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EFFECTS OF PHONOLOGICALLY RELATED WORDS ON TIP-OF-THE-TONGUE (TOT)

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ABSTRACT

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The "tip-of-the tongue" (TOT) experience occurs when a person cannot fully recall a word (target word) but has a very strong sense of what the word is. TOT is a common and frustrating experience that is often perceived as a memory deficit as opposed to an issue with language. The purpose of this study was to measure the effects of quickly presented phonologically related words (words related in sound) on TOT experiences. Previous studies have shown untimed exposure to words that sound similar (phonologically related) to a target word reduced the occurrences of TOT (James and Burke, 2000; Meyer and Bock, 1992). This study investigated whether phonologically related words presented at 75 milliseconds (msec) during a distraction task would reduce TOT experiences; thus, showing TOT is affected by the words without having to fully process them. This study collected data from college students using an individualized computer experiment. Participants were given a shape identification task that asked to identify a "correct" shape (distractor task). Participants received presentations of the words for 75 msec directly before each alternating shape in the distracter task. Participants were given a TOT evoking question, then asked to respond: 1) answer the question 2) indicate they did not know the answer or 3) indicate TOT for the answer. The experiment compared correct and TOT responses between the 2 conditions of phonologically related and unrelated words. Using T-tests statistical analysis, results showed no significant differences for correct and TOT responses between the 2 conditions. Future research could investigate presenting words at different speeds or try using different methodologies for presenting the words.

Effects of Phonologically Related Words on Tip-of-the-Tongue (TOT)

Imagine that you are taking an SAT vocabulary test and face the question, "What word means to formally renounce a throne?" You may be sure that you know this word and are at least able to remember that the word begins with an "ah" sound or that it has a "c" sound in it, but you are still unable to remember the answer. Later, after taking the test, the correct answer "abdicate" pops up into your head out of nowhere. This irritating phenomenon is known as "tip-of-the-tongue" (TOT). TOT is the experience when a word retrieval failure is coupled with a strong feeling of knowing and frustration. One feels as though the target word one is trying to retrieve is right on the tip of ones tongue but one is unable to retrieve the target word at the moment. As seen in the example above, TOT usually occurs for target words that are known to the person but are not accessed frequently. TOTs are universal and happen once a week on average for everyone (Burke, Mackay, Worthley, &Wade, 1991). The proposed experiment will investigate the factors that reduce the occurrence of TOT experiences.

Researchers have investigated the cause of TOT and what factors help to reduce or increase TOT experiences, meaning what factors contribute to the ability to successfully retrieve or fail to retrieve a target word. Previous studies often referred to semantically related words and phonologically related words as primers or inhibitors to a target word. A target word is the word that one is trying to remember. Words semantically related to a target word are words related by meaning while words phonologically related to a target word are words related by sound. For example, if the target word was "abdicate" (meaning to formally renounce a throne), "relinquish" would be a semantically related word and "abrogate" would be a phonologically related word. Exposure to these related words either leads these words to act as primers or inhibiters by increasing or decreasing correct retrieval of the target word respectively.

To find the effects of semantically and phonologically related words on TOT, Meyer and Bock (1992) tested 411 undergraduate students from the University of Michigan in a room together. All were read the same 36 "TOT evoking" target definitions but were randomly assigned a booklet. After hearing the definition, participants were instructed to open their booklet to the page that corresponded to the definition they had just heard. Each page of the booklet provided a word that was either phonologically related to the target word, semantically related to the target word, or a control word that was neither semantically nor phonologically related to the

target word. There were three types of booklets that provided the different types of word for each target word definition. Results indicated that both semantically related and phonologically related words are important in aiding TOT resolution (when TOT occurs first but then is resolved). However, results also showed that phonologically related prime words aid in TOT resolution significantly more than semantically related prime words.

Effects of semantically related words on TOT resolution have been explained through a model of spreading activation (Yaniv and Meyer, 1987). Spreading activation is the excitation of a "semantic node" (or mental representation of meaning) that excites proceeding semantically related nodes (Galotti, 2008). For example, having participants read the word "relinquish" would activate its corresponding semantic node that, in turn, would activate the semantic node of "abdicate". However, as seen from Meyer and Bock (1992) TOT resolution is more likely when participants are presented with phonologically related stimuli.

To explain why phonologically related stimuli are the most effective prime words for the TOT experiences, James and Burke (2000) provided evidence for a transmission deficit (TD) model of TOT. Similar to the Spreading Activation Model, the TD model of TOT claims that TOT occurs because the strength of connections among "phonetic nodes" (mental representations of sound) that represent phonemes making up the target word are too weak to transmit sufficient priming for the activation of the complete phonology of the target word. According to this model, in order for one not to have a TOT experience, all of the phonetic nodes that make up a target word need to be activated. This is because activation of all the phonetic nodes strengthen the connection between the phonetic nodes. Unlike the previous studies mentioned, James and Burke (2000), in experiment 1, measured the effects of primes on reducing TOT before it had ever occurred. Therefore, they measured TOT reduction instead of TOT resolution. However, under the TD model of TOT, when the activation of the phonetic nodes takes place (before or after one experiences TOT) is irrelevant. All that matters in TOT reduction and TOT resolution is that the phonetic nodes of a target word are activated.

James and Burke (2000) examined the effects of phonological primes on TOT by providing a participant with words that were phonologically related to a target word. For experiment one, they hypothesized that TOT would be eliminated for a target word when multiple phonologically related words were presented to a participant prior to the target definition. However, these words needed to activate all of the phonetic nodes that a target word

consisted of. For example, if the target word was “abdicate”, participants were given words such as “abstract”, “indigent”, “tradition”, “locate”, and “truncate”. All of these words contain syllables that encompass every phoneme of “abdicate”.

Thirty-two healthy young and older adults were given 114 target definitions for “highly TOT evoking” target words. After the participants rated ten words on a scale from one to five in terms of how difficult the words were to pronounce, each target word definition was shown to the participant. Then, participants were asked to type the word if they knew it, report whether or not they were experiencing TOT, or report that they did not know the word. In the experimental condition, five phonologically related words and five control words were presented to participants. In the control condition, all ten words were phonologically unrelated. Each subject participated in both the control and experimental condition. James and Burke predicted that activating phonologically related phonemes by pronouncing these words would reduce TOT. Their results were consistent with their hypothesis.

All the studies mentioned above used untimed exposure to phonologically related words, which means that participants had a chance to fully comprehend the words to which they were exposed. The current study was interested in measuring the effects of quickly presented phonologically related words on TOT by testing whether phonologically related words would have an effect on TOT if the words were presented at 75 milliseconds (msec) throughout a distraction task.

In order to measure the effectiveness of quickly presented phonologically related words, the current experiment collected target words, their definitions, and five phonologically related words for each target word from James and Burke (2000). The current experiment also used a shape identification task asking participants to identify a “correct” shape out of the presentation of five random shapes (distractor task). The point of the distractor task was to expose participants to the words without their awareness. The quickly presented related words were flashed throughout the distractor task, which was followed by a corresponding target definition. The researcher hypothesized that the quickly presented words would activate phonetic nodes causing more correct responses and fewer TOT than the control condition, which used phonologically unrelated words.

Methods

Participants

Thirty-six college students attending the University of Montana participated in 112 experimental and control trials. Half of the students participated for psychology credit while the other half participated just to help out the experimenter. None of the participants knew anything about the experiment before taking it except that the experiment was about TOT and that it used a shape identification task.

Materials

Materials consisted of Windows computers that were able to run E-Prime (the program used to write the experiment) each in individual rooms. There were 112 target words chosen from the 139 target words provided by James and Burke (2000). Sixty-seven definitions out of the 139 target words were salvaged from the two papers from which James and Burke (2000) obtained the target words, Burke (1991) and Yaniv and Meyer (1987). The rest of the definitions were obtained through Internet dictionaries. The five phonologically related words associated with each target word (560 words) were taken directly from James and Burke (2000). These words were presented in phonologically related conditions. There were also 560 phonologically unrelated words that were as close to their corresponding related word as possible in concreteness, number of letters, and beginning letters. The experimenter tested that the words were both semantically unrelated and phonologically unrelated to their target words. These words were present in the phonologically unrelated conditions (5 per 112 trials). There were also five pictures of shapes (a triangle, a pentagon, a hexagon, a octagon, and a decagon) that were obtained from Internet sources and modified to be the same color and size. The five shapes were presented randomly in both phonologically related and phonologically unrelated conditions.

Procedure

The experiment consisted of an experimental condition and a control condition. The experimental condition consisted of five phonologically related words flashed for 75 msec before the onset of all five randomized shapes. The control condition was exactly the same but consisted of five phonologically unrelated words.

The experiment started out with text claiming that it was interested in seeing how the shape task would affect the participant's memory recall for the answers to trivial TOT-evoking questions. The quickly flashed words were not mentioned and participants were only instructed to indicate if the presented shape was or was not the "correct" shape (such as a triangle) as

quickly as they could. Participants were also educated on what a TOT state is and how it is different from other lexical decision phenomena (such as vague feelings of knowing: FOK). Participants were given five practice trials before the 112 trials of the true experiment. The practice trials were identical to the actual trials in terms of format, but the practice trials did not contain TOT evoking definitions nor controlled phonologically related or unrelated words. The 112 trials were broken up into four blocks of 28 trials. Within each block of trials, the occurrence of a trial in terms of a target word and whether it was an experiment or control condition was randomized. However, participants participated in an equal number of experimental and control trials (56 for each type of trial). Four experiments were constructed to randomize the occurrence of the trial blocks. Eight participants were randomly assigned to one of the four variants of the experiment.

The trial format started with the shape recognition task in which five shapes were presented at random. Participants were asked to indicate whether the presented shape was the correct shape by pressing "q" or if it was not the correct shape by pressing "p" as quickly as they could. The "correct" shape to identify was changed a total of five times throughout the experiment (for the practice trials and for the four blocks of trials). Words were flashed at 75 msec before each shape was presented. For the 112 experiment trials, these words were either all phonologically related or all phonologically unrelated per trial. The presentation of the distractor task and quickly presented words were followed by the target word definition. From here, participants indicated if they knew the word, didn't know the word, or if they had TOT for the word. If they knew the word, they were asked to type the word to ensure that it was the correct word. If they didn't know the word or had TOT for the word, they were sent to the next trial.

Insert Figure One about here.

Results

Two sample T tests were conducted between the experimental and control condition for response types including “know and correct” (participants indicated “k” and typed in the correct word), “TOT,” “don't know,” and “know but incorrect” (participants indicated “k” but typed in the wrong word). Results showed no significant differences for “know and correct” responses between the two groups, $t(35)=1.18$, $p > .05$. Results showed no significant differences for “TOT” responses between the two groups, $t(35)=.47$, $p > .05$. Results showed no significant differences for “don’t know” responses between the two groups, $t(35)=.98$, $p > .05$. Results showed no significant differences for “know but incorrect” responses between the two groups, $t(35)=1.26$, $p > .05$. Results showed no significant differences between the two conditions for any of the response types suggesting that the phonologically related words had no effect when they were presented at 75 msec.

Insert Figure Two about here.

Discussions

Though previous research has shown phonologically related words to be effective in reducing TOT and increasing correct responses, the current experiment was not able to show significant results for the words presented at 75 msec. The results of this experiment may indicate that phonologically related words presented quickly, which make stimuli less likely to be fully processed, did not activate phonetic nodes and therefore did not affect TOT. The results may also indicate words presented as quickly as 75 msec had no effect, but words presented at slower or faster speeds may have had an effect. If the quick presentation of phonologically related words does not activate phonetic nodes, phonologically related words presented quickly would not affect TOT. Therefore, the only way the words may affect TOT are at speeds slow

enough for participants to fully comprehend the words within experiment designs that do not distract participants from perceiving the words. However, this study did not give a comprehensive conclusion of the effectiveness of quickly presented stimuli because only one word speed presentation was used.

The methodology of the experiment, in terms of the distractor task, may have somehow biased the results. The names of the shapes themselves may have been phonologically related to a target word. Though participants never saw the names of the shapes written in letters during the task (except for when they were asked to identify the "correct" shape in the directions), seeing the shapes may have activated the phonetic nodes associated with the shapes, thus potentially biasing control trials. Target words, such as "liaison," were phonologically related to the shapes "octagon," "hexagon," "decagon," and "pentagon." Seeing the shape "hexagon," for example, may have activated the phonemes "ah" and "n" that are shared in the word "liaison."

It may have also been that participants were more aware of the quickly presented words than the experimenter anticipated. If the participants realized that the flashing words were actually the important component in the experiment, they may have tried to figure out how these words were supposed to help or possibly even anticipated the answer to be one of the words. Therefore, participants may have not passively seen the words but consciously registered them and were distracted by trying to figure out what they were for. Future research could try presenting words at different speeds or could try using different methodologies for presenting the words. A new experiment could use a distractor task that asks participants to spot five "green" items in a picture while simultaneously presenting the words at fast speeds.

The strongest conclusion to draw from this study and previous studies is that phonologically related words have an effect on TOT but only if participants are asked to comprehend the words. Simply flashing related words before a target word definition did not have an effect on the activation of phonetic nodes. Ideas for new studies involving TOT could focus on the counter theory to phonologically related words, the role of phonologically related words as persistent alternatives (PAs).

In the context of TOT, a PA is a phonologically related word that persistently pops into mind while one is trying to retrieve the correct target word (Burke, Mackay, Worthley, and Wade, 1991). For example, when a participant was given the target definition of "abdicate," the word "abstract" may have repeatedly pop up into their mind. Therefore, one could speculate that

phonologically related words reduce TOT experiences by activating the phonetic nodes of a target word, but may exacerbate the TOT experience by acting as a PA. Research on the role of PAs affects on TOT is mixed. Some studies say PAs cause or hinder TOT resolution (Burke, Mackay, Worthley, and Wade, 1991; Woodworth, 1954). Some studies say PAs helps TOT resolution (Brown and McNeill, 1966), and others say PAs just reflects the ongoing processes of the mind searching for the correct answer (Perfect and Hanley, 1992).

A new study could explore the role of phonologically related stimuli in the absences of related words. This new study could expose participants to merely the phonemes that comprise the word by having the participant's see/hear them and then repeat them back. The phoneme condition could be compared to the word condition to see whether or not the phonemes yielded more correct responses and fewer TOT experiences due to the absence of potential PAs.

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Figure captions

Figure One: Example of an experimental condition trial for the target word “abdicate.”

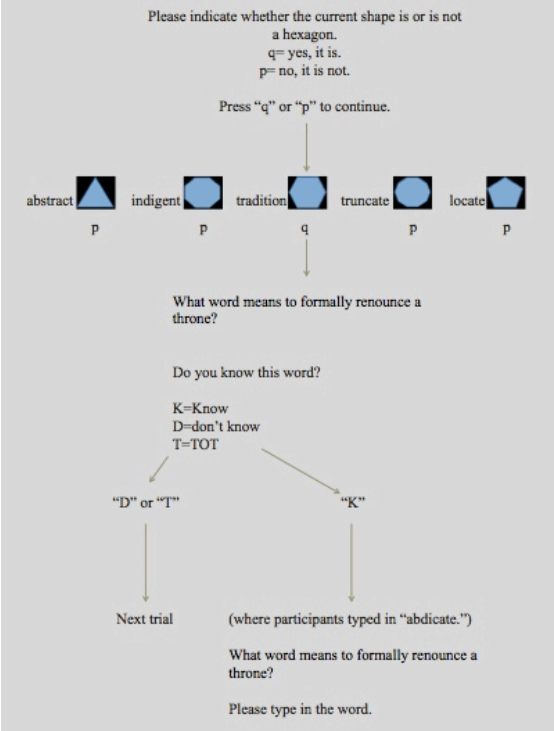

Figure Two: graphed means for all four response options between both conditions. The error bars represent the standard deviations.