

"TIP OF THE TONGUE PHENOMENON" IN NORMAL AND
APHASIC ADULTS: AN EXPLORATORY STUDY

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APRIL 2008

This small work of mine is dedicated

To my beloved

AMMA, APPA

&

Above all to the

ALMIGHTY LORD

CERTIFICATE

This is to certify that this dissertation entitled "**TIP OF THE TONGUE PHENOMENON IN NORMAL AND APHASIC ADULTS: AN EXPLORATORY STUDY**" " is the bonafide work submitted in part fulfillment for the degree of Master of Science (Speech Language Pathology) of the student (Registration No.06SLP002). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

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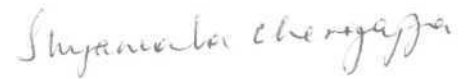
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DECLARATION

This is to certify that this dissertation entitled "**TIP OF THE TONGUE PHENOMENON IN NORMAL AND APHASIC ADULTS: AN EXPLORATORY STUDY**" is the result of my own study under the guidance of Dr. K. C. Shyamala, Professor of Language Pathology, Department of Speech & Language Sciences, All India Institute of Speech and Hearing, Mysore, and has not been submitted in any other university for the award of any diploma or degree.

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"Silent gratitude isn 't much use to anyone." -G.B. Stern

And that's where acknowledgement becomes important

"Commit to the LORD whatever you do, and your plans will succeed."

Proverb 16:3

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TABLE OF CONTENTS

	Page No
INTRODUCTION	1 - 6
REVIEW OF LITERATURE	7-26
METHOD	27 - 37
RESULTS AND DISCUSSION	38 - 74
SUMMARY AND CONCLUSION	75-82
REFERENCES	83 - 88
APPENDIX	i- xi

List of tables

Table No.	Title	Page No.
1.1	Differences between Direct Access and Inferential Models ofTOTs	13
3.1	Demographic details of Young adults:	28
3.2	Demographic details of Middle aged adults	29
3.3	Demographic details of Old aged adults	30
3.4	Demographic details of Aphasic population	31
4.1	Mean and standard deviation values of TOT occurrence for word categories in 20-40 age group	43
4.2	Mean and standard deviation values of TOT occurrences for words categories in 40-60 age group	44
4.3	Mean and standard deviation values of TOT occurrences for word categories- 60-80 age range	45
4.4	Mean and standard deviation values of TOT occurrences in all three groups of subjects for word categories	46
4.5	Results ofMANOVA for comparison of ages within each parameter (word category)	49
4.6	Comparison of TOT occurrences in the word category: Adjective and Verb, across the 3 age group	50
4.7	Comparison of TOT occurrences in the word category: Place names, among 3 age groups.	51
4.8	Comparison of occurrence of TOTs in the word category: Person's names, among 3 age groups.	52
4.9	Comparison of parameters with in each age: Pair wise Comparisons: I group (20-40 years)	53
4.10	Mean and standard deviation values of TOT occurrences in I age group (20-40 years) for words with different number of syllables	55
4.11	Mean and standard deviation values of TOT occurrences in II age group (40-60 years) for words with different numbers of syllables	66

4.12	Mean and standard deviation values of TOT occurrences in ii age group (40-60 years) for words with different numbers of syllables	67
4.13	Mean and standard deviation values of TOT occurrences in iii age group (60-80 years) for the words with different number of syllables	67
4.14	Mean and standard deviation values of the syllables for presence of TOTs across all age groups	68

Lists of Graphs

Graph No.	Title	Page No.
1	Mean and Standard deviation values in terms of percentage for words across the three age groups	47
2	Mean percentage occurrence of TOTs across the category/type of words for all the three groups of subjects	57
3	Mean percentage occurrence of TOTs across age for aphasic population	68
4	Mean percentage occurrence of TOTs across all the three age groups for words with different number of syllables	70

CHAPTER 1

INTRODUCTION

The "Tip-of-the-tongue" phenomenon refers to the experience of feeling confident that one knows an answer, yet is unable to produce the word. It is a noticeable temporary difficulty in lexical access or failure in retrieving someone's name or a word from memory. It is an extreme form of a pause, where the word takes a noticeable time to come out (some times several weeks). This type of memory retrieval has been referred to as a Tip-of-The-Tongue (TOT) state because here one experiences the frustrating feeling that the retrieval of the word is imminent and on the "tip of the tongue." TOTs are usually accompanied by strong "feelings of knowing" what the word is.

Tip of the tongue experiences (TOTs) are one of those illusive oddities of human cognition. Like slips of the tongue, TOTs dazzle us with their subjective strength, yet at the same time, puzzle us with our frustrating inability to retrieve the desired word. The TOT state suggests that information may be available, but inaccessible in memory. The forgetting seems to be clearly caused by a failure to find the right retrieval cue. Sometimes we can successfully recall the forgotten information by stumbling upon a thought or perception that triggers the memory.

Studies of these phenomena have shown speakers generally have an accurate phonological outline of the word, can get the initial sound correctly and mostly know the number of syllables in the word. This suggests that word storage may be partially organized on this basis of some phonological information and that some words in that

"store" are more easily retrieved than others. When we make mistakes in this retrieval process there are often strong phonological similarities between the target word and the mistakes. Mistakes of this type are often referred to as "*malapropism*"

The tip of the tongue experience itself has not escaped the literary reference. The Anton Chekov short story, "A Horse Name" is about a TOT experience (Pitcher, 1999). In the story a servant is trying to recall the name of a particularly painless dentist because his employer is suffering from toothache. But Ivan Yevseich could not remember the name of the celebrated dentist. All he could remember was that the name of the dentist in some way sounded like something related to horses. He had a strong feeling of knowing combined with partial information, a hallmark of the TOT state.

At one time or another, everyone has probably experienced a TOT state. Older adults often complain that they experience more TOT states than they did when they were younger. Regardless of our age, we all experience TOT states, and many of us may wonder how and why we cannot remember something we know so well.

Former President of US George H. Bush had frequent word finding failures. Despite his obvious depth of knowledge and expertise, his speech was sometimes characterized by pauses suggesting a failure to recall a known word. His deficit was usually attributed to absent mindedness, rather than a lack of clear thinking. In other words, it was dismissed as a language production failure, not a more consequential memory failure. His son, President George W. Bush, suffers from a similar affliction. However, the son's speech errors are often interpreted as a lack of knowledge and

therefore a learning deficit. Speech errors occur for both of the Bushes, but the inference of knowledge by observers is different. Research into TOTs may tell us much about the nature of speech errors (Levelt, 1989).

The most famous and often quoted passage from William James captures the feeling of the TOT particularly poetically. James (1890/1964) wrote

"The state of our consciousness is peculiar. There is a gap therein; but no mere gap. It is a gap that is intensely active. A sort of wraith of the name is in it, beckoning us in a given direction, making us at moments tingle with the sense of our closeness and then letting us sink back without the longed-for term. If wrong names are proposed to us, this singularly definite gap acts immediately so as to negate them. They do not fit the mould. And the gap of one word does not feel like the gap of another, all empty of content as both might seem necessarily to be when described as gaps".

What causes TOTs?

It has been thought that interfering words cause the TOTs, but some researchers now believe they are a consequence rather than a cause. Because we have part of the sounds of the word we are searching for, our hard-working brain, searching for words that have those sounds, keeps coming up with the same, wrong, words. A recent study by Dr Lori James of the University of California and Dr Deborah Burke of Pomona College suggests a different cause. How are words held in memory? A lot of emphasis has been placed on the importance of semantic information, the meaning of words. But it may be that the sound of a word is as important as its meaning.

Words contain several types of information, including:

- semantic information (meaning),
- lexical information (letters), and
- Phonological information (sound).

These types of information are held in separate parts of memory. They are connected, for example, when we read the word *Velcro*, the letter information triggers the connected sound information and the connected meaning information, telling us how to pronounce the word and what it means. When we try to think of a word, as opposed to being given it, we generally start with the meaning ("that sticky stuff that has fuzz on one side and tiny hooks on the other"). If the connection between that meaning and the sound information is not strong enough, the sound information won't be activated strongly enough to allow us to retrieve all of it. Drs James and Burke think that TOTs occur because of weak connections between the meaning and the sound of a word. Connections are strengthened when they are used a lot. They are also stronger when they have just been used. If we haven't used a connection for a while, it will weaken. It may also be that aging weakens connections. This may explain why the errant word suddenly "pops up". It may be that we have experienced a similar sound to the target word.

TOTs in patient populations:

TOTs are seen in following groups of patient populations:

Aphasia

Parkinson's disease.

Alzheimer's disease.

An aphasic patient caught in perpetual TOTs state, always trying to remember words that he knows but whose retrieval prove elusive. When asked to retrieve the furry animal that attacks snakes (mongoose), He said: *"the problem is I can't remember in my own head. It's not that I can't say it. I know what it is and I can't know how to say the name. I don't know what the name is of what they are "* (Funnell et al., 1996). And that perhaps is what TOTs feel like to us all: the wave of a magician's wand-now we know it, and now we don't.

TOTs appear to be universal experiences across cultures and languages. If TOTs are constant across cultures and languages, then what we find out about English speaking Americans may indeed generalize to other populations. This is a strong statement, given that most of the research on TOTs has taken place in Western societies among educated peoples.

Need for the study:

Literature in Western context is abundant with data on occurrence of TOT and influence of other variables across age. But there is a lack of data on these aspects among Indian population. By looking at the vast expanse of literature available in the non-Indian population. Thus the need for a study in the Indian population across age groups in normal and disordered population was felt.

Aim of the study

- To explore the nature of TOT phenomenon and thereby to get an insight about the word retrieval process occurring in both language intact subjects and language impaired subjects (Fluent aphasics).

- To investigate the influence of age and language proficiency on TOT occurrence.
- The influence of knowledge of syntax (type of word), in the occurrence of TOT phenomenon.
- To check for the facilitation or inhibition of other languages in retrieval of target word in English. (Effect of bilingualism)
- To study whether provision of phonologically and semantically related cues/words would inhibit or facilitate the retrieval of correct target response.

CHAPTER 2

REVIEW OF LITERATURE

Roger Brown and David McNeill (1966) conducted the first experimental studies of TOT states in normal word-finding, in this study; the authors found that they could induce a TOT state on approximately ten percent of trials. They found that lexical retrieval is not an all or none affair. Partial information such as the number of syllables (60% correct), initial letter or sound (57% correct), and the stress pattern can be retrieved. And also often output nears phonological neighbors. These other words that come to mind are called *interlopers*.

Further investigations showed that TOTs are:

a) A nearly universal experience, b) Occur about once a week, c) Increase with age, d) Frequently elicited by proper names, e) Often enable access to the target word's first letter f) Are often accompanied by words related to the targets and g) Are resolved during the experience about half of the time and also TOTs show that we can be aware of the meaning of a word without being aware of its component sounds and that phonological representations are not unitary entities.

Subsequent research on TOT states has been conducted by experimentally inducing TOT states in the laboratory or asking subjects to keep diaries of everyday occurrences of TOTs (Brown, 1991). These studies have yielded varied characteristics of TOT states

- 1) The TOT is a strong subjective experience that is hard to confuse with any other experience.
- 2) TOTs are generally accompanied by emotional feelings. Emotional frustration may occur when the TOT is first experienced, and relief may be experienced when the TOT is resolved.
- 3) In general, people have some access to characteristics of the TOT target word. Perhaps they can recall a first letter, what the word sounds like, or how you might say the word in other languages.
- 4) People usually do know the word and eventually retrieve it.
- 5) There is a strong motivation to resolve the TOT, that is, to search and find the elusive target word for you.

Descriptions and Anecdotes

TOTs are ubiquitous in its occurrence. We experience them on routine basis. Based on research in which people were asked to record diaries of their TOT experience, it is apparent that TOTs are likely to occur, on average, once a week for any particular person (Burke, MacKay, Worthley, & Wade, 1991; Schwartz, 1999a). That means the average person experiences approximately 52 TOTs each year, with older adults experiencing as many as 100 per year. The scientific literature on TOTs is replete with colorful descriptions of them.

Seminal research on TOTs

Brown and McNeil (1966) showed that 1) TOTs could be studied in a laboratory context. 2) Their study was the first empirical demonstration that TOTs are accurate at predicting target knowledge. They showed that when people were experiencing TOTs they could remember partial information about the missing word, and were likely to eventually either recall or recognize it. 3) They examined the nature of words that were retrieved when people were in a TOT state which although similar in sound or meaning were not judged to be the TOT target.

Much of the early research on TOTs as exemplified by Brown and McNeill (1966) was concerned with two issues: the cause of TOTs and the nature of word retrieval. In much of the subsequent work using TOTs, the TOT has been considered a method or "window" for investigating word retrieval processes.

Brown (1991), in his review of TOTs, lamented the paucity of cross-linguistic research on TOTs, and he called for more. There is one published study with Polish speaking people (Bak, 1987) and several with Japanese speaking people (eg., Murakami, 1980). Since then, TOT research has been conducted in German (Priller & Mittenecker, 1988), Japanese (Iwasaki, Vigliocco, & Garrett, 1988), Italian (Miozzo & Carmazza, 1977; Vigliocco et al., 1997), Spanish (Gonzalez & Miralles, 1977, as cited in Vigliocco et al., 1999), Farsi (Askari, 1999), Hebrew (Faust, Dimitrovsky, & Davidi, 1997; Silverberg, Gollan, & Garrett, 1999) and Ecker and Garrett (1998) looked at TOTs in translating from one language to another. Taken together, the studies demonstrated striking parallels. In each language, people were able to access

semantic, phonological, and in some cases, syntactical elements of the missing target word. Unlike many laboratory phenomena, the TOT exists in most culture, in most languages, and presumably, in the past languages as well as present ones.

TOTs in the field: TOT Diaries

As TOTs are everyday experiences, common across people and across language groups. Because of this aspect of the TOT, we can use a combination of lab and field techniques to study it. In the procedure known as the TOT diary study, rememberers were asked to record natural instances of TOT in their lives over a particular period of time. Because TOTs strike without warning, diarist must keep their diaries handy throughout the day to record them as soon as possible after the onset of a TOT. When a TOT does occur, the participants records various features of the TOT on an entry form. These features may include partial semantic and phonological information, phenomenological experiences, attempts or successful resolutions, and if resolved, what the word is (Burke et al., 1991; Schwartz, 1999b).

There have been five reported diary studies (Burke et al., Ecke, 1997; Heine, Ober, & Shenaut, 1999; Reason & Lucas, 1984; Schwartz, 1999a).

Strength, Emotion and Imminence

Schwartz (1999a) asked diarists to record whether each TOT experienced was

- a) Stronger or weak
- b) Accompanied by a feeling of emotion, or
- c) Accompanied by a sense of imminence.

Strength was defined as the intensity of the TOT feeling, emotionality was defined as a feeling of frustration at being unable to retrieve the target; and imminence was defined as the feeling that retrieval was about to occur.

One diary study explored an issue called *blocking*, which means the retrieval of words known to be incorrect interferes with retrieval of the correct word. For example, somebody might be trying to think of the word "rhinoceros", but failing to retrieve that word might keep retrieving "hippopotamus" (a semantic blocker) or "rhinovirus" (a phonological blocker), which are known to be incorrect.

Some theories of TOT etiology argue that TOTs arise when an incorrect word is retrieved and temporarily blocks retrieval of the correct target. Reason and Lucas (1984) studied the percentage of resolved TOTs as resulting from blocking. They found that over a four week period, participants averaged 2.5 resolved TOTs. They also found that over 50% of resolved TOTs were preceded by intrusive blocking words; words that kept resurfacing, but were recognized as incorrect. In a second study, with fewer participants and fewer TOTs, they found that 70% of resolved TOTs were preceded by intrusive blockers.

Burke et al. (1991) named it as persistent blockers. For the young participants, 67% of TOTs were accompanied by alternates. However as people get older, the number of alternates decreased. In the older group, only 48% of TOTs were accompanied by alternates. He also found that nearly 90% of alternates were from the same syntactic category as the missing word, that over one third shared the initial phonemes, and almost half shared the same number.

Theories of TOT Etiology

Understanding the etiology of TOTs will inform research in lexical retrieval, interference in memory, and the nature of meta-cognition. The mechanism must be able to monitor word retrieval because the TOT experience is essentially a retrieval experience. Finally there may be some reason for the conscious experience known as the TOT. In essence, what function does the TOT experience serve the organism? It has been hypothesized that the function of TOTs is to guide retrieval, to influence the choice of retrieval strategies.

The two classes of theories are:

Direct access views argue that TOTs arise from sensitivity to the unretrieved target. Although items have insufficient memory "strength" to be recalled, they are strong enough to signal their presence as TOTs.

Inferential views claim that TOTs are not based directly on an inaccessible but activated target. Rather, TOTs arise from clues that the rememberer can piece together. These clues are information that is accessible to the rememberer, such as information from the retrieval cue or information related to the target that is retrieved. Although direct access and inferential views are not mutually exclusive, they represent different approaches to the etiology of TOTs, and have led to different research emphases.

Table 1.1 Differences between Direct Access and Inferential Models of TOTs

Theory	Mode of Action	Implication for Accuracy	Doctrine
Direct-Access	Retrieval causes TOT	Direct link between retrieval and judgment	Endorses
Inferential	Heuristic processes cause TOT	Retrieval and heuristic are correlated	Rejects

Direct Access Theory

It has been developed by Burke and her colleagues (Burke et al., 1991; James & Burke, 2000; Rastle & Burke, 1996). Direct-access approaches fall into three basic theories.

1) **The blocking hypothesis** (Jones, 1989), states that the target item is actively suppressed by a stronger competitor. Support for the blocking explanation comes from the experimental finding that presenting a phonologically related cue word with a definition for a target word resulted in more TOTs than when an unrelated cue word was presented (Jones, 1989; Jones and Langford, 1987). Similar results have been found by presenting cues that share orthography (letters) with the target word (Smith and Tindell, 1997). Also, it appears that TOTs are more difficult to resolve when an alternate word has come to mind than when there is no alternate

word (Burke et al., 1991), possibly suggesting that the alternate word blocks the target word and thus causes TOT.

2) Incomplete activation hypothesis or Partial activation; This hypothesis states that TOT occurs when remember cannot recall the target word, but sense its presence nonetheless. According to this explanation, TOTs are caused by the weak or incomplete activation of the target word. Semantic information about the target word may be activated, but the corresponding phonological representation may be only partially activated, (Evidence from an experimental and a diary study in a group of young and old participants by Burke, MacKay, Worthley, and Wade 1991), they argued that the retrieval deficit involves weak links between the semantic and phonological systems.

Based on the incomplete activation hypothesis, by providing a phonologically related cue word with the definition should actually facilitate target retrieval, rather than produce a TOT state. (Meyer and Bock, 1992), these authors reported that:

- (a) Semantically and phonologically related cue words facilitated rather than hindered target word retrieval (contrary to Jones's findings),
- (b) Phonological cues facilitated retrieval more than semantic cues; and
- (c) These related cues facilitated retrieval even after an initial unsuccessful target retrieval attempt.

3) Burke's theory, the transmission deficit model, argued that TOTs arises from component memory representation. TOTs occur when there is activation of the semantic component of the word, but priming does not pass to the phonological level

of the word. For example, on hearing the definition, "a device for protection from the rain or sun," a semantic and perhaps a visual representation of the object may be retrieved, but the definition does not activate the phonological representation (e.g. the word umbrella). Related to Burke's model are recent models by Miozzo and Caramazza (Caramazza & Miozzo, 1997). These models are similar to Burke's in the etiology of TOTs, although they differ in the mechanism of word retrieval. They argued that TOTs arise when phonological information does not follow the retrieval of semantic information, but they disagree on the number of stages in the process. The difference between these two models is more about the nature of lexical retrieval and less about the etiology of TOTs.

Support for the Direct-Access view

Two basic kinds of evidence have been used to promote this theory: Resolution or recall of TOT targets, recognition of TOT targets, and retrieval of partial information. Retrieved partial information may be phonologically, semantically, or syntactically related to the target.

Resolution of TOT targets.

Support for the assumption that TOTs arise from retrieval processes comes from studies that find strong positive correlations between the likelihood of experiencing a TOT and the likelihood of resolving the target. Resolution is the retrieval of a previously unrecalled TOT item. In diary studies, better than 90% of recorded TOTs were reported as eventually resolved (Burke et al., 1991; Heine et al., 1999; Schwartz, 1999a). This high percentage indicated a strong correspondence between TOT phenomenology and objective performance.

In the laboratory, resolution rates with definitions or general information questions were around 40% (Brown, 1991). Resolution is even lower with episodic memory stimuli (Ryan, Petty, & Wenzlaff, 1982; Schwartz, 1998). However, laboratory data are based on studies that investigate immediate resolution, whereas diary studies tap both immediate and delayed resolution. Smith (1994) found that resolution was more likely to occur after a TOT than a non-TOT. He also found that immediate resolution of TOTs for fictional animals was only 9%. Resolution rose to 43% after a 6min delay. Resolution rates for non-TOTs were 3% at the immediate test and 19% at the delayed test. Schwartz (1998) also found lower resolution rates for non-TOT words. These studies demonstrate a strong correspondence between TOTs and the likelihood of successful resolutions, which supports the view that TOTs reflect target retrieval processes.

Partial information of TOT targets

TOTs have been shown to be correlated with knowledge of first letters, last letters, number of syllables, knowledge of similar words, and syllabic stress (Brown, 1991). In partial information reports, the rememberer is asked to recall specific aspects of the target word. This involves phonological information, such as the first letter, the number of syllables, and the syllabic stress (Brown & McNeill, 1966). It may also involve semantic information. TOT reflects activation of a target word, but insufficient activation to achieve full recall. Koriat and Lieblich (1974) showed that more partial information was retrieved when rememberers were in TOT state than could be explained by a guessing strategy based on the frequency, of those letters as initial position letters in the English language.

Murakami (1980) found partial recall of letters in Japanese, and Bak (1987) found partial recall of first letters in Polish. Bak (1987) also documented that Polish rememberers were able to retrieve words that sounded similar to or meant something similar to the TOT word. Askari (1999) showed the same type of partial retrieval of information in Farsi. Other studies examined the relation between TOTs and syntactical features of language. Italian and Spanish speaking rememberers have access to the gender of words when in a TOT (Miozzo and Caramazza, 1997; Vigliocco et al., 1997). Iwasaki, Vigliocco, and Garrett (1998) found that Japanese rememberers have access to parts of speech, such as whether a word was an adjective or an adjectival noun, when in a TOT.

The speaker accesses various semantic attributes of the concept to be articulated. This initial process of retrieval results in lemma. The lemma maintains an abstract representation of the to-be spoken word that combines both the semantic information and various syntactic components (e.g., pluralisation, grammatical gender, part of speech, etc.). According to Partial activation theory the lemma does not contain any phonological information.

Once the lemma representation has been formed, the second stage of lexicon retrieval is initiated. In this second stage, the rememberer compiles an abstract description of how the target word is constructed phonologically. This lexeme is then processed by a motor production unit that actually articulates the word. Normal lexical retrieval is an extremely rapid process, (Martin et al.1994). It is precisely because normal lexical retrieval is rapid that the TOT plays such an important role in delineating theories of lexical retrieval. During TOTs, the retrieval process is slowed.

This slowing of an otherwise rapid retrieval process may allow us to look into the lemma-level retrieval and the lexeme -level retrieval independent of each other.

There are great many variants of lexical retrieval models. In some versions of the models, the two stages are serial that is the lemma must be retrieved in advance of the initiation of the phonological retrieval (Butterworth, 1989, 1992; Miozzo & Caramazza, 1997).

In **interactive models**, the search for the lexeme is partially dependant on the success of the first stage. Thus, in both serial and interactive models, the lemma represents an important preliminary step in accessing word forms. (Harlet & Brown, 1998; Miozzo & Caramazza, 1997). Most researchers agree that much of the evidence used to support TOT-stage models comes from errors in ordinary speech (Caramazza & Miozzo, 1997).

Node Structure Theory (NST)

This theory links TOTs to the retrieval mechanisms for language production, and specifically, to a detailed theory of language production known as the Node Structure theory (NST). The NST resembles other interactive activation models of language production such as Dell's (1985, 1986, 1988), **but** was developed originally **to** provide a general and explicit account of the perception and production of language and other cognitive skills (MacKay, 1981, 1982, 1987), and has since been extended to deal with phenomena of attention, awareness memory and aging.

The model postulates two fundamentally different processes, priming and activation. And differences between these two processes are important for explaining

TOTs. Activation is necessary to consciously retrieve information a node represents, is all or none and does not spread, unlike the concept of spreading activation in other network theories (eg., McClelland & Rumelhart, 1981). Priming or sub threshold excitation prepares a node for possible activation and an activated node primes all nodes connected to it. However, whereas activation proceeds hierarchically (ie, top-down and left-right) in production, priming spreads in parallel to all connected nodes at both higher and lower levels. Priming summates temporally across a single connection and spatially across different simultaneously active connections to the same node. Finally, repeated activation of a node over a prolonged period results in satiation, a temporary decrement in how rapidly a node can transmit priming. Satiation underlies phenomena such as the verbal transformation effect. Perceptual and motor adaptation and the semantic satiation effect (MacKay, 1987).

Phonological access in TOTs

The purpose of TOT research within the context of lexical retrieval models is that TOTs represent instances in which the normal lexical retrieval process has slowed down or is experiencing a selective failure (Burke et al., 1991). Rastle and Burke (1996) reported that "TOTs provide a means of isolating phonological processes within a conceptually driven task". Both one stage and two stage theories predict that during a TOT, participants should be able to retrieve phonological information about the unrecalled target. In the two stage view, a lemma is retrieved, but the lexeme is not completely retrieved. However, the rememberer may be able to activate some aspects of the lexeme, such as the first letter of first syllable. Similarly, a related phonological word may be activated. The one stage view is also compatible with the

retrieval of phonological information. That is, the retrieval process simultaneously pulls out both semantic and phonological information, each of which may be complete or incomplete.

Retrieval of phonologically-related words:

The blocking hypothesis contends that TOTs are caused by the retrieval of items known to be incorrect. There are considerable data that suggest that TOTs are often accompanied by persistent alternates, most often related to the target phonologically. Schachter (1990) gave examples: in one case, a TOT was for the target name "Deese," and the persistent alternate was "Reese." Brown and McNeil (1966) found that 70% of retrieved related words were phonologically related to the missing targets.

Retrieval of first letters:

Rememberers are often able to retrieve the first letter or the first phoneme in the absence of being able to retrieve the complete word when they are experiencing a TOT. In Brown's review (1991), he found that, across a series of studies on the TOT, rememberer could identify the first letter between 50% and 71% of the time during a TOT. In a recent study with Italian speakers, Miozzo and Caramazza (1997) found a 76% rate of correct first phoneme identifications. Koriat and Lieblich (1974) found that for n - TOTs, the first letter was guessed correctly only 10% of the time. Similarly Burke et al. (1991) found that the initial phoneme of the related word retrieved matched the TOT target 36% of the time, whereas chance was only 6%.

Thus there is evidence to suggest that TOTs are often accompanied by the retrieval of phonological information.

Retrieval of last letters

Caramazza and Miozzo (1997) found that the final phoneme for TOTs was retrieved correctly 67% of the time, significantly higher than the rate for n-TOTs (49%). Koriat and Lieblich (1974) found that their participants retrieved the final phoneme on 69% of the TOT targets, significantly higher than the 17% rate for n-TOTs. Finally Rubin (1975) also found a 31% correct rate for last letters, significantly higher than chance, although lower than the other studies. Again these data suggest that during TOTs participants do have access to phonological information, however incomplete.

Number of Syllables

There is also evidence suggesting that, during a TOT, rememberers have access to the number of syllables of the missing target. For example, Koriat and Lieblich (1974) found that rememberers were accurate 80% of the time in identifying the correct number of syllables for targets for which they were experiencing TOTs, but only 38% of the time when they were not experiencing TOTs.

TOTs and Theories of Bilingual Semantic Representation

TOTs have contributed to the understanding of lexical representation in bilinguals. (eg, Aksari, 1999; Gollan & Silverberg).

One of the cognitive issues being studied about bilinguals is the nature of semantic representation. The single store view is that semantic bilinguals represent meaning of words in both languages in a common representational system. On the other hand, the dual store view postulates that meaning is represented separately for each language the person knows. Contemporary views support the single store view, at least for speakers who are native or fully fluent in both languages. Askari (1999) examined semantic and phonological priming in Farsi-English bilinguals. Farsi is an Indo-European language. The bilinguals were mostly Farsi dominant, but had been speaking English since childhood. She compared three priming conditions: a semantic prime, a phonological prime, and a no-prime condition. The primes were words that were presented along the definition.

The participants recalled more words in Farsi than in English. Priming also increased recall of the target word in English, but did not have any effect in Farsi. When English primes were used to prime English definitions, there was a small increase in TOTs when semantic priming occurred. However, for Farsi, when Farsi primes were used, semantic priming increased the number of TOTs, but phonological priming had no effect at all, Askari interpreted these data as supporting Burke's transmission deficit model (Burke et al., 1991) because the primes did not inhibit word retrieval.

TOTs and Aging:

Older adults experience more TOTs than younger adults. There are two major theories that have been introduced to explain age related increase in TOTs: **Decrement model** and the **incremental knowledge model**. The two theories highlight basic difference in the perception of old age.

In the first view, where aging is seen as a time of biological and mental decline, TOTs are more common among older people because their memory networks are beginning to deteriorate, and TOTs reflect these weakened associations. Decrement theory states that TOTs increase with advancing age because of failures and breakdowns in the retrieval system of older adults.

On the other hand, others argue that TOTs reflect the increased knowledge base and vocabulary of older adults. Because they know more, they have more words for which they can experience a TOT (Dahlgren, 1998). These classes of theories are called Incremental knowledge model.

Dahlgren (1998) found that older participants experienced more TOTs than did middle aged and younger participants, thus replicating the central finding the literature. Further more when she used age as a covariate to detect TOT difference among people with high or low vocabulary, high vocabulary subjects experienced more TOTs than low vocabulary participants. Based on these data, she concluded that age alone is insufficient to account for differences in TOTs. Rather age covariates

with knowledge of the world, and those with more knowledge are more likely to experience TOTs, regardless of age.

Aging in the transmission deficit model:

MacKay and Burke (1990) argued that aging weakens the connections between nodes in the model, reducing the amount of priming that can spread from semantic to phonological levels. Because of this, older adults with weaker connections will experience more TOTs, consistent with the decrement model.

Another prediction of the transmission deficit model, according to Burke et al (1991) is that older adults will experience fewer persistent alternates (blockers) during a TOT than will younger adults.

TOTs phenomenon in non- English languages

Researchers have documented the TOT phenomenon in non-English languages such as Polish, Japanese, and Italian (Schwartz, 1999). It demonstrates that people can retrieve other characteristics of the target word, in addition to its first letter and number of syllables. For example, Italian speakers often retrieved the grammatical gender of the target word (Caramazza & Miozzo & Caramazza, 1997).

Tip of the tongue phenomenon in persons with Aphasia:

Aphasia is a general term referring to the acquired language deficits (Kolb & Whishaw, 1996). It is frequently divided into aphasia that affects language comprehension, referred to as Wernicke's aphasia, and aphasia that affects production, referred to as Broca's aphasia. Anomic aphasia referred to as acquired

deficit in lexical retrieval, which is usually accompanied by fluent speech and good comprehension: just an endless inability to find the right word. All persons with aphasia have reduced access to lexical words. The designation of a patient as "anomic" indicates that his access to lexical terms is poor in relation to the fluency of articulation and grammar. Wepman, Bock, Jones and Van Pelt (1956) reported that anomic were particularly over dependant on high frequency words regardless of part of speech.

Barton (1971) used an adaptation of the Brown and McNeil procedure with 16 aphasics, equally divided between anterior and posterior diagnostic types and found that the overall correctness score for letters was 61.7% and for syllables was 65%. The prior literature on aphasia yields little in the way of systematic analysis of word finding difficulties to determine whether the outward failures mask qualitative differences in the breakdown of the word retrieval process.

Funnell, Metcalfe, and T sapkani (1996) relied on FOKs (Feeling of Knowing). The aphasic literature, unfortunately does not address etiology or phenomenology of TOTs, although the studies are relevant from the perspective of lexical retrieval. The studies have addressed a range of aphasic conditions, including Wernicke's aphasia (Goodglass, Kaplan, Weintraub, & Ackerman, 1976), Broca's aphasia (Buce & Howard, 1988; Goodglass et al., 1976), conduction aphasics (Goodglass et al., 1976), and anomic aphasia (Funnell et al.,1996; Goodglass et al.,1976; Vigliocco et al.,1999).

Goodglass et al found that conduction aphasics indicated the greatest number of partial phonological information (TOTs), whereas anomic aphasics reported the fewest. Broca's and Wernicke's aphasics were intermediate. Conduction aphasics also showed the most accurate reporting of partial phonological information, even though all groups were roughly equivalent in their ability to correctly name the target word. Therefore Goodglass et al concluded that the conduction aphasics were best able to use TOT information to help obtain partial information for a target word.

Bruce and Howard (1988) found that the Broca's aphasics benefited from the phonemic cues. They used the label TOT in terms of the accessibility of partial information combined with the inability to retrieve the full target word. Both studies by Funnell (1996) and Vigliocco et al (1999) on anomic aphasia were directed at testing word access theories. In both studies, the predominant problem of the patient was accessing the phonological form of target words. Both patients retained access to semantics, and Vigliocco et al (1999) showed that anomic had access to syntactical information as well. Therefore both studies support the general notion that a complete lemma is accessed before the phonological representation, or lexeme, is retrieved.

Anomic patients will experience TOTs quite frequently. This is a straightforward prediction from direct access theory, but also a prediction of inferential theory. Anomic aphasics have no shortage of retrieved clues, although they are usually semantic, not phonological in nature. Therefore both models predict high frequency of TOTs, and good predictive accuracy when recognition is used as the criterion measure.

CHAPTER 3

METHOD

A) Subjects:

The study consisted of thirty language intact normal subjects who formed I group and six fluent aphasic subjects who formed the II group. Accordingly the study consisted of two groups of subjects.

Group I:

The participants in I group were divided into three sub groups according to their age: with equal number of males and females. Each sub groups had ten subjects in it.

- i. Young adults: 20-40 years
- ii. Middle aged adults: 40-60 years,
- iii. Old aged adults: 60-80 years.

Subject selection criteria: for group I

- The participants selected for the study were devoid of any sensory and other associated problems, as seen on administration of MMSE (Mini Mental Status Examination, Folstein et al, 1975). (**APPENDIX I**)
- They subjects considered for study were either bilinguals or multilingual with any Indian language as their mother tongue and English as their second language with adequate educational background.

International second language proficiency-Rating (Ingram, 1985) was administered to check for their second language proficiency (English) **(APPENDIX II).**

In addition, an informal assessment of their language proficiency and vocabulary were also carried out (spontaneous conversation, narration), this is attached in appendix as I

Table3.1 Demographic details of Young adult: 20-40 years

Subjects	Age/Gender	Education	Native language
1	23 years/female	Pursuing M.Sc degree	Malayalam
2	22 years/female	Pursuing M.Sc degree	Malayalam
3	24 years/female	Pursuing M.Sc degree	Malayalam
4	23 years/female	Pursuing M.Sc degree	Malayalam
5	24 years/female	Pursuing M.Sc degree	Marati
6	26 years/male	Pursuing M.Sc degree	Malayalam
7	23 years/male	Pursuing M.Sc degree	Tamil
8	24 years/male	Pursuing M.Sc degree	Tamil
9	30 years/male	Mechanical Engineering	Tamil
10	36 years/male	Business Management	Tamil

Table 3.2 Demographic details of Middle aged adults: 40-60 years

Subjects	Age/Gender	Education	Native language
1	58 years/male	Instrumentation Engineering	Tamil
2	58 years/male	B.Sc Chemistry	Telugu
3	45 years/male	Civil Engineering	Tamil
4	50 years/male	Advocate	Tamil
5	42 years/male	Software Engineer	Malayalam
6	42 years/female	B.Sc.Ed	Tamil
7	55 years/female	M.sc Literature	Tamil
8	41 years/female	BBM	Tamil
9	45 years/female	Diploma in teacher training	kannada
10	48 years/female	Special educator	kannada

Table 3.3 Demographic details of older adults: 60-80 years

Subjects	Age/Gender	Education	Native language
1	83 years/male	Engineer	kannada
2	70 years/male	Diploma in Engineering	Telugu
3	76 years/male	B.E LLB, BSc	Kannada
4	82 years/male	Advocate	Kannada
5	75 years/male	MA	kannada
6	71 years/female	MSc.Bed Mathematics	Kannada
7	80 years/female	High school Teacher,	Telugu
8	65 years/female	Teacher	Tamil
9	70 years/female	MA	kannada
10	62 years/female	BA (Music)	kannada

Group II: Consisted of disordered population

Six persons with fluent aphasia were considered for study and they were recruited from All India Institute of Speech and Hearing therapy clinic and from also other hospital set ups.

Subject selection criteria considered were:

- Unambiguous classification into one of the fluent diagnostic categories: Wernicke's aphasia, anomic aphasia, transcortical sensory aphasia and conduction aphasia by a Speech Language Pathologist and/or Neurologist.

- The subjects selected for the study had no history of pre-morbid neurological, psychological or any known organic deficit.
- They did not have any sensory deficits such as visual (E.g: visual neglect, visual agnosia) and or auditory deficits as seen on MMSE (Mini Mental Status Examination, Folstein et al, 1975).
- All participants were pre-morbidly right-handed.
- All participants were bilingual aphasics having an Indian language as their mother tongue and English as their second language.

Table 3.4 Demographic details of Aphasic population

Subjects	Age/Gender	Type of aphasia	Language
1	58 years/male	Anomic Aphasia	Urdu
2	63 years/male	Anomic Aphasia	Malayalam
3	59 years/male	Conduction aphasia	Kannada
4	54 years/male	Wernicke's aphasia	Telugu
5	35 years/female	Wernicke's aphasia	Tamil
6	58 years/male	Anomic Aphasia	Kannada

B) Procedure:

Prediction of tip of the tongue phenomenon in normal subjects was investigated by the use of two basic ways:

I) Diary studies: to acquire information on naturally occurring TOTs

II) Experimentally induced TOTs: involved word retrieval tasks.

I) Diary studies: With this procedure, online information about TOTs was acquired as they occurred. The same subjects were asked to estimate how many TOTs they experience per week or month routinely.

The subjects were asked to use the structured questionnaires provided to them to record information about TOTs as they occur spontaneously during a 4-week interval in their everyday life, by maintaining a diary. This examined the aspects of TOT words such as frequency of use, recency of use, syntactic classes and variation with age. The questionnaire is attached in the **APPENDIX III**.

Instructions were given to the subjects to keep the diary nearby at all times, and to begin filling in the diary the moment a TOT occurred, to answer all questions provided to them, for each TOT experienced over the 4-week period, and continue recording information relevant to a TOT whether or not it was ultimately resolved or new TOTs occurred. Subjects were told to contact the experimenter for assistance if required during the four week period.

II) Word retrieval tasks:

Here, subjects had to answer questions designed to induce TOT states

The target was fifty low frequency words selected from the following categories:

- 10 non-object nouns
- 10 object nouns
- 10 adjectives and verbs
- 10 place names and
- 10 names of famous people.

The definitions and questions for inducing TOT states for the above mentioned words were derived from a dictionary, an atlas, reader's digest, general knowledge books, current affair magazines and respective websites. The stimulus is attached in the **APPENDIX IV**.

Pilot study:

Before the actual study, a pilot study was carried out on five normal subjects in the age range of 20-40 years. And the questions that subjects consistently answered correctly or incorrectly in pilot testing was modified or replaced.

For each target, a multiple-choice recognition test was constructed, consisting of the TOT target and 3 foils. The foils shared word type with the target, semantically and phonologically which were derived from the same sources as question but these foils were provided as a cue, when the subjects were in a TOT state and were not able to retrieve the target word.

The experimental task was described to the subjects. Subjects were told not to expect to get all of the answers correct because the questions were made slightly intentionally difficult to answer. The TOT inducing questions were presented to the subject orally and for each question, the subject had to say one of the three possible responses:

K (know), if they felt they knew the answer

D (Don't know), if they did not feel they knew the answer.

T (TOT), if they were in a TOT state, here they were asked to indicate the following:

- The context in which the target word will be used
- Number of syllables in the word
- Any letter or sound and their positions (IMF) which they remember during TOT state
- Any other word that comes to their mind.

Whole of the experimental session was audio recorded for later detailed qualitative description with the consent permission from the participants.

Group II: Aphasic Population

38 picturable objects, with intermediate word frequency were selected (**Appendix IV**)

There were ten each of 1-syllable, 2-syllable, 3-syllable words and 8 words of either 4 or 5 syllables and all these were presented pictorially in a fixed random order. An alphabet card were also used for the indication of first letters, and a card picturing

letters as a series from one to five dashes separated by slashes were used for the indication of syllable length.

Initially a series of high frequency sample words, varying in syllable length, were presented to the subjects to familiarize them with the procedure for pointing to initial letters on the alphabet card and for indicating syllable length. Following this the actual experiment was initiated, where the subjects were first invited to name each picture on presentation.

- A response was treated as correct, if it was a clearly recognizable production, despite error of articulation or phonemic substitutions.
- If the client failed to respond or if responds inappropriately to a given stimulus, the following exploration for the tip of the tongue state was undertaken:

The client was first asked if he/she had an idea of the correct word and knew what it sounded like and then was asked to identify the initial letter on the alphabet card and then to indicate the number of syllables on the syllable card. Following this a word-association was elicited. Finally the subject was provided with phonological or semantic cues.

C) Scoring:

Group I: For word retrieval task:

- A correct response was scored when the subjects provided the target word for a definition/ question.

- A non-target response was scored when the subjects provided a word for the definition/ question different from the target word.
- A positive TOT state was scored with a score of one, when the subject could not retrieve the word right away and provided information regarding the word. In this category both cases in which the subject could not recover the word during the session but could recognize the experimenter target as their target and those subject who could recover the target while completing the questionnaire were included.
- A negative TOT state was scored when subjects could not retrieve the word and provided guesses, but could not recognize the experimenter's target as the word he/she was thinking of.

Group II:

Responses for picture naming were scored in the following categories:

- Correct naming response was scored when the clients provide a target word for the picture.
- Hesitations were scored when the clients provided the target word after a long silent pause or after a series of approximations to the word.
- Non target response was scored when the clients name a picture which would not match the experimenter's target.
- Positive TOTs was scored with a score of one, when the clients were not able to retrieve the target word right away, and recognize the experimenter target as his/her target.
- Negative TOTs was scored when the clients could not retrieve the word, but did not recognize the experimenter's target as his/her target.

Statistical Analysis:

Analyses differed when participants were in positive TOT state and when they were in negative TOT states. During negative TOT states speakers had a different word in mind or were presumably unsure as to whether any words fit the definition. Speaker's guesses in this category were therefore considered as educated guesses based on semantic information and therefore provide a baseline with which to compare guesses in positive TOT states.

The data was subjected for appropriate statistical analysis and following were evaluated:

- a) Age and TOT frequency
- b) Type of TOT word (grammatical class)
- c) Partial information about targets (knowledge of number of syllables, letters/phonemes.)
- d) Persistent alternates and TOT word similarity
- e) Resolution of TOTs.
- f) Recency and acquaintance name TOTs.

The audio recorded sample done during the experiment was used to analyze the above mentioned factors both quantitatively and qualitatively.

CHAPTER 4

RESULTS AND DISCUSSION

The present study was aimed at studying the following:

- The nature of TOT phenomenon and the word retrieval process occurring in both language intact subjects and language impaired subjects (Fluent aphasics).
- The influence of age and language proficiency on TOT occurrence.
- The influence of knowledge of syntax (type of word), in the occurrence of TOT phenomenon.
- Effect of bilingualism in recalling TOT target, whether it is acting as a boost in the retrieval of a word or is it inhibiting the retrieval of the target word.
- The facilitation or inhibition of TOT target when semantic and phonological cues are provided for the subjects.

The study consisted of two groups of subjects:

I group consisted of thirty normal subjects: ten subjects in each of the following age group:

- i) 20-40 years,
- ii) 40-60 years,
- iii) 60-80 years.

II group consisted of 6 fluent aphasic subjects.

For I group, there were 2 tasks: 1) Diary studies

2) Experimentally induced TOTs

Seven variables were considered for analysis:

- o Age and TOT frequency
- o Language proficiency/ educational and economic status and TOT frequency
- o Type of TOT word or the grammatical class of the TOT words
- o Recency and acquaintance name TOTs
- o Partial information about targets (knowledge of number of syllables, letters/phonemes.)
- o Persistent alternates and TOT word similarity
- o Resolution of TOTs

The results of all of these tasks for both normal and aphasic's subjects are discussed below

1) Diary studies:

Diary studies were aimed at tapping the naturally occurring TOTs/spontaneous TOTs. Where the subjects were instructed to note down and approximately make an estimation of how many TOTs they experience per week or month in everyday life. They were provided with a structured questionnaire for this purpose which they had to answer whenever they experienced a TOT state.

Although, diary studies were conducted for all the three age groups of subjects, all the subjects were not able to maintain a diary and note down the TOT information. Hence statistical procedure could not be carried out, but most of the

subjects could say what category of words they usually encountered TOT states routinely

The Results are discussed below descriptively:

Subjects in the three age groups anticipated having about the same number of TOTs but the type of word differed for each age group:

i group of subjects encountered TOTs majorly with remembering the target words which fell under the object noun categories.

- They reported that they were usually out of words when asked questions related to things which they had covered in their school days (for e.g. process of photosynthesis etc).
- They remembered the initial sound/syllable of the target word but could not remember the number of syllables or letters of the words.
- Some of the strategies used by these age groups of subjects were to remember the context in which the word occurred or they tried to picturise the event or situation where the word would occur.
- This group of individuals did not have much problem remembering acquaintance names except few, who could recall the names after a memory search alphabetically.
- The subjects reported of alternate names/words occurring along with target word as a competent during TOT state and most of the persistent alternate words were phonologically related to the target word rather than their semantic relationship with words.

- The resolution time for TOT state varied among individuals, some of them reported that they were able to retrieve the target word in few seconds after the use of some memory strategies. But few others took day to a week's time to retrieve the target word hoping the word would pop up suddenly to their memory.
- Most of the individuals in this group were not much concerned about their retrieval difficulty as it was only an occasional difficulty while it was a part of their routine. Hence did not use any deliberate strategies. Infact most of the individuals in i group were not aware of these TOT states

Most of the ii group subjects were not able to maintain a diary but reported of more problems in retrieving person's names and it happened more with acquaintance names.

The iii group of subjects also experienced increased occurrence of TOTs in retrieving names of places and personalities and especially had problem in retrieving acquaintance names. They also reported of having TOT states in almost all the categories of words (non-object noun, object noun, adjectives and verbs, place names and personality's names) and hence were more concerned about their frequent TOT encounters compared to young and middle aged adults

Hence a descriptive analysis of the corpus of TOT words provided a clear support for the predicted relation between TOTs and frequency and recency of use of the target word. For all age groups, TOTs involved abstract words and object names, place names and personality names that occurred relatively rare in the language, according to word frequency.

Recency also influenced TOT states because acquaintance name TOTs involved names of people who were highly familiar but had not been contacted for at least three months, and much longer in the case of older adults.

Within the Node Structure Theory (MacKay, 1981, 1982, 1987) infrequent and non-recent use weakens connections between lexical and phonological nodes, creating a local priming decrement that causes TOTs. Within the NST, the high FOK (Feeling of Knowing) for older adults results from summation of priming at lexical and semantic nodes which compensates for their general age-linked transmission deficit.

Aging had a clear effect on TOTs which is consistent with age linked transmission deficit. Number of TOTs reported in diaries increased with age. And this increase was evident in midage group adults, 40 years and above. However persistent alternates/blockers decreased in frequency with age. And older adults reported less information about the target word than young or middle aged adults.

Cohen and Faulkner (1986), in a study of naturally occurring TOTs for proper names reported an age related decline in the availability of partial information, and their older subjects explained that often during the TOT experience their "mind went empty." The age difference in occurrence of persistent alternates does not seem to be a cause of the type of words involved in older adults. Such a pattern of data for partial information and persistent alternates is more consistent with Transmission deficit hypotheses than with Inhibition hypotheses.

As the results suggest, the occurrence of TOTs in older age group were relatively more compared to younger adults. Two factors may conspire to reduce transmission of priming in older adults. One is a general transmission deficit resulting from aging. The other is recency because greater age makes possible very long intervals since last use of particular words. Thus older adults may have more TOTs for names because of a greater interval elapsing since last use of these words. But in contradiction, even younger adults (20-40 years) had problem with object nouns, as they had a long interval from those concepts read during their school days.

Experimentally Induced TOT

The TOT states were induced in the same group of subjects experimentally by asking them to answer question/definitions of low and intermediate frequency words.

Age and TOT frequency:

Table 4.1 Mean and standard deviation values of TOT occurrence for word for 20-40 years age group

Type of words	Age Groups	
	20-40 yrs	
	Mean	SD
Non-object noun (NON)	3.5000	1.8409
Object Noun (ON)	4.6667	1.0000
Adjective and verb (A&V)	1.5556	.7265
Place Names (PN)	3.3000	1.7670
Personality Names (PR)	3.8000	1.1353

From the above table 4.1, we can infer that the TOT occurrences are least seen for the word type adjective and verbs in 20-40years age group. And in the word category object noun occurrence of TOT states were relatively higher. Rest of the category of words had similar rate of TOT occurrence. In one of the subject among the ten subjects, there was no TOT evident in the adjective and verb and object noun category of words.

Table 4.2 Mean and standard deviation values of TOT occurrences for words for 40-60 years age group

Type of words	Age Groups	
	40-60 yrs	
	Mean	SD
NON	2.9000	1.2867
ON	3.6667	1.6583
A&V	3.2000	1.2293
PN	3.0000	1.5635
PR	3.9000	1.4491

The mean scores of the subject group show that the TOT occurrence was comparatively less for the word type non-object noun than other types of word. And for all the other types of word the TOT occurrence was almost overlapping and relatively same. Even in this group of subjects, there was one subject who did not have any TOT state for the second type of word category (object noun category).

Table 4.3 Mean and standard deviation values of TOT occurrences for word for 60-80 years age range

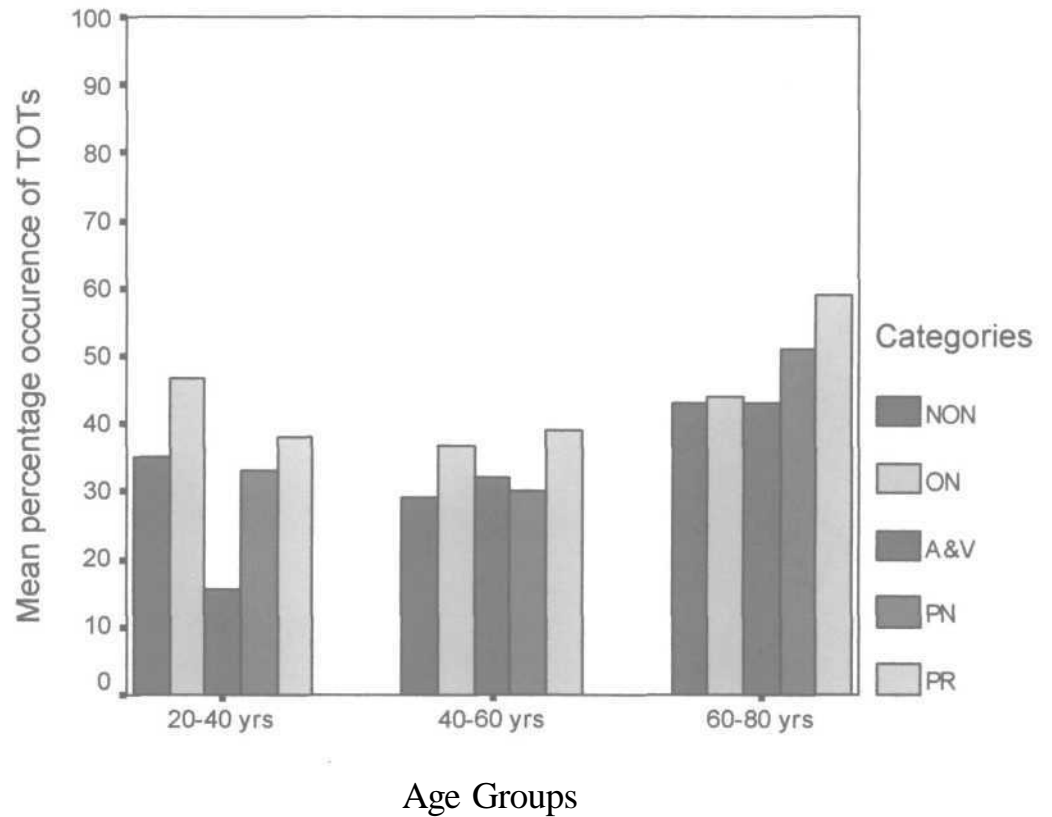
Type of words	Age Groups	
	60-80yrs	
	Mean	SD
NON	4.3000	1.1595
ON	4.4000	1.4298
A&V	4.3000	1.2517
PN	5.1000	1.2867
PR	5.9000	1.1972

From the table we can infer that highest occurrence of TOTs states are seen in the words categories: place and personality names. But when we look at the rest of the word categories i.e. non-object noun, object noun and adjective & verb, the TOT occurrences are relatively same. In this age group, all of the subjects had TOT states in all of the word types unlike i and ii groups of subjects.

Table 4.4 Mean and standard deviation values of TOT occurrences in all the three groups of subjects for word categories

Type of words	Age Groups	
	Total	
	Mean	SD
NON	3.5667	1.5241
ON	4.2500	1.4044
A&V	3.0690	1.5568
PN	3.8000	1.7695
PR	4.5333	1.5698

From the mean scores, we can infer that word types: non-object noun, adjectives and verbs and finally place names show a lesser occurrence of TOTs compared to word types, object nouns and personalities names which show slightly higher occurrences of TOTs.



Graph I Mean and Standard deviation values in terms of percentage for words across the three age groups

If we compare the percentage of TOT occurrences across the age groups, we can identify one major finding that the occurrence/presence of TOTs increases as the age increases and is more prominently seen in aged adults than middle and younger adults. And the percentage of TOT occurrences is almost similar in I and II groups, except for few differences in terms of the word categories.

Out of the eleven cross sectional studies that have been conducted, ten show clear evidence of age-related increases in TOT frequency (Brown, 2000).

- Older adults reported more TOTs for people names and object nouns than young adults. This age effect is consistent with Maylor's (1990b) finding that 70 year olds reported more TOTs than 50 and 20 year olds when trying to name familiar faces.
- And one more reason can be that young adults may have become familiar with some names more recently than older adults, especially the names of people who achieved fame before the young adults were born. For example: names of freedom fighters. Older adults but not young adults, reported more TOTs for acquaintances names than for proper names.

MacKay and Burke (1990) argued that aging weakens the connections between nodes in the model, reducing the amount of priming that can spread from semantic to phonological levels. Because of this probably, older adults with weaker connections will experience more TOTs, consistent with the decrement model.

b) Knowledge of syntax:

A MANOVA was done for comparison of ages within each parameter (type/category of word) to find the word categories which are significant for the presence of TOTs.

Test of Between-Subjects Effects

To have clear information about the TOT occurrence in the type of words in each of the age group, all the parameters were compared with in the age group.

Table 4.5 Comparison of ages within each parameter of type of words

Source	Dependent Variable	F(2,24)	Significance value
AGE	NON	1.780	.190
	ON	1.324	.285
	A&V	14.873	.000
	PN	4.596	.020
	PR	7.964	.002

This sort of comparison was made to determine whether there was any significant difference found between the categories of words considered for the study with in each group. The results revealed that there was a significant difference found only in three of the five categories of words considered; those were adjective and verbs, place names, and personality/persons names. Among these three word categories, to find which group had significant difference in TOT occurrence, a Post Hoc Duncan test was carried out and following are the results:

Table 4.6 Comparison of occurrence of TOTs in the word category: Adjective and Verb, across the three age groups

Age Groups	Subset	
	1	2
20-40 yrs (i)	1.6250	-
40-60 yrs (ii)	-	3.4444
60-80 yrs (iii)	-	4.3000
Significance value	1.000	.096*

Results indicated that for the category adjective and verb, there was a significant difference found in terms of the occurrence of TOT, between the i and ii group of subjects. As we can see from the table 4.6, in I group, the TOT occurrence was very less (1.62) compared to the group iii where the TOT occurrence was highest (4.30) for adjective and verbs. And at the same time, mean scores for group i and group ii are almost same with only meager differences, as in the case of group ii and iii, where again we can find only very minimal difference.

Again we find that the TOTs are more evident in the older adults than younger adults and also there was not much difference noticed in terms of middle aged and older adults that is, TOTs are occurring at the same rate in adjective and verb type in both the age groups. Whereas, in younger adults the occurrence of TOTs in the word type: adjective and verbs are very minimal.

Table 4.7 Comparison of occurrence of TOTs in the word type/category: Place names, among 3 age group.

Age Groups	Subset	
	1	2
20-40 yrs (i)	3.0000	
40-60 yrs (ii)	3.7500	3.7500
60-80 yrs (iii)		5.1000
Significance value	.312	.075*

From the above table, we can infer that there is a significant difference in terms of the word type: Place names for i and ii group and also for ii and iii group. That means to say, there is a clear cut difference in the TOT occurrence in the word type place names.

The mean scores for i group (3.00) were comparatively less compared to that of iii group scores (5.10), hence occurrence of TOTs in the word category, place names is less in younger adults and also in middle aged adults than compared to older aged adults. But the same is not true with the i and ii group, because in both the groups, the TOT occurrence are relatively same with a mean score of 3.00 and 3.75 respectively which is almost analogous i.e., in both younger as well as middle aged adults the occurrence of TOTs in place names are similar and not much of a word retrieval difficulties are noticed in this category of words.

Table 4.8 Comparison of occurrence of TOTs in the word type/category: Person's names, among 3 age groups.

Age Groups	Subset	
	1	2
20-40 yrs (i)	4.0000	
40-60 yrs (ii)	4.2222	
60-80 yrs (iii)		5.9000
Significance value	.681	1.000

The above table gives the significance values of the word type: Personality/ persons name across age groups, on comparison we can infer that there is no significant difference found among the groups. The values are almost similar for all the age groups. The i and ii age group subjects have a very similar value of 4.00 and 4.2 respectively but the iii group subjects have a slightly higher score (5.90) when compared to other age groups. Hence its clearly seen that the occurrence of TOTs in the word type: personality names follow a similar pattern in all the three age groups with a slightly higher occurrence in the older aged individuals compared to other age groups.

Repeated measure ANOVA for comparison of parameters with in each age

A repeated measure ANOVA was carried out for comparison of parameters (types/categories of words) with in each of the age group.

Table 4.9 Pair wise Comparisons of TOT occurrence for word categories with in each age group: I group (20-40 years)

Category 1	Category2	Mean Difference (2-1)	Significance value
2	1	.875	1.000
	3	3.125(*)	.001 (<0.005)
	4	1.000	1.000
	5	.750	1.000
3	1	-2.250	.066
	2	-3.125(*)	.001 (<0.005)
	4	-2.125	.103
	5	-2.375(*)	.004 (<0.005)
5	1	.125	1.000
	2	-.750	1.000
	3	2.375(*)	.004 (<0.005)
	4	.250	1.000

The above table depicts the comparison of a single parameter with the other parameters within a single age group (20-40 years).

The second parameter object noun category of words was compared with the other parameter (word types), and it was found that there was no significant difference among the parameters except for when it was compared with that of the third parameter adjective and verb (3), there was a significant difference seen.

And similarly, the third parameter adjective and verb was compared with that of the other parameters and it was found that there is a significant difference seen when compared with the object-noun (2) and person's name (5). Which means to say that there was a significant difference in the TOT states which occurred in the word type: adjective and verb with that of object noun and person's name.

Finally, we have the last parameter as the person's names (5), the comparison made across the other parameters revealed that there was a significant difference found when the word type person's name was compared with that of the word type adjective and verbs, which again means to say that presence of TOT states differed among both the parameters or word types, person's name and adjective and verb.

i group: 40-60 years

When a pair wise comparison was made across the type of words within an age group, it was found that there was no significant difference found for any of the types of words, which means to say that presence of TOT state was almost similar for all of the types of words in that particular age group.

ii group: 60-80 years

In iii age group which consisted of older adults, it was found that there was no significant difference seen in the presence of TOT states depending upon the type of word considered, which means to say that TOTs were independent of the type of word involved and the presence of TOTs were almost similar for all the types of words in this particular age group.

Results revealed that only for i group there was significant differences seen among the word types but not for other two groups. This simply means to indicate that only for group i, the presence of TOT highly correlated with the type of word and this was not the same with the ii and iii groups.

Table 4.10: Pairwise Comparison for Combined age groups

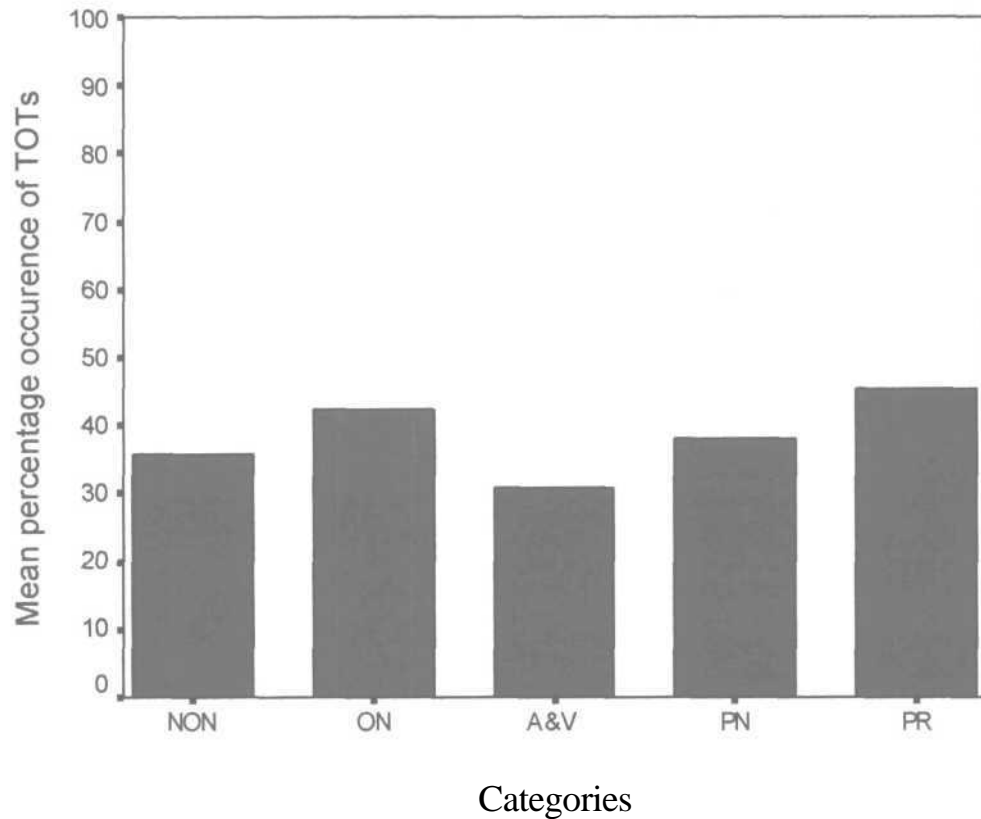
(I) COMBINED	(J) COMBINED	Mean Difference (I-J)	Significance value
3	1	-.556	1.000
	2	-1.037	.238
	4	-.778	.631
	5	-1.556(*)	.001 (<0.005)
5	1	1.000	.090
	2	.519	1.000
	3	1.556(*)	.001 (<0.005)
	4	.778	.181

The above table 10, depicts the comparison of a single parameter with the rest of the four parameters (word type) across the age group, very much similar to the previous statistical procedure but here comparison is made for all the three groups (i, ii & iii) and not done for each age group separately.

As seen in the table above, there was significant difference found for the comparisons made for the third parameter (adjective and verb). And it was found that there was a significance difference in the occurrence of TOT states depending upon the type of words especially as there was difference seen in the word type adjective and verbs with that of person's name.

Similarly, significant difference was found for word type: person name. When this parameter was contrasted with the other four parameters (type of word) it was found that there was a significance difference found for the comparison made between person's names with that of places names.

Hence when a comparison was made between the types of word across all three age groups, it was found that there was a significant difference found in two of the word type that is adjective and verb and person's name. Hence the occurrence of TOT varied depending on the type of word involved across all the age group.



Graph 2 Mean percentage occurrence of TOTs across the category/type of words for all the three groups of subjects.

As a whole the occurrence of TOTs in normal individuals are comparatively less, falling below 50% and not going above 50%. The graph explains that there was increased occurrence of TOTs seen in the word type/category: personality/person names and also object noun compared to other word types.

This gives an important finding as TOTs are majorly seen in proper names and also object nouns in all age group of subjects. Following this we have the word category: place names and non-object nouns. Finally least amount of TOTs was seen in the word category: adjective and verbs.

This gives an important finding as TOTs are majorly seen in proper names and also object nouns in all age group of subjects. Following this we have the word category: place names and non-object nouns. Finally least amount of TOTs was seen in the word category: adjective and verbs.

- We also obtained age related increase in relative frequency of TOTs for object nouns and person names; this can be attributed to the fact that older adults know more of the target words than young adults.
- It was also evident that the subject's educational background, economic status and his/her vocabulary played a major role in both occurrence as well as resolution of TOT. More educated and literate he/she was, less was the occurrence of TOT, but this was not the same with older adults, as they showed general weakened links of cognitive functions (memory), also the daily routine of reading newspaper, listening to news and keeping themselves updated about world knowledge contributed to the fewer occurrences of TOTs.
- The experimentally induced TOTs were sensitive to individuals' knowledge of the language as measured by the informal vocabulary assessments procedures. We assume as is the practice, that vocabulary reflects general knowledge (example, of famous names, places names, rare objects).
- Yet another point to be discussed is the individual's proficiency in a language. It was found that those subjects who were highly proficient in English showed

reduced TOTs and those who were comparatively less proficient showed increased occurrence of TOTs. This was true for all age groups of subjects. Thus indicating the extent of language mastery plays a crucial role in verbal interactions enhancing fluency.

Dahlgren (1998) used age as a covariate to detect TOT difference among people with high or low vocabulary; high vocabulary subjects experienced more TOTs than low vocabulary participants.

The prevalence of proper name TOTs for all age groups and the age related increase in proper name TOTs is consistent with the transmission deficit explanation of TOTs.

Partial information about TOT words (knowledge of number of syllables, letters/phonemes)

The number of correctly reported characteristics (i.e., initial letters, final letters, number of syllables / phonemes and similar sounding words) per TOT did not differ for young, middle aged and older adults. Most of the subjects could recall the initial letter of the word and also a similar sounding letter.

- For example, when asked a question about a famous personality

Who was the first Indian lady in space, who went for space mission twice abroad and she was killed at the end of her second mission, when Columbia exploded over the USA? Who was this great Indo-American?

Most of the subjects could recall the initial letter of her name as /ka/, and some of the subject could even remember her last name as "chawla" but not her first name. And some of the subjects could get a similar sounding phoneme as /sa/ instead of/ch/.

Among the 30 subjects studied for presence of TOT phenomenon, some of the subjects were able to remember the person's name and features and were also able to picturize the object for object nouns or persons in their mind.

- Few of the subjects were able to retrieve part of the name.

For example, they remembered the person's last name as "Williams" but not her first name as "Sunitha Williams". They were also able to rightly recall the place to which the person belonged to.

- For some of the questions in the category of non-object nouns, the subjects were able to remember/recall the scientific process and also some of the terms involved in it but not the target word.

For example, what is the name of the process by which plants make their food?

Most of the subjects who were in TOT state could recall that it is scientific process and were able to retrieve the steps involved in it. And they could also recall some of the terms involved in the process as "chlorophyll".

- Another example in the category object noun:

What do you call an instrument/device for performing calculations by sliding beads along rods or grooves?

Here most of the subjects were able to picturize the device in their mind, and they talked about the utility of the device such as, it's used with small children to teach

basic concept in mathematics and described about its appearance. They were able to recall most of the relevant information related to the device (abacus), when they were in a TOT state.

- An example in the category of place names:

Which is the ancient city which was known as "Banaras", when Lord Buddha visited it in 500BC and is the oldest, continuously inhabited city in the world today?

Here also most of the subjects could say the initial sound of the word as /va/ but not correct answer as "Varanasi".

- An example for the word category: adjective and verbs:

What term is used to refer to something which is made artificially, but not produced or occurring naturally?

The subjects who were in a TOT state could get the part of the word as "made" but not the complete word as they were also able to recall all phonologically related words.

Although most of the subjects reported of such partial information about the TOT word, they showed individual variability in retrieving the partial information related to the TOT target. All of this information also depended upon their educational background, the economic status and also to the type of environment they are exposed to such as their exposure to current affairs information etc.

TOTs have been shown to be accurate predictors of objective memory performance. When rememberers are experiencing TOTs, they often successfully recall partial information about the target. This suggests that people are consistent with the position that people experiencing TOTs are retrieving target information.

These phenomena are consistent with the position that the retrieval process is causing the TOT for the unrecalled word hence, during TOTs, the retrieval process is slowed. (Martin et al.1994. Thus these finding supports the view that TOTs reflect target word activation.

Persistent alternates: TOT word similarity effect

Older adults reported more number of persistent alternates when compared to young and middle aged adults. Those subjects who reported of partial information about the TOT word had reported of more number of alternate words occurring during the TOT state. The persistent alternates were either semantically or phonologically related to the target word.

- For example: What do you call a formal exercise by a team of marchers?

One of the subject came out with all kinds of word which were semantically related to the target word "drill" such as march fast, fast walking, all these words are semantically related to the actual target, as all of these words falls under the single category "physical exercises".

- An example for phonologically related persistent alternate:

What do you call a moving staircase?

The subject was showing an evidence of phonologically related alternate word occurring. He was uttering the word "eliminator" but not the word "escalator". Some of the subjects even showed evidence of getting a persistent alternate word in other languages in which the subject was familiar.

It was also found that there was an influence of the native language in the retrieval of TOT targets in few of the subjects, i.e, the native language added to the TOT state; it was actually inhibiting the recall of the target word, as most of the subjects had persistent alternate words in their native language.

The TOT targets and the persistent alternates tended to share syntactic class, initial phonemes, and number of syllables. Both alternates and age reduced TOT target recall, possibly because they delayed resolution beyond the brief interval available for recall. Subjects who reported of more alternate also reported of more partial information about the target are consistent with the NST because transmission priming influences both of these variables. The overlap in target-alternate phonology reflects spread of priming to lexical nodes sharing phonology with the target word. Alternates also do not accompany all TOTs as it was seen in some of our subjects. The inhibition hypothesis can explain the alternate free TOTs by postulating "unconscious alternates" with insufficient activation to be retrieved, but enough to inhibit the target. And these persistent alternates' occurrence increases with age probably because of the fact that older adult's usually are aware of more number of words in their vocabulary when compared to younger adults.

Resolution of TOTs: How and when??

Correct recall of TOT targets indicates spontaneous resolution. Here occurrence of alternates was also considered because alternates reduced the rate of recall and occurred more frequently for older than young adults.

In general, the resolution of TOT targets occurred at varied times for all the three age groups.

i group:

Resolution of TOT targets occurred more frequently with the younger adults. And the time taken for resolution varied between each subjects, but almost all of the subjects of group I could resolve their TOT state in the time given to them (2mins) before moving to the next question. And most of the subjects were able to correctly utter the TOT target after listening to the cues given to them. One was a semantic cue and another was a phonological cue, whereas few of the subjects were able to recall the TOT target spontaneously without any cues given to them.

Moreover, phonological cue proved to be more beneficial in recalling the TOT word than compared to semantic cue. When both of the cues (semantic as well as phonological) were given, subjects were able to correctly track out the target word in little time compared to only one cue given.

ii group:

Among these subjects, some of them were not able to recall the TOT target in the time given to them even after providing with the semantic and phonological cues, but few others were able to retrieve the target word after the cues given to them. But the resolution time was higher compared to younger adults.

iii group

The resolution was even more delayed and in some subjects it even took a day time and in some it took more than that. And here also most of the subjects were not facilitated by the cue (semantic and phonological) given to them for the retrieval of the TOT target. This again shows that the resolution of TOT targets also follows a pattern. The resolution time is less for younger adults and they are facilitated by cues given to them but for middle and older adults cues are not very helpful in the resolution of TOTs and resolution is also delayed.

The provision of both semantic and phonological cues proved to be beneficial to the subjects in retrieving the TOT target than when phonological and semantic cue were provided alone. Studies also have provided evidence that processing phonologically related words decreases TOT states and increases correct target responses (James and Burke, 2000), lending further support to the incomplete activation explanation of TOTs.

It was also found that in some subjects, provision of a phonological cue added on to the TOT state instead of aiding in the recall of the word probably because a phonologically related word in the same domain as the target would delay resolution. These results are consistent with the results of the study conducted by Meyer and Bock, 1992

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The present results suggest that TOTs can be explained within a general theory of how language units are retrieved during both everyday speech production and experimental tasks. Within this interactive model of speech production, TOTs are

caused by deficits in the transmission of priming that occurs when the connections between lexical and phonological nodes become weakened due to infrequent use, non-recent use, and aging. Consistent with this theory, TOT targets were infrequent words in the language and often had not been used recently used, even though they were highly familiar to the subject.

Group II: Aphasic population

The study was extended to include the aphasic individuals to study the performance of language impaired speakers which would allow us to assess whether syntactic information can be retrieved when full phonological form of the word cannot.

Table: 4.11 Mean and standard deviation values of TOT occurrences in i age Group (20-40 years) for words with different number of syllables

Number of syllables	Age group	
	20-40 years	
	Mean	SD
1 syllable	7.0000	-
2 syllable	4.0000	-
3 syllable	8.0000	-
4/5 syllable	3.0000	-

The above table gives the mean and SD values for the first groups of subject, for the words with different number of syllables, but due to non-availability (within time bound restrictions) of subjects, this group had only one subject.

Table 4.12 Mean and standard deviation values of TOT occurrences in ii age Group (40-60 years) for words with different numbers of syllables

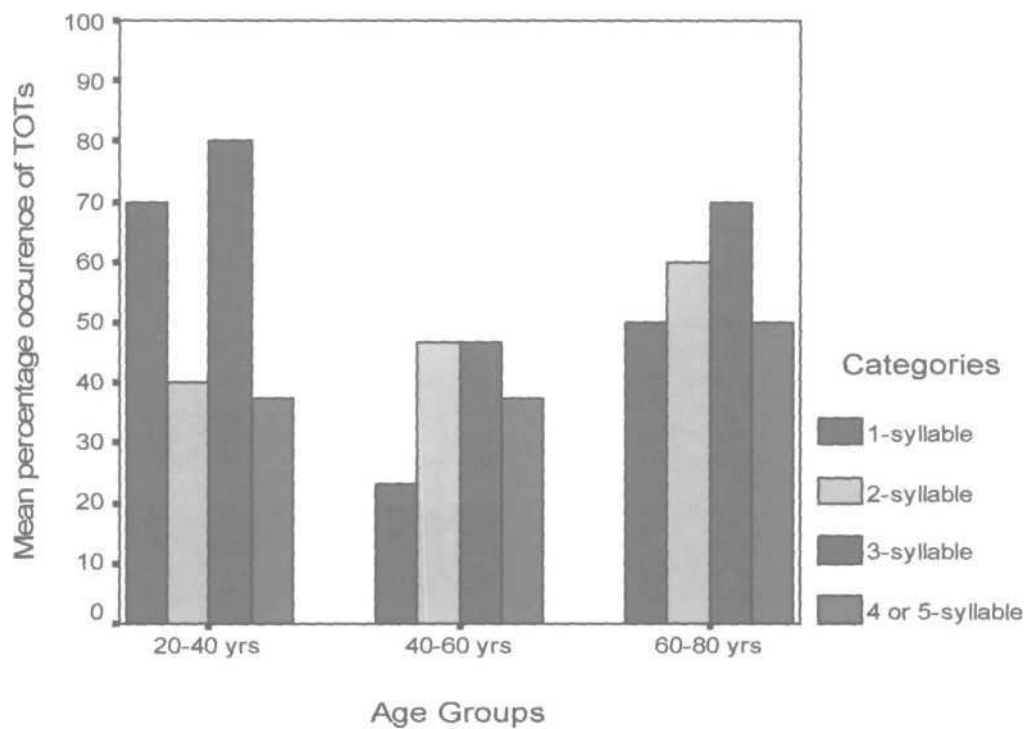
Number of syllables	Age group	
	40-60 years	
	Mean	SD
1 syllable	2.3333	1.5275
2 syllable	4.6667	3.0551
3 syllable	4.6667	.5774
4/5 syllable	3.0000	1.7321

Here also subjects were less in number, there were only two subjects in this group.

Table 4.14 Mean and standard deviation values of the syllables for presence of TOTs across all age groups.

Number of syllables	Age groups	
	Total	
	Mean	SD
1 syllable	4.0000	2.2804
2 syllable	5.0000	2.0976
3 syllable	6.0000	2.0000
4/5 syllable	3.3333	1.3663

The information depicted in the tables indicates the occurrence of TOTs in the words; these are clearly depicted in the form of a graph to have a better understanding:



Graph 3 Mean percentage occurrence of TOTs across age for aphasic population

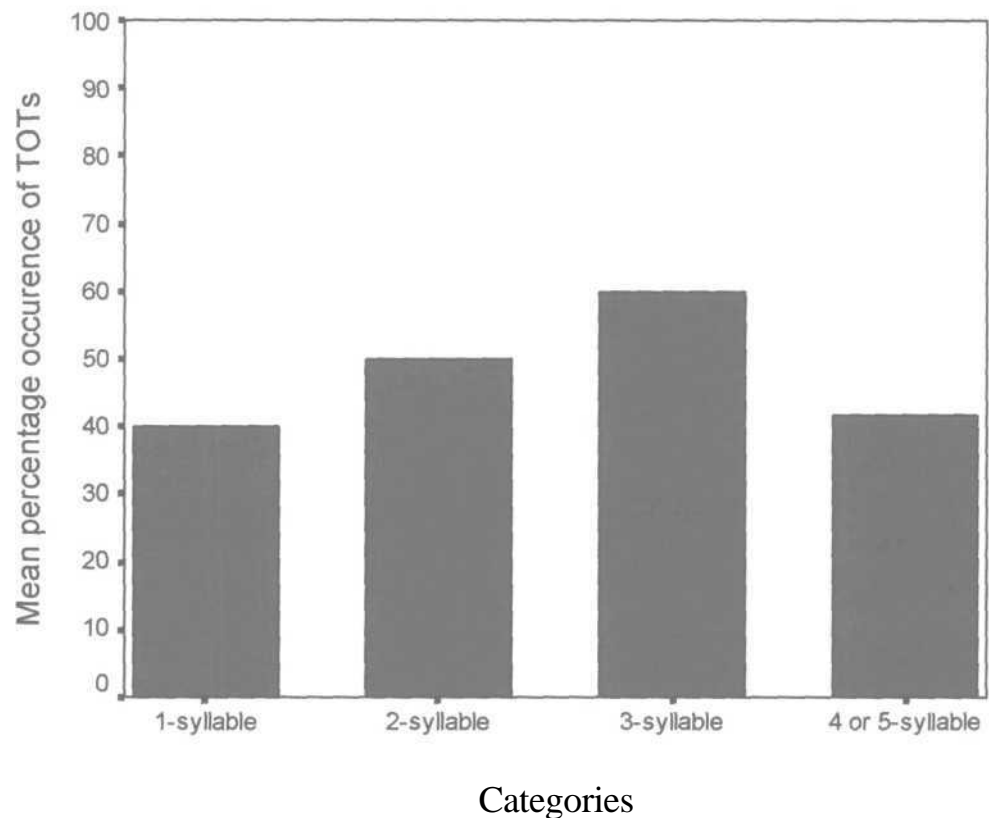
Table 4.13 Mean and standard deviation values of TOT occurrences in iii age group (60-80 years) for the words with different number of syllables

Number of syllables	Age group	
	60-80 years	
	Mean	SD
1 syllable	5.0000	1.4142
2 syllable	6.0000	.0000
3 syllable	7.0000	2.8284
4/5 syllable	4.0000	1.4142

This group also consisted of only two subjects. Hence results cannot be generalized to the population.

In the **ii group** of subjects, who fell in the age range of 40-60 years, the highest occurrence of TOTs were seen with 2 and 3 syllable words and the occurrence were relatively less in 4/5 syllable words and least in 1-syllable word.

In the **iii group** of subjects, (60-80 years), increased occurrence of TOTs was seen in 3-syllable words, followed by 2-syllable and the least amount of TOTs were seen in 1 and 4/5 syllable words when compared to other words. Along with this information we also have a graph depicting mean percentage occurrence of TOTs across all the three age groups for words with different number of syllables.



Graph 4. Mean percentage occurrence of TOTs across all the three age groups for words with different number of syllables

The above graph explains the following:

Across the age group, it was found that there is highest percentage of TOTs occurring in 3-syllable words followed by 2-syllable words and the occurrence of TOTs were similar in both 1 and 4/5 syllable words.

Apart from these, a non parametric test called Friedman test was carried out to make a comparison of parameters, but the results showed that there was no significant difference noted among the parameters (number of syllables).

- Almost all of the aphasic individuals needed cues (semantic and phonological cues) for them to retrieve the target word and it was noted that this cueing strategy was more helpful for anomia aphasics.
- Some of the subjects had hesitation i.e. they provided the target word after a long silent pause (>2s) after a series of approximating attempts to the word, for few of the words not restricted to any particular group of words (number of syllables) but varying among subjects. This was more prominent among Wernicke's aphasic subjects.
- The proportion of negative TOTs was quite small, presumably due to the use of picture as targets as well as to the phonological cueing that was provided the subjects could not retrieve a word.
- All of the aphasics had more TOTs in low frequency words. In particular, the anomia aphasics had only a minimal increase in failures with increasing syllable length; all other groups, particularly the conduction aphasics showed a marked relationship between the failures and syllable length of the word. This result correlates with the study done by Goodglass et al in 1976.
- Not only the anomia aphasics were relatively unaffected by syllable length in their access to object names, but they rarely reported having "an idea of what the target word should be. In contrast, the conduction aphasics as well as Wernicke's aphasic subjects mostly had a feeling for the target word in the picture. Hence this maximal contrast between the anomia aphasics, conduction as well

as wernicke's aphasics is apparent in the actual "tip of the tongue" performance, in spite of small number of subjects.

- Most of the aphasics were able to retrieve or recall the partial information about the target word. Conduction aphasics had significantly more partial information than anomics followed by the wernicke's subjects. They were able to talk about the context in which the object was used.

For example: when the subjects were shown a picture of knife

They were able to rightly say that it is used in cutting vegetable with the action when they were in TOT state.

- But also had hesitations followed by a silent long block and could not recover the word even after providing cues.
- Conduction aphasics identified both first letter and syllabic length of most of the words (one-third) which they could not name. Anomic aphasics' succeeded in less than one often instances and Wernicke's aphasics were not much successful. Hence, the results indicated clear cut superiority on the part of conduction aphasics, as compared to Wernicke's and anomic subjects.

Since the groups were similar in their performance in their rate of failure in naming the stimulus pictures, the observed differences in performance cannot be considered as merely differences in degree of impaired word finding. Rather, it appears that word finding is usually an "all or none " process for Wernicke' and anomic subjects, that is they either recover a name well enough to produce it or they can give least evidence of partial knowledge.

In case of conduction aphasics the evidence of partial knowledge of many words may indicate a breakdown at a later stage in the naming process. An inner auditory representation may be present but is prevented from setting into motion the final neural events which activate the articulatory system. Here either the auditory model is incomplete or as disconnection hypothesis suggest, its route to the motor speech area is not consistently available. These results are supported by the study done by Goodglass et al (1976).

Thus, conduction aphasics with their relatively better intact comprehension and fluency performed superior to anomic or Wernickes aphasics followed by anomic and then Wernickes' aphasics in the present study of a small number of aphasics.

CHAPTER 5

SUMMARY AND CONCLUSION

The present study aimed at studying the nature of Tip-of-the-Tongue phenomenon (TOT) seen ubiquitously in most of the normal individuals in their day to day life as well as in patient population such as individuals with aphasia.

Literature in the Western context is abundant with data on occurrence of TOT and influence of other variables across age. But with regard to Indian context there is a dearth of information in these aspects. Thus the need for a study in the Indian population across age groups in normal and disordered population was felt.

The investigation was carried out to address the following research goals:

- To explore the nature of TOT phenomenon and thereby to get an insight about the word retrieval process occurring in both language intact subjects and language impaired subjects (Fluent aphasics).
- To investigate the influence of age and language proficiency on TOT occurrence.
- To check for the facilitation or inhibition of other languages in retrieval of target word in English. (Effect of bilingualism).
- To study whether provision of phonologically and semantically related cues/words would inhibit or facilitate the retrieval of correct target response in normal as well as in aphasic population.

The study was also aimed at studying some of the factors related to TOT phenomenon such as:

- Type of TOT word: the grammatical class of the TOT word.
- Partial information about targets (knowledge of number of syllables, letters/phonemes or initial or part of the word)
- Persistent alternates or blockers and TOT word similarity
- Resolution of TOTs.
- Recency and acquaintance name TOTs.

For I group of subjects, the stimulus consisted of 50 low and intermediate frequency words in the following category: non-object nouns, object noun, adjective and verbs, place names and personality names. 10 questions/definitions were framed from each of the five categories. The responses of the subjects were scored for the presence of TOT states accompanying phenomenon when they are in TOT state.

Along with this, there was also a diary study conducted to investigate about the naturally occurring TOTs. Where the subjects were instructed to note down and approximately make an estimation of how many TOTs they experience per week or month in everyday life.

The results obtained are given below:

- All of the normal subjects who participated in the study starting from the age range 20 to 80 years experienced TOT states and these were seen more in person' names and object nouns.

- TOTs are majorly seen in proper names and also object nouns in all age group of subjects. Following this we have the word category: place names and non-object nouns where TOTs have their increased occurrence after proper names and object nouns. Finally least amount of TOTs is seen in the word category: adjective and verbs.
- The occurrence of TOT states increases as the age increases and is more prominently seen in aged adults than middle and younger adults. And the percentage of TOT occurrences is almost similar in young and middle aged adults, except for few differences in terms of the word categories.
- Subject's educational background, economic status and his/her vocabulary played a major role in both occurrence as well as resolution of TOT and TOTs were sensitive to individuals' knowledge of the language.
- Subjects who were highly proficient in English showed reduced TOTs and those who were comparatively less proficient showed increased occurrence of TOTs. This was true for all age groups of subjects.
- Native language and other languages known by the subject were actually inhibiting the recall of the target word, as most of the subjects had persistent alternate words in their native language.

- Provision of both semantic and phonetic cues proved to be beneficial to the subjects in retrieving the TOT target than when phonetic and semantic cues were provided alone.

Partial information about TOT words:

The partial information retrieved during TOT states are: recall of initial letter of the word and also a similar sounding letter. Some of the subjects were able to remember the person's name and features and were also able to picturize the object in their mind. Few of the subjects were able to retrieve part of the name. Individual variability was seen in retrieval of partial information.

Persistent alternates: TOT word similarity effect

Older adults reported more number of persistent alternates when compared to young and middle aged adults. Subject with persistent alternates had also reported of more number of alternate words occurring during the TOT state. Here again, individual variability was seen.

Resolution of TOTs:

- Persistent alternates reduced the resolution rate of TOTs and occurred more frequently for young than older adults.
- The resolution time is less for younger adults and they are facilitated by cues given to them but for middle and older adults cues are not so very helpful in the resolution of TOTs and resolution is also delayed.

- When both of the cues (semantic as well as phonetic) were given, subjects were able to correctly track out the target word in little time compared to only one cue given.
- Moreover, phonological cue provided proved to be more beneficial in recalling the TOT word than compared to semantic cue.

Within interactive model of speech production, TOTs are caused by deficits in the transmission of priming that occurs when the connections between lexical and phonological nodes become weakened due to infrequent use, non-recent use, and aging. Consistent with this theory, TOT targets were infrequent words in the language and often had not been used recently used, even though they were highly familiar to the subjects.

Group II: Aphasic population

- The percentage of TOT occurrence is higher in the younger as well as the older aphasic adults when compared to the middle aged adults. But this cannot be taken for generalization, as the number of subjects in each of the group is very meager in number.
- Almost all of the aphasic individuals needed cues (semantic and phonological cues) for them to retrieve the word and it was noted that this cueing strategy was more helpful for anomic aphasia.

- Subjects had hesitation i.e., they provided the target word after a long silent pause (>2s) after a series of approximations to the word. And this was not restricted to any particular words (number of syllables) but varied among subjects. This was more prominent among Wernicke's aphasic subjects.
- All of the aphasics had more TOTs in low frequency words, anomics have only a minimal increase in failures with increasing syllable length; all other groups, particularly the conduction aphasics show a marked relationship between the failures and syllable length of the word. This result correlates with the study done by Goodglass et al (1976).

Most of the aphasics were able to retrieve or recall the partial information about the target word. Conduction aphasics had significantly more partial information than anomics followed by the wernicke's subjects. They were able to talk about the context in which the object was used. Conduction aphasics identified both first letter and syllabic length of most of the words (one-third). Anomic aphasics' succeeded in less than one often instances and Wernicke's aphasics were not much successful.

Hence results indicated clear cut superiority on the part of conduction aphasics, as compared to Wernicke's and anomic subjects. Thus, conduction aphasics with their relatively better intact comprehension and fluency performed superior to anomic or Wernickes aphasics followed by anomic and then Wernickes' aphasics in the present study of a small number of aphasics.

Implications:

- The results would give some insights about the occurrence of TOT or word finding difficulty across age groups.
- This study would serve as a first preliminary attempt made to study the tip of the tongue phenomenon in Indian population.
- This study would provide us with data on which type of words (syntactical class), TOTs occur more and indicate the order of occurrence of these words in both normal and in persons with aphasia.
- This information on TOTs (type of words and their order of occurrence) can aid us in planning the words (type and number of syllables) that can be taken be up initially for therapy for word finding difficulty seen in persons with aphasia.
- It gives insight about the cause for occurrence of TOTs by explaining at which levels of lexical processing the breakdown occurs both in normal individuals and in aphasics.
- Phonological cueing strategy may prove more beneficial in therapy for word finding deficits. And it can also be facilitated with semantic cueing for better retrieval of the words individuals with aphasia.

Limitation of the study:

- The study consisted of less number of aphasic subjects and hence due to the limited sample size, results could not be generalized.

- A comparison between the aphasic and normal subjects could not be done as the method for eliciting TOTs varied between both the groups.
- In the study an attempt was not made to study the reaction time of the subjects in retrieving the answer or TOT words objectively.

Direction for the research future:

- Future studies can be carried out with more number of aphasic individuals' in order to generalize the results into aphasic population and retrieve useful strategies to use with word retrieval deficit seen in these individuals.
- The reaction time studies during TOT state can be carried out on subjects with the use of software programs such as DMDX.
- There can also be attempts made to study the orthographic information and gestural information available when the individual retrieves partial information when he/she is in a TOT state.
- If TOTs really are universal, it would be interesting to know when children start using the expression "it's on the tip of my tongue", given that it exists in most of the language in the world.

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APPENDIX- I

The Mini-Mental State Examination

Patient _____ Examiner _____

Date _____

Maximum Score

Orientation

- 5 () What is the (year) (season) (date) (day) (month)?
- 5 () Where are we (state) (country) (town) (hospital) (floor)?

Registration

- 3 () Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer.

Then repeat them until he/she learns all 3. Count trials and record.

Trials _____

Attention and Calculation

- 5 () Serial 7's. 1 point for each correct answer. Stop after 5 answers.

Alternatively spell "world" backward.

Recall

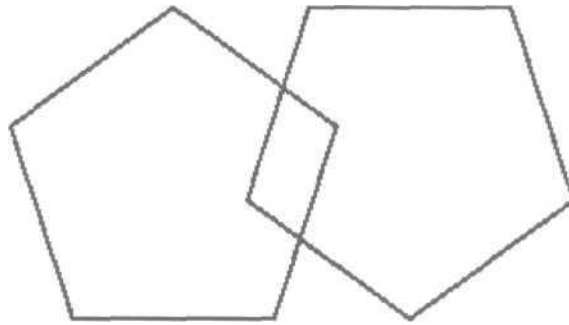
- 3 () Ask for the 3 objects repeated above. Give 1 point for each correct answer.

Language

- 2 () Name a pencil and watch.
- 1 () Repeat the following "No ifs, ands, or buts"
- 3 () Follow a 3-stage command:

"Take a paper in your hand, fold it in half, and put it on the floor."

- 1 () Read and obey the following: CLOSE YOUR EYES
- 1 () Write a sentence.
- 1 () Copy the design shown.



_____ **Total Score**

ASSESS level of consciousness along a continuum

Coma

Alert

Drowsy

Stupor

APPENDIX II

INTERNATIONAL SECOND LANGUAGE PROFICIENCY RATING (ISLPR, Ingram, 1985)

SPEAKING	LISTENING	WRITING	READING
<p>S: 0 Zero Proficiency</p> <p>Unable to function in the language.</p>	<p>L: 0 Zero proficiency</p> <p>Unable to comprehend the spoken language.</p>	<p>W: 0 Zero proficiency</p> <p>Unable to function in the written language.</p>	<p>R: 0 Zero proficiency</p> <p>Unable to comprehend the written language.</p>
<p>S: 0 + Initial proficiency</p> <p>Able to operate only in a very limited capacity within very predictable areas of need.</p>	<p>L: 0 + Initial proficiency</p> <p>Able to comprehend only a very restricted range of simple utterances within the most predictable areas of need and only in face to face situations with people used to</p>	<p>W: 0 + Initial proficiency</p> <p>Able to write clearly a limited number of words or short formulae pertinent to the most predictable areas of everyday needs.</p>	<p>R: 0 + Initial proficiency</p> <p>Able to read only a limited range of essential sight words and short sentences whose forms have been memorized in response to immediate needs.</p>

	dealing with non-native speakers.		
<p>S: 1 Elementary proficiency</p> <p>Able to satisfy basic survival needs and minimum courtesy needs.</p>	<p>L: 1 Elementary proficiency</p> <p>Able to comprehend readily only utterances which are thoroughly familiar or are predictable within the areas of immediate survival needs.</p>	<p>W: 1 Elementary proficiency</p> <p>Able to write with reasonable accuracy short words and brief familiar utterances.</p>	<p>R: 1 Elementary proficiency</p> <p>Able to read short simple sentences and short instructions.</p>

APPENDIX III

Retrospective Questionnaire

- The questions were concerned about the type of word involved (eg: name of person, place, object, nouns, adjectives and verbs).
- Characteristic of the word involved (sound, syllable, number of syllables, when TOT was last encountered).
- Strategies used to resolve the TOT (e.g.: consult dictionary, search memory alphabetically, think of meaning of word).
- The subjects who experience TOTs for acquaintance names were asked 4 additional questions: how long they knew each acquaintance, frequency of contact with him/her, most recent contact, and how well they knew the acquaintance.
- The subjects were asked to indicate any alternate word that came repeatedly to mind along with the language.
- And they were also asked to indicate the correct word when a TOT was successfully resolved with the time interval between TOT onset and resolution and also how concerned they were about TOTs compared to other memory errors.

APPENDIX IV

Stimulus for the group I subjects: question/definitions for experimentally inducing TOTs.

I) Non-object Noun

1) What do you call a formal exercise by a team of marchers?

Target word: Drill

2) What is the name of the process by which plants make their food?

Target word: Photosynthesis

3) What do you call a prolonged and usually abnormal inability to obtain adequate sleep?

Target: Insomnia

4) What is the proper name for a disastrous tidal wave?

Target word: Tsunami.

5) In which sports does a rider on horseback hit a ball with a mallet?

Target word: Polo

6) What would you call a long distance running race?

Target word: Marathon

7) The process by which food is digested and energy is supplied?

Target word: Metabolism.

8) What do you call a room equipped for physical fitness exercise/training?

Target word: Gymnasium

9) The study of the earth's physical features and arrangement of a place?

Target word: Geography

10) The branch of mathematics dealing with lines, angles, surfaces and solids?

Target word: Geometry.

II) Object Noun

- 1) What is the name of the hardwood of an Indian timber tree often used for furniture?

Target word: Teak wood.

- 2) What do you call an instrument for performing calculations by sliding beads along rods or grooves?

Target word: Abacus

- 3) What will you call an instrument for recording earthquakes?

Target word: Seismograph

- 4) What do you call a system for detecting objects by means of radio waves?

Target word: Radar

- 5) A soft, black form of carbon used in pencils, not lead?

Target word: Graphite

- 6) An antibiotic obtained from certain molds often used to cure sore throat?

Target word: Penicillin

- 7) A device for administering a vapor to be inhaled to relieve asthma etc.

Target word: Inhaler

- 8) An instrument with lenses that magnify very small things, making them visible.

Target word: Microscope.

- 9) What do you call a moving staircase?

Target word: Escalator

- 10) A crystalline sugar occurring naturally in fruits, honey etc.

Target word: Glucose.

III) Adjective and Verb

1) What is the name of the severe headache that returns periodically and often is accompanied by nausea?

Target word: Migraine

2) A wild, fierce, cruel, hostile, primitive and uncivilized behavior?

Target word: Savage.

3) To walk in a regular rhythm or an organized column?

Target word: March

4) What term is used to refer to artificial, which is not produced or occurring naturally?

Target word: Man-made.

5) This word means "a condition following a usually short pregnancy"

Target word: Preterm.

6) To make or produce goods on a large scale by machinery

Target word: Manufacture.

7) Reading of a material and correcting the printed proof

Target word: Proof-read.

8) What word means to repair, heal, set right (a dispute etc)

Target word: Mend

9) What would you call, when something is concerning or based on theory rather than practice/practical?

Target word: Theoretical.

10) What would you call, when a room is lacking fresh air or ventilation?

Target word: Stuffy.

IV) Place Names:

- 1) The "ancient city" which was known as Banaras, when Lord Buddha visited it in 500 B.C and is also the oldest, continuously inhabited city in the world today?

Target word: Varanasi

- 2) Among the 2 island groups located around India, which are not under the Indian rule?

Target word: Maldives.

- 3) A mega metropolitan in the east of the country and home of Mother Theresa for many years and also the first city in India with an underground railway system?

Target word: Calcutta.

- 4) Which port city was the first Portuguese colony in India?

Target word: Goa

- 5) Where did Vasco da Gama landed in India?

Target word: Calicut, Kerala.

- 6) Where was Goutam Buddha born?

Target word: Lumbini

- 7) In which 2 cities of Japan, there was a disastrous bomb explosion in the year 1945?

Target word: Hiroshima and Nagasaki.

- 8) In which country would one find 8 of the world's highest mountains?

Target word: Nepal

- 9) Name the state in India that does not have a public seat at the Lok Sabha?

Target word: Mizoram.

10) Which Indian states are known for their Bhandhani work?

Target word: Gujarat and Rajasthan.

V) Personalities/Person' Names:

1) She was the first Indian lady in space; she went for space mission twice abroad (American space shuttle). She was killed at the end of her second mission, when Columbia exploded over the USA. **Who** was this great Indo-American?

Target word: Kalpana Chawla.

2) Who was called the "Hariyana Hurricane" nick named by Guinness Book of World Record?

Target word: Kapil Dev.

3) Name **the** Indian who discovered a law related to Supernova? He also had an asteroid named after him?

Target word: Subrahmanyam Chandrasekar

4) Name the Indian Athlete who lost a medal in an Olympic event by 100th of a second?

Target word: P.T.Usha.

5) She is an Indian basically; she went to the space for the American space shuttle (NASA) had a stay there for around 6 months and recently landed on earth?

Target word: Sunitha Williams.

6) Who was the first Indian woman President of the Indian National Congress?

Target word: Sarojini Naidu

7) Who was known as Frontier Gandhi?

Target word: Khan Abdul Ghaffar Khan.

8) Who became the second Indian cinestar to have her statue unveiled at Madame

Tussaud's wax museum in London?

Target word: Aishwarya Rai.

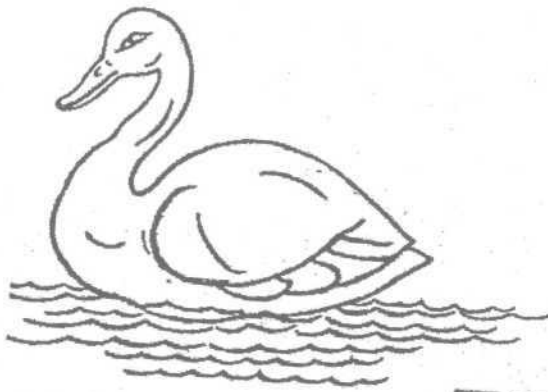
9) The first woman in India to join the elite Indian Police Service in 1972?

Target word: Kiran Bedi.

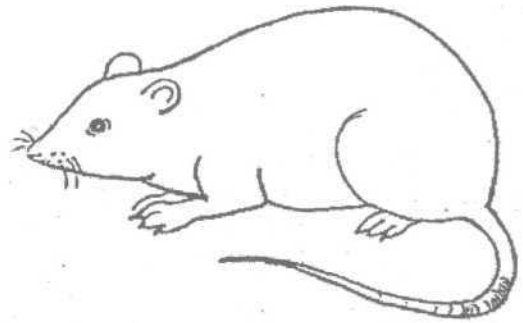
10) By blood she was an Albanian, by citizenship an Indian. She had founded

Missionaries of charity in India. She died on September 5, 1997 on Calcutta.

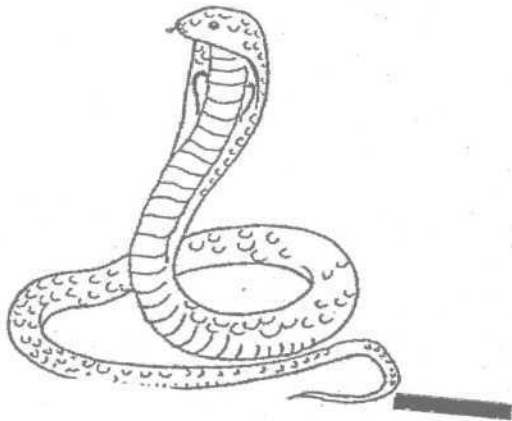
Target word: Mother Theresa.



LC-B11



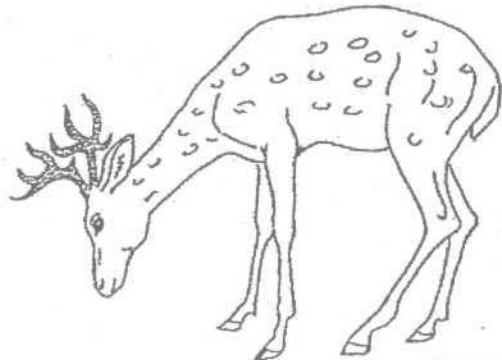
LC-A7



AN-2



LC-D3



LC-A18

