contexts: (a) one in which children had to infer the meaning of a novel word and (b) a second in which the link between object and referent was made unambiguous by the experimenter. They found that the ability to fast map a word through brief ostensive exposure preceded the ability to infer that a novel word refers to a novel object. Furthermore, this ability was related to vocabulary size, such that children with larger expressive and receptive vocabularies were more proficient at fast mapping new words than were children with smaller vocabularies. . They explained that early in development, children understand much more than they say. Further in development, the discrepancy is less apparent, and children often begin to use a word productively immediately after hearing it spoken. These changes reflects an important transition in the child's ability to fast map new words in production and is generally associated with the onset of the vocabulary spurt or naming explosion (Bloom, 1973; Ganger and Brent, 2004; Gershkoff-Stowe and Smith, 1997; Goldfield and Reznick, 1990; Mervis and Bertrand, 1994). One reason for the asymmetry in understanding and saying may be that the two tasks place different demands on retrieval processes (i.e) the retrieval of a word for production may require activation strengths that are greater than those needed to access a word in comprehension (Capone and McGregor, 2005).

This concept is based on a common model of adult lexical access in which the retrieval of a word is not an all-or-none event but, rather, involves a process of graded activation (Stemberger, 1989). To comprehend the meaning of a word, the listener starts with an auditory cue that activates a phonological representation stored previously in memory. Activation gradually spreads from the phonological level to the semantic level where, given sufficient activation of the associated concept, the word is comprehended. In contrast, the retrieval of a word for production, involves reverse flow of information and uses its initial activation from a set of nonlinguistic cues that originates in semantic memory and spreads to the phonological level. Given enough strength to activate the associated sound form of a word, the word is then accessed for production. This model of lexical access suggests that activations are derives from two sources: (a) the strength of connections that link units to one another and (b) the strength associated with each unit at a given moment in time. Because infants acquire many of their early concepts before acquiring the sound forms, it is likely that concepts will initially possess higher levels of activation rather than the sound forms to which they are linked.

Thus for a beginning word learner, hearing a particular word should provide a temporary boost to the initially low level of activation associated with the proper phonological unit. This activation then spreads to the semantic level, where the more highly activated concept needs only a small contribution from the phonological level to become available for access. In comparison, attempts to say a word begin with the already highly activated concept, which may robustly spread activation to the phonological level. However, two general weaknesses of the retrieval system at this early stage of development conspire to make early naming a difficult task: (a) inadequate links between concept and form and (b) initially weak states of phonological activation for most words. As a consequence, the child often fails to retrieve the desired name. Such an experience may be similar to the tip-of-the-tongue phenomenon that adults sometimes experience (Brown and McNeill, 1966) that is, the child "knows" the correct word but is unable to retrieve it (Elbers, 1985; Gershkoff-Stowe, 2007). Hence improvements in children's ability to access stored representations in comprehension should support children's ability to generate the associated words for production. This is because accessing the sound form of a word depends, in part, on the strength of the link to the concept itself, which becomes more robust each time the word is accessed.

Swingley (2009) presented an overview of research as the heart of word learning. He studied the advances taken place in infant studies of word leaning. He emphasizes that methodology plays a major factor in this population. He stated that in the last 20 years variants of the head turn preference methodology (Fernald 1985) have proved invaluable. This technique allows two spoken stimuli differing in source location to be compared, with the experimenter measuring the preferred stimulus on the basis of head orientation (i.e. infants will orient their head towards the source of a more interesting stimulus for a longer period of time). It is generally agreed that the first 12 months of life involve a process of refining and tuning of the phonetic categories that are relevant to the infant’s language. Contrasts that are unused in a particular language will tend to be lost, so that by 10–12 months of age only the phonetic categories that are relevant to a particular language remain. This important precursor to word learning has led to the assumption that vocabulary acquisition starts in earnest only in the second year. Swingley’s (2009) paper questioned this assumption, arguing that there may be ways in which word learning can contribute more interactively to the refinement of phonetic categories. There is good evidence that infants, like adults, can make use of distributional information in the formation of phonetic categories (Maye, Werker & Gerken 2002). He states that a small number of learned words are used as prototypes for the phonemes that they contain. Hence, speculatively, distributional learning may facilitate early word learning, which in turn can help to refine categories. He addressed an important issue of what it means to learn a word? He states that there may be an advantage in terms of learning the form first and the meaning second. Two different methodologies have found that familiarization with form alone can lead to better learning of meaning when a referent subsequently becomes available (Graf Estes, Evans, Alibali & Saffran 2007; Swingley 2007). From around 12 months, infants display knowledge of word meanings. Arias-Trejo and Plunkett (2009) demonstrated such effects, but cautioned that they tell us little as yet about the organization of semantic knowledge in the infant mind.

Arias-Trejo and Plunkett (2009) used intermodal preferential looking task and evidenced that 18-month-olds show no greater preference for the target picture in the related prime condition than the unrelated one. However, 21-month-olds do show selective facilitation when the prime word is related to the target. This constitutes the first clear evidence of semantic links within the infant lexicon, even though spoken word production at 21 months is often limited. The reason for this kind of a pattern in 18 month olds was hypothized that lexical concepts are initially represented as 'islands' in semantic space, with coherent and integrated semantic organization only emerging a little later in development. These studies were typically done in monolingual situation.

Werker, Byers-Heinlein & Fennel (2009) reviewed how word learning proceeded when the language input contains this extra dimension of complexity in terms of bilingual input. It is expected that the increased demands of learning multiple languages at the same time would lead to substantial delays in reaching key stages in infant word learning. The data available so far suggest that any differences between bilingual and monolingual infants are quite subtle, and that any delays for bilinguals are relatively short lived.

Fennell, Byers-Heinlein & Werker, (2007) examined the ability of young children to associate minimally different spoken sequences (e.g. 'bih' and 'dih') with visually presented objects. This mapping can be performed by monolingual infants by 17 months, although the difficulty of the minimal distinction means that 14-month-olds fail. Fennell et al. found that bilingual infants failed this task at both 14 months and 17 months, but 20-month-olds were able to learn the mappings. Werker et al. (2009) argue that the monolingual data can be accounted for by resource limitations: monolingual infants at 14 months can learn new words, but only when task demands are less severe, whereas 17-month-olds have a greater capacity to learn in more demanding circumstances. By extension, the extra level of complexity in the bilingual case may mean that even 17-montholds fail at the minimal pair association task.

Interestingly Werker et al. (2009) using a small number of cases demonstrated that learning abilities appear to be superior for bilinguals (Kovacs and Mehler 2009; Mattock, Polka, Rvachew & Krehm in press). In these cases, it may be that the extra demands placed on bilingual learners have the side-effect of instilling a greater flexibility in general cognitive processes, an advantage that may remain even in adulthood (Costa Hernandez & Galle, 2008).

Rodrıguez-Fornells, Cunillera, Mestres-Misse & Balaguer, (2009) argue whether children come into the world equipped with a dedicated language learning device or acquire language through the application of more general learning mechanisms. Rodrıguez- Fornells et al. (2009) discuss three 'interfaces' that they regard as particularly important for language acquisition. The first is the interface between auditory and pre-motor processes that allows language learners to attempt to pronounce words and phonemes that they may be encountering for the first time. Crucial to this interface is the linking of regions in the posterior left temporal lobe that are involved in speech perception with frontal areas that sustain speech motor programming. The second of Rodrıguez-Fornells et al.'s vital interfaces is the 'meaning integration interface', which evaluates the meanings of new words on the basis of both verbal and non-verbal clues. This function is thought to be mediated by the so-called 'ventral language stream', which links medial, inferior and anterior regions of the left temporal lobe concerned with representing meaning to areas in ventral inferior motor cortex involved with planning and selection of responses. The third and final interface is that between episodic memory for individual events or experiences and lexical memory, which consolidates those experiences into new lexical representations linked to meanings. The important neural structures here appear to be the hippocampus and those cortical areas within the medial temporal lobes with which it is closely associated (parahippocampal, entorhinal and perirhinal cortex).

Although word learning can sometimes be thought of as a specialized or modular component of cognition (Hauser, Chomsky & Fitch 2002; Pinker and Jackendoff 2005), there are parallels between memory for words and other forms of memory, and perhaps these parallels have not yet been sufficiently exploited. Gathercole and Baddeley (1989) evidenced that a child's ability to repeat non-words varying in complexity was a strong correlate of their vocabulary size, suggesting a causal role for working memory in the acquisition of words.

Page and Norris (1998) argue that a crucial piece of evidence linking working memory and word learning is the Hebb repetition effect (Hebb 1961). This procedure involves repeated presentation of stimuli (e.g. letters), for immediate serial recall, with certain lists repeated several times at regular intervals. Although participants do not notice this repetition, their performance on recall of the repeated lists improves on each repetition. The implication is that each episode of presentation involves learning, and the authors argue that this learning is no different from the learning that goes on when a new word is acquired. They support this argument by showing that the Hebb repetition has several properties that would be expected if the same learning mechanism really does underlie both phenomena. Like word learning, these effects are fast, long-lasting and can be found in both adults and children.

Page and Norris (2009) proposed a model that intended to cover aspects of both working memory (immediate serial recall and Hebb repetition) and vocabulary processing (word-form learning and recognition). The model was based on connectionist principles and involved several layers of localist nodes representing the occurrence of basic speech units (e.g. phonemes), as well as sequences of units and their order. The authors show that this kind of model can accommodate the Hebb effect by recruiting new units to represent 'chunks' or sequences of phonemes. It follows that this simple chunking mechanism can likewise be used to learn novel words in exactly the same way.

Gupta and Tisdale (2009) developed a modeling framework encompassing both phonological short-term memory processing and language learning. Gupta and Tisdale considered some factors that determine the ease with which novel words can be processed in the short term, and stored in the long term. These included the phonological short-term memory, vocabulary size, phonotactic and neighbourhood factors, as well as long-term knowledge The authors highlight the distinction between systematic and arbitrary mappings while discussing about long term memory. In terms of language function, the mapping from a heard phonological form to a representation of spoken output (as in immediate serial recall or repetition) is characterized as relatively systematic, whereas the mapping from form to meaning (in recognition) is near arbitrary. This was an important distinction because Gupta and Tisdale utilized a distributed connectionist modeling framework, for which fast learning of new mappings can occur only in the case of systematic mappings. Thus, by focusing on tasks involving the phonological form of novel words, the authors argue that one can capture at least some aspects of both phonological short-term memory and word learning within a single distributed network model. The model that Gupta and Tisdale describe (Gupta and Tisdale in press) is based on a connectionist model of short-term memory putforth by Botvinick and Plaut 2006, but focuses on the extent to which this model can be extended to explain the process of word learning. Many of the properties that the research uncovers stem from the intimate link between short-term memory and vocabulary. For instance, non-word repetition (a measure of short-term memory functionality) improves as the vocabulary size of the model increases. Likewise, Gupta and Tisdale (2009) present new data showing that high phonotactic probability sequences (i.e. containing more common phonemes) leads to more accurate performance in the course of word learning than sequences with a low phonotactic probability (Storkel and Rogers 2000).

Davis and Gaskell (2009) also addressed the issue of learning arbitrary mappings in distributed connectionist systems, and described one solution to the problem, the complementary learning systems model (McClelland, McNaughton & O’Reilly 1995). This model had been applied to many aspects of memory, and assumed that alongside a distributed (neocortical) route, there was also a sparser (hippocampal) route specialized for fast learning of new mappings. One clear prediction of a complementary systems account was that there will be immediate effects of learning (based on the hippocampal route), but also more extended offline transfer of knowledge between the two systems. Thus, learning new words should have some observable delayed effects, depending on the way in which memory has been probed.

The authors reviewed several studies that showed such effects, using both spoken and written word learning (Gaskell and Dumay 2003; Bowers, Davis & Hanley 2005). The observation of delayed effects of learning is done by evaluating whether the integration of novel words with their existing neighbours has occured. The data suggest that novel words are learned in an encapsulated form initially and later are integrated fully with their neighbours (with the slower integration process being associated with sleep; Dumay and Gaskell 2007).

Davis and Gaskell (2009) discussed neuropsychological and neuroimaging data relating to a dual systems account of word learning. On the neuropsychology side, a complementary systems account predicts that damage to the hippocampus would lead to word-learning problems, whereas damage to neocortical areas would lead to processing problems for known words. The authors confirmed these hypotheses, with word-learning studies in amnesics supporting the hippocampal role in learning, and a range of aphasic conditions supporting the neocortical role. To strengthen the predictions of the account on the neocortical side, Davis and Gaskell (2009) carried out a meta-analysis of positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) studies that compared responses to words versus pseudowords. This revealed a network of areas that respond differently to words and pseudowords, and thus represented the neocortical 'signature' of a known word. In particular, two portions of the left superior temporal gyrus show a stronger response to pseudowords than words, relating to dorsal and ventral pathways in the processing of spoken stimuli. With this lexical signature established, Davis and Gaskell described a study that attempted to look for immediate and delayed neural correlates of word learning (Davis, Di Betta, Macdonald & Gaskell 2009). As with previous research, this study found immediate effects of learning in the hippocampus, but importantly, the neocortical areas implicated in lexical processing by the meta-analysis were not affected. These areas only showed word-like responses to novel words for a set of items that had been learned one day prior to the fMRI session, consistent with a role for offline consolidation in neocortical learning. The combined behavioural, neuropsychological and neuroimaging data provide a reasonably supportive case for the application of a general dual systems model of memory to the specific case of word learning.

2.7.1 Studies specifically addressing the issue of monolingualism/ bilingualism and fast mapping/word learning

Monolingual preschool children show that receptive fast mapping skills are far better than expressive fast mapping skills (Alt, Plante & Creusere 2004; Gray, 2003). In addition the authors state that, children's fast mapping receptive scores may be a strong predictor of their skills at producing novel words during a word learning task, a task that provides additional exposures to the novel words (Gray, 2003).

Wilkinson and Mazzitelli (2003) examined fast mapping and novel word learning in typically developing children aged 3;0 to 5;6 who were learning English as either their first (and only) language or as their L2. It was observed that monolingual English-speaking children outperformed their L2-learning peers on the fast mapping task as well as on the standardized vocabulary measure (PPVT-III). For English-only speaking participants, Wilkinson and Mazzitelli (2003) found positive correlations between novel word learning skills, chronological age and existing receptive vocabulary skills (as measured on the PPVT-III). The correlation analysis was done on the overall word learning scores, not on the fast mapping scores. Interestingly, in the case of the early sequential bilingual group there was no correlation between performance on the novel-word learning task and existing vocabulary knowledge in L2.

Hwa-Froelich and Matsuo (2005) used a variety of language-dependent processing measures, including fast mapping, to investigate language ability in Vietnamese-American preschool children. The fast mapping task was implemented using both English and Vietnamese in the same trial. That is, English was used as the primary language but if the child did not respond, the examiner switched to Vietnamese. Performance on fast mapping was correlated with performance on other language-dependent processing measures. However, no overall vocabulary measures or measures of language knowledge were utilized.

Kohnert and Danahy (2007) and Roseberry and Connell (1991) investigated novel morpheme learning in only one language of developing bilinguals and no comparison with other language measures was included in either of these studies.

Kan and Kohnert (2008) studied the fast mapping/ word learning skills of sequential bilingual children (3- 5.3y) in Hmong and English. This was carried out with the background that that young monolingual children's ability to 'fast map' new word forms was closely associated with both their age and existing vocabulary knowledge. Hence the authors studied the potential relationships between age, fast mapping skills and existing vocabulary knowledge in both languages of developing bilingual preschool children. The results revealed that fast mapping performance was not related to age or existing vocabulary knowledge in either Hmong or English. There were, however, significant positive and negative cross-language correlations between L1 fast mapping and L2 vocabulary.

Vishnu, Abraham, Bhat & Chengappa (2010) investigated fast mapping skills in bilinguals and multilinguals in the age range of 18-25 years and concluded that there was no difference between L1 and L2 in bilinguals. The performance of multilinguals in L1, L2 and L3 varied from bilinguals which was jointly determined by the language proficiency, exposure and spoken usage.

Sowmya (ongoing) investigated the fast mapping performance in monolinguals and bilinguals in the age range of 8-12 years and concluded that monolinguals performed better in word learning tasks than bilinguals.

From the above review it is evident that there have been diverse results exhibited by the simultaneous, sequential bilinguals and monolinguals on word learning tasks. The possible processes/ principles employed for word learning is described below. Differential use of one principle over another in this population may justify the pattern of results obtained.

2.7.2 Possible biases/principles accounted for word learning

There have been few principles proposed in the literature which lead the children to learn a word. These are constructed by the children in a two tired developmental sequence, as a function of their sensitivity to linguistic input, contextual information and social interactional cues. Thus the process of lexical learning changes from child to child based on the principle the child uses.

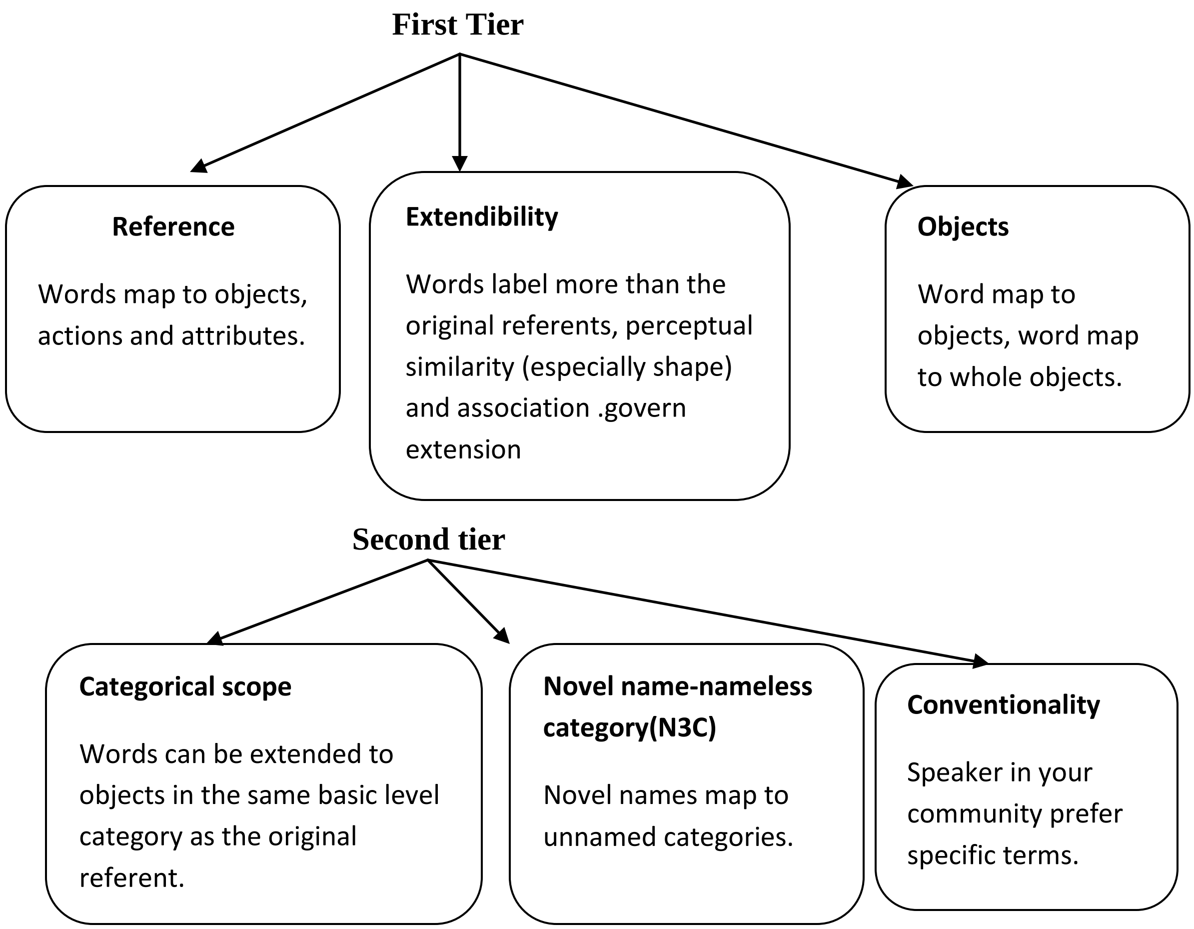


Figure 4: Principles of lexical acquisition

For a child who has only the principles of the first tier (reference, extendability and object scope), word learning is a deliberate and a laborious process. When the child has the principles of second tier (categorical scope, novel name-nameless category N3C and conventionality) acquisition of multiple labels are easier. These principles enable the child to generate limitless, equally logical possibilities for a words meaning. Golinkoff Mervis & Hirsh-Pasek, 1994 proposed a two tiered model of these principles. Principles within a tier emerge within a short time the other in the same time emerges and are claimed to be linked conceptually. These principles are organized developmentally and explain the change in the nature of lexical acquisition process across the second year of life. The fact the lexical learning start slowly and enter a period of rapid growth can be explained by these principles.

Some researchers consider a specialized innate mechanism (constraints) for word learning (Nelson, 1988). This constraint operates in an all or none fashion, are universal and innate and does not allow individual differences. The term constraint here means potentiate learning. There have been oppositions to this point of view (Gelman, 1990) stating that there is flexibility in lexical learning and that they do allow for individual variation across time. As the term constraints was misleading the term lexical principles was adopted. Not all principles function in the same way. The construction of some principles depend on children’s early sensitivity to non linguistic cues and suprasegmental (prosody) information in the speech stream, the other principles rely more heavily on children’s sensitivity to linguistic information. Thus the principle of first tier serve as the output on which the second tiers are built. These principles come online as the child becomes increasingly capable of utilizing the available linguistic and nonlinguistic input. Once the child constructs these principles, they become enabling devices to spur further word learning in a way which was not possible before the construction of these principles.

The principle of reference is the first and the fundamental insight children must attain. It is on this principle all the other principles rest. This principle states that words can be mapped onto the child's representation of objects, actions, events or attributes in the environment. Macnamara (1982) takes reference as a 'primitive' i.e the child is born with a theory of mind (Wellman, 1990). By the time a child produces its first word they have a primitive theory of mind. Thus the cognitive and communicative achievements of the preverbal period are the source of principle of reference. Dromi (1987) concluded that pairing a word with a single referent at this stage may be an operative strategy that the child follows in acquiring meaning. As soon as the children start recognizing (or producing) the words they know in situations other than the original context, the principle of extension sets in. the research supporting the principle of reference are sparse and contradictory. Saffran and Schwartz (1990) evidenced that expressive aphasics struggle to retrieve the correct name for a referent, all but the most globally impaired aphasics never lose the insight that naming exists. The principle of extendibility is considered the hallmark of reference.

Under the extendability principle the criteria for extension are either based on similarity to original referent or on a common thematic relationship. This process may be explained as an outgrowth of a generalization process. This extendibility seems to be driven by perceptual feartures such as shape, smell, sound and touch. Clark (1983) stated that most of the extensions seem to be predominantly based on shape. Knowing that a word is used to refer to something in the environment sufficient. A child needs to know what in the environment is being labeled which is explained by the principle of object scope.

The principle of object scope cover two aspects, that words label objects and that word refers to whole object as opposed to parts or attributes. The object scope principle may be maximally useful to the infant just breaking into the lexicon, knowledge of syntax may later allow mapping outside the class of nouns. These principles comprise the first tier of the model which do not require much of linguistic sophistication. Children who have the first tier of principles but not the second preliminarily pay attention to social cues as they co occur with the prosodic aspects of speech. As infants figure out the relationship between language and other sources of information, they begin to construct the principles of tier two which guide them to further word learning.

The second tier of principles are more dependent on the sensitivity to syntax and will further constrain the basis for extension (categorical scope), help the child to readily map new words to objects in the environment (novel name-nameless category) and it will encourage children to adopt conventional names for things (conventionality). These more advanced principles augment word learning to proceed rapidly and efficiently.

In category scope principle, the extension of novel object words occur mainly on the basis of basic level category membership which are perception, function, communication and knowledge organization (Mervis, 1987). During this stage parental input appears to be mostly at the basic level (Brown, 1958; Blewitt, 1983) and children pay attention to this. In this stage the children start to sort out the fact that shape is only one basis for category membership and that they can be resorted based on the basic level category membership, probably from the developments in understanding category structure, as well as in observing how language works. Thus this principle follows its necessary precursor, the principle of extendability. The child first learns that words can be extended without being completely clear about the basis for extension, though shape is the favoured basis. This principle construction enables the child to go beyond perceptual similarity to extend object labels on the basis of basic level object kind.

Next follows the N3C principle which enables the child to learn a new word swiftly. This differes from the principle of contrast, mutual exclusivity and fill-the-gap. In the N3C principle the phenomenon that takes place is that a child hears a new label in the presence of some named and unnamed objects. Though the speaker does not make an explicit link between the new name and unnamed object , the child seems to have learnt that it was the referent. There are three more principles which have been stated in the literature along with N3C to explain the phenomenon of rapid acquisition of words by children: Clark's (1983) 'contrast' and 'fill-the-gap' and Markman's (1989) 'mutual exclusivity ME'. N3C avoids the pitfalls of all these principles. It states that the child will map the new term to a whole object (given the object scope principle) without a name, before the emergence of this principle the child may ignore many of the new terms they hear or they require repeated exposure. After the emergence of N3C the child requires just one exposure to map the name this principle differes from the previously mentioned principle.

Clark's principle of contrast states that, every two form contrast in meaning…any difference in FORM in a language indicates that there is difference in meaning (Clark,1983). According to this principle the child could continue to affix new labels to the same object, as long as the child thought they were slight variations and extensions. Contrast hence, gives insufficient guidance since it does not provide the child with any strategic advantage for rapid learning of new terms (Grolinkoff, 1994).

Mutual exclusivity (Markman, 1989) claim that young children are biased to assume that an object can have only a single name, which leads the child to map a novel label to an unexpected object since the child avoids attaching a second label to already named object. Markman and Wachtel (1988) conducted a classical study in which they investigated children's use of mutual exclusivity in deciphering part labels. The phenomenon of interest was their specific interest in children's use of mutual exclusivity in deciphering novel parts of given objects. Markman and Wachtel believed that if children adhere to the mutual exclusivity assumption when a familiar whole object term is juxtaposed with a novel part term children will be cued to assume that the novel term is referring to something other than whole object and must be referring to an alternative part of the whole object. Alternately, Markman and Wachtel thought that the mere juxtaposition between familiar and novel terms may assist in part term acquisition, not only mutual exclusivity (Markman and Wachtel, 1988; Merriman and Bowman, 1989). . N3C makes the same predictions as ME when an unnamed object is present the novel names hooks up to unnamed object. ME should be stronger in younger than in older subjects given that it is needed to get the child's word learning off the ground.

Mervis and Ramos (1990) tested seven bilingual infants (1.5 to 1.6) acquiring English and Portuguese (their production vocabularies ranged from 3 to 50 words) for their comprehension of eleven common object names, none of which were cognates. The proportion of words comprehended in the non dominant language that were also comprehended in the dominant language ranged from 0.83 to 1.00. thus, even early in acquisition when it should be most rigidly adhered to, ME is violated. In case of a monolingual children, who hears a novel label but already knows a name for all the objects present. In such a case according to ME they should treat the word as the name for a part or attribute of the object rather than a second label for the object. In such case, ME takes precedence over whole object. Thus the new word would be most likely be treated as the name of a salient, as yet unnamed, part of the object. On the other hand N3C could not apply in this situation since there is no object available for which the child already have a name. Here there are other ways how to interpret a novel term. The children need not muddle about which alternatives to consider, they can rely on linguistic and non linguistic input to determine to referent of the novel label. Baldwin (1989) has shown that 1.7 year old children are sensitive at reading no verbal cues to the reference. If they hear a label while observing someone manipulating an object part it will be taken as the name of the part. In sum ME and N3C make similar kind of prediction when a novel name is presented with a novel object. ME fails to predict what children do when encountered with a novel term in the presence of already named objects.

‘Fill-in-gap’ was proposed as a theory of word learning covering aspects such as over extensions and the use of all purpose words such as ‘that’. This may be because the child wants to talk about something and they don’t have a word for it. N3C makes no justification for this. Clark stated that the neologisms created by children suggests that this part of the fill-in-gap captures important part of generalization. This principle states that when children hear new word, they assume by contrast that the meaning of new word differs from the meaning of known word and map the new word to an unnamed category.

Thus fill-in-gap fails to make clear prediction what a child does in presence of an unlabelled object which N3C does. Thus N3C contribute and explain the possible ways of rapid vocabulary spurt seen in children.

Golinkoff, Hirsh-Pasek, Bailey & Wenger (1992) attribute fast mapping to a (hard-coded) bias towards mapping novel names to nameless object categories. Some researchers suggest a change in children's learning mechanisms, at around the time they start to show evidence of fast mapping (which coincides with a sudden burst in their vocabulary), e.g., from associative to referential (Gopnik and Meltzoff, 1987).

All these principles explained here state what are the processes in play during the acquisition of lexical items. But there may be instances when a wrong hook up of object and labels occur. This problem is solved by the children using the principle of conventionality. According to this principle the speakers expect certain meanings to be expressed by conventional forms within the speaking community, and when children recognize this they become motivated to match the lexical usage to those in the surrounding community. Before the emergence of this principle the children are less concerned about matching the adult phonological model as reflected by the use of 'protowords'. According to this principle and Pinker's (1984) uniqueness principle, words coined by the children as well as their over and under extension are pre-emptable by adult input. Conventionality allows children to correct their over extension even when the only input is the adult provision of the correct label. These are the developmental lexical principles which govern the lexical acquisition in a child.

There has been another principle reported in the literature called the "differentiation hypothesis" (Appel, 1972). This principle clams that older children (mean age: 11 years) tend to approach information differently when they have the intention of learning that information. They use information about already stored categories to cluster information onto more meaningful chunks. They use forms of rehersals to help commit the items to memory. Younger children (mean age: four years) on the other hand do not show use of strategies for learning. They rather exhibit performance based on rote memory. Chen et al., also stated that adults use more of concept mediation whereas children use more of lexical mediation.

There have also been claims that that children use domain-specific word-learning mechanisms (Behrend, 1990; Markman, 1989). This mechanism establishes a constraint in number and type of possible word-to-world mappings that the child will consider when exposed to a novel word, thereby reducing these possible mappings sufficiently to enable the child to make a complete and accurate initial guess about the new word's meaning. Woodward and Markman, (1998), claim this constraint as an integral part of early word learning skills. but this approach has been criticized on the basis the children use social and pragmatic support provided by the people around for word learning and hence the learning process is not entirely guided by the constraints (Akhtar, Carpenter, & Tomasello, 1996; Baldwin, 1993).

Few other researchers like Markson and Bloom, (1997); Samuelson and Smith, (1998) claim that word learning was a function of general learning and information-processing mechanisms rather than a function of a set of mechanisms specialized for the sole task of learning new words. Markson and Bloom (1997) challenged the seminal construct of children's early lexical development, that fast mapping was a characteristic of word learning that set it apart from other types of verbal and nonverbal learning. He evidenced against a dedicated system for word learning in children by proving that children are equally adept at fast-mapping novel words and novel facts.

To delineate if word learning was a function of general attentional and memory procedures or a dedicated unique system studying other factors like extendability was proposed. There are evidences that early word learners will extend a newly learned object name (Golinkoff et al., 1994; Waxman and Gelman, 1986) or action name (Behrend, 1995; Golinkoff et al., 1995) to additional exemplars immediately after learning the new word. Waxman and Booth (2000) also stated this principle of extendability differed across novel words and facts. Behrend (2001) evidenced that children of all ages would extended novel words more frequently and more consistently than novel facts. He stated that 2-year-olds demonstrated this pattern to the same degree as older preschoolers. This strengthened the claim that this systematic extension of novel words was present during early word learning and that it was not simply a function of the older preschoolers' extensive additional experience with learning words and facts. If experience with words was necessary for this bias to develop, then the necessary experience occurs before children are 2 years of age. He also clarified that it was the type of information that guided the extension of the novel word and fact and not some other idiosyncratic characteristic of the objects or of the procedure and are not simply dependent on the general recognition memory processes as demonstrated by Markson and Bloom (1997).

Behrend (2001) concluded that there were shared components and unique components in word and fact learning, as is the case with many types of learning. Whereas the same set of general attentional and cognitive processes may be used during the initial learning of words and facts, there may be a divergence of processes when children decided how to use these novel words. Once the children recognized a word as a novel count noun, children as young as 2 years of age extend it freely to additional exemplars. As with facts children depended more on their general world knowledge to determine if a fact was extendible to additional exemplars. He provided few justifications for the trend observed in his study. He states that it remains possible that children were indeed using a unique or dedicated set of processes for novel names when compared with novel facts. This difference may be supported using the model of a constraint or lexical principle that emerges early in word learning as a default-processing strategy (Golinkoff et al., 1994). A second possibility was that different, though unique, sets of general-information-processing capacities were brought to bear in early childhood when children began to differentially extend novel words and novel facts. A third possibility suggested by him was that children learn through interaction with other language users that words are uniformly extendible and that facts are not uniformly extendible.

Alishahi, Fazly & Stevenson (2008) has discussed fast mapping in the context general probabilistic model of word learning. This word learning algorithm was an adaptation of the IBM translation model proposed by Brown, Peter, Pietra, Pietra, & Mercer (1993).The authors used a computational model to investigate fast mapping and its relation to word learning. This model learns a probabilistic association between a word and its meaning, from exposure to word usages in naturalistic contexts. In this, probabilities can be used to simulate various fast mapping experiments performed on children, such as referent selection and retention. Using this model they evidenced that fast mapping can be explained as an induction process over the acquired associations between words and meanings. This proposes that fast mapping is a general cognitive ability, and not a hard-coded, specialized mechanism of word learning. In addition, their results confirm that the onset of fast mapping is a natural consequence of learning more words, which in turn accelerates the learning of new words. This bootstrapping approach results in a rapid pace of vocabulary acquisition in children, without requiring a developmental change in the underlying learning mechanism.

This view has been supported by few more computational word learning models. The rule-based model of Siskind (1996), and the connectionist model proposed by Regier (2005), both show that learning gets easier as the model is exposed to more input that is, words heard later are learned faster. These findings confirm that fast mapping may simply be a result of learning more words, and that no explicit change in the underlying learning mechanism is needed. However, these studies do not examine various aspects of fast mapping, such as referent selection and retention. Frank, Goodman & Tenenbaum (2007) examined fast mapping in their Bayesian model by testing its performance in a novel target referent selection task. But this study could not offer any conclusive evidence due to technical drawbacks with the model.

Yu and Smith (2007) and Smith and Yu (2008) have suggested the use of statistical information to word learning and proposed cross-situational statistical learning. According to this theory a learner who is exposed to multiple words and multiple referents in a single learning experience need not solve the word-referent mapping problem in this moment; if the learner can instead accumulate co-occurrence statistics of words and referents across multiple temporally distinct learning situations, which the subjects can ultimately figure out the correct pairings from cross-situational statistics.

2.7.3 Methods used in word learning

Stimuli used: There have been various kinds of inputs used in process of studying fast mapping. Falzy (2008) used utterances from the Manchester corpus (Theakston, Pine, & Rowland 2001) in the CHILDES database (MacWhinney, 2000). This provided the novel word. The novel referent was obtained was constructed by making a scene representation for each utterance. Other studies (Carey and Barlett, 1978) use real word as novel word and use a novel real objects as the referent. There have been studies that have employed non words (novel words) and have associated it with a novel picture (Vishnu, Chengappa & Bhat 2008). This method was used to construct stimuli was the present study.

Procedures used: Earlier studies used sentences where a known word and a novel word were used together. They assumed that this helped children select the correct target object in a referent selection task (Carey and Bartlett, 1978). Gathercole and Baddeley (1989) used non word repetition task to account for the working memory being a cause of vocabulary acquisition. Later researchers employed a method where subjects are forced to choose between a novel and a familiar object upon hearing a request (Golinkoff et al., 1992; Halberda, 2003; Horst and Samuelson, 2008). Page and Norris (1998) used the Hebb's repetition effect to provide evidence to link working memory to word learning. Halberda (2006) used eye tracking experiment to study the process of how the phenomenon of fast mapping takes place. Behrend (2001) used three phases namely name and fact training, memory trials, and extension trials to study the processes involved in fast mapping. Name and fact training involved teaching the participants novel name and the novel fact to using a measuring game. This was followed by a probe session of memory trial in which immediately following the training phase, assessment for children's memory for the novel name and novel fact was carried out. The extension trial involved showing the children another set of stimuli and asking if any of those looked like the target stimuli. Some studies have used ostensive naming in which either the target object is held up and named (Waxman and Booth, 2000), the target is the only object that is named (Markson and Bloom, 1997), or the target is the only object present when the name is given (Dollaghan, 1985; Mervis and Bertrand, 1994). These studies have shown that young infants can acquire and retain name–object mappings after limited exposure. Woodward, Markman, & Fitzsimmons (1994) demonstrated that 13-month-old infants can remember a novel name–object mapping after as many as 24 hr if the object is ostensively named. This procedure of ostensive naming reduces the competition during referent selection and plays a role in better retension of the novel word (Horst and Samuelson, 2008). They propose that lexical contrast and ostensive naming reduce competition and facilitate better referent selection and retension. Differences in the kinds of tasks used earlier in fast mapping studies from two-item preferential looking procedures used majorly in infants (Schafer and Plunkett, 1998; Werker, Cohen, Lloyd, Casasola, & Stager, 1998), mutual-exclusivity-based tasks with up to five stimuli at a time (Behrend et al., 2001; Golinkoff et al., 1992; Mervis and Bertrand, 1994) & incidental learning procedures (Carey & Bartlett, 1978; Markson and Bloom, 1997).

In another study by Vishnu, Chengappa & Bhat 2008, Sowmya 2011 (ongoing) & Neha 2011 (ongoing) employed introduction of novel word in the form of simple story narration. Following a specific number of sessions the subjects were tested for fast mapping by providing the participants with the target, a semantically related and an unrelated distracter in which the participants were asked to choose the target. This procedure thus enabled to evaluate the retention phenomenon too. There have been evidence that children can successfully perform the retention task (Golinkoff et al., 1992; Halberda and Goldman, 2008; Halberda, 2006). It is not clear from these studies whether retention is based on a robust representation of the name–object link or the simple repetition of a just-prior selection. This issue is critical because it implicate very different mechanisms: retrieval from a long-term memory store in one case versus the short-term maintenance of a prior response in the other. Some studies have used referent selection task before a retension task thereby leading to a possibility that retention infants demonstrate is based on retrieval of name object links learned during the original referent selection task or on the maintenance of name object links formed during the review period. Horst and Samuelson (2008) suggests few factors playing a vital role in the relationship between referent selection and retension. The authors state that retensions may be based on the links between the name–object mapping and the richly structured context in which the new word was learned. They also quote another possibility that retention is based on integration of the novel word into the larger lexicon which is brought about by explicit lexical contrast which lead to better encoding.

Arias-Trejo and Plunkett (2009) used intermodal preferential looking task. This procedure involved spoken prime and target words (e.g. cat–dog), followed by the simultaneous presentation of two images, one of which depicts the target word. The extent to which there is preferential looking at the target image can then give a measure of the lexical activation of the target word.

2.7.4 Factors in word learning

Age is one of the major factor affecting the performance of fast mapping. It is documented in the literature that older children outperform younger children (Alt et al., 2004; Gray, 2005, 2006).

Another important factor is the integrity of the underlying language system. As reviewed above, children diagnosed with primary developmental impairment or specific language impairment perform more poorly on fast mapping tasks than do their peers with intact language systems (Alt et al., 2004; Alt and Plante, 2006; Dollaghan, 1987; Ellis Weismer & Evans, 2002; Gray, 2004, 2005, 2006).

Another equally important factor is the children's existing language knowledge. Ellis Weismer & Evans (2002) found significant correlations between participants' fast mapping production skills and their vocabulary production scores on the MacArthur-Bates Communicative Development Inventories (Fenson et al., 1993).

It is been evidenced that phonotactic probability influences children's word learning (Storkel, 2001; Storkel and Rogers, 2000). Words that are high in frequency are processed faster and are less susceptible to error than words that are low in frequency (Stemberger and MacWhinney, 1986; Gershkoff-Stowe, 2002). The lexical labels which contain high phonotactic probability sequence are recalled more easily than the lower probabilities. This effect was seen for children ages 3 to 6 years (Storkel, 2001) as well as 10- and 13-year-olds, but not for 7-year-olds, although this null finding was thought to be the result of methodological issues (Storkel and Rogers,2000).

Other factors known to influence lexical access are the phonological and semantic neighborhood characteristics of a word. Neighborhood density is measured by calculating the number of real words that can be created when one phoneme is added, deleted, or changed. Phonologically similar neighborhoods consist of words that differ by the addition, deletion, or substitution of a single phoneme (Luce and Pisoni, 1998). Adult studies of speech production show that access is facilitated when words are from high-density phonological neighborhoods with many phonetically similar words than from sparse neighborhoods with few phonetically similar words (Harley and Bown, 1998; MacKay, 1987; Vitevitch and Sommers, 2003). The relationship between phonotactic frequency and neighborhood density has been documented in English (Storkel, 2004; Vitevich, Luce, Pisoni, & Auer, 1999), and therefore their effects should both be considered in lexical learning studies, although this has not always been the case in the past.

Much of the literature examining the vocabulary knowledge of children with NL focuses on the biases children use to learn new lexical labels. These biases often revolve around the children's knowledge of semantic features and how they use that information to map labels onto novel words. These biases include the mutual exclusivity principle, novel name–nameless hypothesis, whole-object assumption, and taxonomic hypothesis .Semantic similarity is a potent force in early word learning, as suggested by several studies of children's novel word extensions (Baldwin, 1992; Gershkoff-Stowe, Connell, & Smith, 2006; Smith, 2000). The importance of semantic similarity is also revealed in adult studies of lexical access; target words are named more quickly when primed with words that are related in meaning, when table is primed by chair; (Meyer and Schvaneveldt, 1971; Neely, 1977; Plaut and Booth, 2000). Howell, Jankowicz, & Baker (2005) examined the premise that the sensorimotor underpinnings of concepts, in practice, the semantic features associated with concepts, help children to acquire new vocabulary. After creating a list of semantic features familiar to young children (ages 8–28 months), they created computer neural networks to learn new lexical labels. Networks that had more semantic features already represented learned more lexical labels than networks with fewer representations. The assumption of this model is that children use their semantic information to aid their lexical acquisition.

One developmental implication of these similarity neighborhoods is that as the early lexicon begins to expand, improved access to phonological and semantic information should result from increased activation that spreads through a widening network of related concepts and words. This prediction is consistent with recent studies indicating significant gains in processing efficiency between 1 and 2 years of age (Fernald, Perfors, & Marchman, 2006; Fernald, Pinto, Swingley, Weinberg, & McRoberts, 1998). Such findings help account for the characteristic rate change in productive vocabulary growth as children go from saying one word at a time to saying many new words at once (Goldfield and Reznick, 1990). These developments reflect significant changes in the underlying operations of the lexicon as productive vocabulary grows. Specifically, research supports that the language processing system undergoes a shift from incremental improvements on a word-by-word basis to general, system wide growth in word retrieval skills. This shift occurs gradually as the size and density of the lexicon assume a critical mass of words--the result of increased lexical competition and mutual support in the form of spreading activation (Marchman and Bates, 1994; Plunkett and Marchman, 1993). The existence of system wide changes in lexical access has been suggested by several studies of object naming involving typically developing children as well as children with language impairment.

Children with better phonological memories (based on both greater capacities and the ability to store more accurate representations) have better chances of maintaining novel word representations and eventually storing them to long term memory. There are evidences that both phonotactics and phonological working memory play a role in lexical word learning, and both, conceivably, could have an effect on a child's ability to encode and retain the semantic features of a novel object.

Word type effect is also an important factor to be considered in word learning. Children do not appear to map all words with equal proficiency. Most notably, numerous studies have found that both children with SLI and children with NL learn nouns more readily than verbs (Leonard, Miller & Gerber 1982; Oetting and Rice 1995; Rice, Oetting, Marquis, Bode, & Pae 1994; Skipp, Windfuhr, & Conti-Ramsden, 2002).

2.7.5 Word learning and language disorders

The phenomenon of fast mapping has been studied in children with specific language impairments (Dollaghan, 1987; Ellis Weismer and Hesketh, 1996; Gray, 2003; Rice, Buhr, & Oetting, 1992); hearing loss (Lederberg, Preszbindowski, & Spencer, 2000); Williams syndrome (Stevens and Karmiloff-Smith, 1997); and Down syndrome (Chapman, Kay-Raining Bird & Schwartz, 1990; Mervis and Bertrand, 1995).

Douaghan (1987) conducted a study of fast mapping skills ON A group of 11 normal children (ages 4:0-5.6) were compared in those of a group of 11 language impaired children (age 4:1 to 5:4) exhibiting expressive syntactic deficits. Results revealed that normal and language impaired children did not differ in their ability to infer a connection between a novel word and referent, to comprehend a novel word after a single exposure, and to recall some non linguistic information associated with the referent. However, the language impaired children were less successful than the normal subjects in producing the new word, recalling significantly fewer than three phonemes.

Leonard Abbeduto (2007) conducted a fast mapping study on individuals with severely limited receptive vocabulary associated with intellectual disability and concluded that, Individuals with intellectual disabilities performed equally as well as control children in the initial exposure phase but poorer when asked to remember the initial map in the presence of other novel distracters or labels.

Alt and Plante (2006) studied the fast mapping abilities of normal language children with SLI children. Children with SLI performed worse than children with NL in overall scores. The SLI group consistently showed specific deficits in semantic fast mapping when they saw visual information only. The authors state that this mode may have disrupted encoding because it varied from the expected auditory and visual pattern. The children with SLI also performed poorly when they were asked to map phonotactically infrequent linguistic information and when the difficulty of the task increased. A nonword repetition task was administered to both the groups which correlated with both semantic and lexical fast mapping. They supported their results using a limited capacity model of processing, as well as the impact of phonology on word learning.

Children with SLI require more exposures to learn a lexical label than do their peers with NL (Gray, 2004; Rice et al., 1994). SLI do not fast map nonverbal semantic features associated with lexical labels as well as their peers with NL (Alt et al., 2004). Children with SLI also have weaker semantic representations of words than their peers with NL (Kail, Hale, Leonard, & Nippold, 1984; McGregor, Newman, Reilly, & Capone, 2002). McGregor, Newman, Reilly, & Capone, 2002 also found that children with a history of specific language impairment exhibited a general weakness in the processing and storage.

India is a multilingual and multicultural country with a variety of dialects within languages. Studies related to word learning though studied to a fair extent in the western population, needs to be investigated in the Indian population. All these studies have been compared between bilinguals and monolinguals but the impact of age of introduction and the amount of exposure to each language on bilingual language acquisition and the strategies they use is not studied satisfactorily. Going beyond the word learning ability of children the underlying cause of such performance has not been explored in Indian population. Hence this study would address this issue using two methodologies word learning paradigm followed by a free association priming study in the target population.

II.8 Operational definitions of the terminologies used in the dissertation

Novel word: A non word structured according to the phonotactic principles of the target language. This can be constructed by adding, deleting or substituting a phoneme from a real word.

Novel referent: It is a picture addressed as the referent of the novel word. This picture is selected based on the criteria that the child is unfamiliar with the real name of the picture.

Learning: It is a considered as acquiring new knowledge about the novel words trained over a number of training sessions.

Simultaneous bilingual: A child who has had a head start in the acquisition of second language (i.e) English before the age of three years.

Sequential bilinguals: A child who is exposed to second language (i.e) English only after joining school (after three years of age).

Conceptual priming: It involves presentation of associates of prime auditorily before the experiment (but not strictly adhering to one specific aspect of the target like being syntagmatically/paradigmatically related) to avoid tuning the lexical system to respond in the same manner of the associate. Followed by which the prime (stimuli) is presented orthographically and the child is asked to produce any word associated to the prime. This presentation of the associates of prime before the experiment resolves confusions about the task if any. The scoring for this is discussed in detail in the scoring section.

Reaction time: It is the time interval between the offset of the stimuli and onset of the response.

Accuracy: It is the number of correct responses divided by the total number of responses.

CHAPTER 3

METHOD

3.1 Objectives

The objectives of the study were twofold.

- To analyze the learning strategies employed by

1. Bilingual and a predominantly monolingual children.
2. Simultaneous and a sequential bilingual children.

- To device a simple method to differentiate simultaneous from sequential bilingual.

3.2 Subjects selection criteria

3.2.a Inclusionary criteria: Six simultaneous (five males and one females) and six sequential bilinguals (four females and two males) of Kannada-English language and six predominantly monolinguals (three males and three females) of Kannada were selected for the study. The age range of the subjects ranged from seven to eight years. The subjects who rated mid and high socio economic status (I-III) using the NIMH socioeconomic scale developed by Venkatesan (2009) were included in the study. Based on teachers reports children of average and above average academic performance were only included in the study.

3.2.b Exclusionary criteria: Subjects with any history of auditory disorders, hearing loss, speech/language problems, neurological deficits or any other sensory, motor or cognitive problems were excluded from the study using the 'WHO Ten question disability screening checklist' (Singhi, Kumar, Malhi & Kumar, 2007). Children who had influence of other languages apart from Kannada and English were also excluded from the study.

3.2.c Language history of the subjects: The language history of the target languages (Kannada-English) were qualitatively assessed using a questionnaire. This was adapted from “Languages of school going children” by Shanbal and Prema (2007). Each questionnaire was filled out by the parents of participating children. Each questionnaire included questions regarding the usage of language/s by the child in different environments. Specific questions were asked about the people with whom the child interacts in different settings (school vs. weekend), on different days of the week (weekdays vs. weekends), language of communication (Kannada, English or both) between the child and the parent and the age of exposure to the second language i.e number of languages known before nursery and number of languages learnt after nursery.

3.2.d Segregation of participants into groups: The subjects who qualified for the study were quantitatively assessed for their proficiency for both the languages using the “International second language proficiency rating scale (ISLPR)”. The subjects who qualified for the bilingual group rated at S:4 level on ISLPR which fulfills the need for all the subjects to use both the target languages, Kannada and English fluently on all levels pertinent to personal, social, academic or vocational needs. The predominantly monolinguals subjects rated at the S:4 level of ISLPR for Kannada and rated at the S:0+ to S:1 level in English which reflects the use of English at an elementary level where they are able to fulfill their basic survival needs and minimum courtesy requirement. Thus two groups, bilingual and monolingual population respectively were devised (Harini, 2010).

Further segregation of the bilingual group into simultaneous and sequential group were done based the questionnaire by Prema and Shanbal (2007) where specific questions related to the manner of acquisition were addressed. Based on these details the children who had exposure to both the languages (L1 and L2) before the age of three years were categorized to be simultaneous bilinguals and children who were exposed only to one language (L1) predominantly till three years after which introduction to L2 was carried out under formal instruction after the age of three years were taken to be sequential bilinguals. This segregation was based on the guidelines provided by McLaughlin (1978). This resulted in two groups of simultaneous and sequential bilinguals divided based on the age of exposure to the second language, who were controlled for proficiency also.

3.4 Test materials used

An adapted version of the questionnaire developed by Prema & Shanbal (2007) was used to obtain the language history of the child. ISLPR was used to quantify the proficiency in Kannada and English respectively. The 'WHO Ten question disability screening checklist' (Singhi, Kumar, Malhi & Kumar, 2007) was used to rule out any disorder in the study population. 'NIMH socioeconomic scale' developed by Venkatesan (2009) was used to balance the SES of the study population.

The study was divided into two phases. For the fast mapping phase of novel words, eight words each per language which obey the phonotactic rules of the target language were constructed and were paired with eight novel referents which the children had not been exposed to. Thus a total of 16 novel words were developed which were presented coupled with 16 pictures (eight for English and eight for Kannada respectively). For the conceptual priming phase, seven English words and seven Kannada words were used, which resulted in a total of 14 words.

3.5 Procedure

The study was divided into two phases, fast mapping phase and the conceptual priming phase. During the first phase fast mapping of the target words was carried out using a structured methodology adapted from a study by Vishnu, Abraham, Bhat and Chengappa (2010). In this phase the novel words were presented along with novel referents by means of live story narration first in Kannada followed by English in every session using DMDX software developed by Jonathan Forster and Kenneth Forster (1989) at the University of Arizona. The learning material was presented in the order of one stimuli per slide. Specific care was taken regarding the length of the stimuli as children exhibited poorer performance on multisyllabic novel words. Hence the novel words constructed were either mono/bisyllabic. The entire procedure consisted of four sessions, each session lasting ten minutes. These sessions were divided by a break period of ten minutes. Followed by which the testing for the words trained were carried out using two tasks. The first task was referent identification in which the target picture was presented along with a semantically related and unrelated picture and the subject had to identify the target. The targets to be identified were presented using a carrier phrase such as “Show me …..” followed by which the child had to press the key ‘1’ if the target picture was the first in the group of referents presented, ‘2’ if it was the second and ‘3’ if it was the third respectively. For this task a program was written in DMDX, in which the picture presentation was programmed to a timing of 3000 milliseconds with an inter-stimulus interval of 1000 milliseconds for both the languages. The second task was picture naming. The target picture was presented and the child had to name the picture as fast as possible. For the second task also a program was written in DMDX in which the picture presentation was programmed to a timing of 3500 milliseconds with an inter-stimulus interval of 2000 milliseconds for both the languages. Reaction time analysis and error response rates were used to quantify both the tasks.

The second phase of the study was conceptual priming which involves the use of free association task, implicit memory task. The children were presented with seven English words and seven Kannada words orthographically, which resulted in a total of 14 words (Chitra, 2008) which were presented using a Toshiba laptop. For this task a program was written in DMDX, in which the picture presentation was programmed to a timing of 3500ms with an inter-stimulus interval of 2000 milliseconds for Kannada and English. The children were asked to utter any word related to the target as soon as possible. These responses were analyzed for directionality using the database obtained from 20 children (excluding the target population) using the same procedure of conceptual priming. The database was rated by five qualified SLP's for directionality for which they analyzed the words on three domains, part to whole relationship of words were judged to be unidirectional words (U), whole to part words and associative words were judged to be bidirectional words (B) and the words which did not fit any of the above two criteria were taken as none (N) which included phonologically rhyming words, phonologically rhyming non words, cross translational associated words and cross translational non associated words . This database obtained helped to clarify that all the obtained responses could be classified under the domains made for analysis. It also provided further evidence that the stimuli selected was appropriate to age and did not cause any confusion or misinterpretation by the children. It further confirmed the feasibility of seven to eight year old children to carry out this priming task with ease. Using this database as the basis, the responses obtained from the target population was analyzed on the domains of reaction time and directionality.

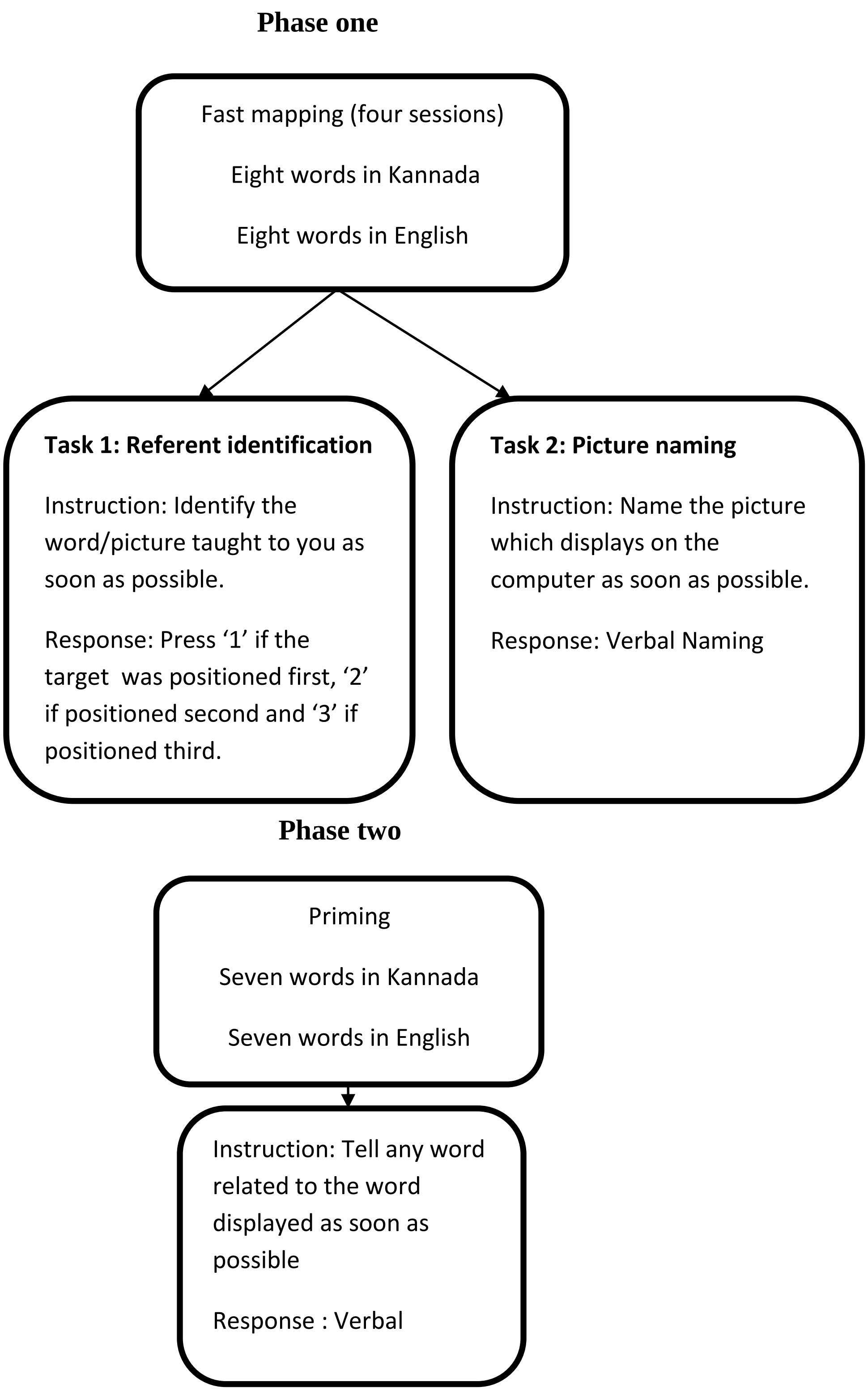


Figure 5: Flow chart of the method

3.6 Scoring and classification of responses

The first phase consisted of two tasks. These tasks were administered in both languages, Kannada and English for the simultaneous and sequential groups and only in Kannada for the predominantly monolingual group. For the referent identification task of the first phase the scores were calculated automatically using reaction time (RT) produced by the DMDX software which was displayed in Microsoft Excel sheet. For the picture naming task of the first phase, the reaction time was calculated manually by loading the recorded audio files into the software 'CheckVocal'. The software consists of three options for analyzing the responses correct, wrong and no response respectively.

1. The responses were scored 'correct' for the following conditions

- If there was a sound substitution followed by self correction. In this condition the RT was calculated from the onset of vocal response which included the sound substitution also.
- In case of responses which were produced after a filled pause the RT was calculated from the onset of vocal responses which included the filled pauses too.

2. The responses were scored 'wrong' for the following conditions

- If only the first phoneme was produced (incomplete response).
- If there were sound substitutions without self correction.

In these conditions the option 'wrong' was selected. Thus the RT was calculated from the onset of vocal response, along with a negative sign which indicated that the response was wrong.

3. The responses were scored 'no response' for the following conditions

- It there was only a filled pause recorded within the time frame allotted.

- Absence of any meaningful vocal response.

In these conditions the option “no response’ was selected. Thus the RT could not be calculated hence the RT value was taken as the duration of time frame allotted for response accompanied with a negative sign.

The second phase of the study consisted of conceptual priming task for Kannada and English respectively. The RT was calculated manually by loading the recorded audio files into the software ‘CheckVocal’. The software consists of three options for analyzing the responses correct, wrong and no response respectively. All the answers were scored ‘correct’. In case of conditions, were the stimulus was repeated before the oral responses, the RT was calculated in the traditional manner (i.e) from the onset of the vocal response. Following the RT analysis, all the responses were subjected to directionality analysis. The responses were categorized under six domains namely, unidirectional words, bidirectional words, phonologically rhyming words, phonologically rhyming non words, cross translational associated words and cross translational non associated words. The terms are operationally defined below

- **Unidirectional words**: These are words associated only in one direction. For example the probability of producing a target ‘dog’ for a prime ‘bone’ is greater than producing a target ‘bone’ for the target ‘dog’ . Hence the strength of association in one direction is greater. Hence for this analysis part to whole word relationships were scored as unidirectional words.
- **Bidirectional words:** These are words that have equal probability of being produced as the target. For example when the target ‘dog’ is produced for the prime ‘cat’. And the target ‘cat’ is produced for the prime ‘dog’ in equal probability. Hence for this analysis

whole to part relationships and association (phonological/semantic) words are scored as bidirectional words.

- **Phonologically rhyming words**: These are target words produced which rhyme with the prime. For example when the prime is ‘bell’ and the target produced is ‘bill’.
- **Phonologically rhyming non words**: These are target words which hold no meaning (non word) but rhyme with the prime. For example when ‘hilk’ is produced as a target for the prime ‘milk’.
- **Cross translational associated words**: These are target words associated to the prime but cross translationally. For example if the prime was ‘dog’ the target produced was ‘bekku’.
- **Cross translation non associated words**: These are target words which are produced cross translationally but do not hold any kind of association with the prime.

The percentages of each type of words were calculated for each language (Kannada-English) for the simultaneous and the sequential bilingual groups. This task was administered only in Kannada for the predominantly monolingual group.

CHAPTER 4

RESULTS AND DISCUSSION

The aim of the study was to explore the word learning performance in monolinguals (Mono) and bilinguals. It was also of interest to examine if there was a difference in this tasks between the bilinguals i.e simultaneous (Simul) versus sequential (sequen) bilinguals. And if there were any differences in performance in this task, to examine the possible reason, a conceptual priming task was also carried out and all the results were subjected to statistical analysis.

4.1 For the first phase of the study, the analysis was done in the following probabilities using the variables reaction time and accuracy.

To determine word learning performance in L1 (Kannada) across groups i.e monolinguals, simultaneous bilinguals and sequential bilinguals.

4.1a Comparison of referent identification across groups in Kannada.

4.1b Comparisons of picture naming across groups in Kannada.

4.1c Comparison of referent identification and picture naming in Kannada across groups.

To determine word leaning performance in L2 (Englsih) between groups i.e simultaneous bilinguals and sequential bilinguals.

4.1d Comparison of referent identification across groups in English.

4.1e Comparisons of picture naming across groups in English.

4.1f Comparisons of referent identification and picture naming in English across groups.

4.2 For the second phase of the study the RT was calculated and the directionality analysis was done and was compared in the following manner.

To determine the lexical semantic organization of L1 (Kannada) across groups i.e monolinguals, simultaneous bilinguals and sequential bilinguals.

4.2a Comparison of priming results across groups in Kannada.

To determine the lexical semantic organization of L2 (English) between groups i.e simultaneous bilinguals and sequential bilinguals.

4.2b Comparision of priming results across groups in English.

To evaluate the stage of lexical semantic development for L1 and L1 in across groups.

4.2c Comparision of directionality analysis of words in Kannada and English in a simultaneous bilingual

4.2d Comparision of directionality analysis of words in Kannada and English in a simultaneous bilingual

4.2e Analysis of word directionality in Kannada by Monolinguals.

4.3 Statistical analysis for all the above data

4.3a Non Parametric test, Kruskal Wallis test was used to compare the performance of all the three groups in Kannada.

4.3b Non parametric test, Mann Whitney test was used to compare the performance of two groups in English

4.3c Non parametric test, Wilcoxon signed rank test was used to compare the performance of the groups across languages and domains

4.1a Comparison of referent identification across groups in Kannada:

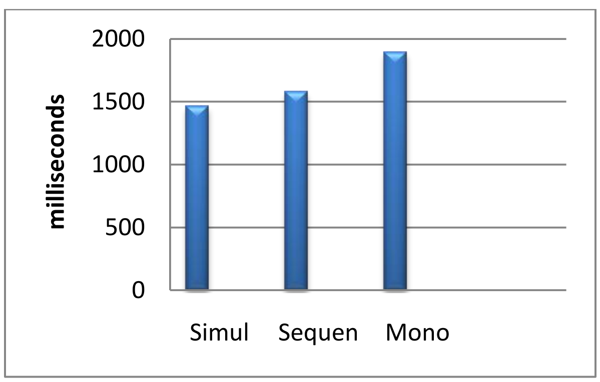
The results were analyzed using two variables, reaction time and accuracy for Kannada across all three groups.

Table 1: Comparison of referent identification across groups in Kannada

Parameter	Simul mean	Simul SD	Sequen mean	Sequen SD	Mono mean	Mono SD
RT	1461.42	396.59	1574.19	463.78	1892.18	293.46
Acc	97.91%	5.10%	89.58%	12.28%	43.75%	13.11%

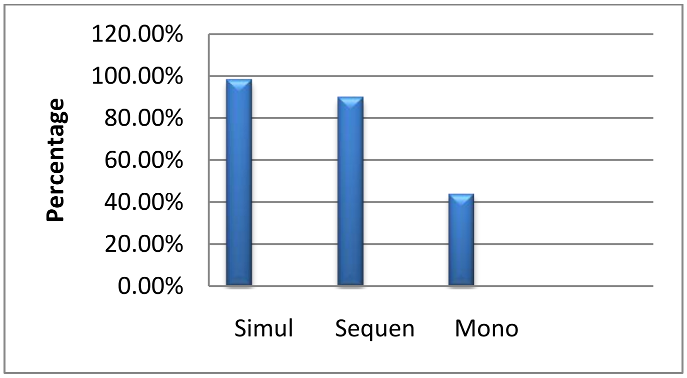
Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals, Mono: Monolinguals, RT: Reaction time, Acc: Accuracy

Figure 6: Comparison of referent identification reaction time (RT) across groups in Kannada



As depicted in the above figure 6, referent identification RT task in Kannada was better in bilinguals when compared to monolinguals. Across bilingual group simultaneous show better performance than sequential.

Figure 7: Comparison of referent identification accuracy across groups in Kannada



As depicted in the above figure 7, accuracy task in Kannada was significantly better in bilinguals (z- 0.001) when compared in monolinguals. Across bilingual group simultaneous show better performance than sequential.

Hence combining the reaction time and accuracy values of referent identification, we can infer that there is bilingual advantage in comparison to monolinguals. Between bilinguals, simultaneous group perform better than sequential in Kannada.

This result of bilingual advantage is in agreement to the findings by Ben-Zeev (1977), Kessler and Quinn (1987), Ervin-Tripp (2000), Bialystok (2001), Wilkinson and Mazzitelli, (2003), Kormi-Nouri, Moniri & Nilsson, (2003), Kan and Kohnert, (2008); Rajsudhakar and Shyamala (2008), Costa Hernandez & Galle, (2008), Kovacs and Mehler (2009); Kaushanskaya and Marian (2009a), Mattock, Polka, Rvachew & Krehm (in press), & Sangeetha (ongoing). They justify this finding stating that it may be the extra demands placed on bilingual learners which result in bilingual’s cognitive system being modified as a result of this experience, this has the side-effect of instilling a greater flexibility in general cognitive processes. This may have produced better performance on referent identification task of fast mapping which reveal better encoding of the target stimuli brought about by increased cognitive resources in bilinguals.

There have been limited studies which have documented the performance of bilinguals on cognitive linguistic tasks as a function of age. Balkan (1970) conducted one such study and evidenced that early bilingual outperformed late bilinguals and monolinguals. There are hardly any data documenting the performance of the subgroup of early bilinguals i.e simultaneous and sequential bilinguals. A study by Sangeetha (ongoing) along the same lines demonstrated that the simultaneous bilinguals performed better than sequential bilinguals and monolinguals on cognitive linguistic tasks. Similar results were obtained in this study which supports the notion that age of acquisition has an influence on the specific changes in memory (Ervin-Tripp, 2000), which may influence the process of encoding which maybe demonstrated as early as difference of three years in the introduction of L2 (English).

4.1b Comparison of picture naming across groups in Kannada:

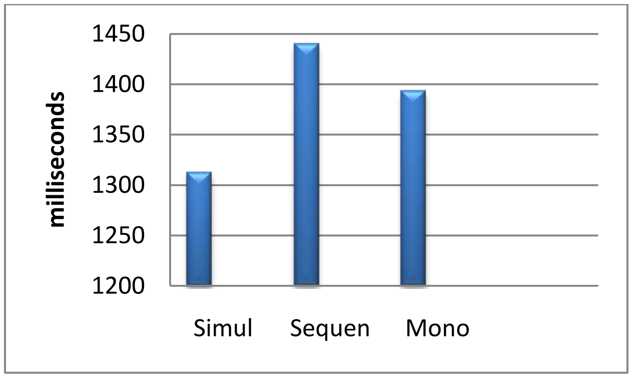
The results were analyzed using two variables, reaction time and accuracy for each group in Kannada.

Table 2: Comparison of picture naming across groups in Kannada

Parameter	Simul Mean	Simul SD	Sequen Mean	Sequen SD	Mono Mean	Mono SD
RT	1312.46	290.45	1439.64	773.63	1393.06	383.53
Acc	70.83%	30.27%	41.66%	31.37%	33.33%	12.90%

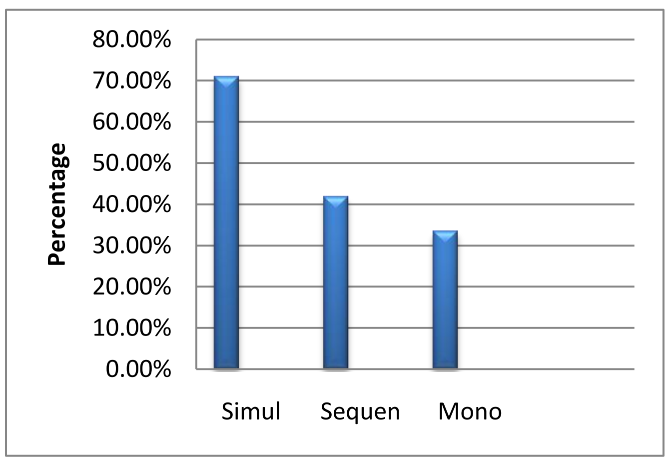
Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals, Mono: Monolinguals, RT: Reaction time, Acc: Accuracy

Figure 8: Comparison of picture naming reaction time (RT) across groups Kannada



As depicted in the above figure 8, picture naming RT task in Kannada was performed better in the hierarchy of simultaneous followed by monolinguals and then by sequential.

Figure 9: Comparison of picture naming accuracy across groups in Kannada



As depicted in the above figure 9, accuracy task in Kannada was better in bilingual when compared to monolinguals. In comparison between bilingual groups, simultaneous were better than monolinguals in Kannada.

Hence combining the RT and accuracy values of picture naming, it can be inferred that bilinguals performed better than monolinguals in Kannada. Even though the RT of picture naming was better in monolinguals than sequential, their accuracy scores reveal poor performance. Between the bilingual group in Kannada, simultaneous have performed better than sequential group.

This result of bilingual advantage is in agreement to the findings by Ben-Zeev (1977), Kessler and Quinn (1987), Ervin-Tripp (2000), Bialystok (2001), Wilkinson and Mazzitelli, (2003), Kormi-Nouri, Moniri & Nilsson, (2003), Kan and Kohnert, (2008); Rajsudhakar and Shyamala (2008), Costa Hernandez & Galle, (2008), Kovacs and Mehler (2009); Kaushanskaya and Marian (2009a), Mattock, Polka, Rvachew & Krehm (in press), & Sangeetha (ongoing). They justify this finding stating that it may be the extra demands placed on bilingual learners which result in bilingual's cognitive system being modified as a result of this experience which have the side-effect of instilling a greater flexibility in general cognitive processes. This enables the bilinguals to systematically learn an abstract novel word (without use of any learning strategy) with efficiency, as they are better than monolinguals at learning abstract information. This is in support with the finding of Kan and Kohnert (2008). This finding justifies why the fast mapping performance of bilinguals does not correlate which their vocabulary scores, as their on word learning tasks is the result of their modified cognitive process due to dual language input. Better performance of simultaneous over sequential bilinguals may be the result of difference in age of introduction of L2 which would have an influence on the specific changes in memory deGroot (2000).

4.1.c Comparison of referent identification & picture naming across groups in Kannada

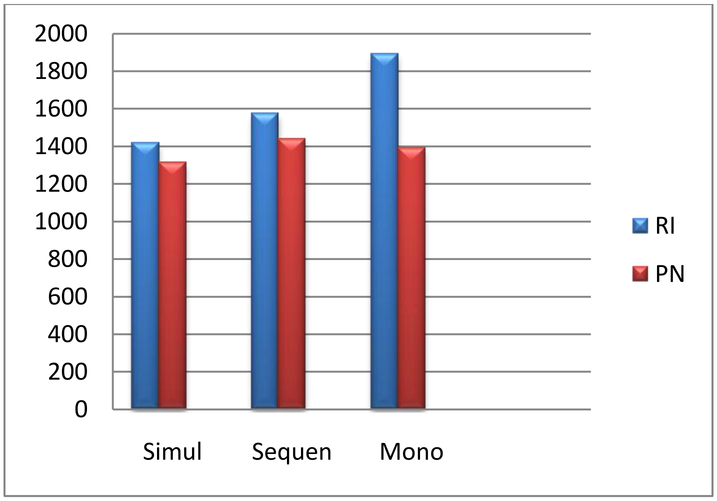
The results are analyzed using two variables, reaction time and accuracy across groups in Kannada.

Table 3: Comparison of referent identification & picture naming across groups in Kannada

Parameters	Simul mean	Simul SD	Seqen mean	Seqen SD	Mono Mean	Mono SD
RT-RI	1461.42	396.59	1574.19	463.78	1892.18	293.46
Acc -RI	97.91%	5.10%	89.58%	12.28%	43.75%	13.11%
RT-PN	1312.46	290.45	1439.64	773.63	1393.06	383.53
Acc- PN	70.83%	30.27%	41.66%	31.37%	33.33%	12.90%

Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals, Mono: Monolinguals, RT: Reaction time, Acc: Accuracy, RI: Referent identification, PN: Picture naming

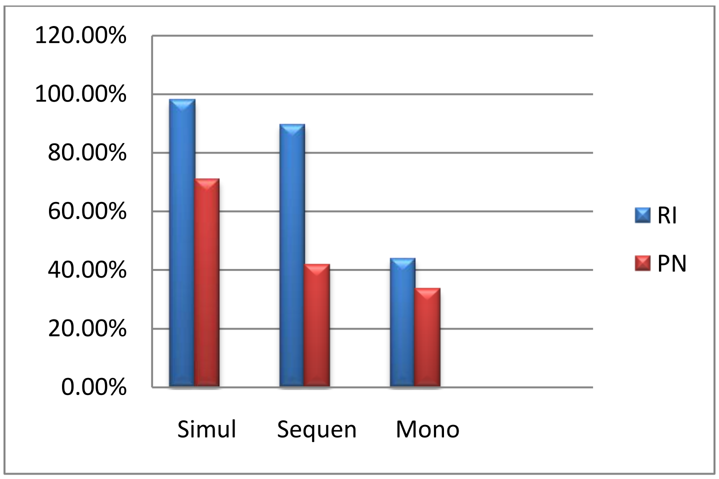
Figure 10: Comparison of referent identification & picture naming RT in Kannada



RI: Referent Identification, PN: Picture Naming

As depicted in the above figure 10, picture naming is consistently better than referent identification across all the groups. The hierarchy of performance in referent identification is simultaneous followed by sequential and monolinguals. In picture naming, simultaneous followed by monolinguals and then sequential performed better.

Figure 11: Comparison of referent identification and picture naming accuracy in Kannada



RI: Referent Identification, PN: Picture Naming

As depicted in the figure 11, the accuracy of referent identification was consistently better than picture naming across all the groups. In referent identification task simultaneous performed better than sequential followed by monolinguals. In picture naming also this was the same trend followed.

The cause of picture naming being better than referent identification across all groups may be the result of the methodology itself, where the referent identification task preceded the task of picture naming which would have resulted in better encoding. This view was supported by Horst & Samuelson (2008).

Hence combining the RT and accuracy values of referent identification versus picture naming in Kannada we can show that the hierarchy of performance was simultaneous performing consistently better than sequential and monolinguals. This finding may explained on the basis of Ben-Zeev (1977), Kessler and Quinn (1987), Ervin-Tripp (2000), Bialystok (2001), Wilkinson and Mazzitelli, (2003), Kormi-Nouri, Moniri & Nilsson, (2003), Kan and Kohnert, (2008); Rajsudhakar and Shyamala (2008), Costa Hernandez & Galle, (2008), Kovacs and Mehler (2009); Kaushanskaya and Marian (2009a), Mattock, Polka, Rvachew & Krehm (in press), & Sangeetha (ongoing) who suggest that the increased cognitive linguistic ability induced in simultaneous bilinguals as a result of early dual language input.

4.1d Comparison of referent identification between groups in English

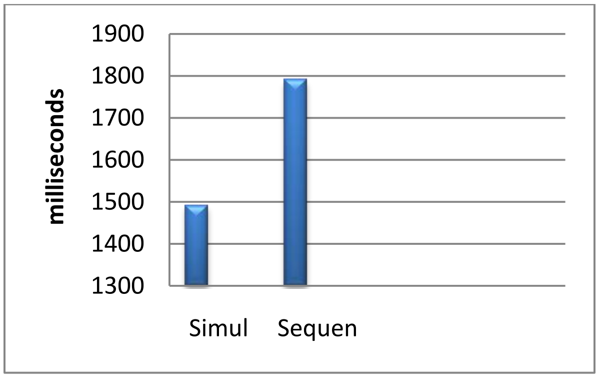
The results were analyzed using two variables, reaction time and accuracy for English across all three groups.

Table 4: Comparison of referent identification between groups in English

Parameter	Simul mean	Simul SD	Sequen mean	Sequen SD
RT	1492.03	666.62	1789.72	626.10
Acc	93.75%	10.45	97.91%	5.10%

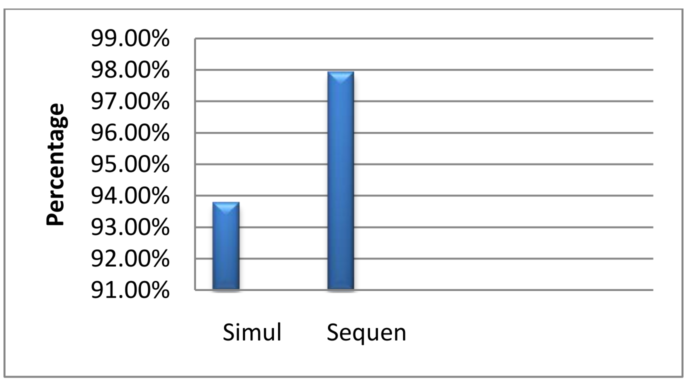
Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals, RT: Reaction time, Acc: Accuracy

Figure 12: Comparison of referent identification reaction time (RT) between groups in English



As depicted in the above figure 12, referent identification RT task in English was better in simultaneous bilinguals when compared to sequential bilinguals.

Figure 13: Comparison of referent identification accuracy between groups in English



As depicted in the above figure 13, accuracy task in English was better in sequential bilinguals when compared to simultaneous bilinguals.

Hence combining the reaction time and accuracy values of referent identification, we evidence that in the domain of referent identification in English, sequential bilinguals perform better than simultaneous bilinguals.

The pattern demonstrated by simultaneous bilinguals (better RT, with reduced accuracy) shed light about an important issue of early introduction of L2. This shows that simultaneous bilingual do not use any learning strategy for L2 novel word acquisition i.e their performance in Kannada and English are almost similar. They are able to effectively map the novel word to the referent due to increased cognitive flexibility. Hence reaction time was better for them but the accuracy for lesser due the fact that adequate efforts may not have been taken to facilitate retention.

The pattern demonstrated by sequential bilinguals vary in stark contrast with that to the simultaneous bilinguals. They show better performance in English compared to Kannada. This may be due to the momentary increase in the input of English due to environmental factors. Kannada shows a probable plataeuing or decline with the introduction of English which is in support with studies by Schaerlaekens, Zink & Verheyden (1995), Leseman (2000), Kohnert (2004), Kan and Kohnert (2005), Page and Norris (1998), Page and Norris (2009). This is also evidenced by few models like the general probabilistic model putforth by Alishahi, Fazly & Stevenson (2008), rule-based model of Siskind (1996), and the connectionist model proposed by Regier (2005). They state that learning gets easier as the model is exposed to more input that is, words heard more are learned faster. It is also important to note that sequential bilinguals used learning strategies to facilitate retention which was evidenced by the next task of picture naming.

4.1e Comparison of picture naming between groups in English

The results were analyzed using two variables, reaction time and accuracy for each groups in English.

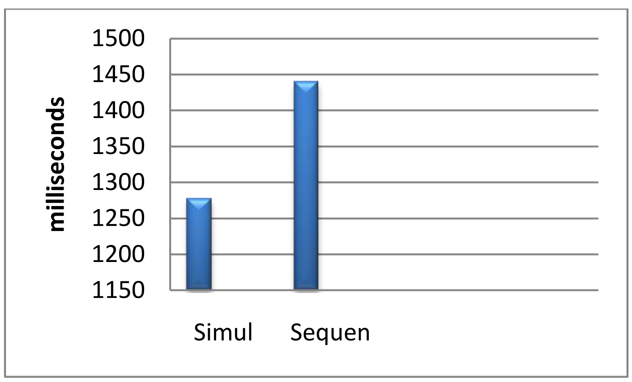
Table 5: Comparison of picture naming between groups in English

Parameter	Simul Mean	Simul SD	Sequen Mean	Sequen SD
RT	1276.65	384.69	1443.59	332.17
Acc	87.5%	15.81%	60.41%	32.03%

Simul- Simultaneous bilinguals, Sequen- Sequential bilinguals,

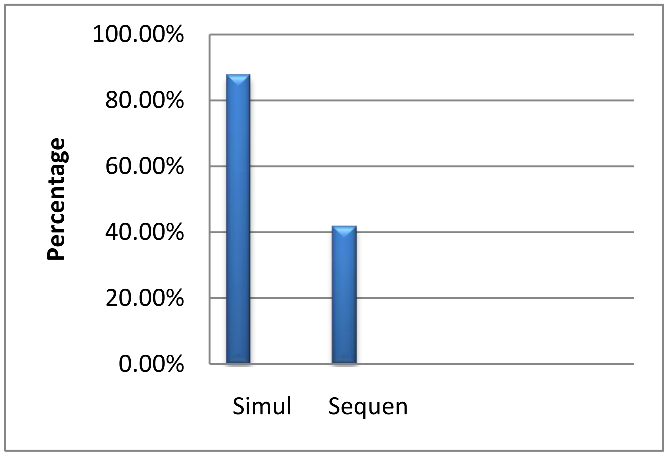
RT- Reaction time, Acc- Accuracy

Figure 14: Comparison of picture naming reaction time (RT) between groups in English



As depicted in the above figure 14, picture naming RT task in English was performed better in the hierarchy of simultaneous followed by sequential bilinguals.

Figure 15: Comparison of picture naming accuracy between groups in English



As depicted in the above figure 15, picture naming RT task in English was performed better in the hierarchy of simultaneous followed by sequential bilinguals.

Though in referent identification sequential bilinguals outperformed simultaneous bilinguals, picture naming was better in simulateous bilinguals. This may be due to the learning strategy used by the sequential bilinguals, which is explained by the "differentiation hypothesis" (Appel,1972). This hypothesis states that children tend to approach information differently when they have the intention of learning that information. They use information about already stored categories to cluster information onto more meaningful chunks. They use forms of rehersals to help commit the items to memory. This hypothesis can be used to explain the learning patterns in sequential bilinguals.

It was observed that sequential bilinguals evidently made use of already stored clusters (real words) to map the novel word. For quote some example on the task of picture naming, if the target word was 'nit' they said 'net' and then self corrected their production to 'nit'. Similar response was found for other words like 'lob' which was equated to ‘log’. They also indulged in rehersals to facilitate retension. This strategy used by them maybe due to nature of the stimuli itself, as the novel words were construced by addition, deletion or substitution of a sound from a real word (Luce & Pisoni, 1998). So due the increased cognitive linguistic flexibility in them they exploit the process of word learning by taking advantage the phonological similarity of words. Though this facilitated the performance in referent identification and resulted in better encoding, the same caused deterioration in picture naming performance due to increased neighbourhood density(Harley & Bown, 1998; MacKay, 1987; Vitevitch & Sommers, 2003) which may have resulted in increased competition. This phenomenon is also supported by Bronson (2000) who states that as the ability for strategy use develops, there would be approach to L2 vocabulary learning may also differ. The same aspect of use of learning strategy was evidenced by Page and Norris (2009) model. Gupta and Tisdale (2009) also showed that high phonotactic probability sequences led to more accurate performance in the course of word learning than sequences with a low phonotactic probability (Storkel and Rogers 2000).

4.1f Comparison of referent identification & picture naming between groups in English

The results are analyzed across two variables, reaction time and accuracy for each language for all the three groups.

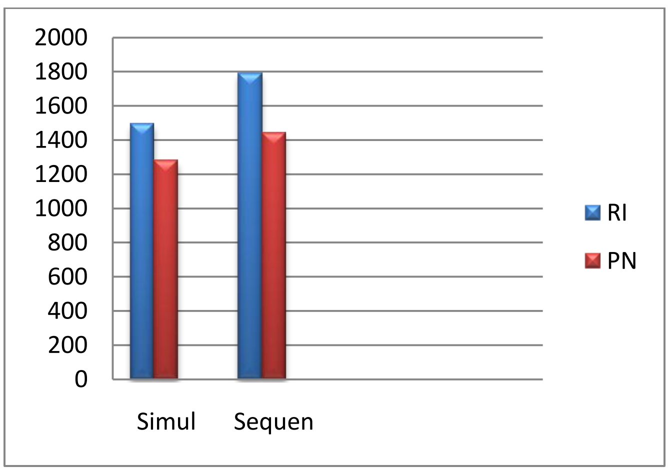
Table 6: Comparison of referent identification & picture naming between groups in English

Parameter	Simul Mean	Simul SD	Sequen Mean	Sequen SD
RT-RI	1492.03	666.62	1789.72	626.10
Acc -RI	93.75%	10.45%	97.91%	5.10%
RT-PN	1276.65	384.69	1443.59	332.17
RT-PN	87.5%	15.81%	60.41%	32.03%

Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals,

RT: Reaction time, Acc: Accuracy, RI: Referent identification, PN: Picture naming

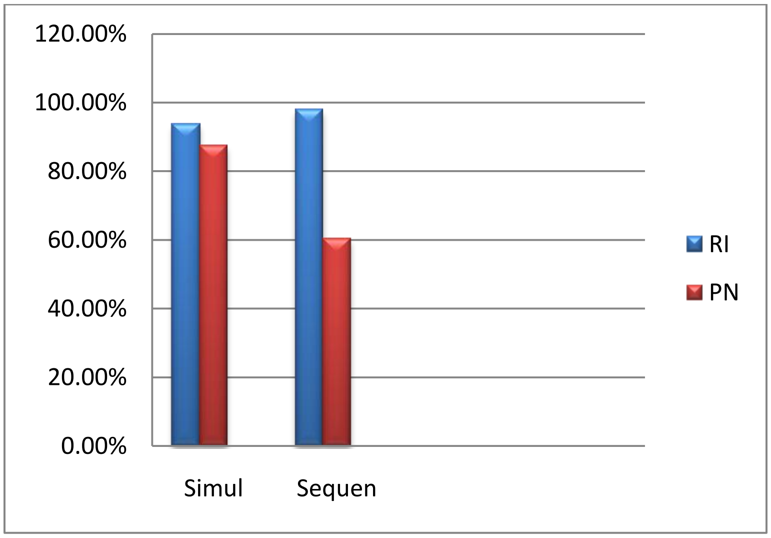
Figure 16: Comparison of referent identification and picture naming RT in English



RI: Referent Identification; PN: Picture Naming

As depicted in the figure 16, picture naming is consistently better than referent identification across groups. In referent identification, simultaneous have performed better than sequential and the same trend is followed for picture naming.

Figure 17: Comparison of referent identification and picture naming accuracy in English



RI: Referent Identification; PN: Picture Naming

As depicted in the above figure 17, the accuracy of referent identification is consistently better than picture naming across groups. In referent identification task sequential performed better than simultaneous. This contrasted with the picture naming performance were simultaneous performed better.

Hence combining the RT and accuracy values of referent identification and picture naming in English we can evidence that overall simultaneous perform better than sequential due to better cognitive linguistic flexibility induced by dual language input. Though the sequential show greater accuracy in referent identification, this was also accompanied by longer RT deteriorating their overall scores in comparison to simultaneous bilinguals.

4.2a Comparison of priming results across groups in Kannada

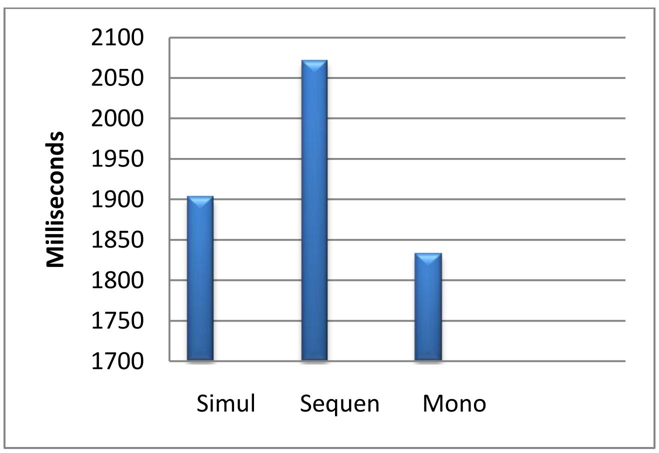
The results were analyzed using two variables, reaction time and accuracy across groups for Kannada.

Table 7: Comparison of priming results across groups in Kannada

Parameter	Simul Mean	Simul SD	Sequen Mean	Sequen SD	Mono Mean	Mono SD
RT	1902.48	286.33	2071.01	206.31	1832.82	333.24
Acc	85.71%	9.03%	83.33%	16.70%	71.42%	18.70%

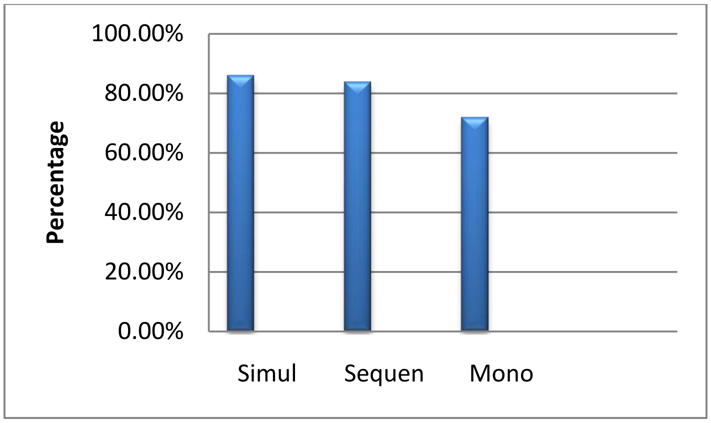
Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals, Mono: Monolinguals, RT: Reaction time, Acc: Accuracy

Figure 18: Comparison of RT in priming across groups in Kannada



As depicted in the figure 18 above, the performance in Kannada in terms of reaction time is best by monolinguals followed by simultaneous and sequential bilinguals.

Figure 19: Comparison of accuracy in priming across groups in Kannada



As depicted in the above figure 19, in Kannada the best performance is by simultaneous followed by sequential and monolinguals.

Hence combining the RT and accuracy values of priming we evidence that in Kannada, simultaneous are the best followed by sequential and monolinguals. If this result was related to the overall vocabulary monolinguals should have done better on the task. But this result reflects the fact that the conceptual organization of lexical semantic knowledge in a simultaneous bilingual is different compared to a sequential bilingual and monolingual. This difference in organization may be the reason of superior word learning abilities in this population. Chitra (2008) studied the lexical organization in bilinguals and monolinguals using a free association task and concluded that there are significant differences observed in the lexical semantic organization in these two groups. The results of the present study shows that there are conceptual difference which occur as a function of age of introduction of L2, as less as three years of age.

42.b Comparison of priming results between groups in English

The results were analyzed using two variables, reaction time and accuracy across groups for Kannada.

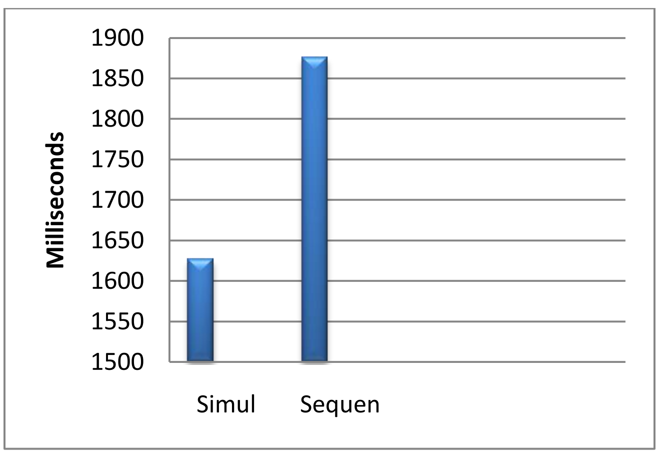
Table 8: Comparison of priming results between groups in English

Parameter	Simul Mean	Simul SD	Sequen Mean	Sequen SD
RT	1626.18	286.79	1875.70	236.65
Acc	95.23%	11.66%	90.47%	11.66%

Simul: Simultaneous bilinguals, Sequen: Sequential bilinguals,

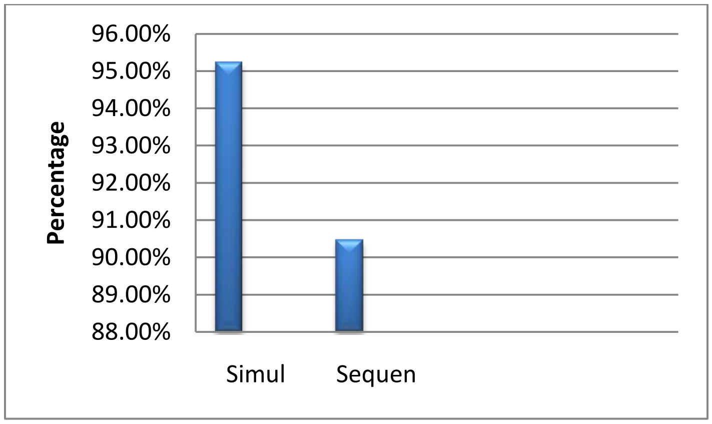
RT: Reaction time, Acc: Accuracy

Figure 20: Comparison of RT in priming between groups in English



As depicted in the above figure 20, in English priming task simultaneous are better than sequential bilinguals.

Figure 21: Comparison of accuracy in priming between groups in English

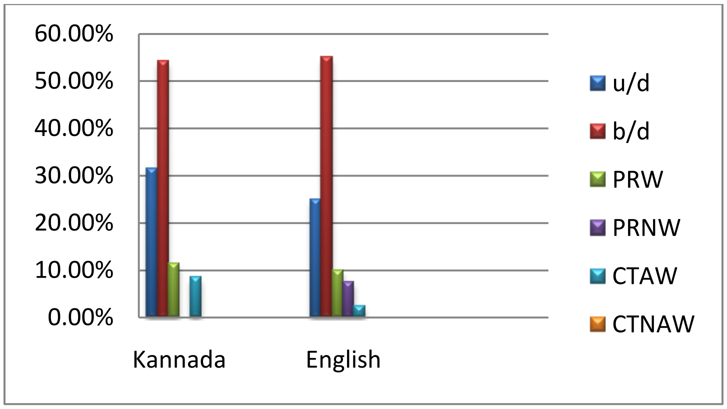


As depicted in the above figure 21, in the accuracy domain also the same trend of simultaneous being better than sequential bilinguals follows.

Hence combining the scores of RT and accuracy the overall performance is better in simultaneous bilingual than sequential bilinguals in English. It is to be noted that, the accuracy values of both simultaneous and sequential bilinguals are better in English than in Kannada. This result in is support with the models proposed by Alishahi, Fazly & Stevenson (2008), rule-based model of Siskind (1996), and the connectionist model proposed by Regier (2005). They state that learning gets easier as the model is exposed to more input that is, words heard more are learned faster. Irrespective of Kannada being the native language there is shift of dominance observed from L1 to L2 in both simultaneous and sequential bilinguals which maybe due to the facilitatory environmental factors for English, which cause a momentary plateauing or regression in the performance of L1.

4.2c Comparison of words directionality across languages in simultaneous bilingual

Figure 22: Comparison of word directionality in simultaneous bilinguals across languages in priming task

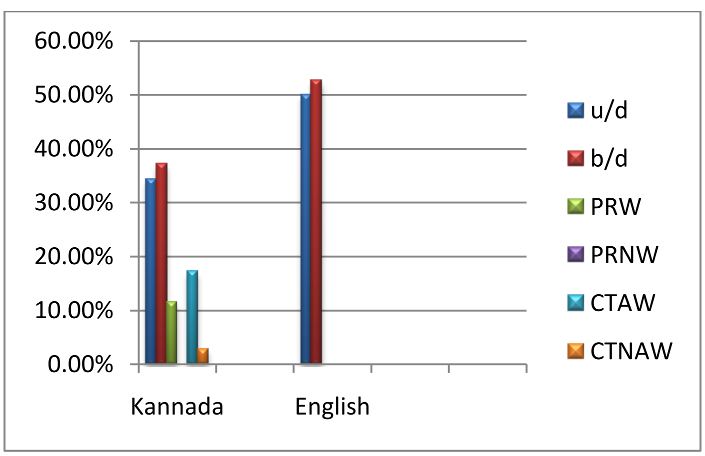


u/d:Unidirectional words, b/d: Bidirectional words, PRW: Phonologically related words, PRNW: Phonologically related non words, CTAW: Cross translational associated words, CTNAW: Cross translational nonassociated words.

As depicted in the above figure 22, there is predominance of bidirectional words (mature responses) produced by simultaneous bilinguals across both the languages. And there were also equal variety of words produced in both the languages which shows equal level of mastery in both the language. This may be the reason for the difference in lexical semantic organization in simultaneous bilinguals. This pattern can be accounted for using the concept mediation model (Potter et al., 1984). The result depicted shows that simultaneous bilinguals could associate to the target word in a variety of manner. There have been studies which document stages of lexical semantic growth across a limited domain like syntagmatic and paradigmatic shifts (Soderman 1993; Namei 2004, Mcara 1984, Lambert and Tucker 1972, Ben-Zeev 1977, Namei 2004, Chitra 2008). Though this pattern of analysis yielded information about the lexical semantic organization certain responses could not be accounted for, hence the above stated scoring was developed to accommodate all the responses based on the pilot study. A point to be noted was that simultaneous population responded to the target not only semantically but also phonologically. To quote a few example for the prime ‘leg’ they responded ‘peg’, for the prime ‘kalu’ they responded ‘malu’. This may be because of improved phonological skills brought about by early exposure to two languages which are phonologically different from each other. This finding will also enable us to account for better word learning abilities in simultaneous bilinguals. Based on the pattern observed in this population it would be interesting to examine if it is the exposure of two phonologically different languages which cause a variation in the lexical semantic organization or if age of introduction to the L2 plays a role to cause these specific changes. There were few remote associations produced by this population which could not be accounted for.

4.2d Comparison of word directionality across languages in sequential bilingual

Figure 23: Comparison of word directionality in sequential bilinguals across languages in priming task

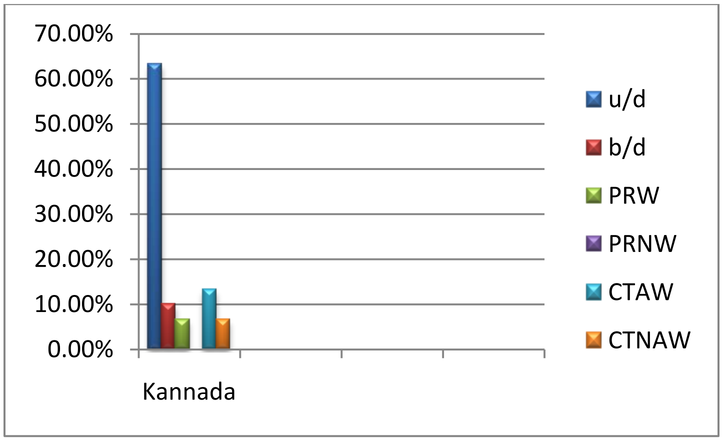


u/d:Unidirectional words, b/d: Bidirectional words, PRW:Phonologically related words, PRNW: Phonologically related non words, CTAW:Cross translational associated words, CTNAW: Cross translational nonassociated words.

As depicted in the above figure 23, there are a wide variety of words produced in Kannada with the predominance of bidirectional words which reveals a mature language system. In English there are only unidirectional and bidirectional words produced with gradual lead taken by bidirectional words. The important point to be noticed in this population was that they could not related to the target word phonologically as this language was not acquired in the same manner like the simultaneous bilinguals i.e they always depend on L1. That is the simultaneous bilinguals may have acquired L1 and L2 based upon contrast which induced increased phonological skills as Kannada and English are phonologically different. But this process has not occurred in sequential bilinguals. They have been exposed to L2 systematically which may not have induced this increased phonological sensitivity in them. As revealed in the graph the percentage of bidirectional and unidirectional words are significantly more in L2 than L1 which is also reflected by better performance in L2 than L1 on the word learning tasks. As the acquisition of L2 is actively under progress there is a momentary plateauing in the performance of L1.

4.2e Comparison of the words assessed on directionality in Kannada by monolinguals

Figure 24: Comparison of word directionality in Kannada by monolinguals



u/d:Unidirectional words, b/d: Bidirectional words, PRW:Phonologically related words, PRNW: Phonologically related non words, CTAW: Cross translational associated words, CTNAW: Cross translational nonassociated words.

As depicted in the above figure 24, monolinguals produce a wide variety of words with the predominance of unidirectional words. The shift of sytagmatic to paradigmatic responses which reveals a maturation of a language system is found to be slowed down in monolinguals as compared bilinguals. This finding is also supported by Chitra (2008). This population responded to the prime word in predominantly unidirectional manner (less matured form of responses). This may be due to reduced cognitive linguistic flexibility due to lack of dual language input. This in turn may have resulted in a relative reduction in phonological skills as compared to bilinguals. This finding would account for poorer performance by monolinguals in word learning tasks.

IV.3a Non Parametric test, Kruskal Wallis test was used to compare the performance of all the three groups in Kannada

Table 9: Comparison of performance of all the three groups in Kannada

	FRTRICK	FACCRIK	FRTPNCK	FACCPNK	CPRTCK	CPACCK
Chi-Square	2.327	13.134	.561	4.759	2.257	2.993
Asymp. Sig.	.312	.001	.755	.093	.323	.224

FRTRICK: fast mapping reaction time referent identification correct Kannada; FACCRIK: fast mapping accuracy referent identification Kannada; FRTPNCK: fast mapping reaction time picture naming correct Kannada; FACCPNK: fast mapping accuracy picture naming Kannada; CPRTCK: conceptual priming reaction time correct Kannada; CPACCK: conceptual priming accuracy Kannada

Significant difference was obtained in accuracy domain of referent identification among the three groups. So Mann Whitney test was used to compare which groups was different from each other.

Comparision between group 1 and 2 (simultaneous and sequential respectively)

Table 10: Simultaneous versus Sequential bilinguals on FACCRI

	FACCRI
Z	-1.340
Asymp Sig (2 tailed)	0.180

FACCRI: fast mapping accuracy referent identification

Comparision between group 1 and 3 (simultaneous and monolinguals respectively)

Table 11: Simultaneous versus Monolinguals on FACCRI

	FACCRI
Z	-3.000
Asymp Sig (2 tailed)	0.003

FACCRI: fast mapping accuracy referent identification

Comparision between group 2 and 3 (sequential and monolinguals respectively)

Table 12: Sequential versus Monolinguals on FACCRI

	FACCRI
Z	-2.918
Asymp Sig (2 tailed)	0.004

FACCRI: fast mapping accuracy referent identification

From the above results it is clear that there was statistically significant difference in one domain, accuracy of referent identification. There was statistically significant difference between the bilingual and monolingual group. Other observation extracted quantitatively and qualitatively, though present may not have reached statistically significant difference due to reduced sample size.

4.3b Non parametric test, Mann Whitney test was used to compare the performance of two groups in English

Table 13: Performance of simultaneous versus sequential bilinguals

	FRTRICE	FACCRIE	FRTPNCE	FACCPNE	CPRTCE	CPACCE
Z	-.480	-.738	-.730	-1.902	-1.441	-.957
Asymp Sig	.631	.461	.465	.057	.150	.338

FRTRICK: fast mapping reaction time referent identification correct English; FACCRIK: fast mapping accuracy referent identification English; FRTPNCK: fast mapping reaction time picture naming correct English; FACCPNK: fast mapping accuracy picture naming English; CPRTCK: conceptual priming reaction time correct English; CPACCK: conceptual priming accuracy English

No statistically significant difference was obtained between the groups, in spite of quantitative differences observed. This may be due to reduces sample size.

4. 3c Non parametric test, Wilcoxon signed rank test was used to compare the performance of the groups across languages and domains

Wilcoxon signed ranks test for group 1 (simultaneous bilinguals)

Table 14: Across parameters comparison for simultaneous bilingual

Parameters	**Z**	**Asymp. Sig. (2-tailed)**
FRTRICE - FRTRICK	-.314	.753
FACCRIE - FACCRIK	-1.000	.317
FRTPNCE - FRTPNCK	-.314	.753
FACCPNE - FACCPNK	-1.857	.063
CPRTCE - CPRTCK	-1.153	.249

CPACCE - CPACCK	-2.000	.046
FRTPNCK - FRTRICK	-.734	.463
FRTPNCE - FRTRICE	-.734	.463
FACCPNK - FACCRIK	-1.826	.068
FACCPNE - FACCRIE	-1.342	.180

FRTRICE: fast mapping reaction time referent identification correct English; FRTRICK: fast mapping reaction time referent identification correct Kannada; FACCRIE: fast mapping accuracy referent identification English; FACCRIK: fast mapping accuracy referent identification Kannada; FRTPNCE: fast mapping reaction time picture naming correct English; FRTPNCK: fast mapping reaction time picture naming correct Kannada; FACCPNE: fast mapping accuracy picture naming English; FACCPNK: fast mapping accuracy picture naming Kannada; CPRTCE: conceptual priming reaction time correct English; CPRTCK: conceptual priming reaction time correct Kannada; CPACCE: conceptual priming accuracy English; CPACCK: conceptual priming accuracy Kannada

As observed in the above table, there was statistically significant difference across language in simultaneous bilinguals in the domain of accuracy of conceptual priming. As mentioned earlier the lack of significant difference in other domains in spite of differences observed maybe due to either equal mastery of both the languages or due to the reduced sample size.

Wilcoxon signed ranks test for group 2 (sequential bilinguals)

Table 15: Across parameters comparison for sequential bilingual

Parameters	Z	Asymp. Sig. (2-tailed)
FRTRICE - FRTRICK	-2.201	.028
FACCRIE - FACCRIK	-1.414	.157
FRTPNCE - FRTPNCK	-1.753	.080

FACCPNE - FACCPNK	-.687	.492
CPRTCE - CPRTCK	-1.153	.249
CPACCE - CPACCK	-.707	.480
FRTPNCK - FRTRICK	-1.153	.249
FRTPNCE - FRTRICE	-1.214	.225
FACCPNK - FACCRIK	-1.682	.093
FACCPNE - FACCRIE	-2.214	.027
FRTPNWK - FRTPNCK	-.135	.893
FRTPNWE - FRTPNCE	-.674	.500
FRTPNWE - FRTPNWK	-1.214	.225

FRTRICE: fast mapping reaction time referent identification correct English; FRTRICK: fast mapping reaction time referent identification correct Kannada; FACCRIE: fast mapping accuracy referent identification English; FACCRIK: fast mapping accuracy referent identification Kannada; FRTPNCE: fast mapping reaction time picture naming correct English; FRTPNCK: fast mapping reaction time picture naming correct Kannada; FACCPNE: fast mapping accuracy picture naming English; FACCPNK: fast mapping accuracy picture naming Kannada; CPRTCE: conceptual priming reaction time correct English; CPRTCK: conceptual priming reaction time correct Kannada; CPACCE: conceptual priming accuracy English; CPACCK: conceptual priming accuracy Kannada

As observed in the above table, statistically significant difference was seen in two domains across languages, reaction time of referent identification and difference between accuracy of referent identification and picture naming in English.

Wilcoxon signed ranks test for group 3 (monolinguals)

Table 16: Across parameters comparison for Monolinguals

Parameters	Z	Asymp. Sig. (2-tailed)
FRTRIWK - FRTRICK	-.943	.345
FRTPNWK - FRTPNCK	-1.572	.116
FRTPNCK - FRTRICK	-2.201	.028
FRTPNWK - FRTRIWK	-1.992	.046
FACCPNK - FACCRIK	-1.633	.102

FRTRIWK: fast mapping reaction time referent identification wrong Kannada; FRTRICK: fast mapping reaction time referent identification correct Kannada; FRTPNWK: fast mapping reaction time picture naming wrong Kannada; FRTPNCK: fast mapping reaction time picture naming correct Kannada; FRTPNCK: fast mapping reaction time picture naming correct Kannada; FRTRICK: fast mapping reaction time referent identification correct Kannada; FRTPNWK: fast mapping reaction time picture naming wrong Kannada; FRTRIWK: fast mapping reaction time referent identification wrong Kannada; FACCPNK: fast mapping accuracy picture naming Kannada; FACCRIK: fast mapping accuracy referent identification Kannada

As observed in the above table, statistically significant difference was observed in monolinguals in their performance between referent identification and picture naming.

Thus *"Bilingualism is one of the experiences capable of influencing cognitive function and, to some extent, cognitive structure. How much bilingualism is necessary, what type of bilingualism is required, and what particular language pairs maximize these influences are all questions that are still waiting to be explored" (cited from Bialystok, 2009, Pg: 9).* The results of the present study offer support for the premise that bilingualism does affect the underlying cognitive processes. The extent to which it influences the cognitive process depends upon the age of introduction of L2 and the nature of the language itself, and the processes involved in acquisition of the language. This study also confirms the classification of bilinguals (McLaughlin, 1978) based on age as, simultaneous and sequential bilinguals in the Indian context where a pure single language input is almost never found. This study provides a piece of evidence against the critical period hypothesis which states that "when a child is exposed to one or more languages within the critical period, should be qualified in the same way as that of simultaneous bilinguals."

Thus bilinguals performed significantly better than monolinguals which is due to that the extra demands placed on bilingual learners which seem to have the side-effect of instilling a greater flexibility in general cognitive processes, an advantage that may remain even in adulthood (Costa Hernandez & Galle, 2008). Bilinguals had the cognitive linguistic ability due to dual language input but the extent to which this ability was exploited to aid word learning seemed to depend upon the age of introduction of L2 and the nature of the language itself. Based on directionality analysis of the priming task the qualitative analysis of error responses of participants indicated that the errors were either phonologically related or cross translation i.e. from L1 to L2. It is likely that such errors would serve as indicators (markers) to differentiate a simultaneous from a sequential bilingual. This aspect of the study requires further in depth exploration. Although a statistically significant difference could not be attained between simultaneous and sequential bilinguals, there was consistently better performance by simultaneous bilinguals across all the tasks. Hence the classification of bilinguals across age as defined in the operational definition seems valid.

Thus novel word learning abilities are influenced as a function of age of introduction of L2. This study shows that there are cognitive advantages brought about by early introduction of L2 which manifests itself across various domains including word learning abilities.

CHAPTER 5

SUMMARY & CONCLUSIONS

The present study aimed at investigating the word learning strategies in monolinguals versus simultaneous and sequential bilinguals. Hence the objectives of the present study are two fold

- To analyze the learning strategies employed by
    3. Bilingual and predominantly monolingual children
    4. Simultaneous and sequential bilingual children
- To device a method to differentiate simultaneous and sequential bilingual children

Six predominantly monolingual Kannada speaking children, six Kannada-English simultaneous bilinguals and six Kannada-English sequential bilinguals in the age range of 7-8 years participated in the study. The study consisted of two phases, the first phase was fast mapping where the training session was followed up by a test session consisting of two tasks, referent identification and picture naming. The results of this phase was analyzed using reaction time and accuracy scores. The second phase of the study was conceptual priming and this phase was analyzed using reaction time and directionality analysis across the below stated domains:

1. Unidirectional words
2. Bidirectional words
3. Phonologically rhyming words
4. Phonologically rhyming non words

5. Cross translational associated words
6. Cross translational associated non words

These data obtained was subjected to statistical analysis. The following inferences can be drawn from the results thus obtained

1. It is seen that there is influence of the age of introduction of L2 observed in the pattern word learning strategies employed for novel word acquistion.
2. This variation in word learning strategies maybe because of the unique way of lexical semantic organization in the three target groups brought about by the age of introduction of L2.
3. There was significant difference across monolingual and bilingual performance, with bilinguals performing better in Kannada.
4. In the bilinguals group simultaneous performed consistently better than the sequential group though it did not reach statistical significance due to limited number of subjects in Kannada.
5. Across languages both simultaneous and sequential bilinguals performed better in English than in Kannada.
6. There was better performance by sequential bilinguals than simultaneous bilinguals in the referent identification section of English, which may be due to increased L2 input.
7. The conceptual priming task further strengthened the results of varying word learning pattern in the target population, by revealing that the lexical semantic organization of L1 and L2 was different in all three groups (Simul, Sequen & Mono).

8. The directionality analysis reveals that the performance on phonological and cross translational tasks may serve as indicators to differentiate simultaneous from sequential bilinguals.

Thus this study has reconfirmed the claim that in age of introduction of L2 which would have an influence on the specific changes in memory deGroot (2000), which may affect the word learning process.

Implication of the present study are

1. Due importance needs to be given when a bilingual history is obtained especially the age of introduction of L2 must be documented as this influences the performance on cognitive linguistic tasks.
2. Not only is there a difference in organization of lexical semantic system between bilinguals and monolingual. There are difference between subgroups of bilinguals too i.e between simultaneous and sequential bilinguals.
3. Furher in depth study of simultaneous and sequential bilinguals on phonological and cross translational task will provide an insight if these tasks could be used as markers to differentiate between these two (Simul & Sequen) group.

This study was only a preliminary attempt to explore the word learning strategies employed by monolinguals, simultaneous and sequential bilinguals. Further studies could be carried out by using the variety of stimulus which include low frequency words. An in depth study can also be carried out to tap the linguistic domains in which simultaneous and sequential bilinguals vary to and to standardize markers to differentiate between this population.

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APPENDIX A- Consent letter to the schools

SH/KSP/Diss/2010-11 3-02-2011

To

The Principal

Dear Sir/Madam,

Sub: Permission for data collection – reg.

Greetings from Prema, AIISH, Mysore.

This is with reference to Master's thesis of Ms……… II M.Sc (Speech-Language Pathology), a student at the All India Institute of Speech and Hearing, Manasagangothri, Mysore. Ms……. is conducting a study to explore vocabulary learning by monolingual children. The study is titled "Novel word learning in simultaneous and sequential bilinguals v/s. monolinguals" for which she proposes to test monolingual children studying in your school. The test involves word reading and may take 30 minutes that is administered in three sessions. I assure you that Ms………. will not disturb the routine schedule of children in the classroom. Due acknowledgment will be made in her report to your school and children. I request you to kindly permit her to collect data on six children on March, 2011 for a period of one day. Your cooperation in this regard would be highly appreciated.

Thanking you,

Yours Sincerely,

Dr. K. S. Prema
Guide & Prof. of Language Pathology
Head-Dept. of Special Education
AIISH, Mysore

APPENDIX B

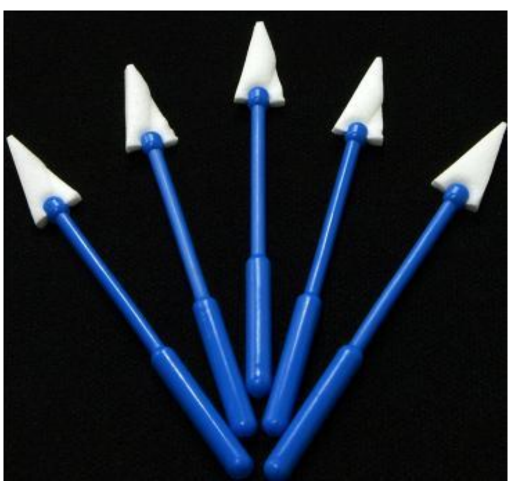
Phase one –Fast mapping

Training session: Basic theme of the story provided here, expansions were added.

Kannada story narration with novel words and associated referents.

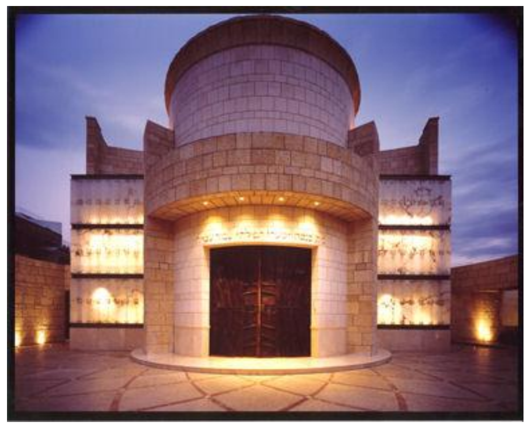
1.

2.



English story narration with novel words and associated referents

1. *Ren* is the worship place for Chinese and *tog* is the worship place of Jewish. Both are known to be famous for beautiful architectures.



2. Mag which are found abundantly in northern part of Africa are usually *cob.*

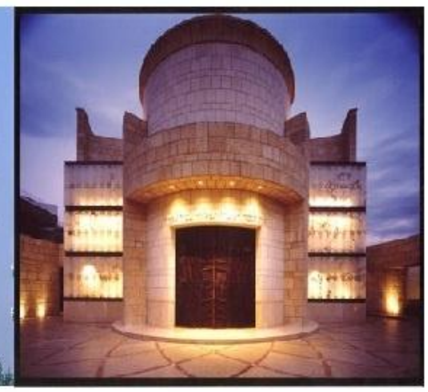
Testing session: Task 1- Referent identification

Kannada (few examples):

English (few examples):







APPENDIX C

List 1 (English) – words for conceptual priming (Chitra, 2008)

1. Spoon
2. Milk
3. Leg
4. Bus
5. Cat
6. Window
7. Doctor

List 2 (Kannada) – words for conceptual priming (Chitra, 2008)

೧. ಚಮಚ

೨. ಹಾಲು

೩. ಕಾಲು

೪. ಬಸ್ಸು

೫. ಬೆಕ್ಕು

೬. ಕಿಟಕಿ

೭. ಟೋಪಿ