READING AND INNER SPEECH: AN EMPIRICAL STUDY OF CHILDREN OF AGE GROUP FIVE TO EIGHT

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DECLARATION

Date: 5/8/2021

I, **Yashika Chandna**, hereby declare that this thesis entitled "***Reading and Inner Speech: An Empirical Study of Children of Age group Five to Eight***" is based on my original research work and to my best of knowledge, has not been submitted in whole or in part in this university or in any other university for the award of any degree.

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Abstract

The study is an investigation into reading and inner speech and how it correlates for bilinguals and multilinguals. Inner speech, because of its elusive nature, has always been challenging to investigate. Therefore, the methods employed in the present study have been adapted from the previous studies done in the area of reading and inner speech by Sokolov, Baddeley and Hitch and Daneman & Carpenter.

In Experiment 1, children were asked to read while their sub- vocal speech was being impeded. As suggested by Baddeley and Hitch's model, the sub- vocal speech is part of a phonological loop that helps in "retention of information in working memory". It was found that sub- vocal impediment severely impairs the comprehension of the text, and it is not L1 or L2 that impacts the reading performance but the proficiency in the language.

Experiment 2, 'Reading span test', which is essentially a recall test, has been used to ascertain if the language of the text has any impact on the retention capacity of the working memory. The study shows that the capacity of working memory is independent of the language of the text. Furthermore, the performance in one language is similar to other, given the proficiency in both languages is comparable.

To further investigate how inner speech functions in multilingual/bilingual mind, the technique of introspective verbal reportage was used to examine whether readers code switch or translate when they engage with the text in their inner speech and does the form (literary or domain-specific) have an impact on the aforesaid phenomenon. The study revealed that children do code switch, code mix in their inner speech while engaging with the text for better comprehension and meaning-making. In the case of domain-specific reading, the distinction between languages seems to blur. More than code-switching, it seemed to be a

the phenomenon of translanguaging. “Translanguaging,” according to Ofelia García, refers to “multiple discursive practices in which bilinguals engage in order to make sense of their bilingual worlds” (García, 2009: 45). Bilinguals/ multilinguals have a flexible and fluid interrelated language system at their disposal; thus, proficiency in one language positively impacts the proficiency in others, the structure and the grammar are compared and are devised as a whole. As per Vygotsky also L1 and L2 cannot be regarded independent of each other in case of any language function; they are “two unrelated processes, either parallel or crossing at certain points and mechanically influencing each other” (Vygotsky, 1986).

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Chapter 1

Introduction and Literature Review

"And so, to completely analyze what we do when we read would almost be the acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all of its history." Huey 1908

To learn to read is a life-long process. It involves knowledge that the reader develops during their interaction with the social environment. It is a highly complicated process, and cognizance of the dynamics of reading requires an understanding of working memory and inner speech. Readers have reported hearing little voices in their heads while reading. This study hereby proposes to illustrate the complex relationship between reading, inner speech (little voices), and working memory. Inner speech has been taken as a construct to understand reading as a process.

It is a highly complicated cognitive, linguistic, meaningful, and sociocultural process in which the reader uses knowledge of the written language, the content of the text, and cultural knowledge to construct the meaning of the text. All of these knowledge systems impact the sense that readers create through the text. All the systems that the reader employs from sociocultural, cognitive, and linguistic are majorly intuitive. Readers use their life experiences to interpret the text, and thus the meaning of the text can differ from one person to another. Text in the familiar language is easily comprehensible compared to an unfamiliar one; familiarity with text further facilitates comprehension. Reading is done for various purposes ranging from content gratification, close reading to skimming and scanning. Different strategies such as reading, re-reading, or re-thinking are used to define ideas, to

make sure that what is being read is understood. Children use their intuitive knowledge of spoken language to comprehend the text while they learn to read independently.

1.1 Reading as A Process

Reading is generally accepted as an "interactive process. " The interaction of the reading process can be represented as an equation: R=D x C, which simply defines reading as equivalent to "decoding times comprehension (Gough & Wren, 1999 in Ehrich, 2006)." To explicate further, reading involves analysis at two different levels, i.e., "the analysis particulars (the decoding of individual units) in relation with broader, more global concerns (the use of context and inference to establish meaning)"(Gough & Wren, 1999 in Ehrich 2006). The extent to which these differing perspectives (D or C) are used in written text processing is debated amongst reading researchers. Some of the researchers argue that comprehension/meaning play a pivotal role over the decoding aspects of reading (Goodman, 1989 (L1); Carrell & Eisterhold, 1989 (L2)), and for others, it is decoding that has a more substantial part to play (Eskey, 1989 (L2); Gough & Wren, 1999 (L1)). It is essential to fix the eyes on the written text and then the letter, syllable, or characters to be able to read and to decode to make meaning; however, it is a controversial subject that has created a divide amongst the researchers (Jared, Levy & Rayner, 1999).

The "role of phonology" regarding the decoding feature of reading has been much debated in recent times. The debate amongst the reading researchers can be divided into two main areas "concerning the role of phonological processes in regard to word identification, that is, whether phonological information facilitates access to word's meaning (pre– lexical), or whether its role is one of identification (post–lexical)" (Perfetti C.A, 1999). To put it in another way, is the written text being translated into a "speech code" before determining the meaning or is meaning being directly obtained from the graphemic properties of the text? Question is "how important is the sound of the word in

the mind of the reader as s/he reads?" (Perfetti,1999). Reading involves processing at two levels: "decoding individual units" and "using text as a whole" to make meaning. Specifically, the decoding aspect of reading is a highly controversial topic for researchers in the field of reading.

1.2 Models of Reading

Various models of reading have been suggested ranging from (a) "word identification" (b) "syntactic parsing" (c) "discourse representations" and (d) "how certain aspects of language processing (e.g., word identification), in conjunction with other constraints (e g., limited visual acuity, saccadic error), guide readers' eyes." Some of the word identification models are "Interactive-Activation (McClelland and Rumelhart, 1981c; Activation-Verification (Paap, Newsome, McDonald, and Schvaneveldt), Multiple-Levels (Norris,1994), Multiple Readout (Grainger and Jacobs,1996), Multiple-Trace Memory (Ans, Carbonnel), Connectionist Dual-Process (Zorzi, Houghton, and Butterworth,1998), and Bayesian Reader models (Norris,2006)" (Rayner & Reichle,2010)

However, the most referred reading model has been the "Dual Route Cascaded (*DRC*)" model (Coltheart, Rastle, Perry, Langdon, and Ziegler 2001) and "The Triangle Model" (Harm and Seidenberg 1999, 2004; Plaut, McClelland, Seidenberg, and Patterson 1996). Though these models are often called "models of reading," but essentially, they are "models of reading aloud" or "reading of single words displayed in isolation," thus cannot be called "models of reading." These models are designed to work as "computer programs" employed to "simulate tasks to study lexical decision making and word frequency effects to study the cognitive processes and representations that are involved in identifying printed words" (Taft,1991 in Rayner & Reichel,2010). These models work on the assumption that "bottom-up information, in the form of letters, or syllables

(orthographic inputs), interacts with lexical knowledge to produce word pronunciations and/or meanings."

DRC and the triangle model put forward distinct frameworks to explain the major theoretical perspectives in the continuing debate over "how words are recognized and represented in the mental lexicon" (Rayner & Reichel, 2010). This debate has been centred around the question of whether "word identification is informed by linguistic features" to get to pronunciation and meaning of the word from its orthography, or whether this process employs different strategies to use the lexical information that provides mutual "soft constraints on the pronunciations and/or meanings that are generated during word identification (Coltheart .M, Rastle. K, Perry. C, Langdon. R, Ziegler. J, 2001)." The DRC model adheres to the former view, although the triangle models are more in conformity with the latter view.

Two assumptions form the base of the DRC model. First, the pronunciation of the word can be produced in two ways either "through grapheme-to-phoneme correspondence that converts the individual graphemes (e.g., letters) of a word into their corresponding phonological representations (i.e., phonemes) or through a more direct mapping of a word's spelling onto its pronunciation"(Coltheart et al.,2001). The model thus, can be associated to "dual-route models" whereby it is implicated that the pronounciation of the words can be generated by either using "specific linguistic rules" that describes how each grapheme is pronounced to combine the pronunciation of a word or through the direct means of retrieving it from the lexicon. Thus, the second fundamental assumption of the DRC model focuses on the" nature of lexical representations":

> "According to the model, both the orthographic and phonological forms of words are represented holistically, as discrete processing units in the lexicon. In contrast to other dual-route models, the assembled and direct routes operate in parallel, with the pronunciation of any given word in most cases being jointly determined by the products of both routes. As the assembled and direct routes operate in parallel, words with regular pronunciations are pronounced

> more quickly and accurately than irregular words because the two routes cooperate to provide robust pronunciations of regular words, but not irregular words." (Rayner. K & Reichle. D.E.,2011)

In the triangle models, the word's pronunciation is considered the result of processing "orthographic input along with other units representing phonological output."(Rayner & Reichle,2011). Thus, in contrast to the DRC model, the triangle model comprises a sum of all knowledge that determines the pronunciation of every word that is produced.

> "The lexical information in triangle model is depicted in a distributed manner with the governing variants positing that both orthographic input and phonological output are represented by particular patterns of distributed activity across the units and not a single unit per se. Thus, the triangle models assume that lexical information is obtained through mediation between the orthographic input and phonological output which are learned through multiple interactions with words"(Rayner. K and Reichle. D.E, 2011).

It has been projected by the triangle models that high-frequency words are pronounced more accurately and rapidly than infrequent words. There are "sentence-level processing models" that explain " how the linguistic structures and constraints (e.g., syntax) facilitates the understanding of individual sentences"(Rayner. K and Reichle. D.E, 2011). Thus, these models are also based on a "bottom-up" approach where meanings of individual words are constructed through letter identification.

Sentence level models can be divided into three categories– "garden-path, constraint-based models, and models based on connectionist frameworks." The importance given to syntactic processing is the basis of differentiation between the two classes of models. The garden-path models (Ferreira and Clifton,1986; Frazier and Clifton1996) prioritized the sentence's grammatical structure. As per these models, the reader creates a single grammatical structure based on the sentence analysis and then interprets and revisits the analysis, if necessary.

The disparate approach, the constraint-based models (Jurafsky,1996; MacDonald, Pearl mutter & Seidenberg 1994; Spivey & Tannhaus,1998 in Rayner & Reichle,2010),

postulates that grammatical structure is just one of the various interacting components in sentence comprehension. In such constraint-based models, “grammatical structure may carry considerable weight in determining the interpretation of a sentence, but plausibility or contextual constraint (or appropriateness) is of equal weightage.”(Rayner. K and Reichle. D.E, 2011). The constraint-based model uses different kinds of information, such as the “thematic role of the initial noun phrase, the bias to take the initial phrase as the main clause versus reduced relative, etc., to predict the qualitative patterns of reading times over various regions of interest.”

Another model that has been proposed is “discourse processing”. The meaning of individual sentences is connected to “more global representations to support text comprehension”(Rayner & Riechle,2010); thus, none of the models complete in itself. Examples of the “discourse-processing models” include the “Construction-Integration (Kintsh & Van Dijk,1978), Situation-Space (Golden and Rumelhart,1993), Landscape (Van den Broek, Risden, Fletcher & Thurow, 1996), Resonance (Myers & O'Brien), and Distributed Situation Space (Frank, Koppen, Noordman & Vonk,2003).” Kintsch and Van Dijk originally developed “The Construction-Integration (CI) model”, which was eventually modified on the representations that are probably provided by “word-identification and sentence- models.”

The CI model works on the assumption that the meaning of the text “arises from an interaction and fusion between to- be comprehended object, usually a text and general knowledge and the personal experience that the comprehender brings to the situation.” (Kintch. W & Welsch. D.M,90-15). Information from the texts facilitates retrieval of related or added information from schemata in long-term memory, and this connection helps the reader comprehend the text by relating it to their personal experience. Together, this information forms a “loose associative network of propositions”. At this point, one sentence

or a phrase is being comprehended with the "all propositions that can be actively retained by working memory at any given time and with the strengths and the length of the associations formed between the given pair can be actively maintained together"(Rayner. K and Reichle. D.E, 2011) . At the stage of integration, the propositions supported by the activation are "normalized" across processing cycles. The related propositions are strengthened while the less critical propositions are weakened. The integration reduces or eliminated the textual inconsistencies.

CI model explains two crucial inferences, "first is a forward or predictive inference", which the reader uses to predict the outcomes or events that the text does not state. The second type of inference "maintains coherence between events in a text and is called backward or bridging inferences". (Carr TH, Pollastek, 1985).

The other models of "discourse processing" describe how representations are constructed using the "literal meaning of the text and information in the memory" (Rayner & Reichle, 2010). However, the models are intended to make direct predictions about reading comprehension, the inferences people make during reading a text, and the type and amount of information that is subsequently remembered.

Another set of the reading model is those of "eye movement control in reading". It determines how "top-down constraints" (e.g., lexical representations) engage with the "bottom-up" culling out of visual information to bring out the patterns of eye movements that are observed when text is read. The coming of the E-Z Reader model (Reichle, Pollatsek, Fisher, and Rayner, 1998) prompted the development of such models. Another pivotal model in this class is SWIFT (Engbert, Nuthmann, Richter, & Kliegl,2005). Some of the other models include "Mr Chips (Legge, Klitz, & Tan,1997), EMMA(Salvucci,2001), *SERIF* (McDonald, Carpenter, &Shillcock,2005), SHARE (Feng,2006), and the Competition-Interaction model (Yang,2006)." (Rayner & Reichle,2010)

"Mr Chips is a computer program" that implements an "ideal observer principle for integration of visual data with lexical knowledge and eye movement control" (Legge, Gordon & Klitz, Timothy & Tjan, Bosco, 1997). This model imitates ideal performance with the given set of "physiological, psychological, and task constraints", though actual performance oof readers is explained by other models. The forward movement of the eyes in "E-Z Reader and EMMA" determines the culmination of lexical processing. "Whereas most of the other models propose that autonomous timer largely determines when the eyes move unless saccadic programming is inhibited by cognitive processing difficulty" (Reilly & Radach,2006). Models like "E-Z Reader and EMMA" postulate that the allocation of attention is sequential, "one word at a time". In contradiction to these, models "SWIFT and Glenmore" postulate that allocation of attention is parallel; therefore, multiple words can be recognized simultaneously. "SERIF", "SHARE", and "the Competition-Inhibition" model proposes that attention has no or a small role to play in "guiding readers eye movements."

As per the "E-Z reader", the eye movement during reading is driven by "lexical processing" at an early stage. "This early stage of lexical processing is called the familiarity check, and it is posited to correspond to the point during word identification when it is safe to begin programming a saccade to the next word" (Rayner & Reichle,2010). The assumptions of the model are directly related to "saccadic programming." (E-Z Reader 10; Reichle, Warren &O'Connell, 2009). The E-Z reader model has been further elaborated to understand the effect of higher-order (i.e., post-lexical) language processing on eye movement during reading. Varied and complex cognitive processes support reading. However, most of the computational models of "reading" focus only on one or two components of the reading process, and little effort has been directed towards explaining how these components interact. Thus, it provides a limited view of what goes on in the minds of readers.

Another ubiquitous feature that readers experience is “inner voices during silent reading” (Huey, 1908/1968 in Ambrason & Goldinger, 1997). However, it appears to be “an elusive experience; inner speech is most prominent in beginning readers, or when fluent readers process difficult text” (Coltheart. et al., 1979 in Amberson & Goldinger,1997).

All the models of reading try to understand how the mind looks at the text and interprets it. The CI model deliberates on the role of working memory and inner speech and how they help in reading comprehension. The present study attempts to understand the role of “working memory and inner speech in reading” but in the context of Indian classrooms, which are multilingual. Other than being multilingual, the factor that affects reading in Indian classrooms is that “English is a second language” for most of the students. Therefore, the language of the text should possibly be one of the factors affecting comprehension of the text. Several studies that have been conducted in the area of reading and the role of inner speech and working memory; have construed learners to be monolingual. However, in a country like India, where multilingualism is a default human condition, code-switching and translation are very much part of their language. Therefore, to understand the dynamics of reading, working memory, and inner speech, first, the constructs of working memory and inner speech must be realized.

1.3 Working memory:

Working memory is universally considered “an essential mental faculty, pre-eminent for cognitive abilities such as planning, problem-solving, and reasoning. There are multiple occasions when we have to keep particular pieces of critical information briefly in our mind, storing them until the opportunity to use them arrives” (Baddeley, 1986). For example, while doing some mental calculation, entering a one-time password (OTP)for online banking transactions, holding driving directions in mind until the landmark is reached. Likewise, at times there are multiple solutions to a problem “such as when you

must look ahead along with various possible sequences of moves in a chess game, and sometimes, as when you must untangle the structure of a complex sentence" (Baddeley,2007).

To perform cognitive operations, certain information needs to be kept accessible to manipulate or transform them. Working memory is an aggregation of this short-term mental storage and manipulation. "Working memory can be equated to a mental blackboard—that is, as a workspace that provides a temporary holding store so that relevant information is highly accessible and available for inspection and computation" (Braver,2005). When the requisite task is completed, information is easily deleted, and again the process begins with other information.

> "Working memory is like RAM (random access memory), RAM is completely flexible with regard to content; there is no fixed mapping. Second, the more RAM a computer has the more complex and sophisticated the programs that can be run on it, and the more programs that can be running simultaneously. Storage in working memory involves a content-free flexible buffer and cognitive abilities are dependent on the size of the buffer" (Braver,2005).

Research suggests that "people widely differ in their working memory capacity (also known as working memory span), the amount of information that can be held accessible(Daneman & Carpenter, 1980)." The differences in working memory span can predict "general intelligence (IQ), verbal SAT scores and even the speed with which a new skill is acquired such as computer programming"(Kane & Engle,2000; Kyllonen& Christal,1990). The relationship between working memory and cognitive ability is apparent through the range of complex cognitive tasks affected by it. (Daneman & Carpenter, 1980).

1.4 A brief history of Working Memory:

In the last hundred years, the research on the function and nature of short-term storage has evolved considerably. "The very terms for this storage system have changed over the years, from primary memory to short-term memory to working memory"(Braver,2005).

William James made the first differentiation between “short-term and long-term storage systems.” He named these “primary memory” and “secondary memory” to indicate the degree of association consciousness and the stored information. In James’s view, “primary memory” acts as the initial storage where information can be stored for conscious attention, inspection, and introspection. In James’s words, “an object of primary memory is thus not brought back; it never was lost” (James, 1890 cited in Braver, 2005). The difference between the varied kinds of memories was based on how information is retrieved. In the case of ‘LTM,’ information can only be retrieved by initiating “an active cognitive process” (Braver, 2005).

Until the 1950s, no experimental studies were conducted to ascertain the characteristics of “Short-Term Memory”. It might be because of the governess of the behaviourist school of thought in the early twentieth century, which swayed the focus away from cognitive studies. Finally, however, “George Miller, an influential cognitive theorist, proved the limited capacity of short-term memory”(Braver, 2005). In his paper, titled “The Magical Number Seven, Plus or Minus Two,” Miller proposed that only seven items can be stored in short-term memory at a time, which influences the performance of various mental tasks.

Miller further suggested that though the number of items that short-term memory can store at a time is limited, what an “item” means or entails is flexible and open to interpretation. Miller (1956) recommended that single items be bunched together into what Miller called “chunks”, which are higher-level organization units. Thus, “three single digits can be chunked together into one three-digit unit”: 7 6 8 become 768. Meaningfulness governs chunking. “The process of chunking is universal in the case of language; the letters are grouped into word-chunks and words into phrase-chunks”(Miller, 1994).

This might be the reason for the ability to hold "verbal information in short-term storage" is better than for other forms of information; chunking can expand the capacity of short-term memory (STM). However, the updated estimate of short-term storage capacity as suggested by reviews is way "lower than seven when participants are restrained from using strategies like chunking or rehearsal" (Cowan, 2001). Studies have found STM to be characteristically disparate from LTM. The capacity of short memory can be defined in terms of "short duration and high level of accessibility"(Cowan, 2014). The central idea of STM is the brevity of duration, and if not rehearsed, it would be lost.

An "experimental technique called the Brown-Peterson task" was developed(Brown, 1958; Peterson & Peterson, 1959) to study short term memory. First, three strings of consonants were given to the participants to memorize and to prevent them from engaging in active rehearsal; they were asked: "to count from 100 backward by 3s." Then, participants were asked to recall the strings after varied set delays. Next, the time course of forgetting was measured by "recall accuracy concerning the delay". It was found that "after a delay as short as 6 seconds, recall accuracy declined to about 50 per cent, and by about 18 seconds recall was close to zero"(Peterson & Peterson, 1959; Braver, 2005). With further deliberation, it was found that the reasons for forgetting information were "passive decay over time or interference from previously stored information"(Braver,2005), and this debate is still going on.

1.5 Models of Working Memory:

"The Atkinson-Shiffrin Model": Richard Atkinson and Richard Shiffrin proposed a model in 1968 which further reinforced the idea of "short-term"(STM) and "long-term memory"(LTM) being different modes for information storage. This model construes short-term memory to be an entry point through which information gets access to LTM. STM provides a means to control and enhance information through "rehearsal and coding strategies

(such as chunking), and that is how the information makes it into long-term memory" (Braver,2005)

Multi Store Model of Memory, Atkison & Shiffrin (1968)

Image Courtesy: " https://practicalpie.com/atkinson-shiffrin-modal-model-of-memory/ "

At present, the influence of this model has reduced as most psychologists conceptualize the short-term storage in a manner that is more dynamic and is not just concentrated on its association to long-term storage. This shift resonated in the usage of the term "working memory", which encapsulated the notion of a workplace where cognitive processing took place and was not just a storage place. "The Atkinson-Shiffrin model is essentially sequential: that is, information passes through short-term memory before entering long-term memory" (Braver,2005). Though, Shallice &Warrington's (1970) neuropsychological study proved that "patients with brain damage who showed drastic impairments in short-term memory nevertheless were able to store new information in long-term memory as neurologically healthy people do". This finding showed that the ' LTM'could access information even when the 'STM' was impaired. Affordances from other studies suggest the there are various systems for "short-term storage".

"Baddeley and Hitch" (1974) tried to resolve this incongruity by "studying the effect of disrupting short-term memory on the capacity of normal people to perform complex tasks

such as reasoning, comprehending and learning" (Baddley,2010). They combined the tasks with a simultaneous activity that depended on STM, such as memorizing and repeating digits of a telephone number.

> "As the length of the sequence increases, the remaining available capacity of short-term memory should be reduced, and performance on the concurrent cognitive task progressively disrupted. We found that there was indeed a consistent effect, with of performance declining with sequence length, but impairment was far from catastrophic speed even with long digit sequences, and the error rate was low and unchanged" (Baddeley,2010).

Thus, strengthening the claim about the availability of "multiple systems for short-term storage and their coordination by the central control system." Miller, Galanter, and Pribram, in their classic book "Plans and the Structure of Behaviour" written in 1960, proposed the term working memory which Atkinson and Shiffrin later used in 1968 in their influential paper– "Human memory: A proposed system and its control processes."(Baddeley,2010)

"The Baddeley-Hitch Model"

"The term working memory (WM) evolved from the earlier concept of short-term memory (STM), and the two are still on occasion used interchangeably" (Baddeley, 2012). The term " STM is used to refer to the simple temporary storage of information, in contrast to WM, which implies a combination of storage and manipulation"(Baddeley, 2012)**.** This active concept of 'working memory' in contrast to the passive notion of STM as a "simple information store" is essential to the 'Baddeley-Hitch model', which is a multi-component model consisting of "two short-term stores and a control system." The properties which differentiate this model from the 'Atkinson-Shiffrin model' are – first, it is a non-linear model; thus, the "short-term storage" is not the only gateway to "long-term memory".

> "Instead, the basic function of short-term storage is to facilitate complex cognitive activities that require the integration, coordination, and manipulation of multiple bits of mentally represented information. Second, there is an integral relationship between a control system—a central executive—that

> governs the deposition and removal of information from short-term storage and the storage buffers themselves, thus making it an effective workplace for mental processes. Third, the model proposes at least two distinct short-term memory buffers, one for verbal information (the phonological loop) and the other for visuospatial information"(Braver, 2005).

As these are independent short-term stores, greater flexibility is allowed in-memory storage. Therefore, if one of the systems is actively employed in the storage of information, the other can still function effectively to manipulate and integrate the information. The notion of "central controller" engaging with "dual short-term memory buffers" has been maintained over the period, and a few aspects of the model have been further explored and delved into, such as "storage within verbal working memory—the phonological loop."(Baddeley, 1986) All three components of the model provide a comprehensive working system for cognitive activities.

"Baddeley And Hitch Model of Working"

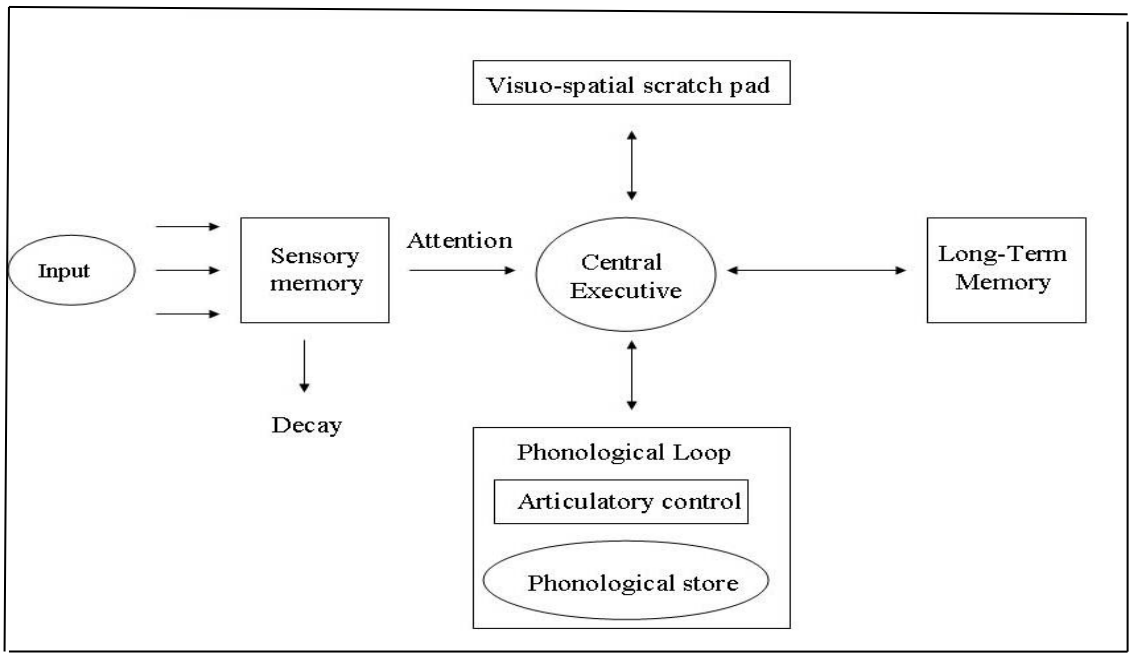


Image Courtesy: "https://www.simplypsychology.org/working%20memory.html"

The Phonological Loop: The verbal working memory is said to involve both a "mind's ear" and a "mind's voice. The model proposed that "the phonological loop system

involves two subcomponents: a phonological store and an articulatory rehearsal process" (Baddeley, 1986). The visually presented, verbal information is encoded; the information is then converted into a sound-based, or "auditory-phonological", code. The sound thus produced reverberates for a brief period before fading away, and to prevent the loss, it must be refreshed, thus the idea of the loop. "The articulatory rehearsal prevents the decay. Once the verbal information is spoken internally by the mind's voice in rehearsal, it can then be again, heard by the mind's ear and maintained in the phonological store" (Braver, 2005).

The verbal information keeps repeating on a loop, as long as it is needed to maintain working memory. In the case of visual material, the first thing is to translate it into a phonological code, sub-vocally rehearsed before having access to the phonological store, whereas speech information can have direct access to the phonological store. "The studies have shown that if the phonological loop is disrupted, then the performance of working memory is impaired" (Baddeley,1986).

The other system in the 'Working Memory model' that helps in processing information is the "visuospatial sketchpad," that is essential for the "online retention of the object and spatial information" (Buchsbaum & Esposito,2008). There are two ways by which a visuospatial sketchpad can processes information: "spatial, like the arrangement of the room, and visual, like the face of a friend or the image of a favourite painting"(Braver,2005). Thus, two different systems might maintain the visuospatial working memory, one for maintaining representations of visual objects and the other for spatial ones. The observations about the visual systems having different neural pathways to process spatial and object visual features have been supported by neuroimaging studies showing separate brain systems for "spatial and object working memory (Courtney, Ungerleider, Keil, & Haxby,1996)."

> "The maintenance of visuospatial imagery in an active state requires top-down, or strategic, processing. As with the phonological loop, where articulatory suppression interferes with the maintenance of verbal information, a concurrent processing demand in the visuospatial domain, such as tracking a

> spot of light moving on a screen, random eye movements, or the presence of irrelevant visual information during learning, likewise impairs memory performance" (Buchsbaum & Esposito,2008).

It has been shown that saccadic rehearsal is pivotal to maintaining visuospatial information, though there is less specified "symmetry between sensory and motor representations of visuospatial information than speech(Postle, Desposito & Corkin, 2005)." In the case of "spatial memory, covert eye movement can act as a medium to revisit locations in memory", which is quite similar to articulatory rehearsal, which helps maintain verbal information (Baddeley, 1986).

When a "spatial interference task disrupts this rehearsal component (Bushbaum et al, 2008)" it impairs task-based performance on spatial working memory but does not affect nonspatial visual memory task (Cocchini, Logie, Della, MacPherson, Baddeley, 2002; Buchsbaum et al., 2008.). Similarly, visual perceptual input interferes with the retention of visual information, such as the shape and colour of the object but does not affect spatial memory (Klauer and Zhao, 2004). The mechanism of 'remembering by doing' functions for both phonological and visuospatial memory (Buchsbaum et al.,2008).

The presence of 'central executive' differentiates the conception of 'working memory' from the earlier models of 'short-term memory'. The 'central executive' determines "(1) when information is deposited in the storage buffers; (2) determines which buffer is selected for storage; (3) integrates and coordinates information between the two buffers; and, most important, (4) provides a mechanism by which information held in the buffers can be inspected, transformed, and otherwise cognitively manipulated" (Braver,2005). Thus, the central executive regulates both utilization of cognitive resources and the suppression of extraneous information that might consume those resources (Baddeley, 1986). "It is the central executive which does the 'work' in the working memory (Braver,2005)".

The ‘central executive’ operates as the “control centre” that supervises information processing, manipulation, and recall, for activities such as “ problem-solving, decision-making, and creative writing” (Chai W. J, Hamid Abd A. I, Abdullah, 2018). The research supporting the notion of ‘Central Executive’ often involves studying “dual-task coordination” that involves doing two different working memory information storage tasks simultaneously. Although one task is associated with storing information based on visuospatial cues and the other is based on auditory verbal information, both neuroimaging and behavioural studies have shown that apart from maintaining and manipulating information, the central executive also performs the function of coordination and time-sharing (Braver, 2005).

The " episodic buffer " is another component, which was later added to the ‘working memory’ model, is the “episodic buffer” (Baddley, 2000). It extracts information from both the “slave systems” and the long-term storage, integrates this information, and maintains it in the WM. Baddeley (2000) suggested some similarities between episodic buffer and episodic long-term memory, but it differs from episodic long–term memory in its temporary nature.

To summarize, Baddeley and Logie (1999, pp 28-29) define working memory as follows:

> “It comprises those functional components of cognition that allow humans to comprehend and mentally represent their immediate environment, to retain information about their immediate past experience, to support the acquisition of new knowledge, to solve problems, and to formulate, relate, and acts on current goals.”

Few other models of working memory have been suggested, but they are broadly in coherence with the multi-component framework, though each has a distinctive focus and terminology.

“Cowan’s Embedded Processes Theory” defines WM as “cognitive processes that are maintained in an unusually accessible state” (Cowan 1999, p. 62). Cowan’s theory focuses on “ limited-capacity attentional focus that operates across areas of activated LTM.” Over the recent years, the central issue concerning Cowan “has been to specify the capacity of this

attentional focus and hence the capacity of WM" (Baddeley, 2012). Substantial evidence from his research suggests that the capacity of 'WM' is much closer to four, unlike an earlier proposition of "seven items." However, these four chunks each might contain more than a single item (Cowan 2005). Thus, "working memory can be construed as a system with limited storage capacity and acts as a working space for cognitive processes. (Mendocna et al. , 2003)"

1.6 Approaches to Working Memory Research

Baddeley (1992) suggested that research in 'working memory' has developed under two different but complementary approaches. The first being the dual-task neuropsychological approach, and the second being the psychometric correlational approach. The prior focused on analysing the structure of working memory (Baddley & Hitch, 1974) and the two subsystems. Thus, it uses neuropsychological evidence and dual-task application as the methods to study working memory.

The latter approach establishes an association "between individual differences in working memory capacity and cognitive abilities (Daneman & Carpenter, 1980, 1983)." The researchers following the above approach believe that 'working memory' capacity dramatically affects the performance in varied cognitive tasks; the larger the working memory capacity, the better is the performance in the cognitive tasks. As per this approach, "working memory" performs two functions – information processing and storage (Baddeley, 1992), which compete while performing demanding cognitive tasks (Daneman & Carpenter, 1980, 1983). Intricate laboratory tasks to measure "working memory" capacity have been designed, and then the results obtained have been correlated with the performance in cognitive tasks (Baddeley, 1992). Thus, multiple studies in "reasoning and reading comprehension in the First language" have been developed using this approach. Daneman and Carpenter (1980) conducted a classic study in the domain of psychometric correlation

approach, whereby they studied the relation between "working memory capacity and reading", which resulted in the development of 'reading span task'.

The reading span task (RST) devised by Daneman and Carpenter became one of the often used "span" tasks or "working memory capacity tasks", which is also a vital performance predictor of several reading abilities. Other tests such as 'Speaking span task' have also been developed to assess working memory capacity (Daneman&Green,1986; Daneman, 1991). This test measure storage and processing of information during sentence production.

Several studies have shown a correlation between "working memory" capacity and first language skills, including spelling (Ormrod & Cochran,1988, in Fortkamp,2000), dictation (Kiewra & Benton,1988), writing (Benton, Kraft, Glover & Plake, 1984 in Fortkamp,2000) and L1 vocabulary learning (Daneman & Green, 1986 in Mendonca, 2003)

1.7 "Working Memory and Reading":

"Reading comprehension is the result of the integration of knowledge and skills such as decoding (Lyon, 1995; Torgesen, 2000), vocabulary (Verhoeven & van Leeuwe, 2008), and syntactic (Cutting & Scarborough, 2006; Oakhill & Cain, 2011) and semantic processing (Nation et al., 1999; Torgesen, 2000). In addition, reading comprehension depends on higher-level control functions (Cain, 2006; Christopher et al., 2012), among which working memory is the most well-established predictor in both adults (Daneman & Merikle, 1996) and children (Cain et al., 2004a, b)" (Nouwens, Groen, & Verhoeven,2017).

Individual variation in reading comprehension performance results from "working memory's capacity to store and process information simultaneously" (Daneman & Merikle,1996, Nouwens et al., 2017). Thus, variance in reading comprehension results from "processing capacities tapped by working memory tasks in both the phonological and the semantic domain"(Daneman & Merikle, 1996).

Baddeley and Hitch (1974, 2000) are widely used working memory models in reading comprehension literature. Baddeley's (2000) model have been used to design various memory tasks, some just to measure the storage capacity, and others to measure both storage and processing.

Several types of research have confirmed that for a "good performance in decoding of written words", it is essential to have a cohesive phonological system and appropriate processing of the information in an organized manner. Thus, phonological processing is essential for decoding written text and allows automatic word recognition, and also enhances attention span, memory, and reasoning, which are essential for the comprehension of the text (Carvalho, Kida, Capellini, Avila, 2014). Furthermore, with the automation of "phonological working memory", more room exists in the "working memory" for meaning-making.

"Higher verbal WM capacity allows engagement of cognitive resources such as the generation of semantic associations, decoding, memory retrieval, and maintenance of salient information to facilitate reading comprehension" (Sesma, Mahone, Levine, Eason, & Cutting, 2009 as cited in Pham & Hasson, 2014).

After regulating the "age, IQ, vocabulary, and word recognition", - Cain, Oakhill, and Bryant (2004) found that verbal WM was responsible for "11.4% of the variance in reading comprehension". A study by Seigneurie, Ehrlich, Oakhill, and Yuill (2000), where vocabulary and reading fluency were controlled, found that verbal WM accounted for 5- 10% variance in reading comprehension.

Apart from verbal WM, the visual-spatial sketchpad also has a role to play in reading comprehension. It stores visual and spatial inputs and linguistic input that can be reassigned to a nonverbal or a visual form. "It allows the visual input to be processed in visuospatial WM, such as reversing the sequence of objects or manipulating images"(Dehn, 2008 in Pham

& Hasson, 2014). Swanson and Howell (2001), in their study on children between 9 – 14, found a high correlation between both "verbal and visuospatial WM and reading comprehension." However, not many researches have established the link between visuospatial working memory and reading comprehension.

Gathercole, Alloway, Willis & Adams (2006) found working memory to be closely related to critical reading difficulties in the developmental stages, specifically in the age group of 6 to 11. In addition, Milwidsky (2008) commented that "children with limited working memory capacities find it difficult to read and write, as they are unable to store sufficient information to be able to perform the targeted tasks."

The studies have found that deficits in "working memory" present an impediment to the acquisition of reading skills (Gray, Fox, Green, Hogan, Petscher, & Cowan (2019); Gathercole, Alloway T, Willis, Adams,2006). In addition, vocabulary and syntactic development is hindered if children have limited "working memory" capacity.

Most of the studies conducted on "working memory" capacity are situated in the field of L1 reading comprehension (e.g. Daneman & Carpenter,1988, Dixon, Le Fevre, Twilley, 1988). Nevertheless, a few research have also been done in the area of L2 and worming memory capacity focused on "speech production, reading comprehension, and acquisition."

Harrington (1991) found a "strong correlation between working memory capacity and L2 lexicon and reading." The association between "L2 working memory capacity and L2 measures of reading" was examined to determine the extent to which it is affected by lexical and grammatical knowledge. The research showed that the "L2 reading span test is an important measure of L2 comprehension"(Harrington, 1992). Mota (1995) explored the relationship between "working memory capacity and L2 speech rate and articulation". A significant correlation was found between "L1 and L2 working memory and reading span test", though the "speaking span test" did not show any correlation. Torres (1998) studied the

relationship between prior knowledge, “L2 working memory capacity”, and “L2 reading comprehension.” Participants scored higher in ‘reading span tests’ and comprehension when their domain knowledge was high. Torres commented that the processing efficiency of the reader affects ‘working memory capacity and comprehension. Finally, Berquist (1998) explored the relationship between “L1 and L2 working memory, reading, and L2 proficiency.” Results depicted a strong correlation between “L1 and L2 reading spans, L1 and L2 word spans, and L2 proficiency.”

Substantial evidence has been provided of the relationship between ‘working memory capacity and reading comprehension. In the next section, the conceptual structure of ‘Inner Speech’ will be discussed.

1.8 ‘Inner Speech’:

The concept of ‘inner speech’, which has been stated by Vygotsky (1986) as one the most “difficult to investigate”, is still the most challenging entity of language to study. This “investigative difficulty” provides the reason as to why this phenomenon is yet the most under-investigated area despite being a crucial language function (Ehrich,2006). “With a few notable exceptions, researchers, such as de Guerrero (1999), Schinke–Llano (1993), and Upton and Lee Thompson (2001), have been calling for future research into this phenomenon for several years, with regrettably, very little response” (Ehrich,2006). ‘Inner speech’ research is still in its nascent stages. The study hereby proposes to understand the complex relationship between “reading, inner speech, and working memory.” Primarily inner speech has been taken as a construct to understand the reading as a process.

Though the term “inner speech” has been represented in multiple ways, one thing that has remained constant is the notion that it is “a silent manifestation of speech directed to oneself” has been resolute (Guerrero, 2005). Sokolov (1972) defined it as "soundless, mental

speech, arising at the instant we think about something, plan or solve problems in our mind, recall books read or conversations heard, read and write silently".

> “Vygotsky (1986) himself referred to inner speech in a multiplicity of ways: as “an entirely separate speech function" (p. 235), a "mental draft," (p. 243), "inner dialogue" (p. 243), "practically wordless 'communication'" (p. 243), "speech almost without words" (p. 244), "a distinct plane of verbal thought" (p. 248), "thought connected with words," (p. 249), and "thinking in pure meanings" (p. 249). (p.1). “He also called it concealed verbalization" and “the speech mechanism of thinking" (p.l). Korba (1989) referred to it as "covert, /intrapersonal language behavior" (p. 219) whereas Morin (1993) equated it with "self-talk" or "internal dialogue" (p. 223). In other instances, inner speech has been interpreted as a "voice in the head" (Beggs & Howarth, 1985, p. 396) and as a rehearsal mechanism supporting interaction between the "inner ear" (auditory imagery) and the "inner voice" (subvocalization) (Smith, Reisberg, & Wilson, 1992).”(Cited in Guerrero, 2005, pp-15)

Different theorists tried defining ‘Inner speech’ in varied ways, but there are three elements that are the basis of every definition. First, inner speech is silent, oriented towards oneself, and it is a spoken language that is language in action and not an abstraction. In the next section, the inner speech will be traced historically.

1.9 Historically tracing the concept of ‘Inner Speech’:

The earliest reference to ‘Inner speech’ can be found in Plato’s passage in which Socrates explains the meaning of thinking “the conversation which the soul holds with herself in considering anything. …asking questions to herself and answering them, affirming and denying and when she has arrived at a decision” Plato defines “thinking as an internal dialogue with one's soul and as words spoken in silence highlights not only the role of inner speech in thinking but also the dialogic nature of inner speech” (cited in Guerrero, 2005). Sokolov subscribes to the notion that “thinking is the same as speaking”. (Sokolov, 1972). Being an idealist, Plato believed that everything exists in a pure state that can be accessed through internal or external dialogue. Thus, thinking is not integrated with inner speech; inner dialogue is made to access true knowledge (Guerrero,2005).

The relationship between “thinking and speech” has divided the researchers into two distinct camps “ (1) Thought and speech are identical and therefore thinking is just inaudible speech, and (2) Thought and speech are not linked. The latter idea implies that thought exists in pure form and speech is just the "expression" of thought” (Sokolov, 1972). With the advent of behaviourism in the 20th century, thought was perceived as “speech minus sound”. In contrast, the Wurzburg school of psychology forwarded the idea of the complete separation of speech from thought. where intellect became "a pure spiritual power" (Vygotsky,1962/2012). How ‘inner speech’ is viewed and conceptualized today has been greatly impacted by these two conceptualizations of the relationship between thought and speech.

Wilhelm von Humboldt, a German linguist, has been credited for coining the term inner speech. Though he defined it, Muller, Potebnya, and Vygotsky further developed his idea. Muller emphasized the integration of “thought and language”, wrote in 1892: "There is no reason without language. There is no language without reason" (Sokolov, 1972 cited in Guerrero, 2005). Potebnya, a Ukrainian linguist, did not “equate thought with language”, nor did viewed “ language as a mere expression of thought.” Instead, he looked at language means of creating (Sokolov, 1972). According to Sokolov (1972 cited in Guerrero, 2005), two French authors initially investigated the phenomenon of inner speech. “Victor Egger, a philosopher and psychologist, wrote La Parole Interieure in 1881, and Gilbert Ballet, a physician interested in aphasia and author of the 1886 Le Language Interieur.” These scholars viewed the “inner speech as a mere vehicle of thought” which had no function in the thinking process. They were interested in the “nature of the images” through which words got represented in ‘verbal memory’. Egger, on studying his own thought conjectured, that ‘inner speech’ was based on auditory images: "My inner speech (ma parole interieure) ... is a

reproduction of my voice" (Sokolov, 1982). Strieker concluded that “inner speech consisted of motor representations” (Sokolov,1982).

Vygotsky, a social culture theorist, is regarded as the foremost exponent of the ‘inner speech’ theory. Marxist perspectives govern his theory and conceptualization. Apart from Potebyna’s ideas on language and thought, Vygotsky found all other conceptualizations insufficient. Vygotsky (1986 cited in Guerrero,2005) repudiated the conceptualization of ‘inner speech’ as verbal memory: "It was in this sense that inner speech was understood by the French authors who tried to find out how words were reproduced in memory-whether as auditory, visual, motor, or synthetic images" (p. 224). As per Vygotsky, verbal memory is only a part of inner speech and not all of it. He also disapproved of inner speech’s conceptualization as speaking in silence." Watson's definition of ‘inner speech’ as "subvocal speech," was rejected by Vygotsky. He also found Russian reflexologists’ concept of ‘inner speech’ as a “reflex truncated in its motor part” to be incomplete (Vygotsky, 1962/2012). Vygotsky’s view was also in contradiction with Goldstein’s all-encompassing definition of ‘inner speech’ “as all the mental processes that precede the act of speaking, including thought, motives, and emotions”.

In support of his conceptualization of ‘inner speech’ as "an autonomous speech function" (p. 248, cited in Guerrero, 2005), Vygotsky declined both “reductionist and all-encompassing” views of ‘inner speech.’ Instead, Vygotsky’s views reflected Potebnya’s notion, "thought does not express itself in words, but rather realizes itself in them" (p. 251cited in Guerrero, 2005). Vygotsky’s conception of ‘inner speech’ was not only based on Humboldt and Potebnya concept of ‘inner speech’ but also on the Jakubinsky, to whom he referred while “comparing inner to dialogic speech”, and he borrowed the differentiation of sense and meaning from the French psychologist Paulhan which he used while discussing the semantic aspect of inner speech. Vygotsky’s ingenious contribution in the study of ‘inner

speech' came with a treatise on connecting inner speech with egocentric speech, an occurrence that Piaget noted but disregarded it as insignificant for a child's cognitive development.

Vygotsky (1986) looked at inner speech through the lens of historical materialism; thus, it becomes "a capacity which is not innate but rather a historical-cultural product: Once we acknowledge the historical character of verbal thought, we must consider it subject to all the premises of historical materialism" (pp. 94-95,1986). Vygotsky prepared the ground for studying 'inner speech' through the lens of socio- historicism. To understand "inner speech as a socio-cultural-historical construct", we need to see it in the light of cultural-historical activity theory, whose leading proponent was A. N. Leontiev. "Conceptualizing inner speech from an activity theory point of view reiterates the notion of inner speech being a process originating from human, social, practical, and communicative activity rather than as an inherent faculty of the mind." (Guerrero, 2005)

1.10 Language and Thought- Related or Unrelated:

The relationship between language and thought is still an enigma that researchers are trying to decode, which is apparent from Carruthers and Boucher's treatise "Language and Thought" published in 1998. The debate of language and thought has been revived by renewed interest in consciousness and how the creation of the experience of consciousness is advanced by language (Guerrero, 2005). One major issue that has been discussed amongst researchers is the role of "inner speech in conscious thought and whether consciousness is possible without it." The question remains: "Is language independent of thought, or are language and thought inextricably related? (Guerrero, 2005)".

Carruthers and Boucher (1998) suggested two approaches to answers this question. First, the communicative perspective of language, the of philosophers of mind and language from this school of thought such as "Locke, Russell, Grice, Searle, Fodor, Chomsky, and Pinker"

primarily view language “as a means of communication, rather than as an essential tool of thought” and the cognitive conception of language. As per thinkers of the communicative tradition, fundamental thinking is carried out in an abstract representational or computational language; thus, inner speech is seen as just an encoder/ decoder of pure thoughts. Fodor did not view the "language of thought" as natural language. As per him, it was “Mentalese, an innate representational metalanguage in which the computations, or cognitive processes, are carried out” (cited in Guerrero,2005).

Another variation of this approach is the supra communicative conception of language, which considers “language as an enhancer of thought” thought is construed as an independent entity (Carruthers & Boucher, 1998). Clark (1998) and Jackendoff (1996) hold the view that “language in the form of inner speech helps thinking, rather than constitutes thinking.” The researchers belonging to the cognitive school of thought believe language is intrinsically associated with thinking, therefore the idea of “thinking in natural language”(Guerrero,2005). Carruthers and Boucher (1998) identified many supporters of this position in a varied group of philosophers and psychologists. However, these thinkers differed in their view of how language is implicated in thought- “those who think that thought *requires* language and those who see language as constitutive of thought” (Carruthers & Boucher, 1998 cited in Guerrero, 2005).

The significant differentiation: "It is one thing to say that language is required for or is a necessary condition /thought or certain kinds of thought... and it is quite another to claim that language itself is constitutively involved in those thoughts, or is the medium of those thoughts" (Carruthers & Boucher, 1998, cited in Guerrero, 2005). As per Carruthers and Boucher’s division, Vygotsky should fall in the ‘required for’ category. It is also commensurate with his view on egocentric speech, which internalizes and transforms into

inner speech. The views on Egocentric speech will be delved into to understand 'inner speech' development in the next section.

1.11 Egocentric speech- Piaget and Vygotsky

In the Vygotskian view, "the child's initial speech is communicative rather than intellectual; speech for the young child is an external form of social interaction and control"(Vygotsky,20120. Gradually, speech acquires the function of "cognitive self-regulation and becomes means of thinking and not just communication (Vygotsky,1962/2012)."

Social speech turns into egocentric speech, a transitional phase as per Vygotsky, marking the difference in his conception of egocentric speech from Piaget. Vygotsky critically challenges the theorists such as Piaget and Stern in their interpretations of the relationship between language and thoughts and its development. Vygotsky criticizes Piaget's theory for it, impressed greatly upon ego-centrism.

Piaget proposed the existence of two kinds of thoughts- Directed (conscious and adapted to reality) and Autistic (strictly individual, creates for itself a reality of imagination or dreams). The ego-centric thought of a child lies exactly in between these two. That is to say, it satisfies personal needs and includes specific mental adaptations. He conjectured that it is egocentrism, which permeates the entire thinking of a child. Socialized thinking starts to take shape after seven years of age, but egocentric features do not vanish but remain there as a thought. This egocentrism, he said, is not influenced by the social world. It has implications for the language used by children. As understood by Piaget, thus, "the conversations of children fall into two groups-the egocentric and socialized." Till the age of seven or eight, a child's thoughts are ego-centric, and so is his speech. After that age, the egocentric talk subsides, but egocentric thought remains, i.e. after he grows up, there are thoughts within him that are incommunicable to others (Schmidt,1983).

On the other hand, Vygotsky takes a very different position and argues that ‘egocentric speech’ is not an accompaniment to the child’s activity, which disappears after a certain age. Instead, it takes the form of ‘inner speech’ that plays a vital role in a child's cognitive development. Egocentric speech, he says, is a transitional stage in the evolution from vocal to inner speech. The inner speech becomes an instrument of thought for a child and helps him in problem-solving (by directing himself, planning towards a purposeful behaviour). However, this must be understood as merely a social phenomenon. Such a higher mental function (problem-solving by inner speech) exists first between people as they communicate and then within the individual as a cognitive process.

Another theory that Vygotsky refutes is that of Stern. Stern expounded that the development of language is dependent upon the “intentionality” of speech. He objectifies speech, and this search for an objective leads to a development of language (speech). There occurs a critical change in the child when he inquiries about the names of objects around him and, in the process, build up his vocabulary (Vygotsky, 1962, pp 27).

Vygotsky looked at the social determinants responsible for the turning points in a child’s linguistic and intellectual development. As stated earlier, a child understands a word only when there is a meaning attached to it or any conceptualization of that word. However, is it doubtful if a child of 1.5 years has an awareness of “Convergence”? This should not be mistaken the way Vygotsky has placed importance on social factors because, in convergence, the external environment only accelerates or slows the development of speech, which follows its laws of “intentionality”. The relationship of thought and speech undergoes many changes, and they may also develop along different lines (Vygotsky, 1962/2012).

Speech development goes through “external speech” to "egocentric speech" and then is internalized as ‘inner speech’. As already stated, inner speech depends upon outside factors. As the external operation of speech turns inwards, a profound change occurs as the

child begins to use logical memory. There is a constant interaction between the inner and outer world. The speech becomes a basic structure of his thinking. In other words, thought development is determined by language: linguistic tools, and socio-cultural experience (Vygotsky, 1962/2012).

Vygotsky looks at egocentric speech as a near approximation of 'inner speech'. However, unlike Piaget's conception, 'egocentric speech' has a role in determining a child's realistic thinking. He suggests that the coefficient of ego-centrism does not decrease as a child grows; instead, it becomes more pronounced, making it difficult to understand a child's thoughts.

His experiments completely refuted Piaget's thesis by proving that egocentric speech disappears when the feeling of being understood is absent, group monologue is excluded (Sasso & Morais, 2014). 'Egocentric speech' (inner speech) develops out of social speech.

"Egocentric speech is a transitory phase that marks the beginning of speech internalization. It is denoted by less than intelligible and frequently abbreviated language" (Vygotsky, 1962/2012). "Egocentric speech" is a "self-directed speech" but spoken loudly and performs a private intellectual function. Gradually, vocalization, the last social feature of 'egocentric speech', is dropped, turning inwards as 'inner speech'. This transition transforms the function of speech from majorly communicative to the intellectual and the structure. As 'inner speech' is self–directed, it becomes "vocally imperceptible, syntactically reduced, and semantically condensed" (Guerrero,2005).

Galperin (1967), who researched the process of internalization, proposed that there are two stages are which are necessary for the formation of higher mental functions:

"External speech for oneself and inner speech." "The first form of 'action in mind' is ordinary speech but without the volume" Though it has been considered as a transitory step towards the formation of psychological action. When it has been "mastered and automatized,

external speech for oneself gets reduced to verbal meanings, and the action transfers to the plane of inner speech."(Galperin 1967 cited in Guerrero, 2005)

As per Galperin, the "essence" of former planes is never lost in cognitively demanding situations; there is a tendency to go back to the "external mode" of self-regulatory speech. Adults at times externalize their "inner speech" in the form of audible "private speech" when encountered with cognitively demanding tasks; Frawley and Lantolf (1985) "referred to this aspect of mental activity as the principle of continuous access".

Though for certain functions this internalization never happens, Vygotsky (1978) established that: "For many functions, the stage of external signs lasts forever, that is, it is their final stage of development" (p. 57/ 1962). Wertsch (1998) defined this construct as "mastery and appropriation." The idea of "mastery" put forwards the possibility that a few forms of mediated action might never turn inwards and vanish, as mastery is knowing 'how to do a thing' whereas appropriation is making something one's own, construction of knowledge. Thus, the movement from mastery to appropriation can be seen as a movement from external to inner speech.

> "The decreasing vocalization of egocentric speech denotes a developing abstraction from the sound the child's new faculty to think words instead of pronouncing them. This is the positive meaning of the sinking coefficient of egocentric speech. The downward curve indicates development towards inner speech… (Vygotsky,1986)"

1.12 Features of Inner Speech

As inner speech develops, there is a tendency towards prediction, where a person removes the subject and verb from the sentence in his thoughts and abbreviations. The "sense of a word, which is the sum of all the psychological events aroused in our consciousness by the word" (Guerrero, 2005), predominates the meaning of the word; "a single word is so saturated with its sense" (Guerrero,2005) that to explain it in external speech, one would require multiple words. That is to say that a person knows multiple meanings of a word in his

inner speech, but when in a particular situation he has to explain that thing in the form of external speech, he will have to contextualize that using many words.

In other words, it is difficult to express that inner speech into words; it cannot be simply vocalized. Thought assumes importance. It is not just words that are vocalized but thoughts. The speaker takes time to disclose his/her thoughts; though complete thought is present at once, it develops successively in speech. The translation of the "predicative structure of inner speech" is required to make the speech intelligible to others. To understand this, we move even beyond inner speech to thoughts. Different thoughts may lead to different speech. Thus, the transformation of inner speech to external speech depends on the underlying thought, which must first pass through meanings. It needs to be understood that external speech is not just words but thoughts and motives also. That is how thoughts make a transition towards words through various planes. (Vygotsky,1962/2012).

Vygotsky (1986 cited in Guerrero, 2005) states, "…inner speech is speech for oneself: external speech is for others. Thus, inner speech is an independent speech function." Syntactically 'inner speech' and external speech are different; "inner speech consists of predicates (the leaving out of the subject) and is highly abbreviated. Predication is the natural form of inner speech. It is as much a law of inner speech to omit subjects as it is a law to have both subject and predicate in written language" (Vygotsky,1962/2012).

Thus, as described by Vygotsky, the main characters of inner speech are- First, soundless is the most apparent and observable feature of inner speech. It cannot be simply considered "speech- minus sound" as it is not its soundless nature that makes it peculiar but its "abbreviated syntax". The words are omitted in 'inner speech' because we know the subject and situation; therefore, they can be left. "Vygotsky hypothesized that the typical syntactic structure of inner speech is predicative. The predicativeness of inner speech is

sometimes so extreme that the inner speech is speech almost without words (Guerrero, 2005)."

The third is the presidency of "word sense over word meaning." "Borrowing from Paulhan (1928 cited in Guerrero,2005), word sense is described as "…the sum of all the psychological events aroused in our consciousness by the word". Word meaning is a fixed entity, whereas word sense is defined through the situation and it changes with change in the context. "Word sense has multiple zones, of which meaning is just one (Vygotsky, 1962/2012)." Vygotsky explains word sense by use of the word "souls" from Gogol's novel *Dead* Souls. The term "souls" in the Gogol's novel refer to "serfs or servants". The novel is about the charlatan who travels across 19th century Russia where he buys "the deeds and titles of dead souls or servants" to represent himself as an aristocrat. As the novel goes forward the word 'soul' begins to take a new meaning. The "sense of the title *Dead Souls*" integrates with varied aspects of the novel, e.g., the plot, 19th century Russia, Russian people at the time, and gives the overall sense of the novel. Thus, the word – Dead and Souls, invoke multiple meanings and semantic nuances. Individual words are combined into a single entity communicating a complex idea and the meanings of its elements; this process is known as "agglutination"; and that "sense of words combine and flow into one another and influence each other (Vygotsky, 1986)." Due to word sense and agglutination development, inner speech is found in two forms, "a syntactic form (predication) and a more meaning-centred form." 'Inner speech' has a distinct language function is woven around "word sense and meaning." Syntactically also it has a distinct structure in comparison to external speech.

Frawley (1997) studied "inner speech within the framework of sociocultural theory"; he considered a socially originated language, both private and 'inner speech', as a biologically given language of thought.

1.13 Theoretical Frameworks Informing Research in Inner Speech

Presently, 'inner speech' is being studied in almost every field where "thought and language" cross each other. Inner speech has been closely studied in cognition in areas such as cognitive psychophysiology, psycholinguistics, neurolinguistics, and applied disciplines such as language education, speech pathology, and speech communication (Guerrero, 2005). Two major theoretical conceptualizations form the basis for 'inner speech research. One is based on Vygotsky's (1962,1986) writing, i.e., "Sociocultural theory view, and the other is cognitive psychology information processing framework, in various models of working memory'(Baddeley and Lewis, 1981; Baddeley, 1986 cited in Guerrero,2017)." The social origin of the thinking function of inner speech is focused on sociocultural theory perspective while in information processing perspective approaches inner speech as a subvocal mechanism which is essential for "maintenance and manipulation of information in working memory.(Bushbaum & Esposito, 2008)" "These two perspectives on IS (inner speech)—its equation with verbal thought and its role in VWM (verbal working memory)—are not mutually exclusive although they come from distinct theoretical approaches to cognition, and most SCT and IPF oriented studies do acknowledge, although give relative weight to, both verbal thought and mental rehearsal as IS descriptors" (Guerrero,2017).

There are divergent views regarding what is "inner speech within the sociocultural theory framework", it majorly oscillates between (Zinchenko 2007: 219) the notion of "inner speech" as "thought connected with words" and "thinking in pure meanings" (Vygotsky 1962/2012). Lantolf & Thorne (2006: 206 cited in Guerrero,2017) strictly adhere to "Vygotsky's conceptualization of inner speech as thinking in pure meanings", thus reducing inner speech to just semantics or meaning. However, other researchers such as Sokolov, Vocate, and Guerrero lean more towards inner speech as "thought connected with words", and Vygotsky's put forward the idea of inner speech "having a predicative syntactic form,

allow it to adopt, at times and for certain cognitive functions— for example, during self-talk or in preparing what to say—certain formal properties, such as abbreviated syntax(preservation sentence elements that encode new or focal information) and word forms saturated with senses"(Guererro, 2017). Within this view inner speech can be conceptualized as fluid constantly moving between "wordless thought and more expanded, elaborate, and often discursive linguistic form."

> "Recently, IS has been defined as 'internalized, inaudible verbal thought that may or may not reach conscious awareness and may or may not is accompanied by subliminal vocal activity'(Marvel & Desmond 2012: 43) and as 'subvocal self-talk that takes place in an identifiable linguistic code and is directed primarily at the self" (Pavlenko 2014: 256 cited in Guerrero,2017)

Both perspectives of inner speech have been utilized; as previously stated, they are not mutually exclusive. Thus, the information processing perspective has guided the research question based on 'working memory' and reading, though the sociocultural theory perspective has informed overarching explanation and analysis. In the next section, the studies in the area of reading and inner speech will be reviewed.

1.14 Reading and Inner Speech:

Several studies have been carried out in the field of educational psychology concerning "inner speech in language learning and cognition (Guerrero,2005)." Researches have been conducted in the area development of 'inner speech' and its role in cognitive development of children. Notably, the role of "inner speech as a mediator in reading" has been explored by Hardyck & Petrinovich, 1970, Beggs & Howarth, 1985 and Yaden in 1984; its role in writing was studied by Moffet in 1982 & 1985 and Trimbur in 1987 and Rohrkemper in 1986 studied the role of "inner speech in mathematical problem-solving." In addition, researches have been conducted to study the development of "inner speech awareness and the probability of teaching children to use inner speech(Liva, Fijalkow, & Fijalkow, 1994; Otte, 2001) (Cited in Guerrero, 2005).

Huey (1908/1968, Cited in Yaden,1984) commented that it was “not uncommon for the readers to experience inner voices during silent reading”. Further, Coltheart, Besner, Jonasson, & Davelaar(1979) in their study reported that “inner speech was an elusive experience and most prominent in beginning readers and when seasoned readers processed difficult text”. The focus of present debates in the area of ‘inner speech’ is about its role in “silent reading”, for example, “dual-route theory states that word meanings are accessed through either a direct visual route or a phonological route (Coltheart, 1978; McCusker, Hillinger, & Bias, 1981; Seidenberg, Waters, Barnes, & Tanenhaus, 1984).” The phonological route requires printed words to be translated into a speech code before lexical access, thus making it slower to access meaning. The dual-route theory proposes that the phonological route is primarily used by “unskilled readers or is used when words are unfamiliar, as these situations preclude direct visual access.” (Abramson& Goldinger,1997).

Other theories argue the use of phonology as inevitable of reading. In an experiment conducted by Van Orden in 1987, college students were asked to “verify if the words were examples of the given categories. In a category such as animal, participants made many false-positive errors to homophone foils, such as bare, relative to spelling control foils, such as bade. This finding, along with many others (e.g., Glushko, 1979; Healy, 1976; Lukatela & Turvey, 1993), indicates that phonology affects silent reading, regardless of a reader’s skill.” Though the role of phonology in lexical access is debatable most of the researchers agree on its role storage of words in “working memory” post its access for comprehension of the sentence (Huey, 1968; McCutchen & Perfetti, 1982; Perfetti, Zhang, & Berent, 1992). Rarely there are any researches which have tried to explain the “nature of the implied phonological representations, are they similar to overt speech, such that readers experience “inner voices,” or are they more abstract? (McCusker et al., 1981).”

Huey (1908/1968, Cited in Yaden,1984) proposed that “phonological representations in reading were auditory in nature. He observed that silent reading involved auditory imagery or a voice in the head”. A similar view is that “inner speech entails sub articulation.” Stricker (1880, Cited in Abramson et al., 1997) suggested that “silent reading was impossible without some movement of the larynx and lips”. Behaviourists readily aligned to this view and dropped the “mentalistic ideas such as auditory imagery in favour of more concrete, observable behaviours.” (Ambrason & Goldinger, 1997). Watson (1919, Cited in Abramson et al.,1997) proposed that thought was rooted in overt speech, and it becomes sub articulate with maturation. The same sequence of development was proposed for reading as well. Initially, words are sounded out externally; then, gradually, this vocalized reading gets internalized.

In research done by Reed in 1916, it was found that “subject moved their tongue while reading the text silently, whispering text, and reading text aloud, but not when they sat relaxed.” The only difference being in amplitudes of tongue movements in three reading conditions. “Faaborg-Anderson and Edfeldt (1958 cited in Abramson & Goldinger, 1997)” found that with the increased difficulty of the text, the activity in vocal musculature increases; similar results were reported by Hardyck & Petrinovich, 1970 Sokolov, 1972. Despite these findings, there is no clarity on whether silent reading always entails subvocal speech or not.

The opposing researchers “suggest that inner speech is faster than overt speech (Anderson, 1982; Foss & Hakes, 1978), it lags behind comprehension (Gough, 1972; Rohrman & Gough, 1967; also see McGuigan, 1984), and that thought can occur without subarticulation (Smith, Brown, Toman, & Goodman, 1947)” (cited in Ambrason et al.,1997). Given these contradictory results, McCusker (1981) concluded that subarticulation could be epiphenomenal and not necessary for reading. McGuigan (1984) observed that

subarticulation had compliant properties; for example, increased cognitive workload resulted in increased subvocal activity. As per Beggs and Howarth (1985), 'inner speech' provides access to prosodic elements such as intonation, stress, rhyme and rhythm during silent reading, 'inner speech' in a way "give voice" to these features which facilitate reading comprehension. Beggs and Howarth's (1985) study supports the notion that inner speech in reading is not just the case of access to abstract sound codes that assist word identification.

J. F. Ehrich (2006) has argued that 'inner speech' condenses "easy to read text into compact meaning units through agglutination, predication and word sense." It is through these processes that Vygotskian 'inner speech' "contracts to act as an efficient storage system for word meaning." Ehrich's model explains the "reading process as the interaction of inner speech expansion and contraction." He proposed considering "phonological activations in reading as inner speech per se and expansion of inner speech as a subvocal rehearsal to solve reading problems."

> Leontiev(1978) "argued that inner speech as a cognitive process has a direct memory function. He described inner speech as having two codes: a code to plan the speech and to retain content in STM, and as a code to solve problems. In terms of retaining content in STM as a function of inner speech, there are many studies from cognitive psychology which support this claim. These studies have demonstrated that speech codes are used as a form of rehearsal (also known as a subvocal rehearsal) to prevent decay or memory loss in STM (Baddeley, Thomson, & Buchanan, 1975 cited in Ehrich, 2006)

Baddeley's (1986) concept of phonological code is the process of rehearsing information to prevent the decay of information. As explained earlier, his "working memory model consists of a tripartite system involving a central executive processor and two slave systems". The phonological store acts as a repository for verbal information, and the visual cache stores visual information. "Verbal information is rehearsed within the phonological store through a mechanism referred to as the phonological loop, which functions to prevent memory loss in 'STM' or working memory" (Baddeley, 1986 cited in Ehrich, 2006). As per research, information can be stored by children younger than seven as "phonological codes"

but it is post 7 years of age that "actual silent rehearsal of this phonological information occurs (Cowan & Kail, 1996; Flavell, Beach, & Chinsky, 1996 Cited in Ehrich,2006)." This brings forth the link between "subvocal rehearsal" as a medium to maintain verbal information in 'STM' and Vygotskian 'inner speech'. Vygotsky (1962/2012) proposed that "egocentric speech changes into inner speech at around seven years of age and the same age, children begin to subvocally rehearse words in their mind to remember them."

Craik and Watkins (1973) distinguished subvocal rehearsals as "maintenance and elaborative". "Maintenance rehearsal comprises of subvocalization of words to retain them in STM (Ehrich, 2006)" whereas elaborative rehearsal is an intricate process essential for retention of information in memory beyond the short term (Craik & Watkins, 1973). Both are used in the context of reading. "Subvocal rehearsal has been linked with the storage of words in English reading (e.g., Kleiman, 1975; Pollatsek, Lesch, Morris & Rayner, 1992)." Pollatsek et al. (1992) linked "phonological coding in word identification to phonological coding in STM." The research done Pollastek et al.(1992) stated that there is "general agreement among reading researchers that phonological coding helps readers retain information in STM."

The way 'working memory' functions, a direct linkage to inner speech can be imagined in the form of a facilitator. Chunking increases 'working memory' capacity and inner speech work with word sense and agglutination, which can further enhance the quality of chunking, thus, 'working memory'. Even phonological loop works on rehearsal which is overt, thus presumably part of inner speech.

1.15 Researches in reading, inner speech, and working memory with foreign language and second language perspective.

Most of the studies in 'inner speech' have been conducted from a single language perspective. In the 1990s, in the Soviet Union, studies were conducted in the field of 'inner

speech' with the perspective of the second language and foreign language. Preeminent among these was Sokolov's s (1972) "Psychophysiological Research on Inner Speech", comprising the reading of foreign language texts. Zachesova and Ushakova (1994) conducted experiments to study 'inner speech' mechanisms when language has artificially acquired. A few non-empirical research were conducted outside the Soviet Union to study the link between "inner speech and L2/FL learning (Hellmich & Esser, 1975; Rohrer, 1987 cited Guerrero,2005)." Frawley and Lantolf (1984 &1985) conducted the early L2 studies based on sociocultural theory, which focused on "inner speech features that get externalized in the private speech of L2 learners."

In 1990, two major empirical studies were conducted which withdrew support from Vygotsky's sociocultural theory to study "mental rehearsal as a phenomenon related to L2 inner speech"(Guerrero 2005). The retrospective questionnaire and interviews were used; the initial studies showed that "L2 learners do have inner speech in the L2." Researches conducted in the late 20th and early 21st centuries provided essential insights into L2 inner speech processes. Some of the most critical studies in the areas of "verbal thought among bilinguals (Steiner, 1985b), preference for a language of thought among L2 learners (Cohen, 1998), private speech (example, Lantolf & Yanez, 2003; McCafferty, 1994a, 1994b; Ohta, 2001), and language play (Lantolf, 1997)" (Cited in Guerrero,2005). Quite a few researches within the "L2 inner speech" research have explored the "role played by the LI in inner speech processes." There are researches which have been done in the area of "L2 vocabulary acquisition (Ushakova, 1994), symbolic gestures (McCafferty, 1998; McCafferty & Ahmed, 2000), reading (Upton & Lee-Thompson, 2001), and writing (Huh, 2002), provide evidence of inner speech being strongly influenced by LI semantics."(Guerrero,2005)

The present study looks at the sub-vocal activity of the readers to see whether it has a particular function in reading or it is an epiphenomenal, as suggested by Mc Cusker,

Abramson, and Goldinger (1997). The study also looks at how retention in 'working memory' is affected by the use of a particular language and the "relation between reading, inner speech, and working memory" in the context of multilingual readers.

1.16 Theoretical Framework: Vygotsky and Inner Speech: Socio-cultural perspective

Several researchers have used Vygotskian 'inner speech' as a theoretical framework to study reading as a process. For example, Guerrero, 2004 & Sokolov, 1972 found that 'inner speech' plays a pivotal role in reading. The research in the area of reading was lately also informed by other developmental and constructivist viewpoints, which brought in a new perspective and helped develop reading research as a science (Karmiloff-Smith,1992). Looking at the reading process through the lens of Vygotskian inner speech helps understand reading at many different levels and initiates a new line of empirical investigation.

Marx's philosophy greatly influenced Vygotsky's theory that "the social structure or nature that influences the human mind or psychology" (Guerrero,2005). Thus, his work looks at the cultural settings having a significant effect on shaping a child's cognitive development. "The main tenets of socio-cultural theory can be summed as (a) the social origin of higher mental functions and the related concept of internalization, (b) tool and sign mediation, (c) the genetic analysis of higher mental functions, and (d) basic principles of activity theory (Guerrero, 2005)."

Vygotsky put forth the idea of developing higher psychological processes first on the social plane, in interpersonal relationships, and in the interaction with physical, cultural, and symbolic tools that are part of the social world. Then these functions get internalized at an intra- psychological level. Finally, it is captured by Vygotsky's famous "law of general development."

> " Every function in the child's cultural development appears twice: first, on the social plane, and later, on the individual plane; first between people (inter-psychological), and then inside the child (intra-psychological) (Vygotsky,1978)."

Internalization is pivotal for the development of higher psychological functions. Internalization by Vygotsky(1978) is seen as the process by which "external sign-mediated activity is reconstructed on the internal plane and begins to operate as higher mental activity". The reconstruction process meant transformation and not just transference of interpersonal activity to intrapersonal activity; it leads to creating a new psychological plane. Leontiev (1981 cited in Guerrero, 2005) expressed: "The process of internalization is not the transferal of an external activity to a preexisting, internal plane of consciousness: it is the process in which the internal plane is informed. Transformation is marked by a series of developmental changes in the function and structure of social forms of behaviour."

In consonance with the Vygotskian view of inner speech, Baddley and Hitch's (1974) model of 'working memory' has been used in the study to explore and understand the relationship between reading and inner speech for bilingual/multilingual learners. Their model conceives inner speech in the process-oriented role, which is being used in problem-solving and higher-order cognitive processes; that is the role Vygotsky proposed.

1.17 Rationale of the study:

Large numbers of researches have been carried out in the field of reading, reading and inner speech, and reading and working memory. However, very few studies look at the dynamics of inner speech, working memory, and reading. However, some of the studies have tried to explore the relation of working memory and inner speech but not in the context of reading. Moreover, all the studies carried out till now tend to assume the reader to be monolingual, whereas, in the case of India and many other countries, every reader will be bilingual at the least. Thus, this study aims at exploring the relation of all three in a Bilingual/ multilingual context. Thus, the study can guide multilingual pedagogical practices for reading and also guide language policy formation.

Operational Definitions:

Reading*:* "Reading is a number of interactive processes between the reader and the text, in which readers use their knowledge to build, to create, and to construct meaning*."(*As defined by TESOL/ UK).

Inner speech: "Inner speech is not the interior aspect of external speech—it is a function in itself. It still remains speech, i.e., thought connected with words. But while in external speech, thought is embodied in words, in inner speech, words die as they bring forth thought. Inner speech is, to a large extent thinking in pure meanings. It is a dynamic, shifting, unstable thing, fluttering between word and thought, the two more or less stable, more or less firmly delineated components of verbal thought" (Lev Vygotsky, *Thought, and Language*, 1934. MIT Press, 1962/2012).

Working memory: "It is a system of components that holds a limited amount of information temporarily in a heightened state of availability for use in ongoing processing." (Cowan, 2017).

Home language: Language spoken by children at home and majorly in a non-formal context. In most cases, this is the first language that children acquire from their immediate environment.

Second language: "This term is used to refer to a language which is not a mother tongue but is used for certain communicative functions in society. It is learned after the first language (L1) or mother tongue. For example, English is a second language in India, or French is a second language in Tahiti. This term refers to non-native speakers who are learning, for example, the English language in an English language environment. There are usually programs designed for students learning a certain language as an additional language." (Wikipedia)

Third language or foreign language: Language that child learns in a unique environment for a specific purpose. It can be a foreign language or an indigenous language but not spoken in a child's environment.

1.18 Research questions:

- Is comprehension affected if subvocal rehearsal is impeded?
- Does language proficiency affect articulatory suppression?
- Does the impact of articulatory suppression the same in the case of 1st and 2nd language?
- Does the language of the text have an impact on its retention in working memory and thus comprehension?
- Do learners code switch, code mix, and translate in their inner speech while reading a text in L1 and L2?
- Does the kind of text – literary or domain-specific have an impact on the language of inner speech?

1.19 Method:

Children in the age group of 5 to 8 years were randomly selected, and linguistic profiling was done; children exposed to at least 2 languages were selected. As a result, 60 bilingual/multilingual children were selected in the age group between 5 to 8 years.

Studying "inner speech is a methodological challenge because of its covert and elusive nature, inner speech is an exceedingly difficult phenomenon to examine empirically" (Vygotsky, 1962/2012). Vygotsky solved the problem presented by the exclusivity and dynamic nature of "inner speech by viewing it from an experimental- developmental viewpoint a method that allowed him to make inferences about inner speech through observation of egocentric speech" (Guerrero,2005). Following Vygotsky, many have employed the "genetic method by focusing on private speech. That is the ontogenetic predecessor of inner speech."

“Inner Speech” has been studied by employing various alternative methods such as “verbal report methodology’, such as questionnaires, interviews, think-aloud techniques, first-person narratives, learner diaries, and thought sampling takes advantage of those aspects of inner speech that are available to intro or retrospection” (Guerrero, 2005). Besides, “inner speech” has been studied using techniques such as neuroimaging, speech interface, and electrophysiological measurements.

To study the first, second and third questions, a reading experiment utilizing a “sentence verification task” was performed whereby “subjects were presented with long, complex sentences, some of which were semantically meaningful and some were not. Sentences, which were not semantically meaningful, were structurally similar to the semantically meaningful sentences except that they contained an anomalous word (Baddeley & Lewis, 1981, p.113).” “The verification task” was to ascertain “whether or not each complex sentence was meaningful. During the verification tasks, subjects were required to count repeatedly from 1 to 6 to impair the phonological processing (this technique is known as articulatory suppression)”(Baddeley & Lewis,1981). The task was done twice, once with suppression (experimental) and once without suppression(control) in both English and the home language.

An altered version of the “Daneman & Carpenter reading span task” was used to study the impact of language on retention in “working memory’. Two tests were prepared as per the reading level determined ASER in both L1 and L2.

To study the impact of bilingualism/multilingualism on the language of “inner speech” while reading a literary or a domain-specific text in L1 and L2, the technique “introspective verbal report” was used.

The first two questions, the third, and fourth and fifth questions combined will be treated in a paper-length chapter. The chapters are largely independent, though connections

between them will be noted from time to time. A conclusion will show that the positions argued for in the various chapters are consistent and also note some further connections.

LIMITATION:

The limitation of the study pertains more to its investigative difficulty as researchers will have to depend mainly on participant's reportage to make any comments or claims regarding the study

Chapter - 2

Sub- Vocal Rehearsal and Comprehension

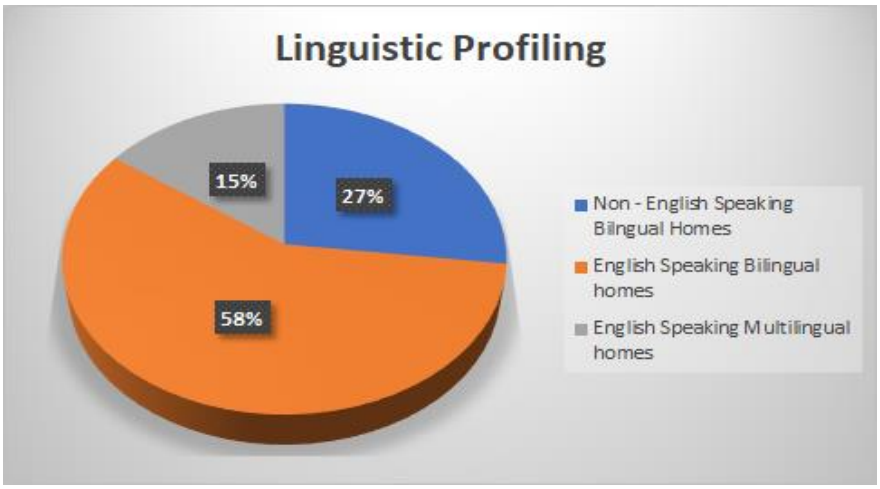
This chapter explores the role of sub-vocal activity in comprehension of the text and its effect on language proficiency and age. Speech during reading has been of interest to educators working towards improving students' reading for decades now. Hearing voices or subvocal speech in reading has a long been topic of interest, but it was only in 1957 that systematic evidence was collected on the relationship between speech muscle activity and reading. A needle electrode was directly inserted by Faaborg- Anderson in the laryngeal muscle to record the activity of muscles during the reading. It was “found that activity in vocal musculature increased with the difficulty of the text” (cited in Ambrason & Goldinger,1997). Although similar results were reported by studies conducted by Sokolov,1972 and Hardyck & Petronovich, 1970 but is not clear whether “silent reading always entails subvocal speech or not”; the present research tries to investigate the reported results further.

2.1 Method:

This is a modest effort to understand the role of subvocalization in reading and add value to the already existing canon of reading research. The ‘Sentence Verification Task’ has been used to study the impact of impediment of sub-vocal rehearsal on comprehension of the text. Further, it has been used to study if language proficiency correlates with a sub-vocal impediment or articulatory suppression and thus comprehension. Sentence verification tasks have been previously used by “Baddeley and Lewis (1981) where they have shown that the accuracy of processing complex sentences” is affected by subvocalization. Long, complex sentences were presented to the readers, some of which were semantically coherent and some were not, though, structurally both the sentences were similar apart from the presence of an anomalous word is a semantically meaningless sentence. For example, “She does not mind

going to the dentist to have fillings, but she does not like the pain [rent] when he gives her the injection at the beginning. (Baddeley & Lewis, 1981, p.113)". However, the word pain would be replaced by the rent in a semantically nonsensical sentence (Baddeley & Lewis, 1981).

Two sets of tests were prepared for the present study, one each in Hindi and English catering to children at different reading levels. Hindi and English were chosen as languages for the test because the former is the widely spoken regional language in Noida, Uttar Pradesh, from where the sample of 60 children was randomly selected and is also one of the languages taught in the school. English, on the other hand, is the medium of instruction in school for all the participants. Thus, each of the participants had exposure to both the languages at home or in school, though the value and the nature of the exposure varied from one household to another.



The ASER (Annual Status Education Report, Pratham,2017) literacy tool was used to assess literacy skills in both the languages- Hindi and English for all the sixty participants. Specifically, this group of children was examined for their reading and comprehension abilities- the decoding ability in reading is related to reading comprehension.

The task was presented in English and Hindi. For each correctly read letter in the letter reading subtask, word in the word reading subtask, and sentence in the paragraph or story, children, obtained 1 point. If one word was misread in a sentence, children still

obtained 1 point. If 2 or more words were read incorrectly, children did not obtain any points for that sentence. Two comprehension questions were asked, post the paragraph for level 1 readers and post the story for Level 2 readers. In each language, which children were asked to answer orally, children obtained 1 point for each correctly answered question. Questions were read to children in case of their inability to read. However, the letters, words, and sentences in the ASER task were read-only by the children. The children who were able to correctly read 50%of the letters in the letter subtask and 50% of the words in word subtask have been categorized as ‘ Emergent Readers’; children who read level 1 paragraph with at the most 1 mistake per sentence have been categorized as Level 1 readers and children who read the level 2 story with a maximum of 1 mistake in each sentence and correctly answered the at least one of the two comprehension questions correctly have been regarded as ‘ Level 2’ reader.

Tests were prepared from Pratham Level 1 and Level 2 reading material, respectively, so parity is maintained between the assessed reading level and the tests prepared for the present study. Therefore, children were given the test as per their reading level.

Children were initially required to read and mark ‘tick’ for the meaningful sentences and ‘cross’ for meaningless sentences during sentence verification tasks in normal silent reading conditions. Then the same task was required to be done while repeatedly counting numbers from 1 to 6, this was done to impair their phonological processing, and this technique is called articulatory suppression. The sentences were rearranged before the task was done for the second time to reduce the recency effect. Finally, children were encouraged to maintain the same articulatory rate, i.e., the same number of counts per second; this was done to maintain the equivalent suppression while engaged in the task.

Sentence Verification Task

Test in English (Level 1) :

I like to pet furry cats, but not dogs.

I like to pet furry cats, but table dogs.

I like to pet furry pens, but not dogs.

I like to pet furry rabbits, but not dogs.

I like to pet furry mugs, but not dogs.

I like to pet furry cats, but copy dogs.

Test in English (Level 2)

She drank her milk, although she doesn’t like it.

She drank her milk, although she didn't balloon it.

She drank her chair, although she doesn’t like it.

She drank her coffee, although she doesn’t like it.

She drank her dress, although she doesn’t like it.

She drank her milk, although she doesn’t cat it.

Test in Hindi (Level1)

राधा को आम नहीं, अनार पसंदहै।

राधा कोआम नहीं ,अनार कलम है।

राधा को आम नल, अनार पसंदहै।

राधा को आम पसंद है, अनार नही.

राधा को आम पसंद है, अनार बाल है।

राधा को आम घर है, अनार पसंद है।

Test in Hindi (Level2)

मुझे नानी के घर जाना, और वहां आम के पेड़ पर चड़ना पसंद है।

मुझे नानी के घर जाना, और वहां आम के पेड़ पर कलम पसंद है।

मुझे नानी के रेत जाना, और वहां आम के पेड़ पर चड़ना पसंद है।

मुझे नानी के घर जाना, और वहां अमरुद के पेड़ पर चड़ना पसंद है।

मुझे नानी के घर जाना, और वहां आम के पेड़ पर टोपी पसंद है।

मुझे नानी के घर कटोरी, और वहां आम के पेड़ पर चड़ना पसंद है।

2.1 Results

2.2(1) "Impact of Articulatory Suppression on Reading":

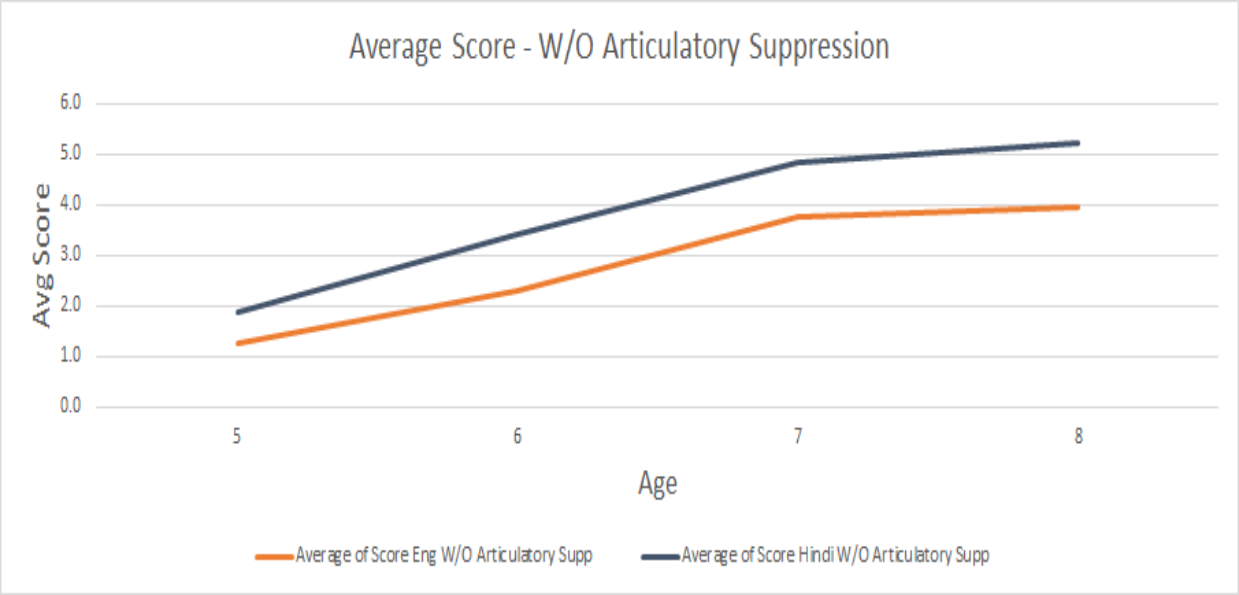
The following Table A shows the "impact of articulatory suppression on reading" comprehension in both Hindi and English languages. Each item on the task was given 1 point; thus 0 being the minimum and 6 being the maximum. Graph 1 shows scores in Hindi and English without suppression, and graph 2 depicts the scores in both the languages with suppression.

Table A

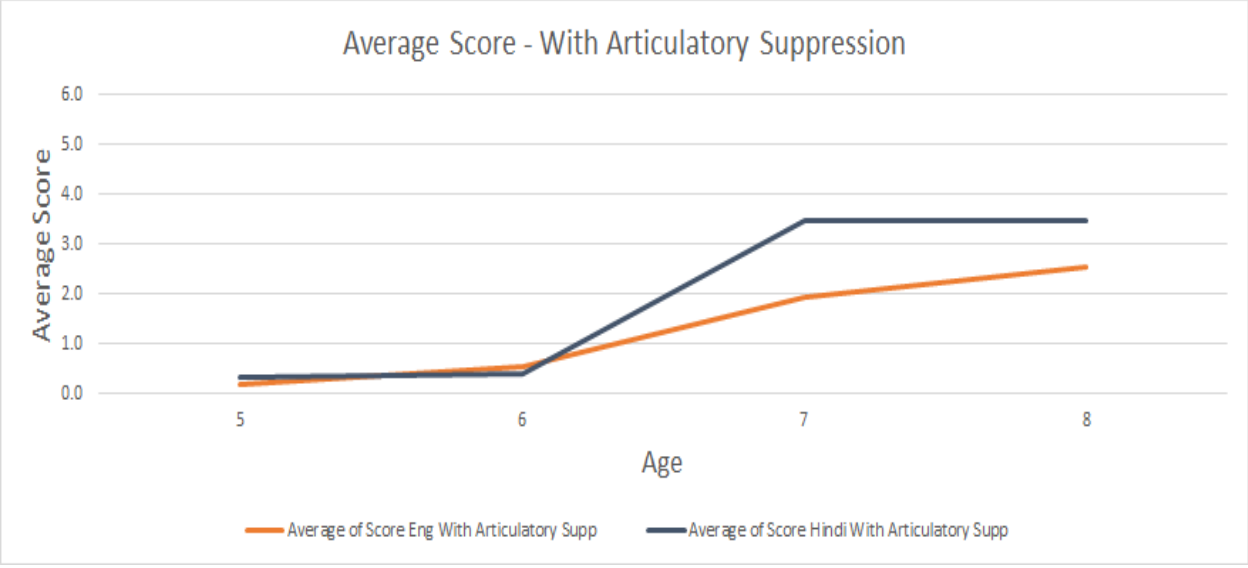
Age, score with and without articulatory suppression

Age in Years	Average Task Score w/o Articulatory Suppression (English) (Max 6)	Average Score with Articulation Suppression (ENG) (Max 6)	Average Task score w/o Articulatory Suppression (Hindi) (Max 6)	Average Score with Articulation Suppression (Hindi) (Max 6)
5	1.3	0.2	1.9	0.3
6	2.3	0.5	3.4	0.4
7	3.8	1.9	4.8	3.5
8	3.9	2.5	5.2	3.5

Graph 1



Graph 2



Graph 2 clearly shows a considerable drop in average task scores when children are subjected to articulatory suppression in both languages.

The statistical analysis results for the impact of sub-vocal impediment on comprehension are presented in Table B. The two-tailed paired t-test was run (STATA, 2020) with an assumption that there is no difference before and after the sub-vocal impediment. The results for English (t= -8.450, p =0.00018) and for Hindi (t= -8.630, p =0.0001) shows that impediment has a significant effect on comprehension of the text.

ENGLISH

t-test percentageenglishwithsupression (r) = =percentageenglishwithoutsupression(i)

Paired t-test

Variable | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]

---+---

percen~r | 60 20.83333 4.147792 32.12865 12.53362 29.13304

percen~i | 60 45.55556 5.102014 39.52003 35.34645 55.76466

---+---

diff | 60 -24.72222 2.924335 22.6518 -30.5738 -18.87064

---

mean(diff) = mean (percentageengl~r - percentageengl~i) t = -8.4540

Ho: mean(diff) = 0 degrees of freedom = 59

Ha: mean(diff) < 0 Ha: mean(diff)!= 0 Ha: mean(diff) > 0

Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.00

HINDI

t-test percentageshindiwithsuppression(n)==percentagehindiwithoutsuppression(t)

Paired t test

Variable | Obs Mean Std. Err. Std. Dev. [95% Conf. Interval]

---+---

percen~n | 60 30 5.116349 39.63107 19.76221 40.23779

percent~t | 60 61.94444 4.587362 35.53355 52.76515 71.12373

---+---

diff | 60 -31.94444 3.701251 28.66977 -39.35063 -24.53826

---

mean(diff) = mean(percentagehindi~n - percentagehindi~t) t = -8.6307

Ho: mean(diff) = 0 degrees of freedom = 59

Ha: mean(diff) < 0 Ha: mean(diff) != 0 Ha: mean(diff) > 0

Pr(T < t) = 0.0000 Pr(|T| > |t|) = 0.0000 Pr(T > t) = 1.0000

The results reflect that subvocal rehearsal plays an essential role in decoding the text, thus comprehension. Irrespective of the language of the text or the age of the reader, articulatory suppression or sub-vocal impediment reduces the ability to comprehend the text. Leontiev (1978) argued that "inner speech" has a direct memory function as a cognitive process. He explained that "inner speech" has "two codes: a code to plan the speech and to retain content in short-term memory (STM), and a code to solve problems" (Agina, Tennyson & Kommers, 2015). Multiple cognitive psychological studies have supported the function of '"inner speech"' as a facilitator of the retention of information in STM. Several studies have illustrated that "speech codes are used in the form of rehearsal (also known as a subvocal

rehearsal) to prevent decay or memory loss in STM (e.g.Baddeley, Thomson, & Buchanan, 1975 cited in Guerrero,2005)".

Baddeley(1986) explained the process of "rehearsing information as a phonological code to prevent decay through his model of working memory" (Refer Chapter 1 – Pg. 18-19). The Model comprises "a tripartite system that involves a central executive processor and two dependent systems. In these two dependent systems, verbal information is stored in the phonological store, and visual information is stored in the visual cache". "Verbal information" is practised within the phonological store through a mechanism referred to as the "phonological loop", which prevents memory loss in STM or working memory (Baddeley, 1986). Association of word storage and "subvocal rehearsal" has also been explored in English reading (e.g. Kleiman,1975). Pollatsek, Lesch, Morris & Rayner (1992) linked "phonological coding in word identification to phonological coding in STM." Their research strengthen the claim of reading researchers of "phonological coding helping readers to retain information in STM".

In light of the above researches, it can be stated that articulatory suppression reduces the retention of the information in 'working memory'. A series of experiments were conducted by Pollastek (1992) both at "word and sentence level" using Mcconkie and Rayners's(1975) "moving window paradigm", which requires textual "window" to be situated in alignment to the letter that is at the centre of the reader's attention, the window moves with the reader's movement to the following letter. "Outside of this window, text appears mutilated and obscure"(Pollatsek et al., 1992). He argued that phonological coding, which aids word recognition and is also a means to store information in 'STM', and both these functions might be intertwined. Pollatsek et al. 's (1992) study described "subvocal maintenance rehearsal" as the means to hold words in 'STM' while the "eye moves across

saccades of text." His study corroborated with Leontiev's (1978) "dual-code description of "inner speech"."

It is necessary to differentiate between "two types of subvocal rehearsal: maintenance and elaborative" (Craik & Watkins, 1973). "Maintenance rehearsal" comprises of the "subvocalization of words" to maintain them in 'STM', whereas "Elaborative rehearsal" is a complex process essential for "memory retention beyond the short term"(Craik & Watkins, 1973). For reading, both maintenance and elaborative subvocal rehearsal are probably essential for processing written text.

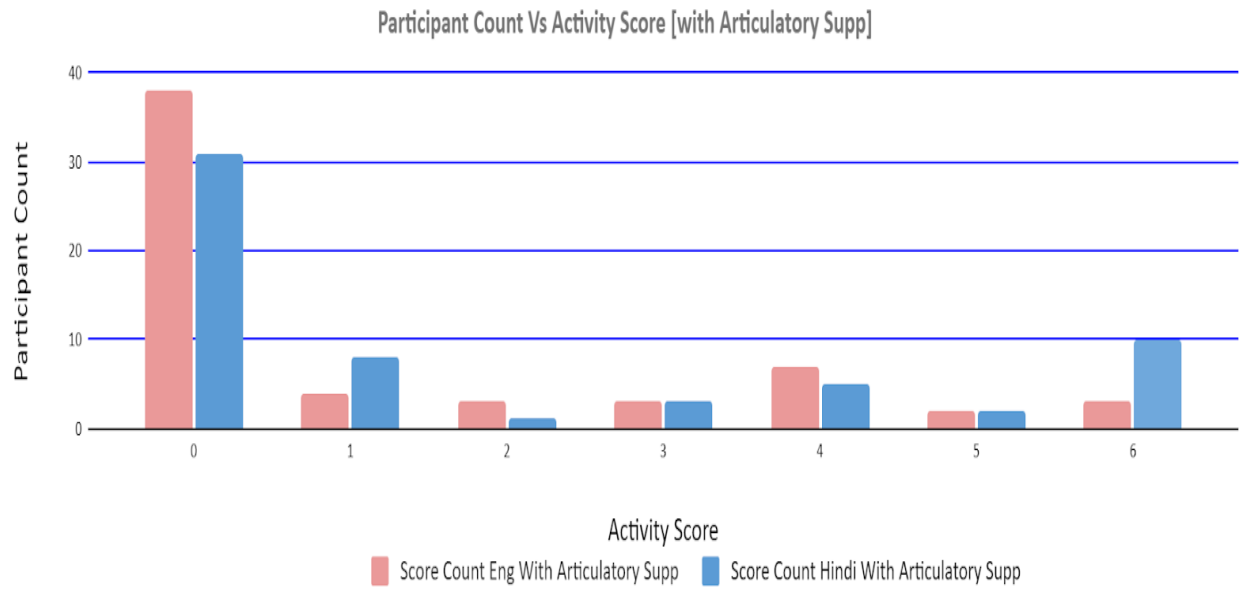
The experiment conducted was more of an elaborative subvocal rehearsal which was at play as it involves extracting meaning from the complex sentences during reading (Baddeley and Lewis,1981 representation of the text cannot be accessed. There have been researches which have claimed that without "activation of phonological codes, lexical and semantic representations cannot be accessed (McCutchen & Perfetti, 1982; Perfetti, Bell, & Delaney, 1988; Perfetti & McCutchen, 1982; Rayner & Pollatsek, 1989; Van Orden, 1987; Van Orden, Johnston, & Hale, 1988 cited in Kato, 2009)." The Phonological Model proposed by Van Orden (1987) advocates the role of "pre-lexical, assembled phonology during reading", and proponents of the model proclaim that a word's phonology is "the initial and primary code by which a word accesses its representation in the internal lexicon" (Lukatela & Turvey, 1994b cited in Leininger, 2014). The second part of the research assessed the impact of language proficiency on reading comprehension with articulatory suppression across both languages.

2.2(2) Impact of Articulatory Suppression across L1 and L2 Reading.

Table B

Score with Articulatory Suppression	No of children (English)	No. of Children (Hindi)
0	38	31
1	4	8
2	3	1
3	3	3
4	6	7
5	2	4
6	4	6

Graph3



With suppression

```
. ttest percentageenglishwitharticulator == percentagehindisupression

Paired t-test

------------------------------------------------------------------------------
Variable |        Obs      Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
percen~r |         60    20.83333    4.147792      32.12865        12.53362    29.13304
percen~n |         60       30     5.116349  39.63107         19.76221    40.23779
---------+--------------------------------------------------------------------
diff |     60   -9.166667 5.171646         40.0594   -19.51511    1.181773
------------------------------------------------------------------------------
 mean(diff) = mean (percentageengl~r - percentagehind~n)       t =  -1.7725
 Ho: mean(diff) = 0                           degrees of freedom =           59
 Ha: mean(diff) < 0                Ha: mean(diff) != 0                 Ha: mean(diff) > 0
 Pr(T < t) = 0.0407      Pr(|T| > |t|) = 0.0815              Pr(T > t) = 0.9593
```

To determine whether the impact of “articulatory suppression" is the same in the case of 1st and 2nd language, a two-tailed paired t-test was run (STATA, 2020), with an assumption that there will be no effect of language on the impact of articulatory suppression. The result (*t*= -1.7725) is less than 2; thus, the null hypothesis is confirmed that it is not the 1st or the 2nd language that impacts the reading performance under the condition of articulatory suppression but the proficiency in the language.

Sokolov (1972) correlated the movement of the mouth musculature to “inner speech”. Several experiments were carried out to measure the “ amount of muscle activity connected with speech (tensions in the tongue and lower lip) during complex reading tasks (as well as in several non-reading tasks)”. These reading tasks were designed around subjects’ native language and a foreign language. Foreign language texts were selected at one level above the proficiency level of the subject. Oscillograms were used to detect muscle activity through a measure of electrical activity. During the reading of foreign language text, when the proficiency level of the subject was inadequate strong motor speech impulses were detected. Similar results were seen during the reading of complex phrases in the native language texts. Most of the children in the study who had a similar level of proficiency in both languages performed comparably under articulatory suppressed conditions.

2.2(3) Language Proficiency and its effect on the impact of articulatory suppression

As discussed earlier in the chapter, the ASER literary tool (Pratham, 2017) was used to determine children's reading levels. This is a concise test in which children were asked to read letters, words, sentences in a paragraph and a short story. Importantly, with these four subtasks, the classical ASER task seems to measure decoding in reading rather than general literacy, the latter of which would arguably entail the ability to decode as well as comprehend the word or text at hand (cf. Gough & Tunmer, 1986; in fact, decoding is only one of five pillars of reading comprehension, Pressley, 2000). Therefore, comprehension questions were developed to assess children's understanding of the content of the story. An example story (shortened version) and an example question are given n below:

(Story section) : “A big tree stood in a garden. It was alone and lonely. One day a bird came and sat on it. The bird held a seed in its beak. It dropped the seed near the tree. A small plant grew there.

(Question) How did the small plant grow near the tree?” (ASER, 2017)

'Table C' represents the average score of children in English sentence verification task at varying levels of reading with and without suppression, and 'Table D' represents the same for Hindi

Table C

ASER Reading Level (English)	Average Score W/O Articulatory Suppression	Average Score with Articulatory Suppression
Emergent	0.3	0.0
Level1	2.9	0.4
Level 2	5.9	4.3

Graph 4

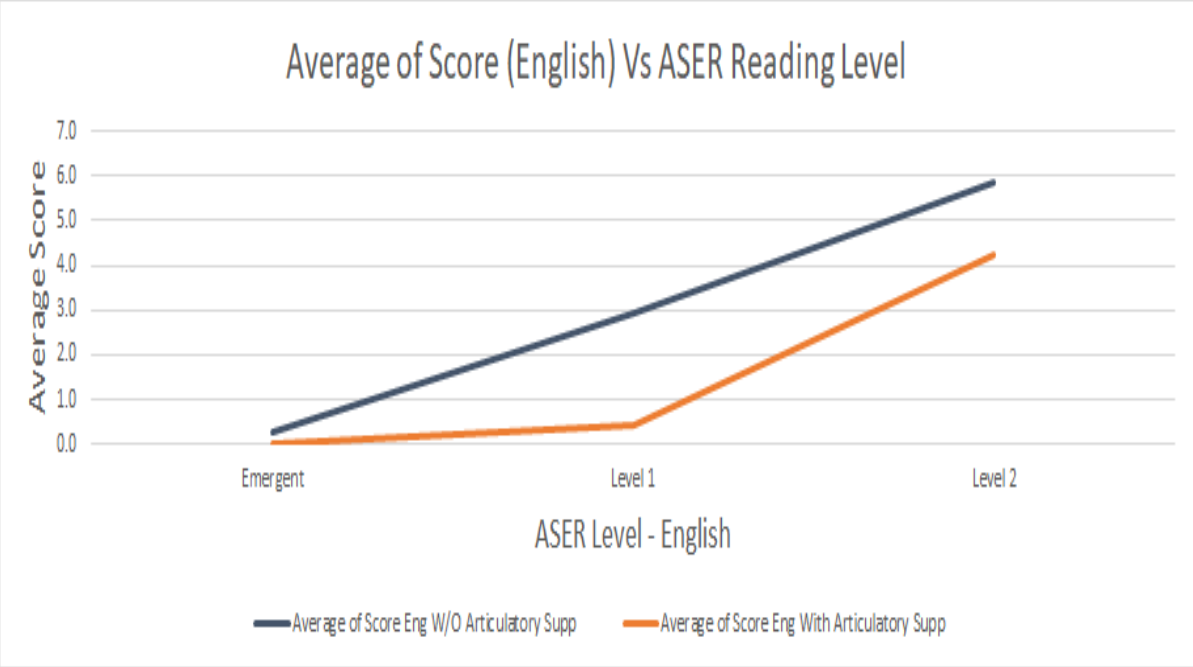
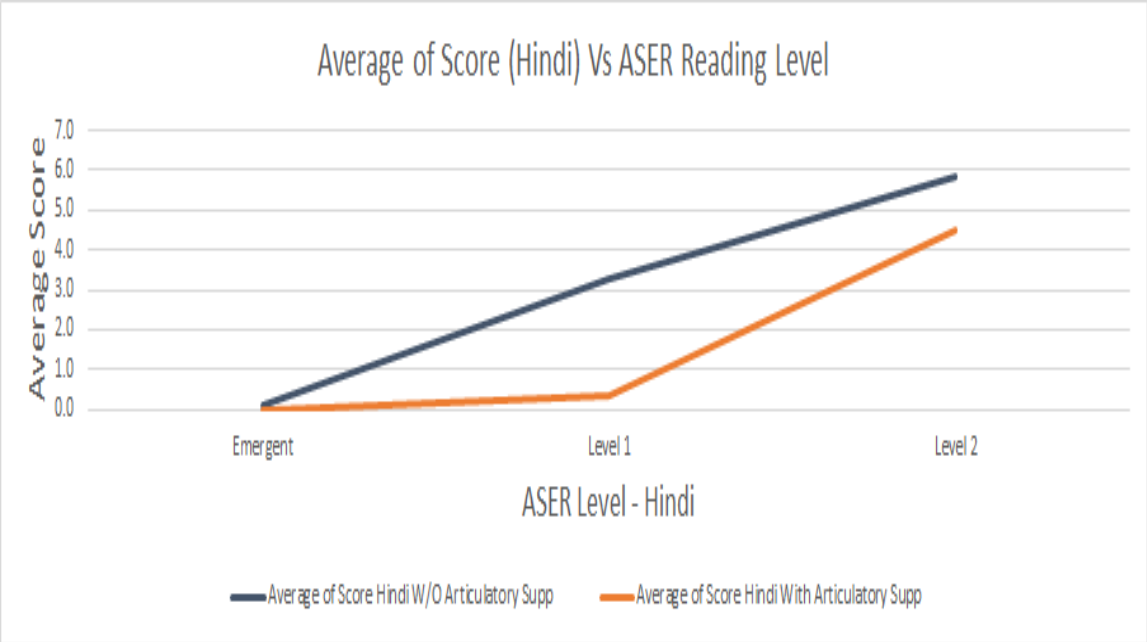


Table D

ASER Reading Level (Hindi)	Average Score W/O Articulatory Suppression	Average Score with Articulatory Suppression
Emergent	0.1	0.0
Level1	3.3	0.3
Level 2	5.8	4.4

Graph 5



Graph 3 and 4 clearly shows a positive impact of language proficiency on the task score under the articulatory suppressed condition. Children at level 2 of reading performed better on sentence verification tasks than children at emergent and level 1. In general, level 2 readers performed better in both conditions with and without articulatory suppression, though their level of reading precision fell considerably due to articulatory suppression. Most of the proficient readers seem to access the written text through orthographic routes. Thus, pointing

towards the attributes such as length of exposure to language, sight vocabulary, which might be helping in activating orthographic routes for reading and meaning-making.

There have been researchers which have stated that "phonological mediation is an optional process and is not always necessary for semantic activation (Coltheart,1978; Coltheart, Davelaar, Jonasson, & Besner,1977; Jared & Seidenberg, 1991; Seidenberg,1985a, 1985b; Waters & Seidenberg, 1985, cited in Kato, 2009)". Coltheart, Curtis, Atkins, and Haller (1993; see also Jackson &, 2001) suggested "dual-route models of word recognition", where the dominant route Coltheart during reading is through from "direct access from orthography to meanings" and phonological mediation comes into play under the circumstances, where the reader encounters an "unfamiliar or low-frequency vocabulary or when exact wordings need to be held in memory while processing complicated structures". Thus, it can be deduced that children who performed comparatively better with articulatory suppression must have been able to access the semantics of text directly through orthographic mode without the need for phonological mediation.

Kato (2009) investigated the "effect of articulatory suppression on second language visual comprehension and its relation to L2 reading proficiency and lower-level processing efficiency." Based on the study on 64 college-level Japanese ESL learners, Kato emphasized "independent involvement of phonological and orthographic processing skills." The results showed considerably poor "reading rates and verification correctness" under the condition of articulatory suppression, which reiterates the hypothesis that "articulatory suppression" adversely affects L2 reading performance. The processing efficiency of L2 orthography has been seen as a "strong predictor of overall L2 reading ability." There are empirical proofs that support the hypothesis that the higher the level of ESL reading proficiency depends on L2 orthographic processing skills.

To further delineate why the readers at level 2 perform better under suppressed conditions in both languages, three case studies will be dealt with in detail to apprehend and rationalize the results.

2.3 CASE STUDY 1

Child's Name: X5

Age: 7 years

School: Private School

ASER Reading level (Hindi) - 1

ASER Reading level (English)-2

Home Language - Hindi

Sentence Verification Task Score (H): 1/6

Sentence Verification Task Score (E): 4/6

The child predominantly spoke in Hindi at home with his parents and his grandparents. The child was quite comfortable talking in English too but never initiated the conversation in said language, though answered in it if spoken. The first language that the child was exposed to was Hindi, though interspersed with a few commonly used English words. However, the exposure to Hindi was limited to listening and speaking. The reading and the writing skills in Hindi were introduced at the age of 5 in the school context.

On the other hand, English reading was introduced at the age of 2 through storytelling and picture book reading, whereby the mother narrated the stories in English while pointing at the pictures. Gradually she started giving small instructions in English, and the child was encouraged to read more in English. At present, the child has read more than 50 books in English and has also been introduced to novellas, as told by the mother. At the same time, no such effort has been made to enhance Hindi reading. On the contrary, the reading in Hindi is curtailed to what is being done in school; the child has a small reading corner at home and

specific reading time, but there is not much Hindi literature apart from the school texts. On being asked about the child's preferred language of reading, he said, “English as Hindi has a lot of matras (मात्रा) which are difficult to understand” and in the case of music and films, the bent was towards Hindi. The difference between the performance in Hindi and English can be attributed to their various orthographies.

During the reading assessment task, the child could read the English text silently and correctly answer all comprehension questions. However, in Hindi, the child was still at the decoding stage, where every word was broken into syllables. Despite Hindi being the first language, the child was more comfortable reading in English as the skill of reading was learned in it.

When the child was asked- ‘In which language was it easier for you to read while counting and why?’ The child replied, “Reading English is easier as it does not have any matras and words are easy to get, whereas in Hindi, it is difficult to read without reading it (meant - aloud) and cannot get chothi (smaller sound) and badi (bigger sound) matra.”

In this **case,** the child mentions that he could read English text easily because he could recognise most of the words without actually reading them, and Hindi was difficult to read because of ‘matras’. The difficulty in reading Hindi can also be attributed to its orthography. Das, Padakannaya, Pugh, and Singh (2011), in their study “Neuroimaging reveals dual routes to reading in simultaneous proficient readers of two orthographies,” found that orthographic differences in varied languages foist disparate weightage on separate component processes, and thus on different paths during reading tasks. As per the study, when shallow or phonemic orthographies, which rely on spelling to sound correspondence such as Italian and Hindi, showed increased activation in the phonological loop; whereas opaque languages such as French or English have a less direct relationship between letters

and sounds, readers depend more on “lexically mediated path for processing with increased activation semantically driven pathway (Das et al., 2011).”

Das et al.,2011 used behavioural measures and functional neuroimaging to test whether Hindi/ English biliterate readers demonstrate “orthography-specific reading pathways”.The results from the study suggested that the route adapted for reading different orthographies is likely to be determined by “reading proficiency and age of acquisition.” If both the languages are learned simultaneously, then readers tend to use orthography specific reading networks, whereas, if one language is learned in early years and other in later years then language-specific activation patterns are not exhibited, the reading network of L1 is used to read L2. Hindi has transparent orthography thus is phonologically tuned, i.e., each alphabet is phonologically different from other. In contrast, English is opaque; therefore, reading is governed by lexical semantics. Thus, the effect of suppression of sub-vocal articulation Hindi might have been more in comparison to English.

“In reading different orthographies”, Kumar, Das, & Bapi (2009) compared English and Hindi orthographies. The spatial script of Devanagari embodies complex visual units, wherein vowels are laid out in a nonlinear manner around consonants. It was observed that reading tasks in Hindi script placed an extended processing load on the visuospatial processing system. This is because Hindi being an alphasyllabary, i.e. “segmental writing system in which consonant-vowel sequences are written as a unit; each unit is based on a consonant letter, and vowel notation is secondary (Kumar et al.,2009).” Thus, the visuospatial “complexity of Akshara (alphasyllabograph)” reduces the benefit of “orthographic transparency in reading/writing.” However, this disadvantage can be overcome by the “language proficiency of individuals (Padakannaya, Rekha, Nigam, & Karanth, 1993; Sproat & Padakannaya, 2008; Vaid & Gupta, 2002 cited in Kumar et al.,2009).”

The lack of proficiency in Hindi can be ascribed to Parents' attitude towards a particular language. Globalisation has changed the way English as a language is being conceived and looked at, and it is not just the language of trade but the language of power and upward mobility. Parents want their children to get English medium education as knowledge and dominance in the English language can label them intelligent and modern. The bent towards English is a result of our colonial legacy. Lord Macaulay, in 1835, emphasized English language teaching in India for the first time through his "Minute of Education". He compelled English on Indians way back in 1835, and the roots have gone too deep in India's psyche and socio- political system.

In 1854, Sir Charles Wood expressed that "English would be an appropriate medium for higher levels of education because fluency in English was a prerequisite to seek admission into an established university (Ghosh, 2015)." Today, every middle-class family aims to secure a seat for their child in a good university, and English is essential; thus, it explains the parents' focus and bent towards learning English. "The power and the prestige of the language are defined by the domains in which language is used. But the importance of the English language is exaggerated in the Indian linguistic situation. Therefore, the role of English in India is not replacive; instead, it overlaps with local languages in various domains (Sridhar 1985, Sridhar and Sridhar 1986)."

Another factor that might have facilitated the reading in English could have been rich sight vocabulary; Pollatsek et al. (1992) acknowledged that automatically recognised words trigger a phonological code that then helps store the word in 'STM' (Short Term Memory). All the words that the moving eye comes across are not equal in "complexity, frequency, or familiarity". Several pieces of research suggest that high-frequency words, words that are often encountered while reading, are processed swiftly and efficiently than "low-frequency words (Rayner & Clifton, 2002)."

> In their study, Rayner and Clifton (2002) found that in "lexical decision tasks, low-frequency words take an average of 100 – 150 mins longer than high-frequency words to process, and this is significant as lexical decision tasks involve reading. The fact that high-frequency words take less time to process than low-frequency words in a reading context suggests that either (1) the same process is taking place, but the process takes much longer for low-frequency words or (2) that there may be two different processes involved, one for high-frequency words and one for low-frequency words."

Various studies link the "retrieval of phonological codes" during silent reading exclusively to low-frequency words. For example, Jared, Levy, & Rayner (1999), in series of 6 experiments on adult readers, found that "phonological processes were only activated during the reading of low-frequency words." This can further be linked to the Vygotskian problem-solving component of inner speech as it may explain why "low-frequency words result in the access of phonological codes during silent reading." When cognition is challenged because of an unusual word, "inner speech" as an "elaborative subvocal rehearsal" resurfaces to facilitate the retrieval of meaning. Vygotsky (1986) "described the ontogenetic development of of children through the need to solve problems." Thus, proficient readers may have a more significant number of high-frequency words at their disposal because of higher proficiency.

2.4 Case Study 2

Age: 5+ years

School: Private School

ASER Reading level (Hindi) - 1

ASER Reading level (English)- Emergent

Home Language - Hindi

Sentence Verification Task Score (H): 2/6

Sentence Verification Task Score (E): 0/6

The child spoke in fluent Hindi, which was interspersed with certain borrowed English words. The child had a bilingual household, but it was Hindi which

was predominantly used. It was the first language that the child acquired, and her exposure to English was minimal and was through a few cartoon programs that she viewed. She had a dedicated hour of Hindi tutoring thrice a week, where stories were narrated, read, and made. She preferred talking, reading, and telling stories in Hindi. On asking the child's mother about the need for focused learning of Hindi, she said, "if she will learn one language fully and fluently then she would be able to grasp the other language too, and Hindi seemed to be a natural choice as that is the language which is spoken at home."

She was introduced to English just six months ago when she joined the school, which was her first intentional exposure to the written text in English. She scored 100% on the Level 1 Hindi ASER test but could not recognize alphabets correctly in English. She scored 30% on the English ASER test. Similar results were observed in the sentence verification task when done without impediment. The child could correctly identify meaningless and meaningful sentences in Hindi, but while doing so, even on being asked to read silently, she could not help vocalizing it. On being asked, " आप मन-मन में क्यों नहीं पढ़ते?(Why don't you read silently?) " to which she replied , "बोल बोल कर ही समझ आता है नहीं तो हो नहीं (I cannot understand without vocalizing)." When the same task was performed with articulatory suppression, the level of correctness dropped from 100% to 33%but it was still higher than 90 % of her peers in the same age group and with the same reading level in Hindi. Her exposure to the words through story reading probably helped in reading while sub-vocal rehearsal was impeded.

In this **case,** the child could not read silently and told the researcher that, without vocalizing she cannot comprehend the text, number of children in the age group of 5 to 7 faced a similar challenge, and a few emergent readers in the age group of 7+ also confronted the same problem. This difficulty can be accounted for the 'age' as several studies have proven, "young children can store information as phonological codes but the actual silent

rehearsal of this phonological information does not arise until around 7 years (e.g., Cowan & Kail, 1996; Flavell, Beach, & Chinsky, 1996 cited in Guerrero,2005).” This connects Vygotskian ‘inner speech’ to “subvocal rehearsal as a mechanism to retain verbal information in STM”. Vygotsky (1986) proposed that around seven years of age “egocentric speech’ changes into “inner speech.” At the same time, children begin to subvocally rehearse words in their minds to remember them, which might be why children younger than seven needed to vocalize to rehearse the words in their private speech. Beggs and Howarth (1985) stated that “an essential function of inner speech during silent reading is to facilitate access to prosodic elements such as rhythm, stress, and intonation as in most of the written text, prosodic elements are not extrinsically stated. (Guerrero,2005).” Inner speech helps verbalise these features, which help to access and retain the information in working memory through the phonological loop. When sub-vocal rehearsal has impeded, the verbalization of these features becomes impossible, thus hindering the comprehension of the text.

In an experiment, Beggs and Howarth (1985) explored “the effect of prosodically enhanced texts on children’s reading comprehension.” Children in the age group of eight to ten were given some short passages. Procidicity of a few of the passages was “enhanced through markers that identified stresses and pauses in the text.” Children read those texts aloud and were then given a set of comprehension questions to test their understanding of the passages. Children performed significantly better on the text, which was prosodically enhanced; thus, when the elements of social speech, such as “intonation, stress, and rhythm”, are used in reading, children exhibit a pronounced understanding of the text. Therefore, when subvocal rehearsal is impeded, it reduces the ability to comprehend.

The case also ascertains that proficiency in language does help in overcoming the visuospatial overload created by the alphasyllabary orthography of Hindi. As the child had greater exposure to Hindi texts and reading, despite impeded sub-vocal rehearsal, she

performed better than 90% of the peers, and the only difference between her and others was the constant exposure to Hindi reading. It would have resulted in a higher number of sight words to her disposal, and also, the ease with the orthography would have contributed to better performance. The Child's mother focused on building reading skills in one language as she believed that expertise in one language could be transferred to the other. Her belief corroborates with the "Linguistic Interdependence Hypothesis", which was developed by Cummins (1979), who argues that knowledge of (L1) can undoubtedly be transferred during second language acquisition. Linguistic knowledge of one language that a child possesses can be an asset in developing corresponding abilities in the second. Researches in second language acquisition in the past few decades studied the impact of 'L1' on 'L2', and numerous "experimental results have suggested that L1 does play a significant role in L2 learning and processing (Chan, 2004; Burt & Krashen, 1982; Keung & Ho, 2009; Sparks, Patton, Ganschow, & Humbach, 2009; Sparks, Patton, Ganschow, Humbach, & Javorsky, 2008; Wang, Perfetti, & Liu, 2005 Cited in Hui Kai, 2010)."

The transference of linguistic knowledge might be one of the reasons for the comparable performance of children in both the languages in both suppressed and non-suppressed conditions. However, this can be contested because both languages have different orthographies, and studies have shown that transference is more productive if orthographies of L1 and L2 are the same. Therefore, several researchers have looked into the "reading processes and relationships between L1 and L2 reading when both L1 and L2 orthographies are similar (e.g., Spanish and English) (Cisero & Royer, 1995; Cobo-Lewis, Eilers, Pearson, & Umbel, 2002; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993; Hardin, 2001; Lopez & Greenfield, 2004 Cited in Chuang,2010)".The effect of L1 on L2 reading comprehension has also been explored, it has been found that the "reading transfer among alphabetic languages is more dependable, whereas language transfer in reading ability between two dissimilar

orthographic systems (e.g., Mandarin Chinese and English) is less dependable (Chuang,2010)."

In another study conducted by Wang, Koda, & Perfetti (2003) on alphabetic and non-alphabetic L1 effect on learning of English. It was found that L1 orthography can result in varied extents of L2 literacy proficiency transference. Wang et al. (2003) noted that "Korean EFL students with their alphabetic L1 literacy background performed considerably better than Chinese EFL students with non-alphabetic L1 literacy backgrounds." In addition, Korean EFL learners made fewer errors in both reading and writing. From these studies, it can be deduced that linguistic transference between English and Hindi is possible despite different orthographies, and proficiency in one can positively affect skill development in another.

2.5 Case Study 3

Age: 6 years

School: State-Run Primary School

ASER Reading level (Hindi) - Emergent

ASER Reading level (English)- Emergent

Home Language - Hindi

Sentence Verification Task Score (H): 0/6

Sentence Verification Task Score (E): 0/6

The child communicated only in Hindi, the first language learned and the only language spoken at home interspersed with frozen English vocabulary. The child is a first-generation learner whose only exposure to language was through conversation at home and limited interaction with peers. Both the parents worked through significant parts of the day and spent a brief time with the child. The interaction between the parents and child was limited to transactional conversations where the child was given instructions or was asked about her

needs. Basil Bernstein (1964) termed this as 'restricted code'- "A restricted is code one where all the words and the organizing are wholly predictable for speakers and listeners. Thus, limiting the exposure to complex language structures and vocabulary." The child's introduction to English and other language skills in Hindi, such as reading and writing, began at the age of 5 in school. The exposure to reading text was limited to school textbooks; on further probing the child about her learning in the classroom, she said, "अभी अक्षर पढ़ते हैं जो मैम ब्लैकबोर्ड पर लिखतेहैं." Researcher: "क्या क्लास में कुछ किताबें या चित्र हैं?" to which she replied, "नहीं सब की किताबें बस्ते में होती हैं ." " आप अंग्रेजी की क्लास में क्या करते हो?" child replied - " बिंदु बिंदु से अक्षर बनाते हैं"

The classroom lacked adequate exposure to the language. The child could read 80% of the Akshar in Hindi correctly and 40% of the morphemes correctly in the ASER reading test; mostly, all the morphemes read correctly were bisyllabic. In the case of English, the correctness percentage dropped to 60% and 20 %, respectively. While reading Hindi, the child could recognise and focus on phonetics, but in English, the reading seemed more rote memorized as in 'B' was not '**ब**' but "B for the ball'. The child could not recognize a single phoneme without associating it with the learned morpheme. On being asked about more words with the same sound, the child could not say any, but this was not the case with Hindi.

Case studies highlight the importance of word recognition, development of sight vocabulary in assessing orthographic mode for reading, proficiency in the language, and linguistic transference in developing reading skills. Recognizing specific words automatically or on sight advances effortless reading with understanding, though it is not a replacement for the vital skill of decoding (McArthur et al., 2015). Learning certain sight words helps children focus their energy on decoding more complex words and facilitates accessing the text through orthographic mode. The importance of 'private speech' internalisation into 'inner speech' for silent reading has also been reflected.

Chapter 3

Language of text and Working Memory Retention

This chapter explores the effect of language (home and school/2nd language) on working memory (WM) efficiency. The reading process comprises of series of comprehension stages. Koda (2005) conclusively points out that “once extracted from print, lexical information must be consolidated into larger, meaningful chunks, such as phrases, sentences, and paragraphs, and WM plays a pivotal role in this critical process.” So, it is safe to say that “beyond lexical access, virtually every operation in reading relies on WM”. Considerable empirical research has been conducted to study the function of working memory in reading comprehension in L1. The studies typically pointed out high correlations between ‘WM’ capacity and reading comprehension.

Working memory consists of the “immediate memory processes involved in simultaneous storage and information processing (Baddeley, 1986; Carpenter & Just,1989 cited in Osaka & Osaka,1992)”. In “working memory”, the point of concern is the effectiveness of storing the fragmentary result of comprehension for a short period while processing of new information takes place. “Relative efficiency in such processing can be expressed in terms of working memory capacity (Carpenter & Just, 1989).”

Daneman and Carpenter (1980) developed a “reading span test (RST)” to measure ”working memory capacity.” It is a “memory test designed to measure both processing and storage functions during reading (Daneman et al., 1980)”. The capacity of “working memory” is closely associated with an individual's reading ability. In reading, there is always new information being added which is perpetually being decoded, reorganized, and combined what has already been comprehended through the understanding of syntax, semantics, and pragmatics, though this information is stored for a short span in the working memory. (Daneman & Carpenter, 1980).

In the “reading span test”, sets of two to five or six sentences are read aloud by the participants in an attempt to remember the last word of each sentence. Usually, the test begins with the most accessible set that is of two per set and gradually move upwards to sets with five or six sentences but modified versions are also there, in which there are randomized trials (Friedman & Miyake, 2005). In most of the cases, the task is called off once a participant “fails” a level (e.g., “if a participant fails to recall a majority of the trials in a level Daneman & Carpenter,1980)”, but a few researchers carry out all the trials with all the participants (e.g., Shah & Miyake, 1996) as it provides a vast range of scoring methods, but it can become overbearing for the participants, once it moves beyond their abilities. “The original span score is the highest level at which the participant recalls a majority of the trials (e.g., two out of three sets, as was done by Daneman & Carpenter (1980), or three out of five sets, as was done by Miyake, Just, & Carpenter (1994) Cited in Friedman, Miyaki, 2005).”

Apart from the conventional scoring method, researchers have also adopted other scoring methods, such as “counting the total number of words in perfectly recalled sets (Engle, Tuholski, Laughlin, & Conway, 1999; McNamara & Scott, 2001), the total number of words recalled (Friedman & Miyake, 2000; Tirre & Peña, 1992; Turner & Engle, 1989), or the proportion of words per set averaged across all sets (Kane et al., 2004)”. The literature about different scoring methods states that varied methods' results are often highly correlated and usually have the same result patterns (e.g., Klein & Fiss, 1999; Turner & Engle, 1989; Waters & Caplan, 1996). For the present study, the total number of words recalled has been used as a scoring method.

Apart from scoring, the other concern related to RST is that it has been mostly used with adults. However, there have been researches where it has been altered and used with children. “In tests for children, a common approach is to ask children to read a set of incomplete sentences and to complete each with an appropriate word (Towes, Cowan,

Hortan, & Whytock,2008)". Supposedly these words form contact and give purpose to children to read (e.g., Leather& Henry,1994). A modified version of Daneman & Carpenter (1980) RST was prepared to study the development of children's reading span, which had "20 sets of sentences. The number of sentences in each set varied from two to five. The children were asked to read the sentences in a set aloud and then to recall the final words of all of the sentences in the set" (e.g., Sunhee Ko, Kyung Soon Choi, and Mina Hwang, 2009)". Nelson Cowan and team (2003) used RST to analyse children's working memory processes response-time.

For the present study, four reading span tests were prepared catering to two different levels of readers in Hindi and English, respectively. These levels aligned with the ASER reading test, and therefore the sentences for the RST were also picked up from Level 1 and 2 Pratham books to maintain coherence in the reading level. The test consisted of 12 sets of sentences, and the number of sentences varied from two to four in each set. Specifically for Hindi tasks, sentences were chosen which did not end with case markers (है, ही, था, थी). It was done to reduce the "word-length effect", traditionally "the classical word length effect is explained by the increased complexity of longer terms (Neath and Nairne, 1995), or increased rehearsal time (Baddeley, 1986, 2003; Page and Norris, 1998; Burgess and Hitch, 1999 cited in Katkov, Romani and Tsodyks,2014)". The first version suggests that shorter words are easier to recall, and in the second account, short words require shorter rehearsal time; thus, more short words can be rehearsed and recalled. Thus, the length of the end words was considered while choosing the sentences in both languages.

Example of RST English Level 1

Set 1

- There is a mouse in the house.
- There is a story about a frog which talks.

Set 2

- I listen to the story and then sleep.
- The tiger falls into a hole.

Example of RST Level 1 Hindi

Set 1

- उनमें नमक डालदो ,बाबा ने कहा।
- उसके बाद बाबा ने आमों घूप में रखा।

Set 2

- मलहार ने कहा की वह बड़ा घर बनायेगी।
- हम आमों में से पानी कै से निकालेंगे।

Example of RST Level 2 English

Set 1

- My Amma tells me a story every night.
- Don’t throw cushions on the floor.

Set 2

- The cat looked at the mouse and fled under the bed.
- Tiger lives in the forest and likes to bake.

Example of RST Level 2 Hindi

Set 1

- मेरी उनगलियाॉ मेरे हाथ कर सकतेहैं..ठक - ठक।
- मगर,कभी हो जाती है गड़बड़ कितनी सारी।

Set 2

- अगरआपइससेदेखतेहैतोहदिखेसबकुच्छबेहतर .

- गुल्लीकेपासएकछोटासाबस्ताजिसमेंहैसंसारउसका.

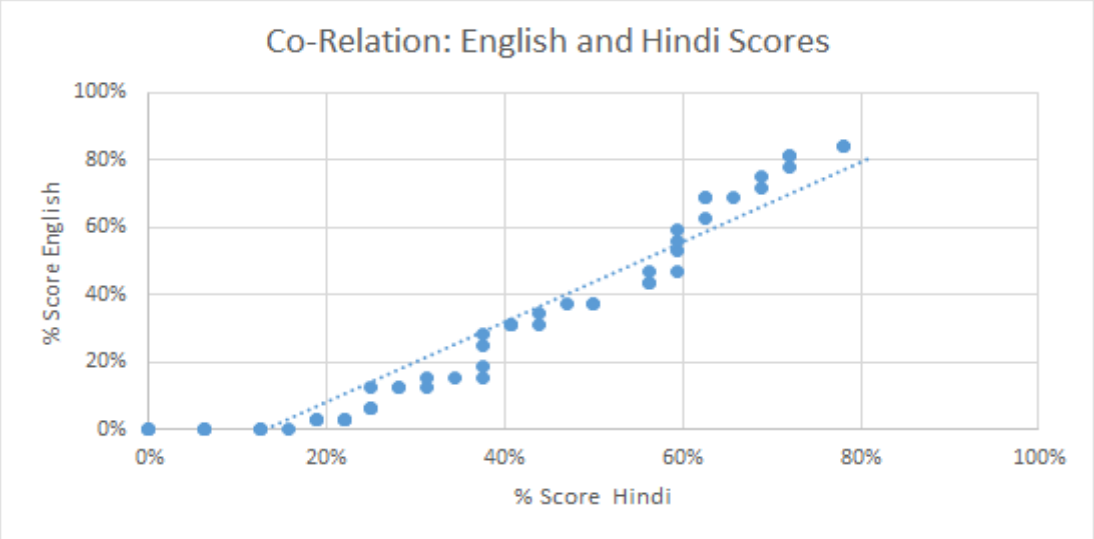
The procedure was replicated from Daneman and Carpenter's test (1980). "Each sentence was written on a single line across the centre of a 13 x 18 cm white sheet. The cards were arranged in three sets, each of which comprised two, three, four, and five sentences. Blank cards were inserted between the sets (Osaka & Osaka, 1993)." Unrelated sentences were put within a set. Children had to read each sentence aloud at their own pace. As soon as the first sentence was read, the next was shown, and the children were asked to continue reading aloud. Once "all the sentences of the set were read, the child was asked to recall the last word of each sentence within the set. The order of reporting these final words was based on the free recall procedure(Osaka & Osaka,1993)." The children were told to refrain from telling the last target word first within each set to avoid the recency effect. The Hindi 'reading span test' was the same as the English. For every correct answer, one mark was allotted. All the children completed 12 sets, and scores were given as per the total number of correct answers, thus 42 being the highest and 0 were the lowest. The First English task was administered, and then, after a day's gap, the Hindi task was carried out. Tests were spaced out to balance the load on working memory.

3.1 L1, L2, And Retention in Working Memory

The intuitive feeling while delving into working memory retention associated with reading comprehension would be that children ought to perform better in their first language or native language than second. Based on the fundamental thought process, it can be argued that the second/ foreign language preoccupies more of working memory than the first language would. This is led to the formation of a testable hypothesis: There should be a significant difference in performance on RST for working measures combining storage and processing when children are tested in their first language vis -a vi second language.

Contrary to the hypothesis, Graph 5 shows that children who performed well in the first language, i.e., Hindi, performed equally well in their second language, i.e., English. Moreover, both show high correlations between Hindi and English. Thus, language does not seem to impact the storing and processing capacity of working memory.

Graph 6



Correlation between Hindi and English scores at 1 per cent level of significance

pwcorr Hindi_percentage English_percentage, star(0.01)

Hindi_~e	Englis~e	
Hindi_perc~e	1.0000	
English_pe~e	0.6656*	1.0000

The correlation coefficient (r = 0.6656) shows a strong relationship between Hindi and English RST scores. The difference in children's performance in both languages seems to be more a function of language proficiency and age than the language itself. Higher the

language span of exposure and immersion seems to be its storage and processing in the 'working memory'.

In a research done by Mariko Osaka & Naoyuki Osaka (1992), " Language-independent working memory as measured by Japanese and English reading span tests", the correlation between the Japanese and Daneman and Carpenter version of RST was found to be high (0.72). The results of their study indicated that the 'working memory' efficiency for reading is not dependent on the language. Osaka, Osaka & Groner conducted another study (1993) did the same study with French and German Languages, and the "efficiency of working memory was measured with two versions of reading span tests, written in German and in French, using German/French bilingual subjects. The correlation between the German and French versions was highly significant (r: 0.85). The results indicated that the efficiency of working memory for reading is independent of language, reconfirming the results obtained by Osaka and Osaka (1992)." Daneman & Carpenter (1980), conducted a "reading span test with 20 subjects, reported that the reading span varied from 2 to 5 with the mean of 3.15 (SD = 0.93). 0.84, 0.72, and 0.75, respectively.(Osaka & Osaka,1993)" All of the coefficients were statistically significant (ps < .(01). The results showed that the capacity of 'working memory' related to language processing is anchored in proficiency and not the language per se. If a child has a high reading span in his or her native language, he or she would be able to develop a similar "reading span" in a second language. However, if the reading span is lower in the first language, the student will not develop a "high span" in the second language.

The study was conducted by Elisabet & Simola, Marjut & Mesothelioma, Oili & Maury, Sini. (2002) to see if there was "a measurable extra load on working memory when a less proficient language had to be comprehended". An altered version of the reading span task was used. Sentences used were in the participant's first language, i.e. Hindi or second language English. It was found that 'working memory span' and decision accuracy for native

language was better for participants who were less proficient in the second language, whereas no such difference was seen in the case of participants who were comparably proficient in both native and second language. The study concluded that sentence comprehension develops with practice, requiring less working memory resources.

In a study conducted by "Kormi-Nouri, Moniri, and Nilsson (2003), where Swedish - Persian bilingual children from the middle-income group were found to have a favourable relationship between bilingualism and episodic and semantic memory, the effect was stronger for older children than the younger ones (Cited in Bosman & Janssen,2017)." The children who were part of this study used both languages in their everyday life. The researchers deduced that the "cognitive advantages of being bilingual develop only when both languages are comparably proficient (Bosman et al., 2017)." Reading is a cognitive activity, and thus, proficiency is equally important when it comes to reading competency, which involves working memory retention. Another study done by Da Fontoura and Siegel (1995) showed that "Portuguese-English Canadian bilingual children performed equally well in reading, syntactic skills, and working memory as monolingual children when language proficiency was equal for both languages.".

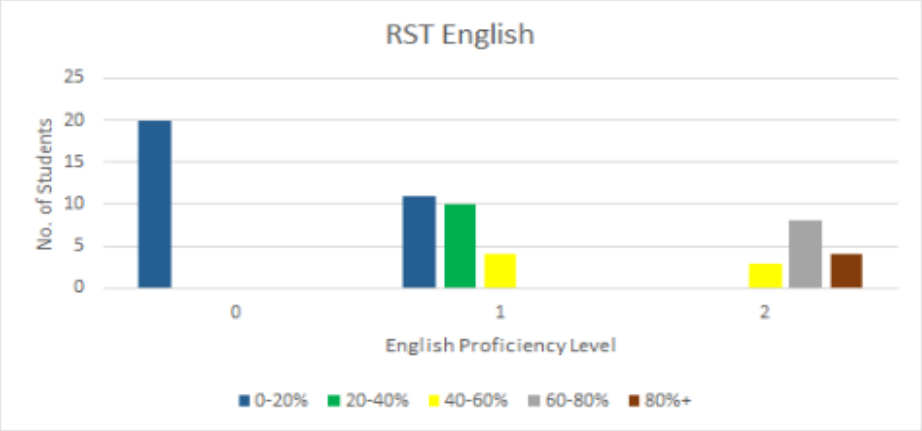
Abreu (2011) tested 'working memory' skills of bilingual children between the age group of 6 to 8 years in the middle to upper class and lower-income group "living in Luxembourg, with Luxembourgish as their second language" and those of monolingual Luxembourgish. Both the groups performed similarly in the middle and upper classes when tested for working memory in Luxembourgish. Thus, it can be deduced that it is not the first or second language that affects retention in working memory but the language proficiency.

3.2 Language Proficiency and Retention in Working Memory:

The present study also revealed the same trends, though it was observed that the level of proficiency impacted the correlation between RST scores in both languages. If the child is

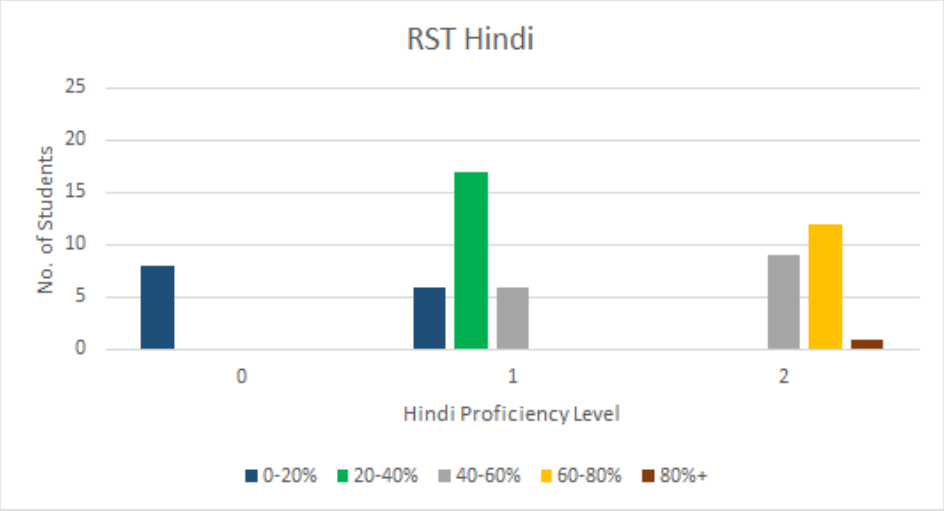
equally proficient in both languages in an ideal scenario, then RST for both would be highly correlated. The following graphs depict the relationship between language proficiency and RST scores in English and Hindi.

Graph 7



X-axis - ASER Language proficiency level; Y-axis - Number of children in the varied ranges of RST scores. The colours denote the range of RST scores.

Graph 8



X-axis - ASER Language proficiency level; Y-axis - Number of children in the varied ranges of RST scores. The colours denote the range of the RST score

1. Correlation between Hindi RST Scores and Level of Reading for Hindi at 1 per cent level of significance

pwcorr Hindi_percentage Normalise_HindiVar, star(0.01)

Hindi_~e Nor~iVar

Hindi_perc~e 1.0000

Normali~iVar 0.8636* 1.0000

2. Correlation between English scores and Level of reading in English at 1 per cent level of significance

pwcorr English_percentage Normalise_EnglishVar, star(0.01)

| Englis~e Nor~hVar

---+---

English_pe~e | 1.0000

Normali~hVar | 0.9028* 1.0000

Note: Since the data for the level of reading was ordinal, it has been converted into continuous data using the following formula: (Observed value-Minimum Value)/(Maximum Value-Minimum Value)

Graphs 7 (English) and 8 (Hindi) depict a positive correlation between language proficiency and RST scores in both languages. However, the correlation coefficient for Hindi language proficiency and RST is significant at 0.8636, and for English, it is significant at 0.9028; thus l working memory storage and processing are strongly correlated to proficiency in the given language and not language itself.

To elucidate this further, 2 case studies were conducted, one in which a child performed almost 5 times better in Hindi than in English and the other was when a child could not remember a single word in Hindi but scored in English 56%. These two and a few other cases were complete outliers as per the general pattern seen and the value of (r).

3.3 CASE STUDY 4

Child's Name: X1

Age: 7+ years

School: State-run primary school.

ASER Reading level (Hindi) - 2

ASER Reading level (English)-1

Home Language - Hindi

RST Score Hindi - 62.5%

RST Score English - 12.50%

The child predominantly spoke in Hindi, and it was his home language and the first language he acquired, whereas English was introduced in the school at the age of 5 +. He was a first-generation learner who was learning the English language at school; thus, the home environment was bereft of any English language input apart from the frozen English words which have become part of the colloquial language such as – phone, mobile, car, fridge, etc. Thus, the child's exposure to English was limited to what was being taught at school as there were no other opportunities to learn, speak or practice English, whereas Hindi was the default choice for all the conversation and reading.

The child preferred to read literature in Hindi, "हिन्दी की कहानी पढ़ने मे मज़े आते हें, इनगलिश समझ नही आती." (I enjoy reading in Hindi as I do not understand English.). As the child's exposure to LI was exponentially higher than L2, it explains the difference in proficiency in the language. Another factor that resulted in greater proficiency in Hindi

compared to English was the ‘span’ of knowing the language. The result of proficiency in Hindi on working memory capacity is apparent in its RST scores. While reading the sentences in Hindi, the child used sub-vocal rehearsal while trying to remember 3 or more words, whereas, in English, he used it while trying to remember two words. The child kept revising the list by repeating it to himself as soon as a new word was introduced. He was able to phonetically and semantically engage with the text in Hindi, while reading the child, syllabified the longer words and on being asked how did he remembered the words he said, “कुछ कुछ तो बार बार मन मे बोल बोल कर, कुछ पता नहीं ऐसे ही पढ़के समझके..”(I tend to remember certain word by repeating them in my head and some other just my understanding while reading).

The child’s verbatim was reflective of the use of sub-vocal rehearsal to refresh and retain the information in “working memory” in “phonological form” and, in some cases, the semantic code. However, governing view maintains that “information is maintained in working memory in phonological form refreshed by articulatory rehearsal (Baddeley, 1992b; Hulme, Roodenrys, Brown, & Mercer, 1995; Logie, 1996 Cited in Ruchkin et al.1999)”. In addition, certain divergent views emphasize “that language processing inherently activates a variety of different types of codes (lexical, semantic, syntactic) and that these codes are maintained over time (Monsell,1984; Saffran, 1990; Saffran & Martin, 1990; Martin & Romani, 1994; Martin & Saffran,1997 Cited in Ruchkin et al.,1999).”

Several behavioural studies have shown the impact of “lexical-semantic code” on the retention of verbal in ‘working memory’. For example, in a study consisting of “serial recall, memory span was greater for words than for nonwords (Hulme, Maughan, & Brown, 1991; Schweickert, 1993)” and fewer errors were made while recalling high-frequency words (Watkins, 1977). In case study 1, high-frequency words were easy to recall despite the impediment of sub-vocal rehearsal. Fewer errors were reported to have occurred when the

subjects retained semantically dissimilar words and when words could be easily imagined (Ruchkin et al., 1999; Bourassa & Besner,1994). Thus, looking at these results, it can be said that "lexical-semantic codes play a prominent role in working memory retention." The common view holds that "phonological and lexical-semantic codes" are mechanically activated as words are encoded, irrespective of their retention in working memory. The activated "lexical-semantic codes" majorly contribute to performance at the time of retrieval (Baddeley, 1972; Baddeley, 1990; Logie,1996; Hulme et al., 1997). Another view hypothesizes that "lexical-semantic codes play" help in maintenance words in 'working memory'(Saffran, 1990; Saffran & Martin, 1990 Cited in Ruchkin,2017). The child scored better in Hindi RST because he could access and retain words in working memory by activating both phonological loop and semantic code.

On the contrary, when the child read English sentences, he read every alphabet without associating it with a sound, nor was he able to combine the sounds to form a word. Most of the words that he could remember were high-frequency words that he had read before; therefore, they were part of his language repertoire. Harrington .M & Sawyer (1992) studied the effect of the difference in reading skills on L2 working memory capacity. Reading involves various cognitive processes such as identifying individual letters and words to make inferences and interpret the text.

There are two approaches to reading – "bottom-up" and "top-down". "Bottom-up" involves processing words and letters, semantic activation, representation, and encoding of the same in contextually relevant meaning. In comparison, the top-down process involves using the reader's background knowledge of the word (schema) to make meaning. Instead of relying on understanding words, sentences, or sounds, the knowledge outside the text is being used. The child probably used a top-down approach while reading in Hindi as he had the background knowledge to fall back on and contextualize the text to make meaning. The span

of knowing Hindi was much longer than English, thus a greater number of sight words and high-frequency words. In English, the child was using a bottom-up approach because of which load of working memory increased as reading required more processing, and thus working memory's capacity to retain information was reduced.

Researches propose an apparent difference between L2 "skilled" and "unskilled readers" in terms of processing. The L2 readers who are less skilled tend to depend more on "graphic cues" in reading than higher levels of the "semantic and inferential process" (Harrington & Sawyer,1992). The studies by "Favreau, Segalowitz, 1983; Magiste,1986; Segalowitz,1986 (cited in Harrington & Sawyer,1992)" showed that meaning activation in L2 is slower than in L1, even for proficient bilinguals. The results have been appropriated to "individual differences in the relative degree of automaticity in reading processes (Mc Laughlin, 1987 cited in Tomasello 1988)". "Torres (1998) explored the relationship between previous knowledge, L2 working memory capacity, and L2 reading comprehension." Her study claimed that the processing efficiency of the readers affects their 'working memory' capacity and their retrieval and comprehension abilities.

The dependency of less-skilled readers on graphic cues can be traced to the pedagogical practices at school. Conventionally reading has been construed as a "decoding process", that is, looking for "oral equivalents of written language (Shobha Sinha,2000)".

> "In terms of literacy acquisition, the dominant perspective (reading readiness) considered learning to read as learning to decode. Then, the instructional implication was to master 'decoding'. This was accomplished by mastery of subskills in a sequence. Additionally, there was a tendency to focus on formal and not functional aspects of language while learning to read (Teale and Sulzby, 1986, cited in Sinha,2000)."

Though the new texts designed as per NCF 2015 are as per the top-down approach, the pedagogy is structured around "letter-sounds association." Children are expected to learn the letter-sound correspondence and master the phonics sequentially. What is needed is an authentic engagement with literacy in a meaningful manner. An immersive environment

needs to be created, where children can be involved in authentic tasks (Hiebert,1994) “involve children in immediate use of literacy for enjoyment and communication”. In an immersion, approach learners are exposed to the target language by making it part of everyday conversation and instruction. In an engaging, immersive environment, the teacher speaks the targeted language slowly, clearly and uses highly comprehensible language. The verbal language has to be accompanied with appropriate non-verbal cues such as hand gestures, appropriate modelling, visual aids, and acting out techniques (Burt,1965 cited in Sinha,2000). Immersion also includes having a print-rich environment and engaging learners in interesting, meaningful texts. Thus, pedagogy has a significant role to play in language proficiency. Daneman and Merikle (1996) “found that proficient readers have higher working memory capacity due to their ability to allocate a greater amount of their resources to the retention of items and not to the processes.” Daneman and Carpenter (1980) stated “that working memory capacity is functional and differs according to an individual's processing efficiency in the task.” Language proficiency is a major factor that determines the efficiency of working memory. However, working memory capacity can also help responsible for developing greater language proficiency. It is almost as if both work in tandem.

3.4 CASE STUDY 5

Child’s Name: X2

Age: 8 years

School: International Bachelorette School.

ASER Reading level (Hindi) - Emergent

ASER Reading level (English) -2

Home Language - Dominant English - Hindi Bilingual

RST Score Hindi - 10.4%

RST Score English - 65.8%

The child predominantly spoke in English with his parents and his peers. He tried to speak in Hindi with his grandparents. The child went to Australia at the age of 1 and was there for 6+ years; Australia being predominantly an English-speaking country, became the child's default language. It was during covid times that the family had to move back to India due to job loss. Thus, the child primarily grew in an environment in which his dominant language for reading, writing, listening, and speaking was English. The only exposure to Hindi was his grandparents' regular phone calls and his parents' and neighbours' sparse interaction in the said language. However, exposure has tremendously increased from last year due to increased interaction with grandparents, peers whose dominant language is Hindi. When parents were asked about their view on learning Hindi, the mother said, " As it was not much needed, so our focus was to help him master the English language. Though we spoke to him Hindi at times specifically so that he could connect with grandparents and other relatives back home." With their move back, the child was introduced to Hindi in a more structured manner through online classroom engagement. The reading and writing in Hindi were new, so it was almost his introduction to the orthography of Hindi. Here the notion of the mother tongue being the child's first language is overturned, and the language first learned becomes the dominant language in his social plane.

Language proficiency is a function of the order of acquisition, age of acquisition, learning context, and exposure length. Usually, a "chronological approach" is adopted by researchers to define the order of acquisition and refer to the "first (L1), second (L2), third (L3)" language (Pavlenko,2015). The second language usually refers to any language learned late in life. But in this case, the child was exposed to both languages simultaneously; thus, the age of acquisition is the same. Scholars have defined such bilingualism as 'Bilingual First Language Acquisition' (BFLA). De Houwer has defined it as "the development of language

in young children who hear two languages spoken to them from birth." (Grosjean& Ping Li, 2013). It is relatively an inclusive definition that includes passive bilinguals, who do not use both the languages actively but are exposed to them since birth. Grosjean's (2008) definition excludes passive bilinguals as it says "regular use of two or more languages" thus BFLA can be defined as "the concurrent acquisition of two languages in a child who is exposed to them from birth and used both regularly in early childhood." (Grosjean& Ping Li, 2013). However, the situation gets complicated when school comes into the picture, which seems to be the reason for the unequal development of both languages.

> "The Logical Problem of Bilingual Acquisition (Yip& Matthews, 2007, P.30, Ping Li, 2013) recognizes that the problem posed by the input is more severe for the child both quantitatively and qualitatively: In terms of quantity, assuming an idealized case in which the input available to the child is balanced, the child will hear on average half as much input in each language as the corresponding monolingual child. Under more realistic assumptions, the input will be unbalanced, leaving the child with perhaps 30-40% of her input in one of the two languages. This is the basis for the development of a weaker language.
> Qualitatively, the indeterminacy of input - the fact that a given sample of input is compatible with numerous underlying grammars- is compounded in the case of bilingual children to the extent that the two target grammars may suggest different analyses for a given utterance. This problem forms the basis for the input ambiguity account for cross-linguistic influence (Muller, 1998; Yip & Matthews, 2007)."

The child's exposure to English manifoldly increased; once he joined the child care centre and then school, his peer interaction increased and his exposure to the written form of English. Thus, a print-rich environment for English led to the development of sight vocabulary and high-frequency words, thus better reading capacity. Whereas in Hindi, no such exposure was given, making it a weaker language.

Another factor that impacts proficiency of language in the "context of acquisition (CoA), it refers to the context in which the language is learned" (Pavlenko,2015). In this case, the child acquired English in an environment that was naturalistic and immersive, whereby he was using the said language in his daily life and the structured environment of the school. In

the case of Hindi, the environment was naturalistic, but it was just too sparse as it was restricted with home space. Thus, other than listening and speaking, no other language skills were introduced.

During the RST, the child read English sentences silently, though sub-vocally rehearsed them when the words to be remembered soared. On being asked about how he remembered the words, he said it was mostly "the things that come to my mind reading the sentence that makes me remember words", and when the number of words to be recalled increased, he rehearsed them in his mind but at times while rehearsing his inner speech became audible. The child's reference to remembering 'things' related to words is close to what Vygotsky (1986) described as word sense. J.F Ehrich (2006) "Borrowing from Paulhan (1928), word sense is described as …the sum of all the psychological events aroused in our consciousness by the word (Vygotsky, 1986, p. 245 cited in Guerrero,2005)."

"Word sense is defined through the context in which it occurs; hence, it will fluctuate in different situations, whereas word meaning is static and unmoving. Word sense has many zones, of which meaning is just one (Vygotsky, 1986 cited in Guerrero,2005)". In English, the child was able to access the words through a visuospatial sketchpad whereas, in the case of Hindi, the child read the text with great difficulty, he had problems recognizing the phonemes, and even when he was able to, he had a problem sewing the sounds together to form a word.

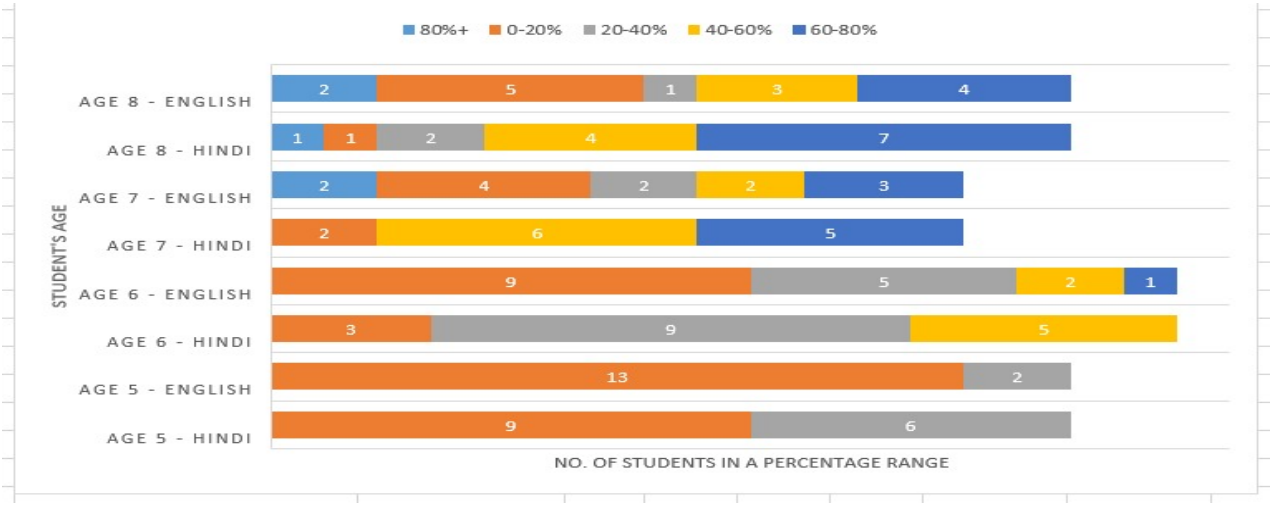
The research carried by Dornic in the 1970s pioneered work on the relation between 'working memory and foreign language. The study combined secondary and primary tasks based on the first (dominant) instruction and the less well-commanded language (non - dominant). The study showed considerably reduced performance on the secondary task and an increased level of effort when instructions were given in a non-dominant language. Dornic analyzed the results and reported the "decoding and encoding of a non-dominant language

consume more working memory capacity"(Service et al., 2002) than the processing in the dominant language. The additional load on working memory while using less dominant language was partially because of reliance on a "rehearsal with the help of inner speech"(Service et al.,2002), and being "less efficient in the language" would have made it difficult to access the working memory through varied loops. Thus, the child struggled to remember Hindi words due to an excessive processing load on working memory.

The studies on bilingualism and 'working memory' are divisive on the superiority of the bilingual mind. " Bialystok (2001) argued that a bilingual advantage with working memory is expected to occur when there is a high proficiency in both languages (see also Cummins, 2000 cited in Bosman & Janssen,2017). Bilingual advantage can be explained through other factors such as "social class and exposure to both languages (Bosman et al.,2017). Most of the findings supporting "bilingual advantage" have been found in "middle- or upper-class children who have been exposed to both languages since birth and also use both languages on a daily bases." Engel de Abreu's (2011) study is the only exception where monolingual children outperformed bilingual children hailing from the middle and upper-middle class, as the monolingual children performed better on language skills focussed on vocabulary and syntax.

3.5 Age and Working Memory Retention

Graph 9



Graph 9 depicts the scores of RST (Hindi & English) with respect to children's age.

Age has an important role to play in the functioning of working memory. As the age is increasing, thus are the number of children in higher score brackets. It reflects upon the developmental and growth stages of working memory. Hulme et al. (1984) noted that "as children grow older, an increased rate of rehearsal enables children to maintain increasing verbal material in the phonological loop. "Gathercole et al. (2004) Before 7 years of age, spontaneous rehearsal does not reliably occur (see Gathercole & Hitch, 1993, for a review); in younger children, the phonological loop, therefore, consists of the phonological store only. Further factors implicated in the development of phonological memory capacity include changes in the speed of memory scanning during retrieval (Cowan et al., 1998) and of output processes (Cowan et al., 1992)." This could be one of the reasons that children in the age group of 5- 6 performed poorly in RST compared to children in the age group of 7-8 years.

Other age-related factors that might be responsible for an increase in the effectiveness of working memory could be the "deployment of strategies, accumulation of long-term knowledge relating to visuospatial structures, or enhanced support of central executive (Pickering, 2001 cited in Gathercole, Pickering, Ambridge, & Wearing 2004)". High-

frequency words and sight vocabulary are part of long-term memory accumulated over time, and in chapter 2, it has been found that the larger the sight vocabulary, the higher the reading comprehension, which is a function of higher "working memory capacity". 'Working memory' will be engaged more in retention than in processing.

In the case of "working memory", apart from the development of phonological loop, and visuospatial sketchpad, the central executive also play an important role in the enhancement of 'working memory' capacity (Gathercole et al.,2004). "Developmental changes in the central executive have majorly been investigated in the context of the complex memory span paradigm that requires simultaneous processing and storage commands (Gathercole & Alloway,2006)". For example, the reading span test comes under such a paradigm as it requires participants to process sentence order successively and then recall the final word of each sentence in chronological order (Daneman and Carpenter, 1980). "Performance on complex memory span tasks has been considered to be limited by the capacity of the central executive alone, till the recent past, though now it has been found that phonological loop provides storage during complex memory span tasks (Baddeley&Logie, 1999; Duff & Logie, 2001; see also, LaPointe & Engle, 1990; Lobley, Gathercole, & Baddeley, 2003 cited in Gathercole et al., 2004)."

Another theoretical approach to "complex memory span is that it utilizes general working memory capacity that limits both processing and storage (e.g., Daneman & Carpenter, 1980, 1983; Engle, Cantor, & Carullo, 1992; Swanson, 1999 cited in Gathercole et al., 2004)." Coherent with this approach is Case, Kurland & Goldberg's (1982) recommendation that "an incremental memory span performance is observed across the early and middle childhood years." As the additional resources for storage support develop there is a drop in the processing demands of memory tasks. This kind of "resource-sharing model"(Gathercole et al., 2004) have been challenged based on "absences of the predicted trade-offs

between processing and storage in complex span tasks (e.g., Towse & Hitch, 1995; Towse, Hitch, & Hutton, 1998, 2002 cited in Gathercole et al.,2004)."

> "Gathercole, Pickering, Ambridge & Waring (2004) conducted a study to investigate changes across the childhood years in the capacity of the varied components of the Baddeley and Hitch (1974) model of working memory and to explore whether the structure of working memory remains the same across the developmental period or undergoes changes. The development of the phonological loop, the central executive, and the visuospatial sketchpad was found to be similar, exhibiting linear increases in performance from 4 years through to adolescence. The tripartite structure of the adult working memory model, gave a good account of the interrelationships between measures of short-term memory from 6 years onward, with no evidence of consistent developmental changes in the relationships between the components."

The study hypothesized a closer link between the processing efficiency in older age and increased performance in the phonological loop and the central executive tasks.

Thus, it can be said that working memory retention increases from primary years through adolescence, and this also corresponds with the internalization of inner speech, thus providing bases for the effective working of the phonological loop.

Apart from age, another factor that limits the working memory capacity is 'attention'. Engle and colleagues (Turner; Engle, 1989; Conway, Engle,1996; Kane et al., 2001; Engle, 2002) proposed the Controlled-Attention View. The primary argument of this view is the difference in the individual's ability to control attention. In case of distraction, when an individual needs to suppress irrelevant information while performing a cognitive task, in such a situation, "working memory capacity" is challenged. "In this sense, those with more working memory capacity, the higher spans, as measured by complex span tests such as the reading, the speaking and the operation span tests, are better able to channel attention to specific pieces of information, preventing it from being captured by external and/or internal interfering thoughts (Feldman-Barrett et al.,2004 cited in Gathercole et al.,2004)."

Therefore, it is essential to reduce distractions while reading to fully utilize the working memory capacity. Distractions can be reduced by creating dedicated reading spaces

and time. Distractions also get reduced if an engaging age-appropriate text is provided. During the research, younger children were easily distracted by ambient noise and other physical movements and objects; thus, it can be deduced that lack of attention can also contribute to the lower RST scores in the age group of 5 to 6+ years.

Chapter 4

Exploration of the relation between Text and Translation in Inner Speech

This chapter attempts to examine inner speech during reading, see whether learners translate, code switch while engaging with the text in their inner speech, and whether the kind of the text (literary or domain-specific) impacts it. Before delving into the method used to navigate the research, I will try to explicate the process of code-switching. It is a fascinating phenomenon that is usually observed in bilingual/ multilingual populations across the globe. However, many studies have been conducted in the field of cognitive psychology to understand how two or more languages are stored in a bilingual memory and how bilinguals switch in and out of languages. This mostly happens in "speech production when an individual speaking in one language rapidly switches a word or a phrase in that language with a word or a phrase in the other language (Li, 1996, Riehl M.C., 2003)". Hymes has defined code Switching & code Mixing as "a common term for alternative use of two or more languages, varieties of a language or even speech styles". Bokamba (1989) defines both concepts as:

> "Code-switching is the mixing of words, phrases, and sentences from two distinct grammatical (sub)systems across sentence boundaries within the same speech event… code-mixing is the embedding of various linguistic units such as affixes (bound morphemes), words (unbound morphemes), phrases and clauses from a cooperative activity where the participants, to in infer what is intended, must reconcile what they hear with what they understand."

Though this phenomenon has been mainly studied for social speech, this chapter has explored the same phenomenon for inner speech. As language is first learned at the social plane and then internalized at an individual plane (Vygotsky, 1983), thus it can be hypothesized that a similar phenomenon should be observable in inner speech.

4.1 Method – Verbal Report with Think-aloud Protocol

To study the ‘inner speech’ while reading, the method of the introspective verbal report has been employed with the think-aloud protocol. However, it is probably one of the most contested data collection methods in ‘ inner speech’ research. A verbal report is a method of “data collection in which the source of information is the subject's own statements or verbalizations about the object of study, in this case, inner speech (Guerrero, 2005).” The legitimacy of such self-report methods has been questioned by researchers on and off as a method of mental data collection (Ericsson & Simon, 1984; Lieberman, 1979; Lyons,1986; Nisbert & Wilson, 1977 cited in Guerrero,2005).

With the emergence of cognitive psychology, the view towards verbal reports changed, once “the reports which were thought unreliable and insufficient as sources of evidence about cognitive processes, found renewed support as ways of gaining access into covert, mental phenomena(Guerrero,2005)”. The information processing model of memory further strengthened the return to introspective data as it delimits the scope and conditions of verbalizing mental process. Verbal data is categorized as “Introspective and retrospective (Guerrero, 2005).” Introspective conventionally “requires the subject to verbalize thoughts while performing a task, that is the time when data is still in short-term memory. Retrospection calls for report data on the cognitive process after some time of their occurrence (Guerrero,2005).” Cohen's (1987, 1998) classification of verbal report data into “three types- self-report, self-observation, and self -revelation” (Cited in Guerrero,2005) is one of the most relevant classifications which takes the notion of “introspection and retrospection into account.” . Self-report data is based on the subject's generalized observation about the learning process or language usage without specifying any event or experience. In self-observation, remarks are based on “observation of specific language behaviour while the task is being performed or retrospectively sometime after the event”

(Guerrero,2005). “Self-revelation” refers to “thinking aloud”; it is an external expression of ongoing thoughts as a task is being performed; it is an unedited introspective thought.

Before discussing the method used for the present study, the significant factors that limit the use of verbal reports have been considered. First, most of the cognitive processes are unavailable for reporting as they occur without conscious awareness. Another critical deficiency of relying on verbal reports is that it is memory-based, and memory is not always dependable. Three main problems that have been identified with memory are “ (1) Even with conscious awareness of the process, the information may have been obliterated and may thus be irretrievable; (2)the information may be recalled or reported incompletely; and (3) the information may be recalled or reported inaccurately (Ericsson & Simon, 1980; Lieberman, 1979; Nisbett & Wilson, 1977cited in Guerrero,2005).” In association with the last two points, and accepted limitation of verbal reports is that rather than reporting exact thoughts, the subject’s inferences might imbue the memory gaps. Likewise, subjects might offer their “interpretations” of recollection in the form of plausible causal theories (Nisbett & Wilson, 1977 cited in Guerrero,2005). Despite these shortcomings, self-report methods of data collection have been used as it provides “information about mental processes that cannot be obtained through external observation.” It also offers glimpses of how certain cognitive operations are conducted, thus bringing the learner’s metacognitive knowledge to the surface (Wenden, 1986). They also offer insight into the subjective experiences of learners and knowledge about their perceptions and beliefs. Finally, in the case of private speech, it allows gathering information that can yield hypotheses or serve as a point of departure.

To tap the ‘inner speech’ while reading or what is also referred to as inner reading voices(IRV), two different kinds of texts were used- literary and domain-specific, in both Hindi and English, chosen as per the reading level(1&2).To tap IRV, the think-aloud protocol was used whereby children were required to vocalize their thoughts while reading. Think-

aloud protocols are considered to provide rich data on inner speech. Some researches that have employed thinking aloud as a technique to investigate inner speech while reading is "Sokolov's (1972) research on the understanding of the text. Upton and Lee Thompson (2001) found the use of L1 inner speech in L2 reading using think-aloud (Guerrero,2005)."

Woodall (2000) used the same technique to look at code-switching in the writing of English - speaking students of Japanese. Children were asked to read the text silently, and when they were almost halfway through, a buzzer was pressed, and they were asked to verbalize their exact thought, words or draw images that were running in their minds. To familiarize children with the task, it was done twice before finally doing it for the purpose of data collection. To elicit and facilitate verbalization, specific cue questions were asked?

Cue Questions:

What is that you are thinking?

Can you tell me precisely the events playing in your head?

What are the words that are there in your mind at present?

* Child's preferred language was used to ask the cue question

Sample of the reading text used: (Children were given typed text and not the book to remove the picture support to comprehend the text.)

Level 1 Hindi Reading (Literary) - (मुझे स्कूल नहीं जाना - Pratham Books Level 1)

चलो, उठजाओ.

में नहीं उठना चाहता.

Level 1 Hindi Reading - Domain Specific (Maths NCERT BOOK)

रीमा के पास 8 कंचे हैं.

उसने दो शमा को दे दिए

Level 2 Hindi Reading(Literary)- (पीशी और मै - Pratham Books Level 2)

पैदल सैर करने जाना मुझे बहुत पसंद है.

खास तौर पर अपनी पीशी के साथ.

Level 2 Hindi Reading Domain Specific -(Maths - NCERT BOOK)

कविता बाजार में मोती बेचती है.

वह दस मोतियों से बनी माला बेचती है.

Level 1 English Reading (Literary) - Rani's First Day at School (Pratham Books- Level 1)

"It is my first day at school.

Mummy is holding my hand and walking with me."

Level 1 English Reading (Domain Specific) - (Maths - NCERT BOOK)

Reena had a total of 9 storybooks.

She gave 2 to Sona.

Level 2 English Reading (Literary) (Grandma's Glasses - Pratham Books Level 2)

"Nani keeps losing her glasses."

"Where did I keep them?" she keeps asking.

Level 2 English Reading (Domain Specific) (Maths - NCERT BOOK)

Anu bought pencils for 18 rupees.

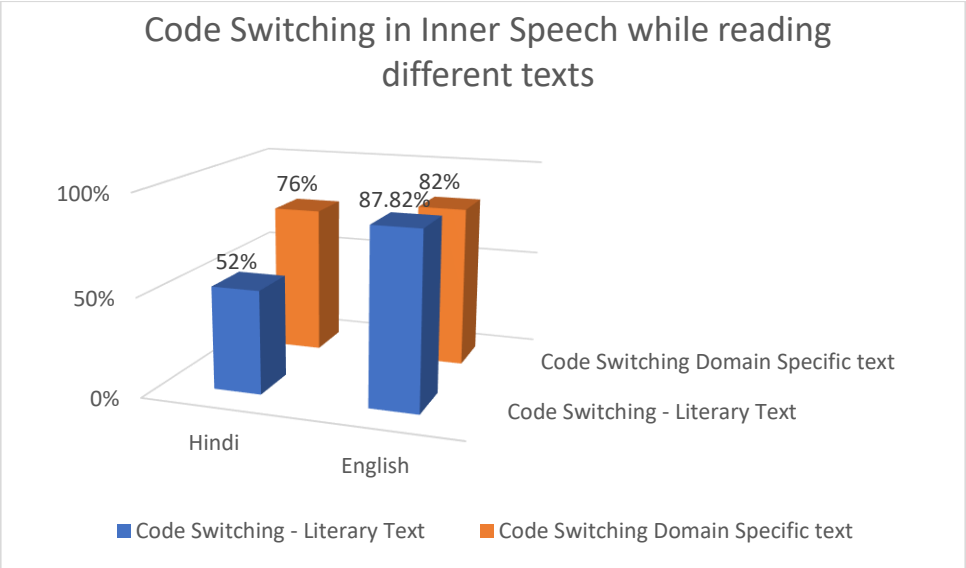
She has 10-rupee notes and 1-rupee coins.

4.2 Code Switching and Code Mixing while Reading Literary Texts.

The study revealed that bilingual or multilingual children switch, mix, and translate in their inner speech and private speech while engaging with the text for better comprehension and meaning-making. For example, 52% of children code switched and code mixed while reading Hindi literary text, and this percentage increased to 76% when the domain-specific text was read. In the case of English literary text, 87.82% of children code switched, code mixed, translated, and in the case of domain-specific reading, 82% of children code switched and translated. The close study of data reveals that the code-switching and code-mixing in an

inner speech in a bilingual or a multilingual mind are affected by language dominance, proficiency, and frequency of usage in everyday interaction, background knowledge, and cultural schemas. Further, it will be discussed how inner speech code-switching and translation helps in comprehension of the text.

Graph 10



The mental translation is one factor that majorly impacts reading comprehension, the "mental reprocessing of L2 words, phrases, or sentences in L1 forms while reading L2 texts" (Kern, 1994, p. 442). Research has shown that “mental translation”(Upton & Thompson,2001) is one of the most common cognitive strategies that learners are employing to make meaning of the text “(e.g. Chamot & Kupper, 1989; Kern, 1994 cited in Upton et al.,2001)”. Cook (1992) argued that all second language learners employ L1 resources to process the L2. He suggested that "the L2 user does not effectively switch off the L1 while processing the L2, but has it constantly available" (Cook, 1992, p. 571). It has been acknowledged that "Mental translation" is associated with Vygotsky's concept of inner speech (1986). Vygotsky emphasized the role of inner speech in thought. As per Vygotsky, L1 and L2 cannot be regarded independent of each other in case of any language function;

they are “two unrelated processes, either parallel or crossing at certain points and mechanically influencing each other” (Vygotsky, 1986, p. 211).

In Vygotsky’s words: “The relation of thought to word is a process, a continuous movement back and forth from thought to word, and from word to thought...Thought is not merely expressed in words; it comes into existence through it.” (1986, p. 218). Recent studies which have looked at second language acquisition through the Vygotskian lens have clearly stated that the cognitive influence of one's first language on second language acquisition is apparent (Upton et al.,2001). It has also been observed in several other pieces of research that “L2 (non-dominant language) learners use their L1 (dominant) language to comprehend L2, at least in the early stages of language acquisition (Upton et al.,2001).”

The present study also showed similar trends, where one language is being supported by another for text comprehension. But is L1 supporting L2 or dominant language supporting non-dominant or languages working together as a whole and using bilingual repertoire for meaning-making? To understand and analyze the language usage in inner speech while reading, verbalizations will be examined using Upton and Thompson (2001) categories of how L1 (dominant language) is used to comprehend the text in L2 (non-dominant language) will be used. The L1 is generally used to “wrestle with” or try to affirm the meaning of the text. The categories devised by Upton and Lee -Thompson (2001) are:

> “ 1) Translation word/ Phrase meaning - the participants translate (semantic unit) into their L1. 2) Wrestling with words/ phrase meaning- the participant attempts to translate unknown English words or phrases into their L1. 3) Confirm comprehension of larger portions of the text beyond word/ phrase level- the participant summarizes or translates a larger portion of the text into their L1 to confirm comprehension. 4) Wrestling with the meaning of larger portions of the text beyond words/ phrases-the participant has difficulty and attempts to understand a sentence or paragraph. 5) Predicting/anticipating text structure and the context- the participant expresses in their L1 predictions and or anticipations of what content or text structure will occur in the succeeding portions of the text.”
>
> “These five categories were further bifurcated as supportive or non-supportive, that is, whether the strategy employed helped in meaning-making or not. To

decide the effectiveness of the strategy, it was seen whether it reflects the intended meaning or not."

Examples - Level 1 - Hindi Literary Reading

Text -

मैं नहीं उठना चाहता. मुझे शौचालय नहीं जाना

X1 ,(6 years) ,

" शोशोशौचालय ...यह तो market मैं होता है Toilet." " Pink colour का"

Category – "Translating word/ phrase – Supportive"

Text -

मैं दांत नहीं मांजना चाहता. मैंन नहाना नहीं चाहता. मैं नाश्ते में इडली नहीं खाना चाहता

X8 ,(5yrs) -

"दाँत मांजना brush करना.", "मैं भी करता हूं सुबह."

Category – "Translating word/ phrase – Supportive"

X 4 (6 years)

" इडली कौन खाता है breakfast मैं."

Category – "confirm comprehension of larger portions of the text beyond words/ phrase level" - supportive

Text -

सुप्रभात चलो जल्दी उठ जाओ.

X 14 (6 years)

" सुप्रभात ...सुप्रभात ...यह क्या होता है…" " don't know...पर उठने…" looking at the researcher seeking confirmation " क्या goodmorning होता है."

Category – "Wrestling with word / phrase" - supportive

Text -

और... और जल्दी हटो मुझे शौचालय जाना है. मैं आया रॉकेट बनके... रास्ते से हटो."

X 22 (7 years)

"रॉकेट... कैसे कोई place है क्या शौचा.." the child looked at the researcher with the utter confusion and frustration " where does he want to go ?"

Category – "Wrestling with meaning of larger portions of text beyond words/ phrases." - Non - supportive.

Examples - Level 2 - Hindi Literary Reading

Text

जब पीशी मेरा हाथ पकड़ के चलती है तो मुझे अच्छा लगता है.

लेकिन जब वह हाथ छोड़ देती हैं तो और भी अच्छा लगता है.

X 16 (8 years)

उसकी पीशी अकेले चलने देती है तो उसे अच्छा लगता है.

Category : "Confirm comprehension of larger portions of the text beyond word / phrase level."

But there is no code switching or translation. – Supportive

Text

पीशी को नीचे गिरे हुए फूल इकट्ठा करना अच्छा लगता है

मुझे पत्थर इकट्ठे करना भाता है

बड़े वाले , छोटे वाले

गोल वाले, चपटे वाले

X 17 (7 years)

Road से सामान ...कट्ठा करते हैं

Category: "Confirm comprehension of larger portions of the text beyond word/phrase level." Supportive

X37 (7 years)

भाता... अच्छा लगना (looking at the researcher to confirm)

Category – "Wrestling with word / Phrase meaning."- Supportive

Text

दिलीप भाऊ ने अपनी जादुई सी लुभावनी दुकान से यह क्लिप दी.

X 52 (6+ years)

The child could not read the word लुभावनी then re-read the first half of the sentence. " Magic shop"

Category: "Translating word/ phrase meaning" - Non - supportive

X9 (8 years)

लुभावनी… good shop.

Category: "Translating word/ phrase meaning" - Supportive

It was observed that 52% of children code switched or codemixed while reading Hindi literary text. As per Upton and Thompson's category, 34 % of the children "translated word or phrase meaning" while engaging with the text in their inner speech. 48% wrestled with the word and phrase meaning, and 13% code switched while confirming the comprehension of more significant portions of the text beyond word or phrase level. Finally, 5% wrestled with the meaning of more significant portions of text beyond words and phrases.

For 94% of the children, Hindi was their dominant home language; still, they code switched in their inner speech while reading. Even with increased proficiency, code-switching at the morphological level where words were translated or wrestled with continued to be part of inner speech. 84% of the time, code-switching facilitated comprehension. Though it is to be noted that children used sentence structure of Hindi and switched Hindi

words with their English counterparts and at two instances with Punjabi while 'confirming the comprehension'. Children code switched, as they had access to the more frequently used words in their daily lives. Many of these words were loan words from English, which predominantly Hindi speakers use.

Words like 'सुप्रभात', 'शौचालय', and ' कक्षा' are lesser-used words in daily routine, they tend to be more textual than colloquial. These words are rarely found in written texts, and children who could recognise these words had a prior experience or background knowledge of the same. For example, children had seen their teacher writing 'सुप्रभात' on the blackboard during "before lunch" Hindi classes. Another student reported "यह वर्ड तो (while referring to शौचालय) मैंने मार्केटमें पिंक टॉयलेट के बाहर देखा है." (I have seen this word outside the pink toilet in the market.) She could not decode the word but had the image of the word in her mind, which facilitated her access to the meaning via visual route. At the same time, words such as ' Toilet', ' Brush', ' class' and ' Good morning' are commonly used, day-to-day colloquial words which have been borrowed from English and are now part of Hindi repertoire as well. Thus the question arises whether to consider such swapping as code-switching or not?

Examples - English L1- Literary Reading

Text

"There are so many children.

They come by bus. They come by car.

They come by rickshaw. They cycle.

They walk like me."

X4 (6 years)

Bus, Car, Cycle….बच्चे (Bus, car, cycle are loan words in Hindi)

Category: "Translating word/phrase meaning." Supportive

X 11(7 years)

सब स्कूल जा रहे हैं... बस कार साइकिल से (Everyone is going to school by bus, car, cycle)

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level. Supportive

Text

"We reach the gate. Mummy let go of my hand.

She stays at the gate. I have to go inside alone.

There are so many new faces all around me"

X 33 (6 years)

Let go...go ..जाना होता है (had to go)...mummy चली गई (left)...a.lone ...a ...lone – एक (one)

Category: "Wrestling with words/ phrases" - One part supportive, the second part- non-supportive

X48 (7 years)

Mummy...gate पर (on)..alone..home alone जैसे अकेले..(like alone)

Category : - "Translating word/ phrase meaning." Supportive

Text

"I take one step. I take another step. I look back. Mummy gets smaller as I walk away. Will she disappear?"

X 27(6 years)

Walk away...walk ... चलना (walk) ..away ...दूर...(far)

Category – "Translating word/ phrase meaning." Supportive

Text

"Mummy says, " Rani, I will be here when you come out." I let go of her hand. She waves to me."

X 15 (6 years)

bye-bye, कर रही है मम्मी (mummy is saying bye)...wave ...bye-bye होता है.

Category: "Confirm comprehension of larger portions of the text beyond word/phrase level well as Translating word and phrase meaning." Supportive

English - Literary Text - Level 2

Text

"Nani keeps losing her glasses." "Where did I keep them?" "She always asks. Without her glasses, she cannot find her glasses."

X 31 (7 years)

Oh! Granny lost her glasses. (no translation or code-switching)

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level." Supportive

X53 (7 years)

चश्मे खो गए नानी के (Nani lost her glasses)

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level."Supportive

Text

"Sometimes spectacles are in the bathroom. or on the bed or her head." "Nani," I say, "they are on your head."

X 2(8 years)

मम्मी भी ऐसा करती हैं (Mummy also does the same). Supportive

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level."

X16 (8 years)

मैं अपना चश्मा में बैग भूल जाता हूं. (I forget my spectacles in my bag)

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level." Supportive

Text:

"I did nothing much today. Except Veena's mother-in-law came, you know. And how much she gossips! We had many cups of tea. And she ate all the ladoos your mother has made,"

X43 (7)

कोई आया था मिलने और चाय लड्डू खाकर चला गया (Someone came had chai and ladoos and then left)

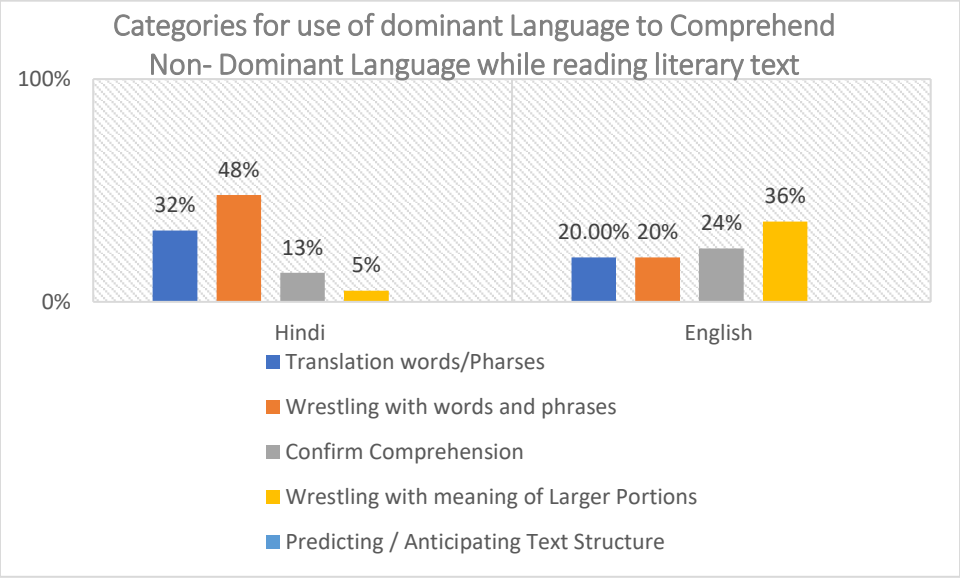
Category: "Confirm comprehension of larger portions of text beyond word/ phrase level." Supportive

X47(8 years)

Nani will get her चश्मा in the end.

Category: Predicting and anticipating text structure or content. Supportive

Graph 11



Graph 11 depicts the percentage use of Upton and Lee's category of the dominant language in comprehending non-dominant language while reading literary texts.

In English literary reading, 87.82% of the children code switched and translated while engaging with the text in their inner speech. However, 36% of the learners wrestled with the meaning of the larger word/ phrase, and for comprehension, they resort to code-switching. Thus, 24% of children confirmed their comprehension through translation and code-switching; another 20% translated the word or phrase to facilitate comprehension, and the remaining 20% wrestled with words and phrases.

It was observed that with the increase in proficiency, children code switched or translated more to confirm their comprehension, whereas Level 1 learners translated words/phrases. For Level 2 learners, 87% of times L1 supported the comprehension, and for Level 1, it supported around 58%. These results corroborated with Upton and Thomson's (2001) study where results showed that "Second language readers actively used L1 as they try to make sense of L2 text. However, the study also suggested that the reliance on L1 declines as proficiency in L2 increases."

Kern (1994) found that dependence on mental translation reduces with an increase in proficiency in L2. However, learners do fall back on the strategy of thinking about an L2 text in L1 while reading it whenever needed. Upton and Lee's categories will be used to study code-switching during domain-specific reading to understand this phenomenon further.

4.3 Code Switching and Code Mixing while reading Domain Specific Texts:

When children at ASER **Level 1** read Hindi domain specific text:

Text :

रीमा के पास 8 मोती थे. उसने 2 कला को दे दिए और फिर अयान के मांगने पर तीन उसे दे दिए. तो रीमा के पास कितने मोती बचे?

X1,(6 years)

" 2 (Two) दे दिए फिर 3 (Three) दिए, उसके पास कितने बचे" … ' how many left निकालना है"

Category: "Translation of word/ phrase." Supportive

X8,(5yrs)

" 1 (one), 2(two), 3(three) 4 (four),5 (five) ... 1 (one) (while doing so, the child was making circles to denote each number, kept on repeating the counting)

Category: Unclear

X4 (6 years)

"Total 8 मोतीहै. 2 give away कर दिए.. तो बच गए 1,2,3,4,5,6,7,8 ...2 गए..6 बचे (Child counted on her fingers and folded 2 fingers when she said " गए")

Category: "Translation of word/ phrase." Supportive

X14, (6ys)

2 (two) and 3 (three) तो 5 (five) हो गए , 8 में से 5 (five) गए … 2 (two).

Category: Unclear

X 27 (7 years)

"8 मोती हैं...she gave 2 away..so 6 left ..gave away 3...3 left."

Category – "Translation of word/ phrase."

Examples ASER Level 2 - Domain specific reading Hindi

Text :

कविता बाजार में मोती बेचती है।

वह दस मोतियों से बानी माला भी बेचती है और खुले मोती भी बेचती है।

रज़िया को 12 मोती चाहिए थे इसलिए कविता ने उसे एक माला और दो खुले मोती दे दिए।

सीमा को 27 मोती चाहिए , तोह बताओ कविता को उसे कितनी मालाएं और कितने खुले मोती देने होंगे.

X16 (8 years)

10 की माला...Ten's group and 2 खुले ..one's 12 ...तो 10 का group and 7 one's देने होंगे…

Category: "Confirm comprehension of larger portions of text beyond word/ phrase level."

Supportive

X 17 (7 years)

17 चाहिए तो 10 को अलग करके Ten's में डाल देंगे और 7 को one's में डाल देंगे ..

Category: "Wrestling with the meaning of larger portions of text beyond word/ phrase."

Supportive

X37 (7 years)

12, 1 - 10 की माला...2 ..2 खुले ... तो 17 केलिए …(the child remains silent post this verbalization)

Category: "Translating word /phrase meaning"

Non- supportive

X 22 (6+ years)

... plus करना है...

Category: "wrestling with word/phrase meaning."

Non- supportive

X9 (8 years)

Expanded form करना है..place value का question लग रहा है.

Category: "Confirm comprehension of larger portions of the text beyond word/ phrase level."

All the children, without exception, read numbers in English, though the text had numerical values written. It is important to note that all the children study in schools with English as a medium of instruction; thus, all the subjects apart from the Hindi language are taught in English, at least at the textbook level. 84% of children code switched, that is when numbers were not considered, and 61% of them code switched using a mathematical register (plus, add, place value, one's, ten's, expanded form, left, grouping) they would have learned

as part of the mathematics curriculum. The code-switching can be categorized as 31% "translated word/phrase meaning", 34% "Wrestled with word/ phrase meaning," and 45% "confirmed comprehension of larger portions of the text beyond word/ phrase level." Though the verbalizations have been categorized, they are not as distinct and clear as they were for the literary text. There is much overlap between the categories; some of the translated words can also be considered comprehension confirmation or vice versa.

Examples ASER Level 1 English - Domain Specific

Text :

Reena had a total of 9 storybooks. She gave 3 to Akhil and 2 to Sona. How many is she left with?

X4 (6 years)

9 थी 3 दे दी(while counting 1, 2, 3, 4, 5,6,7,8,9,...) 3 गई …(again started counting on fingers) …left...

Category : "Translating words/ phrases."

Supportive

X11 (7 years)

Total 9 books है...9 left निकालनी है..minus karna hai kya…(kept looking at the researcher for approval

Category: "Translating words and phrases."

Supportive

X33 (6 years)

9 books थी ... फिर 3 ...2 रहगई... (gave up " नहींआरहा")

Non - supportive

X8 (5 years)

सबको plus करना है….

Category - Unclear

Non- supportive

X27 (6 years)

9 books थी..3 दे दी ..1,2,3,4,5,6,7,8,9...3 gave away (drew lines on the paper and cut 3 out of them and again counted) 1,2,3,4,5,6...2 more gave away …

Category: "Translating word/ phrase"

Supportive

Examples Of ASER 2 Level English Reading (Domain Specific)

Text :

Reema sold stick-like sweets, so to make things easy, she packed sweets in bundles of ten and kept some loose. If someone wanted 20 sweets, she would just give 2 bundles of ten. Piya wanted 17 sweets, so how many bundles of tens and loose sweets will Reema give to Piya.

X31(7 years)

17 sweets देनी है … loose के भी bundle बनाएंगे...17 count करके.. पर bundle देना है…

Category: "Translation of words/phrases."

Supportive

X53(7 years)

10 का one bundle है... तो 17 मैं one, ten का bundle होगा और बाकी loose....

Category: "Confirmation of comprehension."

Supportive

X2 (8 Years)

Place Value बतानी है 17 की...Tens place पर 1 आएगा और ones place पर 7 आएगा

Category: Confirmation of Comprehension

At level 1, 67% of the children code switched to understand the operation that is to be used, but 42% of them reaffirmed it using English mathematical terms. At level 2, 78% of

code switched to using the structure of Hindi and using connectors, but mathematical concepts were used in English. In the case of English domain-specific reading, it was not easy to ascertain a single category as it was in the case of Hindi. As more than simple code-switching, it seems mathematics has its own language to understand further the process of code-switching and translation in the context of the nature of the text; two detailed case studies were done one.

4.4 Case Study 6:

Name: X 21

Age: 6 years

School: Small private school

ASER Reading Level (E) – 1

ASER Reading Level (H) - 1

On being asked, " what exactly is going in your mind while reading Hindi text?" -'मुझे स्कूल नहीं जाना' , X21 replied, " मुझे भी स्कूल जाना नहीं पसंदऔर इडली शहद कौन खाता है ?". He said that he saw himself sitting with his mother on the kitchen floor and having chai and rusk for breakfast before going to school. The first verbalization is reflective of the child's association with the text through personal experience and the second verbalization is more of a question as it seems to conflict with the child's knowledge system or schema. The text was read in Hindi, and the child engaged with it in the same language in his inner speech; his 'inner speech' was audible as it was more towards private speech. The only word that the child code switched was 'शौचालय', though he faced problems in decoding most of the words, he did not code-switch.

The child belonged to a predominantly Hindi-speaking household, where exposure to other languages was limited or restricted to institutions or schools. His exposure to English was limited to what was being taught at school and certain words and expressions which were

being used in his immediate environment. While reading the English text 'Rani's First Day at School,' the child syllabified every word with more than two syllables. He faced problems comprehending phrases such as - 'let go, let go', 'I don't feel so grown up..', 'mummy gets smaller as I walk away. While engaging with the text, child code switched almost every time to make sense of each word. Probably that also led to disengagement with the text. On being asked about what exactly he is thinking about the text, just before he was about to give up "लड़की स्कूल जा रही है... फिर पता नहीं" (Girl is going to school… then I do not know). The child was still able to comprehend the overall theme of the text. Thus, code-switching facilitated meaning-making in case L2 text.

The child (X 21) when reading the domain-specific text in Hindi, the numbers were rehearsed in English, and the mathematical concept was also comprehended and confirmed in English "2(two) plus 3(three), five हुआ अब 8 मेंसे 5 subtract तो 3 (three) hua." All the children, irrespective of their limited exposure to English, used English numerals. While reading the domain-specific text in English, the mathematical concepts and numbers were read in English, though connectors and structure of the Hindi language were deployed.

4.5 Case Study 7

Name – X32

Age – 7+ years

School - Tier 1 Private School

X 32 (7+ yrs) (ASER Hindi Level 2) - The child was asked to exactly verbalize her thoughts while reading the Hindi text 'पीशीऔरमैं' " अच्छा पीशी मतलब बुआ." The child rephrased and repeated what was written in the text; it seemed that she was trying to clarify the meaning of the word ' पीशी' as it is not a commonly used word in the Northern belt of India. While doing so, the child's inner speech could be heard; it was externalized. When the child was halfway through the story, the buzzer was pressed, and she was asked to present the

exact thought at that very moment - "कुत्ता बिल्ली चूहा पेड़ सैर करते हुए यह सब दिखाई देता है. मुझे अभी अपने घरके पीछे वाली सड़क दिखाई दे रही है जहां मैं (walk) करने जाती हूं, वहां भी यही सब दिखता है."

The child, while engaging with the text in her inner speech and code-switched thrice as noted through her verbalizations-सैर was switched to walk, इकट्ठा - collect, जेब- pocket, the imagery that the child provided was vivid and detailed. She connected the text with her real-life experiences, thus activating a schema that helped her in meaning-making.

When the child read the domain-specific text in Hindi, numbers were again read in English, on being asked what she was thinking, she replied, " grouping करनी है ना. Ones और tens की ``The child was trying to connect with concepts in her inner speech through language, which she was more aware of and proficient in when it came to mathematical concepts. The child belonged to a bilingual household, where Hindi was used more often than English, though English academic activities were carried out.

The phenomenon of code-switching while reading domain-specific text in Hindi was observed for 75% of Level 2 Hindi readers, while only 39% code switched while reading Hindi literary text. The gap between code-switching while reading literary or domain-specific text in English was relatively narrow,84% of ASER level 2 readers code switched while reading the literary text, and 79% code switched while reading the domain-specific text. The nature of code-switching was quite different in both cases- in the case of the literary text, code-switching was majorly done to ascertain the comprehension or to figure out (wrestle) the word or phrase meaning, whereas in the case of domain-specific reading the code-switching was mainly translating words and phrases.

4.6 Is it L1 supporting L2 comprehension or Languages supporting text comprehension?

Several studies support the role of L1 in L2 reading; Upton (1997; 1998) conducted a study where they asked eleven native speakers of Japanese to “think aloud as they read an expository text in English.” He found that the reliance on L1 decreases as the proficiency in L2 increased. “Further, he noted that L2 readers with lower L2 proficiency used their L1 more frequently when: 1) wrestling with the vocabulary they did not know or were not sure about; 2) seeking to gain a more global understanding of the L2 text, and 3) attempting to summarize or confirm what was understood.”

Further, Cohen (1995) and Upton (1998) suggest that “L1 is often used to think about a process” and not just translation. “While mental translation--the reprocessing of L2 words, phrases, or sentences into L1 forms--occurs frequently, many L2 readers also appear to tap their L1 to help them wrestle with and reflect on meaning as they read an L2 text.” Thus, it can be stated that “reading in L2 is not a monolingual process (Upton et al.,2001).” Kern's (1994) study unlike Upton (1998) did not support the finding that, “higher proficiency in L2 decreases the dependency on L1.” It was found that “despite the L2 proficiency level a majority (52%) (Kern, 1994)” of subjects expressed their thoughts in L1 either in part or in whole. Though this conjunction needs to be firmed up by further research, it still seems apparent that many L2 readers, who are still firming up their L2 language skills, think L2 texts in their L1. Hawras (1996) replicated Kern's study and reached a similar conclusion. Kern (1994) further proposes that "the difficulty in thinking about difficult concepts and ideas in a second language places an extra load on memory and comprehension processes" and so results in “L2 readers switching to their L1 to think about what they are reading .” Similar observations were made in the case of English text reading in the present study. Though the overall percentage of code-switching in the case of Hindi literary text is lower than in English

literary text, in the case of domain-specific reading, the percentage of code-switching in Hindi and English is almost similar.

Kern's research results align with findings of code-switching trend in English literary text reading though it somewhat also explains the code-switching in Hindi literary texts. However, his proposal of "the difficulty in thinking about difficult concepts and ideas in a second language places an extra load on memory and comprehension processes (Kern,1994)" does not get reflected in the results of code-switching in domain-specific reading, as the percentage of code-switching in Hindi (L1) domain-specific reading is 76%. Children were finding it difficult to deal with mathematical concepts in L1 rather than in L2. In English domain-specific reading, mathematical concepts were still dealt with in English though children used sentence structure and grammatical structure of Hindi. The difference in language choice to engage with the text in inner speech as per the domain can also be attributed to ' Emotions.'

Reading literary text invokes a certain kind of response or emotion in the reader (Reader-response theory, the 1960s), which a domain-specific text doesn't as it is more of a factual text—drawing from Dewaele's (2015) study where he used "Bilingualism and Emotions web questionnaire (BEQ)" to analyze language predisposition for inner speech, and specifically emotional 'inner speech', among multilingual. "The context of acquisition, self-perceived proficiency, general frequency of use, and perceived emotionality related to language, as well as socio biographical information including age, gender, and education level (Dewale,2015)", were taken as independent variables in his analysis. The findings reported the more frequent use of languages acquired earlier in life in inner speech, specifically in emotional inner speech. He also concluded that "it takes a while before LX becomes internalized to the point of becoming the multilingual language of the heart" (Dewaele 2015 b, 25). Dewaele's (2015b) findings explain the reason for lesser code-

switching in reading Hindi literary text and a higher percentage of code-switching in English literary text. Hindi is a more frequently used language in the social surrounding; children's perceived notion of proficiency would have also been higher.

Larsen, Schrauf, Fromholt,and Rubin. (2002) studied "20 Polish-Danish bilinguals who migrated from Poland to Denmark as adults." The results showed that "younger bilinguals used L2 Danish more frequently for inner speech than their older counterparts and L2 proficiency correlated positively with L2 use for inner speech", this result was reaffirmed by the study conducted by Matsumoto and Stanny (2006), who recommended that "proficiency and length of exposure are linked to internal language use". However, these studies somehow do not explain code-switching while reading text in Hindi. So why did children use L2 in comprehending L1 text?

This difference between the nature and frequency of code-switching across domains and languages can be attributed to the "complementarity principle, i.e., the fact that the languages are often acquired and used in different contexts, with different people, and for different purposes (Grosjean, 2008), most bilinguals hardly exhibit equal skills in all language areas (Pavlenko,2014). If the level of proficiency of bilingual's is observed across domains such as "immediate family, distant relatives, work, sports, religion, school, shopping, friends, going out, hobbies, etc.," and if a language is associated with these domains, "it would be observed that some domains are covered by one language, some others by another language, and some by several languages. Hardly do bilinguals have all domains covered by all their languages (Pavlenko,2014)) "

Cook's (1998) study explains code-switching in Hindi texts, both literary and domain-specific. He designed a "questionnaire to explore internal L2 use in 59 multilingual." Participants were asked to answer on a two-point scale from "always L1" to "always L2."

Participants were from different ethnic and age groups- ranging from under 18 to over 60, and their L2 learning proficiencies varied.

> The study focused on internal language use for organization tasks (making appointments, shopping lists, keeping a diary, cheque stubs), mental tasks (counting, adding up, working out sums), memory tasks (phone numbers, working out routes, days of the week, historical dates), unconscious uses (dreaming, singing to oneself, talking to oneself), emotional uses (feeling pain or sadness, feeling tired, reaction to things going wrong, feeling happy), as well as praying and talking to non-communicators such as infants or animals.

The questions were around participants' external and internal language usage. The findings showed that "external language use was more L2-oriented while praying and non-communicative language use was more L1-oriented (Cook,1998)." Based on his findings, Cook (1998) recommended that "there is a strong plausibility that the language used externally for a given purpose is the same as the language used internally." That might explain the code-switching in Hindi text as at ASER level 1 reading task, children essentially translated/swapped words which are less frequently used with English words that were part of the day-to-day language repertoire.

Cook's (1998) findings can also explain the higher percentage of code-switching in L1 (Hindi) domain-specific reading. Mathematics as a discipline is taught and learned in English without exception, though it is quite probable that a teacher adopts a bilingual approach towards teaching. Apart from external language usage, it is "proficiency and length of exposure to a language (Cook,1998)" that determines whether the language will be part of the inner speech or not.

Even with all the research, no conclusive argument can be put forward regarding how languages are operating - why L1 reading requires L2 code-switching to facilitate comprehension, though intuitively, it should be just L1 supporting L2. Probably the hierarchy of L1, L2 and L3, and so on needs to be reviewed. This approach looks at language learning as an additive process. Since the early twentieth century, this has been the ideology behind

foreign-language programs relying on what is construed as the "direct method," with students "immersed solely in the language being studied and allowed only to use that target language (Cummins 2007)." Looking at multilingualism as "additive bilingualism" and persistence on "pure languages free of interference", seeing multilingualism, that is, through a "monoglossic lens often does more harm than good" (Valle 2000; García 2009). We need to look at the language practice of bilinguals through the lens of 'heteroglossia', "the language practices that are not made up of two or more autonomous language systems. For a bilingual speaker, grammar consists of features that are socially assigned to one or the other language (Garcia & Woodley,2015)." The bilingual mind does not distinguish languages like L1, L2, or L3. Jorgensen (2008) calls the "combination of features that are not distinct and complete "languages' ' in themselves as polylingualism." Canagarajah (2011) coined the term code meshing to describe a single-integrated system of language. "Metrolingualism" is the term Otsu Ji and Pennycook (2010) proposed to refer to the fluid language practices in urban contexts. However, translanguaging term coined in Welsh {trawsieithu) by Cen Williams (1994) is used more often too flexible and fluid language practices.

Translanguaging, as defined by Garcia (2009; 2011; forthcoming), is "not to the use of two separate languages or even the shift of one language or code to the other since there are not two languages. Rather, translanguaging is rooted in the belief that bilingual speakers select language features from one integrated system and soft assemble their language practices in ways that fit their communicative situations.". The linguistic repertoire of bilinguals is considered as "language continuum" in translanguaging practices (García, 2009). Translanguaging goes beyond the conventional, static linguistic term "code-switching "and is also different from Cummins's cognitive view on the interdependence among the languages of bilinguals (García, 2009). Based on a holistic perspective, García and Li(2014) conclude, "Translanguaging, as we have said, liberates language from structuralist-only or mentalist-

only or even social-only definitions. Instead, it signals a trans-semiotic system with many meaning-making signs, primarily linguistic ones that combine to make up a person's semiotic repertoire".

Translanguaging, thus actually explains the code-switching across languages, while children engaged with text in their inner speech, as it is not two distinct languages that children are dealing with, but they have an integrated system at their disposal to facilitate comprehension of the text, and the external system gets replicated for the inner speech.

In the case of domain-specific reading, it is imperative to see mathematical discourse having its own language. "Mathematics discourse is inquiry-based, which involves mathematical reasoning and problem-solving of mathematical concepts such as geometrical relationships and algebraic rules" (Lemke, 2003, He, Peichang . et al., 2016). The symbolism, visual displays, and natural language in mathematics have their unique ways of meaning-making through lexico-grammatical systems. Mathematical language has its lexico-grammatical pattern such as "technical vocabulary, dense noun phrases, V+ing forms, conjunctions with technical meanings, and implicit logical relationships (Schleppegrell, 2007 cited in Hajer & Noren,2017)". The mathematics register is different from everyday language as it presents linguistic challenges and demands additional semantic, thematic, and generic efforts from learners. The mathematics register comprises a set of mathematical symbols and terminologies to make mathematical meanings.

Studies have shown that mathematical understanding is related to understanding mathematics vocabulary (Schleppegrell, 2007; Thompson & Rubenstein, 2000). Learning mathematics means getting well versed with both the language system and meaning system of mathematics (Chapman & Lee, 1990). Thus, a higher percentage of code-switching in inner speech while reading both Hindi and English domain-specific text can be explained by the existence of different mathematical register that children get acquainted with within the

mathematics classroom. It becomes part of their language resource and comes in handy whenever engaging with the mathematical text. Moreover, mathematics has its own register, and children might be translanguaging using this very register; thus, their distinction of Hindi & English being two different languages would have blurred. Vygotsky's sociocultural theory would see translanguaging as a mediator of thought and tool that can be used to create cognitive spaces in which the reader can facilitate his or her understanding of the text.

Chapter 5

Conclusion And Pedagogical Implications

5.1 Conclusion:

The study is an investigation into reading and inner speech and how it correlates for bilinguals and multilinguals. Inner speech, because of its elusive nature, has always been challenging to investigate. The methods used in the present study have been adapted from the previous studies done in reading and inner speech by Sokolov, Baddeley, and Hitch and Daneman & Carpenter. In Experiment 1, children were asked to read while their sub-vocal speech was being impeded; they verbally counted 1to 6 on the loop while they read. Sub-vocal speech is typically the internal speech uttered while reading; it provides the sound to the words when the text is being read. Thus, it helps the mind to access meanings and facilitates comprehension of the text. Furthermore, Baddeley and Hitch's model suggested that the sub-vocal speech is part of a phonological loop that helps retain information in working memory.

It has been found that sub-vocal impediment severely impairs the comprehension of the text. The two-tailed paired t-test was run (STATA, 2020) with an assumption that there is no difference before and after the sub-vocal impediment. The results for English (t= -8.450, p =0.00018) and for Hindi (t= -8.630, p =0.0001) shows that impediment has a significant effect on comprehension of the text.

To determine whether the impact of “articulatory suppression” is the same in the case of 1st and 2nd language, a two-tailed paired t-test was run (STATA, 2020), with an assumption that there will be no effect of language on the impact of articulatory suppression.

The result (t= -1.7725)is less than 2; thus, the null hypothesis is confirmed that it is not the 1st or the 2nd language that impacts the reading performance under the condition of articulatory suppression but the proficiency in the language.

Language proficiency plays an important role in reducing the impact of sub-vocal impediments. Proficient readers can access meaning through both orthographic mode and auditory mode. Orthographic mode activates visuospatial sketchpad, another route for storing information in working memory apart from sub-vocal rehearsal (Baddeley & Hitch, 1986). The increased proficiency meant larger numbers of sight words and high-frequency words at one's disposal to extract meaning from the text. As a result, the readers as level 2 of the ASER reading test performed better than level 1 and emergent readers.

Experiment 2, the reading span test, which is essentially a recall test, is used to ascertain if the language of the text has any impact on the retention capacity of the 'working memory.' The study shows that 'working memory' capacity is independent of the language of the text. The correlation coefficient (r = 0.6656) signifies a strong relationship between Hindi and English reading span test scores. The performance in one language is similar to other, given the proficiency in both languages is comparable. The difference in children's performance in both languages is more a function of language proficiency and age than the language itself. The higher the span of the language of exposure and immersion, the higher is the "storage and processing capacity in the working memory."

The results of the present study are found to be consistent with the research done by Mariko Osaka & Naoyuki Osaka (1992) "Language-independent working memory as measured by Japanese and English reading span tests" the correlation between the Japanese and Daneman and Carpenter version of RST was found to be high (0.72). Thus, the results of their study indicated that the "efficiency of working memory for reading is independent of language structure (Osaka & Osaka1992)". Furthermore, Osaka, Osaka & Groner (1993)

conducted a similar study on French and German bilinguals where the "correlation between the German and the French versions of RST was found to be highly significant (r: 0.85). Thus, the results indicated that the efficiency of working memory for reading is independent of language (Osaka, Osaka &Groner,1993)", reconfirming the results obtained by the present study.

The working memory capacity is a function of language proficiency. For example, the correlation coefficient for Hindi language proficiency and reading span test was found to be significant at 0.8636. English was significant at 0.9028; thus, 'working memory' storage and processing are strongly correlated to proficiency in the given language.

Another factor that seems to play an important role in retention in 'working memory' is age. With the increase in age, the number of children in higher score brackets also increased. It reflects upon the developmental and growth stages of working memory. The children in the age bracket of 7 to 8+ performed better than their peers in the age group of 5 to 7; the finding coincides with the developmental stages of inner speech as suggested by Vygotsky. It is around 7 years of age that inner speech gets internalized, and to work with the phonological loop or visuospatial sketchpad, the inner reading voice needs to be activated. Thus, children in the age group of 7 to 8 performed better than 5 to 7.

To further investigate how inner speech functions in multilingual/bilingual minds, the technique of introspective verbal reportage has been used to examine whether readers code switch or translate when they engage with the text in their inner speech. Though this is one of the most contested methods because researchers depend on the subject's reporting, which can be inaccurate or biased, this method gets closest to understanding the inner speech as a cognitive tool. Another factor examined using this technique is the impact of the form of text (literary or domain-specific) on code-switching and code-mixing in the inner speech.

The study reveals that bilingual or multilingual children do code switch, code mix or translates in their inner speech and private speech while engaging with the text for better comprehension and meaning making.52% of children code switched while reading Hindi literary text and this percentage increased to 76% when the domain-specific text was read. In the case of the English literature reading, 87.82% of children code switched, while in domain-specific reading, 82% of children code switched. The close study of data reveals that code-switching and translation in 'inner speech' in a bilingual or a multilingual mind is affected by "age of acquisition, length of exposure, language dominance, proficiency, and frequency of usage in everyday interaction(Alderson & Fernyhough,2015)."

However, in domain-specific reading, the distinction between languages, that is, Hindi and English, seems to blur. More than code-switching, it appears to be a phenomenon of translanguaging. "Translanguaging," according to Ofelia García, refers to "multiple discursive practices in which bilinguals engage to make sense of their bilingual worlds" (García, 2009: 45). Drawing on a holistic perspective, García and Li (2014) conclude, "Translanguaging, as we have said, liberates language from structuralist-only or mentalist-only or even social-only definitions. Instead, it signals a trans-semiotic system with many meaning-making signs, primarily linguistic ones that combine to make up a person's semiotic repertoire". Mathematics discourse is multimodal in nature, and mathematical meaning is realized through the co-deployment of multiple semiotic systems (Lemke, 2003; Moschkovich, 2010; O'Halloran, 2005; Schleppegrell, 2007) that are in the forms of mathematical symbolism (e.g., formulas, equations, and clusters), visual displays (e.g., tables, graphs, and drawings), and natural language (e.g., verbal explanations and written instructions). Mathematics has its own registers, and children might be translangualing using this very register; thus, their distinction of Hindi & English being 2 different languages would have blurred.

Translanguaging not just explicates the reasons for high percentage code-switching in domain-specific reading but also explains L2 code-switching in the reading of the L1 text, L1 being seen as a dominant language and L2 being a non-dominant language. Bilinguals/ multilinguals have a flexible and fluid interrelated language system at their disposal. It is an integrated language system; thus, proficiency in one language positively impacts proficiency in others, the structure and the grammar are compared and are devised as a whole. The lack of impact of language on working memory can also be attributed to the fact that for bilinguals and multilinguals, it works as one system; therefore, the child who performed well in working memory task (reading span test) in one language ought to perform comparably well in the other language. As for the child, these are not two different languages operating but one integrated system. As per Vygotsky also L1 and L2 cannot be regarded independent of each other in case of any language function. They are "two unrelated processes, either parallel or crossing at certain points and mechanically influencing each other" (Vygotsky, 1986, p. 211)

5.2 Implications for Future Research:

The study, being exploratory, raises several opportunities for future research in terms of theory development and concept validation. More research will be essential to refine and further elaborate the findings.

First, the study offers an opportunity to refine and validate the results using lab techniques such as neuroimaging, and electromyography which could not be performed in lack of lab facilities.

Second, a longitudinal study should be conducted with multilingual subjects in the age group of 5 to 8 years to study the developmental stages of working memory, reading and its correspondence with the internalization of inner speech

Third, the phenomenon of code-switching and code-mixing should be studied in the context of other domain-specific texts and other genres of the literary text.

5.3 Pedagogical Implications:

"Huey (1908/1968)" commented that it is was not rare for the readers to experience "inner voices" during silent reading. Further, in their study, Coltheart, Besner, Jonasson, &Davelaar (1979) reported that inner speech is an elusive experience and most prominent in beginning readers and when seasoned readers process complex text. The present study has been able to establish the importance of inner speech in the development of reading skills. We need to acknowledge its importance and make it part of our classroom environment and create reading engagement around it.

- Before learning to read, children need to acquire language and being familiar with the spoken form. In the classroom, we start reading before even creating an environment for language immersion. As the study shows, it is not the first or second language that determines the reading competence in that language but the proficiency. As children do not get equal exposure to all the languages which are to be taught in school, therefore ample opportunities should be created for children to engage in language through speaking and listening. Thus, the focus should be on developing oracy through contextualized language. The focus should be on story-telling, rhymes, poem recitation, story-making, engaging in conversations around daily routines and chores. It will work on developing the 'inner ear' and familiarize children with prosodic features of the language. These activities should be done in all the targeted languages, and children should be encouraged to tell stories in their home languages and tell the meaning of the same in everyday language to the extent possible. Teachers should facilitate children to map the phonemic similarities across their language repertoire as this will enhance the familiarity with the sounds in their inner voice across languages.

- To initiate reading, picture books with no text or a line should be used. Children should be encouraged to make stories around the pictures and share them with the group. The use of public voice is good training for the inner voice.
- Children should be introduced to reading through aloud reading and gradually move towards silent reading as inner speech internalizes. For children in the age group of 4 to 7, aloud reading, simultaneous reading and big book reading are essential strategies to engage with the text in their private speech. Simultaneous reading helps children to form grapheme-phoneme correspondence. The sounds of the words get registered, which further helps them engage with the text in their private speech as this facilitates subvocalization, which further enhances retention in working memory. Aloud reading by children can be used as a powerful "diagnostic tool by teachers (Goodman, 1982a, b; Wallace, 1989 cited in Ridgway, 2009)." "The level of a reader's comprehension, for example, can often be surmised by listening to their stress, intonation, and the way they divide the text into chunks." (Ridgway, 2009). When I say aloud reading, it means 'reading to oneself' and not 'reading to' as it is generally construed because that is how policies put it forward. When children read aloud to themselves, they actually construct the meaning of the text and create phonological memory of the words, which help them to subvocalize and retrieve meaning from the phonological loop when they start reading silently.
- From the age of 7, silent reading should be fostered in children as it facilitates engagement with the text in inner speech. Children should be encouraged to subvocalize as it helps to recode printed words, facilitating access to their meaning held in memory through phonological loop and subvocalization. It also helps to retain "information in working memory for higher semantic integration (Lee, 2015)."
- Liva et al. (2003) further propose that inner speech helps learners dig into their prior knowledge of language to solve reading problems. A learner can activate the preexisting

schemas that he/ she has learned from the people around or on a social plane employing inner speech. However, this process becomes viable only when the learner can establish the link between oral and the written language.

- Children need to be trained to use subvocalization as it facilitates the establishment of a relationship between what is being read and their knowledge of the language and the world. Liva. A Fijalkow. E, Fijalkow. (1994), in their paper "Learning to Use Inner speech for Improving Reading and Writing of Poor Readers, experimentally proved that good readers assure themselves of the general meaning of the text by re-reading and subvocalizing."

> " This subvocalization is nothing more than the manifestation of explicit self-speech, which allows the child to find a relationship between what he/she discovers written and his/her knowledge of the language. This putting into relationship allows to make comparisons of a semantic and a syntactical nature between what he/she hears in what is written and, what he/she thinks he must write in the blanks, and what he/she knows from his experience in language and his/her knowledge of the world. In this way, he/she relies on things he/she already knows to make progress in the reading of the text and to complete it."

- According to Huey (1908/1986), words that are not essential for meaning-making are not considered in inner speech, which does not affect the sentence structure. 'Inner speech' is an abbreviated form of sound representation ", but it is a tally that has its place and its time in the inner rhythmic sequence.". Thus, children should be encouraged to engage with the text in their inner speech.
- As per Ehrich (2006), "Vygotskian inner speech processes text during silent reading." It puts text into chunks of compact units that elicit meanings "when reading becomes problematic (Ehrich, 2006)." Vygotsky (1986) noted that the nature of inner speech lies in prediction. Therefore, "Vygotsky's inner speech is a condensed form of speech with the most efficient meaning units and hence facilitates rapid reading (Lee,2015)." Therefore children should be encouraged to engage in 'inner speech'.
- It is important to choose age-appropriate text which is neither too easy nor too difficult. Otherwise, struggling readers can become easily frustrated if the text level is too high, and

proficient readers can lose interest if the text is too simple. Lipson and Lang (1991) observed that weak readers need a sense of satisfaction in identifying the words in the text without difficulty. Text familiarity also strengthens engagement within the initial phase of reading development. It can be enhanced through the use of predictable books (Lipson & Lang, 1991). Text familiarity works in consonance with being able to retrieve without processing text in working memory.

- In the initial reading phase, children should be given texts that are contextually aligned to their immediate environment. It helps to associate text with their already existing schemas, thus reducing working memory load. Gradually, as the language proficiency and reading increases, more abstract, contextually distant, and imaginative texts can be introduced. Finally, as with attainment of proficiency, children will be able to construct an image of the text by engaging with it in their inner speech.
- Text having a natural flow of language should be used so that children can find it relatable and can efficiently deal with it in their inner speech as internal language is similar to external language.
- A text-rich environment should be created so that children have higher number words as part of their sight vocabulary. This can help access the meaning of words instantly through long-term memory without engaging with it in working memory. The repetition of sight words leads to automatization, and it is a well-known fact that progression from emergent to the fluent reader is accompanied by automatization (Laberge & Samuels 1974; McLeod & McLaughlin, 1986; Schneider & Schiffrin, 1977). Sight vocabulary should be developed in multiple languages simultaneously. Things in the classroom should be labelled in English, Hindi, and various other languages that children in particular class speak e.g. label - Door - डोर (use Hindi orthography as well to draw a similarity between the sounds); दरवाजा - Darwaza. Flip classroom strategy should be used whereby a child who knows a particular

language becomes the facilitator. It would also facilitate in development and implementation of a multilingual education policy.

- Cook suggested that teachers should not treat the L2 independent of L1; according to Cook, one cannot separate the two - "The L1 is present in the L2 learners' minds, whether the teacher wants it to be there or not. The L2 knowledge that is being created in them is connected in all sorts of ways with their L1 knowledge" (Cook, 1992, p. 584, Upton and Thompson, 2001). Thus, it is important to devise pedagogy to engage bilingual minds and multilingual minds. Parallels between the sound systems of multiple languages should be drawn so that children can engage with text with awareness of sound and prosody. However, the policymakers see languages in silos, and each language has been accorded a specific position in society. English is the default connect language, and Hindi is being pushed to gain that status. This is why we are gradually losing rich language diversity as monolingual and monocultural policies are institutionally curbing it. The presence of multilingual and multicultural minds is being negated; the children are pushed to learn English, Hindi, and in some cases, the state language; at times, none of them is the child's home language. It not only takes away a child's ethnic and cultural identity but also suppresses the assertion.
- Teachers should focus on helping children create 'word sense' then look for word meaning, and this can be done through the simple activity of 'hunching' whereby children are encouraged to make sense of the word through the context of the text. This will help develop reading fluency and the predictive function of language, which is vastly supported by inner speech. The word sense is more context-driven, whereas meanings work on exactness and working with word sense helps children become independent learners, someone who can construct their own knowledge systems based on their experience. However, policymakers do not approve of this plurality in the learning system as knowledge for them is still single, sacrosanct, and unidirectional.

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Appendix A

ASER Hindi Test

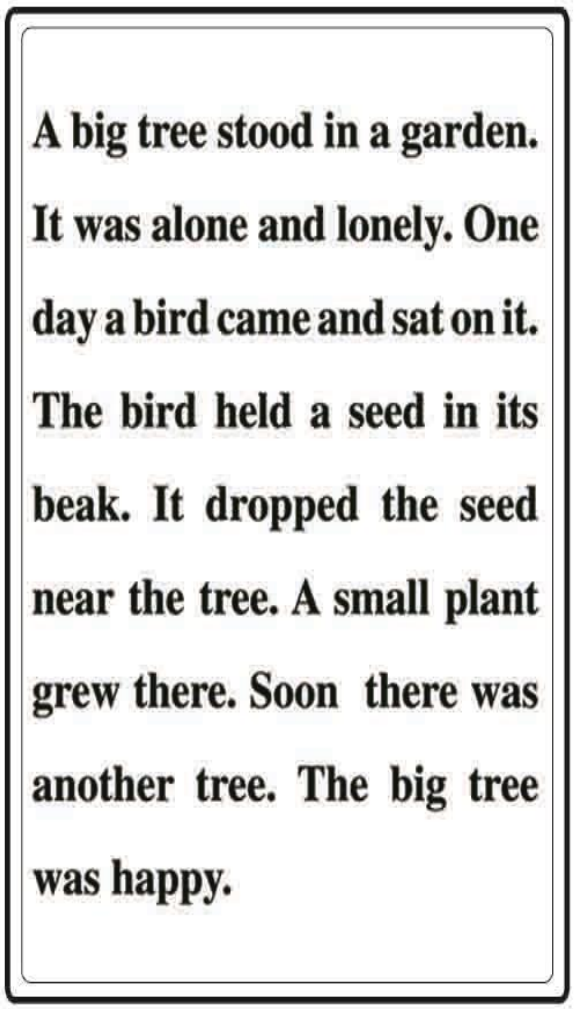
Comprehension Questions: Level 1

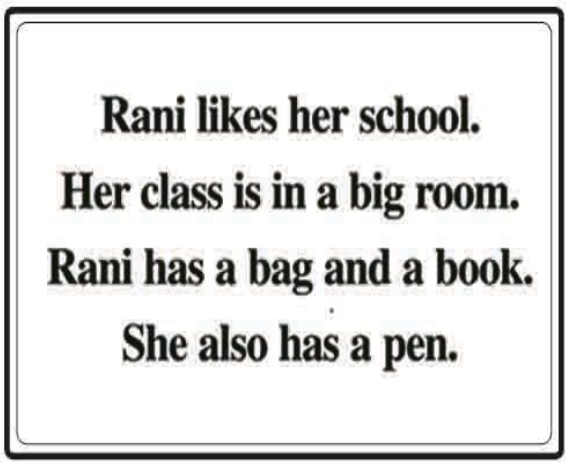
- तोता कहाँ रहता था?
- वह क्या खाता था?

Comprehension Questions Level 2

- कौन सा महीना चल रहा था ?
- भैया ने झूला कैसे बनाया ?

ASER Proficiency Test – English





Comprehension Questions Level 1:

- Does Rani like her school?
- What all things does Rani has?

Comprehension Question Level 2:

- What did the bird hold in its beak?
- How did a small plant grow near the tree?

Appendix B

Reading span Test

Level 1
English

1(a) They came by bus.
1(b) Everyone is inside now.

2(a) They will come back by noon.
2(b) Monday will be sunny.

3(a) Mummy let go of my hand.
3(b) Birds eat rice and seeds.

4(a) Friday was cloudy.
4(b) Birds sing with joy.

5(a) I looked around up and down.
5(b) He was a fat king.
5(c) Roses have a sweet smell.

6(a) Suva has a thin dog.
6(b) Bheema loves to sleep.
6(c) There is a pup in the bush.

7(a) Dog runs after a bird.
7(b) Reena loves to play on the swing.
7(c) I will have eggs for breakfast.

8(a) Lion is the king of the Jungle.
8(b) Rohit likes to skip rope.
8(c) The sun went down.

9(a) Let's play on the slide.
9(b) I miss my friends.
9(c) Hippo wants to dance.
9(d) Birds are singing.

10(a) Go dance somewhere else.
10(b) Bird is sitting on a rock.
10(c) Dog shivers due to cold.
10(d) Sumi loves to play with sand.

11(a) Butterflies sit on flowers.
11(b) Last night it rained.
11(c) Aman loves to play with blocks.
11(d) Bumble Bee buzzes loudly.

12(a) The world is full of toys.
12(b) Kitty cat is on a spree.
12(c) Crow is eating the roti.
12(d) Monkey is sleeping under the tree.

Level 2 English

1(a) Radha's home is near a forest.
1(b) Red and Yellow make Orange.

2(a) It is all the cat's fault.
2(b) She sits on a rock and cries.

3(a) Look around before crossing the street.
3(b) Honey bees love flowers.

4(a) Tears rolled down her cheeks and fell to the ground.
4(b) The city is very crowded and noisy.
4(c) Little flowers of Jasmine smell sweet.

5(a) The worm has laid eggs on the leaf.
5(b) A peacock perched on the Peepal tree.
5(c) Srinivas was having a very bad day.

6(a) India is the largest producer of Bananas.
6(b) My cat got stuck on the electric pole.
6(c) So, you are saying the dog ate your homework.

7(a) A butterfly flew down from the white clouds.
7(b) Mother hen sits on her eggs.
7(c) The dog ran off as fast as he could.

8(a) Tiger leaped out from behind the bushes.
8(b) One day the frog was very hungry.
8(c) There is a lizard on the car seat.

9(a) Bus leaves early in the morning.
9(b) Mother hen is happy with her lovely chicks.
9(c) Birds are building a nest behind the window.
9(d) There are insects in the water.

10(a) There are bugs and moths flying around the candle.
10(b) A snail wants to take a tour of my garden.
10(c) Tara likes to climb rocks.
10(d) We had omelettes for breakfast today.

11(a) I went to the zoo to see an African lion.
11(b) Children do not have to go to school in June.
11(c) I want to sleep as late as I want.
11(d) Summer is a season to have ice creams.

12 (a) I like to go for walks and sing songs.
12(b) Siya pressed the tiny seed into the warm earth.
12(c) I don't like to miss my dance class.
12(d) Green beans are the same length as pencils.

Level1
Hindi
1(a) बिना को नहाना नही पसन्द
1(b) लड़की खा रही थी ककड़ी

2(a)हमारी गाड़ी छूट गई.
2(b) दौड़ी - दौड़ी आयी पकौड़ी।

3(a) माँ से मेरा हाथ छूट गया।
3(b) अम्मा आज लगा दो झूला।

4(a) एक डाल पर एक थी मकड़ी।
4(b) खूब लगाया सैर सपाटा।

5(a) एक अंडे में से बतख का बच्चा निकला।
5(b) मैंने एक तितली पकड़ी।
5(c) कागज़ की नाव बनाई।

6(a) पैसा पास होता तो चार चने लाते।
6(b) तोता गाता है टाये - टाये।
6(c) काका चला रही है चक्की।

7(a) कुत्ता भागा रोटी लेकर।
7(b) बुढ़िया बांस उठाकर दौड़ी।
7(c) ऊंट चला भई ऊंट चला।

8(a) कोहरा ही कोहरा है चारों ओर।
8(b) नीना सुन्दर फूल देखो।
8(c) नानी के घर पहुंच गए हम।
8(d) माँ के जाते ही छोटी रोने लगी।

9(a) दरवाज़े पर ताला लगा दो।
9(b) पापा गए थे शहर से बहार ।
9(c) कोई मज़े की कहानी सुनाओ।
9(d) दादी के पास ट्रेन से जाएंगे।

10(a) कुकर की सीटी सुन, माँ भागी।
10(b) हीना पापा के साथ खेत पर गई।
10 (c) पटरी पर दौड़ती ट्रैन देखो।

10(d) सूरज डूबा और उल्लू जगा।

11(a) पक्षी करते हैं ढेर सी बातें।
11(b) इतनी सारी किताबें।
11(c) आँख खुलते की रमा कसरत के लिए भागी।
11(d) एक चूहा था , बड़ा ही नटखट।

12(a) देखो - देखो ! बाघ आया।
12(b) मीलों की दूरी तेह करती ट्रैन
12(c) सुबह सुबह की कोसी धूप।
12(d) देखो आज कितना बड़ा लग रहा है चाँद।

Level 2
Hindi

1(a) मोटी , पतली, रंग -बिरंगी , कहानियों से भरी हुई किताबें।
1(b) पापा आप अपनी मूछों को और छोटा मत कीजिए।

2(a) चलो हम बगीचे को खूबसूरत बनाएं।
2(b) आधी रात को रमा ने सुन्दर सपना देखा।

3(a) माँ ने डरावना चेहरा बनाकर रोहन को डराया।
3(b) अपने मालिक को देखते ही, हाची उनसे जा लिपटा।

4(a) मेंढक ढेर सारे कीट पतंगे देख कर बहुत खुश हो गया।
4(b) कमरे के एक कोने में ही मोमबत्ती लगाई और जलाई भी नहीं।

5(a) बस में बैठे लोग तेज़ी से पीछे की ओर भागे।
5(b) रिया की सुन्दर गायकी ने समा बांध दिया।
5(c) एक झुण्ड मैं कितनी भेड़ें होंगी।

6(a) लोगों को देख छोटा बाघ कुछ घबराया।
6(b) लालाजी बीच बाजार खड़े ले रहे अनार।
6(c) यह किताब बहुत बड़ी है , मेरे बस्ते में नहीं आएगी।

7(a) पानी लाने जाने के लिए मैंने अपनी चप्पल ढूंढी।
7(b) रौनक को सपना आया की उसका अपना सर्कस है।
7(c) मटर रसोई के दरवाज़े की ओर लुढ़का।

8(a) अँधेरे कमरे में अचानक किसी ने बत्ती जलाई।
8(b) सर्कस में जोकर के कारनामे देखकर सभी ने बहुत तालियां बजाई।
8(c) आनया को दुनिया में सबसे प्यारा है अपना ,अंगूठा।

9(a) पानी के बीचों- बीच अलका को दिखा दरियाई घोडा।

9(b) मैना ने मटर को देखा और उस पर चोंच मारी।
9(c) दूर पेड़ों के बीच एक रौशनी टिम-टिम करती दिखी।
9 (d) मास्टरजी ने दूर तक बच्चों को अपनी साइकिल पर घुमाया।

10(a) दौड़ी - दौड़ी मुन्नी आयी, जल्दी आना चंदू भाई।
10(b) पूरी मंडली घबराई देख एक - दूसरे की परछाई।
10(c) बारिश हो रही है , बाहर नहीं खेल पाएंगे।
10(d) वह बहुत सावधानी से पत्रों पर आगे बड़ी।

11(a)बंद किया अम्मा ने पंखा और सबको डांट पिलाई।
11(b)तिनका - तिनका जोड़ कर चिड़िया ने घोंसला बनाया।
11(c)कम्पोस्ट बनाने के लिए खोदना पड़ता है गड्ढा।
11(d)एक समय की बात है , आकाश से एक यात्री धरती पर आन पड़ा।

12(a)किया और उसके दादाजी जल्दी से बाहर निकले।
12(b) एक बड़ी से कूद लगायी और फिर वापस ज़मीन पर आ गया लट्टु।
12(c) हाथी की छींक तोह बहुत तेज़ होती होगी।
12(d)हाथ से हाथ मिलाओ और बड़ा गोला बनाओ।

Appendix C

Texts Used For Think Aloud Protocols

Level 1 Hindi (Literary Text)

सुप्रभात ! चलो उठ जाओ।

मैं नही उठना चाहता।

मुझे शौचालय नहीं जाना।

मैं दांत नही मांजना चाहता।

मैं नहाना नही चाहता।

मैं नाश्ते में इडली नहीं खाना चाहता।

मैं स्कूल नहीं जाना चाहता।

आज तोह तुम्हारी कक्षा चिड़िया घर की सैर पर जा रही है।

मुझे शहद के साथ इडली अच्छी लगती है।

मैं स्कूल जाना चाहता हूँ।

मैं नए टूथ ब्रश से दांत मांजना चाहता हूँ।

और जल्दी - जल्दी हटो मुझे शौचालय जाना है।

मैं आया रॉकेट बन के। रास्ते से हटो। मेरे आगे मत जाओ।

Level 1 (Hindi) Domain-Specific text

रीमा के पास 8 कंचे हैं।

उसने 2 शमा को और 3 अयान को खेलने के लिए दे दिए।

तोह उसके पास कितने कंचे बच गए।

Level 2 (Hindi) (Literary text)

पैदल सैर करने जाना मुझे बहुत अच्छा लगता है।

खासतौर पर अपनी पिशी के साथ। अपनी बुआ को मैं पिशी कहता हूँ।

जब पिशी मेरा हाथ पकड़ कर चलती है तोह मुझे बहुत अच्छा लगता है।

लेकिन जब वह हाथ छोड़ देती हैं तोह और भी ज़्यादा अच्छा लगता है।

हम कभी तेज़ नहीं चलते।

हम कभी भी ठहर जाते हैं हाल- चाल पूछने के लिए…

कुत्ते का , बिल्ली का,चूहे का , कौआ का , पेड़ का।

पिशी को नीचे गिरे हुए फूल इकठे करना अच्छा लगता है।

मुझे पत्थर इकठे करना भाता है।

बड़े वाले , छोटे वाले, गोल वाले , चपटे वाले

लेकिन सबसे अच्छे होते हैं बहुत नंन्हे वाले।

इतने नन्हे की मेरी जेब के किनारों में फंसे रह जाते हैं।

पिशी के साथ सैर करके लौटने के बाद मेरी जेबें भरी होती हैं।

आज ,अज्जी ने अपनी टोकरी से मटर की एक फली निकाल कर दी।

निर्मल दीदी ने चुप चाप इंतज़ार करने के लिए मुझे एक स्टीकर दिया।

अंजुम आंटी ने अपने बटनों के जार से एक लाल बटन दिया।

जब मैं घर पहुँचता हूँ तो अपनी जेबों में से सब कुछ निकाल कर अपने पीले वाले डिब्बे में रख लेता हूँ।

अगर मुझे जेब में वह नन्हा सा पत्थर मिल जाये तोह मैं वह अपनी पीशी को दे दूंगा।

Level 2 (Hindi) Domain-specific text

कविता बाजार में मोती बेचती है।

वह दस मोतियों से बानी माला भी बेचती है और खुले मोती भी बेचती है।
रज़िया को 12 मोती चाहिए थे इसलिए कविता ने उसे एक माला और दो खुले मोती दे दिए।

सीमा को 27 मोती चाहिए , तोह बताओ कविता को उसे कितनी मालाएं और कितने खुले मोती देने होंगे.

Level 1 English (Literary Text)

Rani's First Day at School

It is my first day at school.

Mummy is holding my hand and walking with me.

"I am grown up now.", I say. "Let go", "Let go!"

Mummy holds my hand very tight.

There are many children near the school.

They come by bus. They come by car.

They come by rickshaw. They cycle.

They walk, like me.

We reach the gate. Mummy lets go of my hand.

She stays at the gate. I have to go inside alone.

There are many new faces all around me.

I take one step. I take another step. I look back.

Mummy gets smaller as I walk away. Will she disappear?

I run back to her. I don't feel so grown up. I hold her hand." Don't go away", I say.

Everyone is inside now. I am the only one outside.

The teacher comes out. She smiles at me. I smile back.

Mummy says, " Rani, I will be here when you come out."

I let go of her hand. she waves to me.
I run inside. Mummy will be there after school.

Level 1 (English) Domain-specific reading

Reena has a total of 7 books.

She gives 2 books to Akhil and 3 to Sonia. How many is she left with?

Level 2 (English) Literary Text

Nani keeps losing her glasses.

“Where did I keep them?” she always asks.

Without her glasses, she cannot find her glasses.

So, she needs me. To be her eyes, to find her own eyes.

Sometimes her spectacles are in the bathroom. or on her bed or on her head.

“Nani”, I say, “they are on your head!”

“Of course! How silly of me. Thank you, Richa dear”, she says with a giggle.

This time, though, I cannot find Nani’s glasses. Not yet.

I have looked everywhere. In all the usual places.

On her head, in the bathroom, inside her cupboard, and on the puja shelf.

I have looked under her favourite chair and on the dining table.

Nothing. No glasses. Where could they be?

I decided to be a good detective.

I decided to find out what she had done all day.

“I did nothing much today. Except that Veena’s mother-in-law came, you know. And how much she gossips! We had many cups of tea. And she ate all the ladoos your mother had made,” said Nani.

Raju said, “Nani was very busy today, she wrote a letter to the Chief Minister about her pension.”

Amma said, “She spoke for a long time to your masi. She finished knitting a sweater for Raju. And then she went for a short walk.”

I now had many clues. I quickly looked around new places in the house.

Aha! I have found the missing glasses!

The spectacles were wrapped in wool, kept next to her pen under the phone on her desk.

And I found half-eaten ladoo there as well.

For Nani’s next birthday, I will save money for an extra pair of glasses.

Level 2 English Domain-Specific Text:

Reema sold sweets which were stick-like, so to make things easy she packed sweets in bundles of ten and kept some loose. if someone wanted 20 sweets, she would just give 2 bundles of ten. Piya wanted 17 sweets so how many bundles of tens and loose sweets will Reema give it to Piya?