

“Tip of the Tongue Phenomenon” in Normal and Aphasic Adults: An Exploratory Study

Anusuya M. MSc *, Dr.K.C.Shyamala **

*(Speech Language Pathology), Assistant Professor, Department of Speech Language & Hearing Sciences, Saveetha Medical college and Hospital
** Professor in Language Pathology Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore

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Abstract- 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 disordered population such as individuals with aphasia. The study consisted of 30 normal subjects grouped in 3 age group: young, middle and old respectively and 6 subjects with fluent aphasia. Prediction of tip of the tongue phenomenon in normal subjects was investigated by the use of two basic ways: diary studies to acquire information on naturally occurring TOTs and experimentally induced TOTs which involved word retrieval tasks. Results revealed that 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, even though they were highly familiar to the subjects. Results also indicated clear cut superiority on the part of conduction aphasics, as compared to Wernicke’s and anomic aphasic subjects, the results gave some insights about the occurrence of TOT in normal as well as aphasic population across three age groups.

Index Terms- Tip-of-the-tongue phenomenon (TOT), fluent aphasia, word retrieval

I. 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 (sometimes several weeks). This type of memory retrieval has been referred to as a Tip-of-The-Tongue (TOT) state.

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.

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:

- TOT is a strong subjective experience that is hard to confuse with any other experience.
- TOTs are generally accompanied by emotional feelings. Emotional frustration may occur when the TOT is first experienced, and relief may be experienced when it is resolved.
- 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 we might say the word in other languages.
- People usually do know the word and eventually retrieve it.
- There is a strong motivation to resolve the TOT, that is, to search and find the elusive target word.

It has been thought that interfering words cause the TOTs, but some researchers now believe that 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. In a study by Dr Lori James of the University of California and Dr Deborah Burke of Pomona College (2000) suggests a different cause. A lot of emphasis has been placed on the importance of semantic information. 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 say 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, 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’re 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.

Aphasia is a general term referring to the acquired language deficits. 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.

Goodglass et al. (1976) 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.

II. METHOD

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

Group I: The participants in group I were divided into 3 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.

All the participants selected for the study were Bilinguals/multilinguals with any Indian language as their mother tongue and English as their second language with adequate educational background. They were devoid of any sensory and other associated problems, as seen on administration of Mini Mental State examination (MMSE). International second language proficiency-Rating (Ingram, 1985) was administered to check for their second language proficiency. In addition, an informal assessment of their language proficiency and vocabulary were also carried out.

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, Mysuru and also from other hospital set ups. The subjects selected were unambiguously classified into one of the fluent diagnostic categories: Wernicke’s aphasia, anomic aphasia, transcortical sensory aphasia and conduction aphasia by a certified Speech Language Pathologist and/or Neurologist and had no history of pre-morbid neurological, psychological or any known organic deficit. And had no sensory deficits such as visual (visual

neglect, visual agnosia) and or auditory deficit as seen on MMSE (Mini Mental Status Examination, Folstein et al., 1975). All participants were bilingual aphasics and were pre-morbidly right-handed having an Indian language as their mother tongue and English as their second language.

III. MATERIAL

Group I: Normal Population

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.

Diary studies: With this procedure, online information about TOTs was acquired as they occurred. They 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.

Word retrieval tasks: Here, subjects had to answer questions designed to induce TOT states. The target was 50 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.

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 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 and any other word that comes to their mind.

Group II: Aphasic Population

38 picturable objects, with intermediate word frequency were selected. There were 10 each of 1-syllable, 2-syllable, 3-syllable words and 8 words of either 4 or 5 syllables which were presented pictorially in a fixed random order. An alphabet card was also used for the indication of first letters, and a card picturing letters as a series from one to five dashes separated by slashes was used for the indication of syllable length.

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 subjects 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 client names a picture, which would not match the experimenter's target.
- Positive TOTs were scored with a score of one, when the clients were not able to retrieve the target word right away, and recognized the experimenter target as his/her target.
- Negative TOTs were scored when the clients could not retrieve the word, and also did not recognize the experimenter's target as his/her target.

IV. STATISTICAL ANALYSIS

Analyses differed when participants were in positive TOT state and when they were in negative TOT state. During negative TOT states, speakers had a different word in mind or were presumably unsure as to whether any word 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 analyse the above-mentioned factors both quantitatively

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

V. RESULTS AND DISCUSSION:

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

Group I 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 picturize 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 weeks' 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. In fact, most of the individuals in I group were not aware of these TOT states.

Most of the **group II** 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.

Group III 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.

VI. DESCRIPTIVE ANALYSIS:

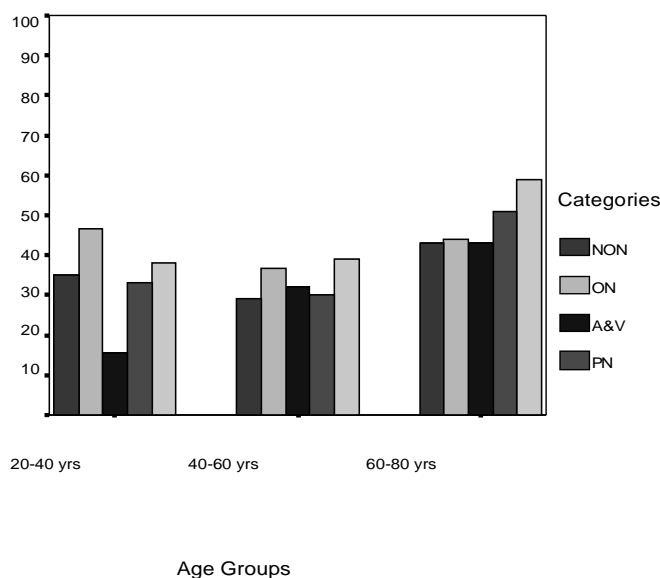
Hence a descriptive analysis of the corpus of TOT words provided a clear support for the predicted relation between TOTs and frequency and recency of use of the target word. For all age groups, TOTs involved abstract words, object names, place names and personality names that occurred relatively rare 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 Feeling of Knowing (FOK) 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 mid-age 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: Graph 1: 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 infer that the occurrence of TOTs increases as the age increases and is more prominently seen in aged adults than middle and younger aged 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. It is clear that almost all of the normal subjects who participated in the study from the age range 20 to 80 years had experienced TOT states and these are seen more in person’s names and object nouns category of words. Out of the 11 cross sectional studies that have been conducted, 10 show clear evidence of age-related increases in TOT frequency.

Older adults reported more TOTs for people’s name and object nouns than young adults. This age effect is consistent with

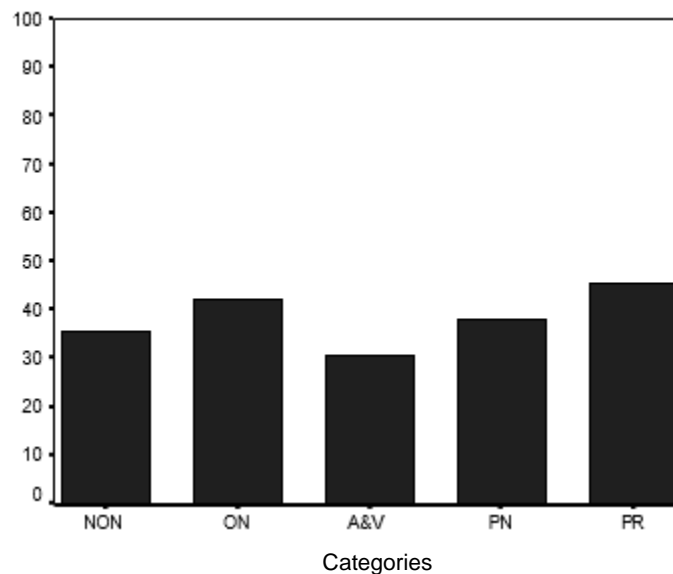
Maylor’s (1990) finding that 70-year-old reported more TOTs than 50- and 20-year-old when trying to name familiar faces.

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.

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



On the whole the occurrence of TOTs in normal individuals are comparatively less, falling below 50%. The graph explains that there was increased occurrence of TOTs seen in the word category: personality/person names and also object noun compared to other word types. From which we can infer that TOTs are majorly seen in proper names and also object nouns in all the age group of subjects. Following this we have the word category: place names and non-object nouns. Finally, least number of TOTs was seen in the word category: adjective and verbs.

- 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). Apart from this, 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 group 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.

Persistent alternates: TOT word similarity effect

Older adults reported a greater 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 a greater number of alternate words occurring during the TOT state. The persistent alternates were either semantically or phonologically related to the target word.

Resolution of TOTs: How and when

Group I: Resolution of TOT targets occurred more frequently with the younger adults. And the time taken for resolution varied between each subject, 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 when compared to semantic cue. When both cues (semantic as well as phonological) were given, subjects were able to correctly utter the target word in less time compared to only one cue given.

Group II: Among these subjects, some of them were not able to recall the TOT target in the time given to them even after providing 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.

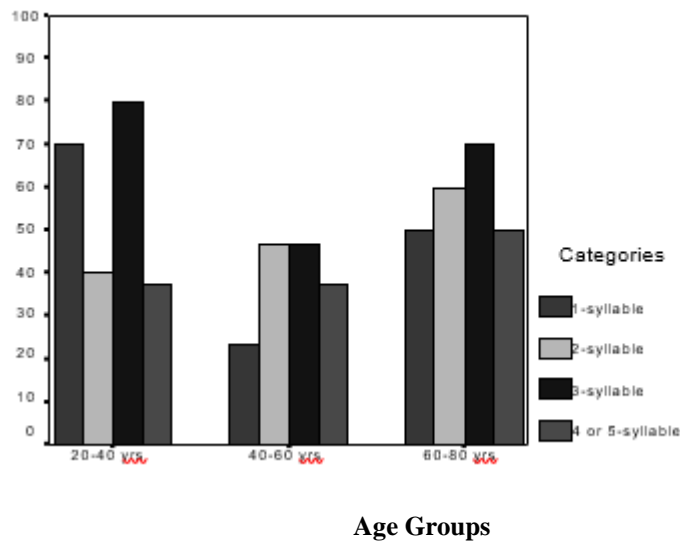
Group III: The resolution was even more delayed and, in some subject, it took a day and in some it took more than a day. Most of the subjects were not facilitated by the cue (semantic and phonological) given to them for the retrieval of the TOT target. This again shows that the resolution of TOT targets also follows a pattern.

The provision of both semantic and phonological cues proved to be beneficial to the subjects in retrieving the TOT target when compared to phonological and semantic cues 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

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, even though they were highly familiar to the subject.

Group II: Aphasic population: Graph 3: Mean percentage occurrence of TOTs across age for aphasic population



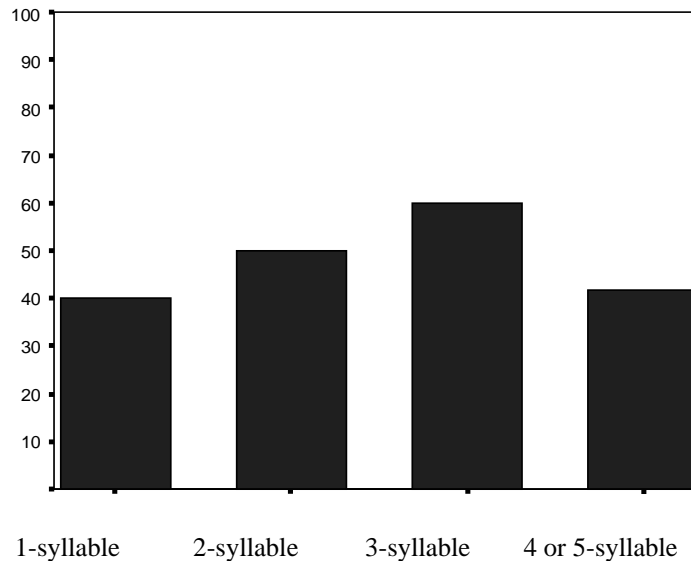
The mean percentage of TOT occurrence is higher in the younger as well as in the older aphasic adults when compared to the middle-aged adults. But these results cannot be generalized, as the number of subjects in each of the group was very meager in number.

group I: the mean percentage of occurrence of TOTs is higher in the 3- syllable words, followed by 1-syllable word, and then finally followed by 2-syllable and 4/5-syllable words where the occurrence of TOTs was least.

group II: the highest occurrence of TOTs was seen with 2 and 3 syllable words and the occurrence were relatively less in 4/5 syllable words and least in 1-syllable word.

group III: increased occurrence of TOTs was seen in 3-syllable words, followed by 2-syllable and the least number of TOTs were seen in 1 and 4/5 syllable words compared to other words.

Graph 4: Mean percentage occurrence of TOTs across all three-age group for words with different number of syllables



As understood from the above graph, 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.

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 anomic 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 anomic subjects 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 anomic subjects 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 an idea for the target word in the picture. Hence this maximal contrast between the anomic subjects, 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 anomic followed by the Wernicke's subjects. They were able to talk about the context in which the object was used.

In case of conduction aphasic subjects, 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 aphasics followed by Wernicke's aphasics in the present study of a small number of aphasic subjects.

VII. CONCLUSIONS

The results would give some insights about the occurrence of Tip of the tongue phenomenon or word finding difficulty across age groups and 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 syntactical class of words, tip of the tongue phenomenon occurs more and indicates order of occurrence of the 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 initially taken for speech language therapy for word finding difficulty seen in persons with aphasia. The study also gives insight about the cause for occurrence of

TOTs by explaining at which level of lexical processing the breakdown occurs both in normal population and in persons with aphasia. Phonological cueing strategy will be more beneficial in therapy phase for word finding difficulty. And it can also be facilitated with semantic cueing for better retrieval of the words in individuals with aphasia.

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AUTHORS

First Author – Anusuya M. MSc (Speech Language Pathology), Assistant Professor, Department of Speech Language & Hearing Sciences, Saveetha Medical college and Hospital.
nethu.anu@gmail.com

Second Author – Dr.K.C.Shyamala Professor in Language Pathology Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore.
shyamalak@yahoo.com.

Correspondence Author – Anusuya.M, nethu.anu@gmail.com.
9940431416.