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The effect of strategies on relieving initial and recurring tip of the tongue states

Cheryl Elizabeth Emery

THE EFFECT OF STRATEGIES ON RELIEVING INITIAL AND RECURRING TIP-OF-THE-TONGUE STATES

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

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in

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ABSTRACT

One of the most common forms of memory failure is the phenomenon known as "tip-of-the-tongue" (TOT), where you can't quite articulate a particular word, even though you know that you know it. In this thesis, strategies for resolving this phenomenon were explored in two experiments in which participants were shown cast photos of popular television shows and required to state the name of the show. Experiment 1 compared the effectiveness of two strategies for resolving TOTs: a phonological strategy that provided participants with the initials of the show, and a semantic strategy, in which participants were given general semantic cues. It was found that participants in a TOT state who used the phonological strategy experienced more resolutions than participants who used the semantic strategy. Experiment 2 further explored the effectiveness of different strategies, by adding an episodic strategy and using a different phonological strategy in which participants supplied their own phonological cues. Contrary to the results from Experiment 1, the new phonological strategy was not found to be more useful in initial resolution, while there was a small but nonsignificant advantage of the episodic strategy. The main purpose of

Experiment 2, though, was to examine what factors might influence the frequency of recurring TOTs; i.e., when a person becomes stuck on the same word on multiple occasions. Participants were tested on the same photos on two separate days, and it was predicted that if the phonological strategies did not lead to resolution on Day 1, they would be more likely to result in recurring TOT experiences on Day 2 compared to the other strategies. Results showed this to be the case. This is theorized to be due to the fact that, while the participants were focusing on incorrect information during their initial unsuccessful retrieval attempt, they were inadvertently "learning" that incorrect information.

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To my unofficial mentor and boss, Dr. Mary Dolan, I will never forget that it is because of you that I've

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To my mother Sondra and my husband Chris,

for everything

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CHAPTER ONE

INTRODUCTION

Early Research

Human memory is intricate and complex, with almost infinite storage space. The process begins with the decision to pay attention to a specific stimulus, thus sending it to short-term memory. Items that are deemed important enough are then encoded into long-term memory, where they are stored until such time as they are needed to be retrieved. This system is efficient and, for the most part, effective. Such a complex design, however, also leaves numerous opportunities for failure. Items might not be encoded properly in the first place. This is most often due to personal schemas and autobiographical associations which skew the way we interpret the information (Kellogg, 2007). Even if encoded correctly, items might not be stored properly, much like mislabeling a box with properly organized contents before sending it up to the attic. The information is there, but becomes almost impossible to find.

Most instances of memory failure, however, occur during the retrieval phase, where, even though the information has been encoded and stored correctly, some unknown variable prevents it from being accessed (Kellogg, 2007). One of the most common (and irritating) memory lapse experiences is the phenomenon known as "tip-of-the-tongue" (TOT), where you can't quite articulate a particular word, even though you know that you know it (Brown & McNeill, 1966). This experience is usually accompanied by an intense sense of frustration and urgency, as the sufferer almost obsessively focuses on attempting to overcome the momentary block. This is similar to a "feeling of knowing" (FOK) situation, where the person thinks they are familiar with the answer they are searching for, and is confident they would recognize it if they heard it, but can't quite seem to recall it at the moment (Koriat, 1975). However, when a person is in a true TOT state, they are not just familiar with the word, but are positive that they know the answer they are searching for. Further, the person feels as if it is right on the verge of getting out, but is being blocked somehow. Thus, a person is aware of their knowledge of the word in question, but is unable to articulate it (Riefer, 2002; Schwartz, 2008).

Attempts to explain how and why this phenomenon occurs have focused mainly on the phonological and semantic aspects of word recognition. The phonology of a word is based on information such as its sound, the number of syllables, the first and last letters, and the way it's pronounced. This is a purely tonal perception; it doesn't matter what the word means. On the other hand, the semantics of a word relate to its meaning; the situational or interrelated conceptual characteristics that separate it from other sounds in a language. For example, the phonological definition of the word "president" might be that it has three syllables, it begins with a short 'P' sound and the emphasis is on the first syllable. The semantic definition of the word "president", however, might be that it is a very powerful person who leads a company or country, makes a lot of money, and is voted into office. Both phonological and semantic information about any particular item is stored in memory, though perhaps in different places (Hanley & Cowell, 1988; Jones, 1989; Schwartz, 2008). It is for this reason that researchers have looked at both aspects for clues as to the fundamental causes of TOTs.

Beginning in the mid-sixties, a handful of groundbreaking studies marked the beginnings of scientific research on the FOK and TOT phenomena. These early studies discovered that it was possible to induce TOT moments in a laboratory setting, thus allowing them to be studied using experimental methods (Brown & McNeill, 1966; Hart, 1965; Yarmey, 1973). The methodology developed in these experiments has continued to be utilized, either through exact replication or with minor modifications, by most researchers in the field, even in the present day.

The procedure developed by Hart (1965) to study the FOK phenomenon was based on the idea that "recognition exceeds recall". In other words, we will always be familiar with more information than we can access at any given moment. Because of this, Hart developed the recall-judgment-recognition paradigm (RJR), where he could measure FOKs using general knowledge questions and a multiple-choice task. His goal was to assess the accuracy of participants' FOK judgments, which he determined by their ability to consistently select the correct answer from a multiple choice test. According to the RJR paradigm, if participants express a FOK for a particular question but cannot come up with the answer on their own, they should

easily be able to recognize it when it is presented as an option in a list. Hart's findings confirmed this hypothesis, leading him to theorize that FOK moments are not random, subjective occurrences, but play a functional role in the human memory system.

Hart described the memory system as imperfect, by which he meant that we are not always able to perfectly store every bit of information as we intend, nor can we perfectly recall every bit of information that we require. He considered FOK judgments to be a vital part of the limited solution to this problem. Their purpose, Hart believed, was twofold. First, they serve to prevent duplicate storage. In other words, when faced with a bit of information which is not immediately recognized as already known, a FOK tells the brain that even though that information is not accessible, it does in fact already exist somewhere in storage and does not need to be stored anew. Secondly, FOK judgments serve to guide the sufferer towards eventual recall, by encouraging further effort (Hart, 1965).

In 1966, Brown and McNeill began their research using subjective, self-report measures to track TOT moments in daily life. They soon began to wonder if it was possible to

intentionally induce such moments, so that the phenomenon could be more accurately studied in a controlled environment. They developed a design which used carefully-chosen dictionary definitions of uncommon words. These were items that Brown and McNeill felt the student participants would have become acquainted with over the course of their studies, but would not have much opportunity to use in everyday speech. They then asked a careful series of follow-up questions whenever a participant expressed being in a TOT state, and were thus able to gain valuable insight into the phonological and semantic aspects of the experience.

Brown and McNeill (1966) discovered that even though resolution was sometimes impossible, partial recall was almost always available. In other words, certain characteristics of the target word were accessible. Phonologically, participants were often able to accurately identify the number of syllables, the initial letter, and other words which had similarities in sound. Semantically, participants were often able to list words which shared similar meanings as that of the target word. From this, Brown and McNeill concluded that TOT experiences, like their FOK counterparts, were not just random idiosyncrasies

in the human memory system, but served a vital purpose. They described the system as a "mental dictionary", where each word or piece of information is cross-referenced and grouped into multiple sets and subsets based on sound, meaning, and individual episodic experiences. Being able to recognize various aspects of a word, even when it is not available in its entirety, helped the sufferer to more efficiently search for the target by narrowing down the possible subsets within the sets.

A few years later, Yarmey (1973) adopted Brown and McNeill's design, but adjusted it so he could study the distinction between verbal and visual stimuli and their various influences on the TOT experience. He believed that recall was achieved by both verbal and visual processes, and that TOTs would be easier and more often resolved if the brain was encouraged to utilize both of these processes. To this end, he changed Brown and McNeill's design from dictionary definitions to photos of famous people's faces. Strictly phonological stimuli, he reasoned, would inevitably bias the participant's brain towards searching only through phonological processes. His hope was that by inducing TOTs through visual stimuli, participants

would avoid that bias and use the whole of their memory system in their search efforts.

When in a TOT state, participants in Yarmey's (1973) study were also given a choice of strategies to use in an attempt to achieve resolution. They were encouraged to use both semantic cues (such as what job the person held, where they were most likely to be seen and how long ago they had been in the public eye), and phonological cues (such as the first letter of the name and the total number of syllables). Yarmey found that people were more likely to use semantic cues first, even though they were not usually effective in achieving resolution. What this suggested was that semantic information played a role in the beginning of the memory retrieval process, though not in the completion of that process. Overall, phonological cues, though attempted only after semantic cues had failed, proved to be more effective in achieving resolution.

Theories

Theories on the underlying cognitive characteristics of the TOT phenomenon can be broken down into two main classes: direct-access theories and inferential theories. Direct-access theories suggest that TOTs occur when an item

is only partially recalled from memory; it is salient enough that the person is aware of its presence, but not strong enough to be fully retrieved (Schwartz, 1999). Such theories propose various types of interference as the cause of TOT moments, and focus on the retrieval process. The first direct-access theory, proposed in 1966 by TOT pioneers Brown and McNeill, was the incomplete-activation model. This model suggested that TOTs were the result of a bottleneck of sorts, where the item is initially retrieved and recognized as having been found, but then is unable to complete the journey because it is not quite a strong enough memory to provide complete access. According to this theory, items that cause TOTs have inherently stronger levels of familiarity, and are more likely to be eventually retrieved compared to items that we simply can't remember (Schwartz, 2008).

Another direct-activation theory has been proposed by Jones (1989), who posited the blocking hypothesis. Jones theorized that TOTs are the result of a similar, phonologically related item known as an interloper being inadvertently accessed instead of the target item. For example, if a person was trying to remember the name of a particular round, drum-like musical instrument with small

cymbals on it, they might find themselves in a TOT state if the word "tangerine" was accidentally accessed instead. The actual answer, "tambourine", might be difficult to recover because the phonological similarity between the two words would cause a blockage in the recall process. Thus, the incorrect word interferes with the person's ability to retrieve the correct item. In his study, Jones used interlopers that were either phonological or semantic in conjunction with dictionary definitions, in order to ascertain if the TOT state was equally caused by any analogous word, or just one with a phonological connection. He offered participants decoy answers that were either semantically, phonologically, or not related to the target. He found that the phonologically similar words caused TOTs significantly more than the ones that were alike in meaning, suggesting that it was a phonological block that was at the core of the TOT phenomenon. This is different from the incomplete-activation theory in that the target word is assumed to not be activated at all, whereas in Brown and McNeill's (1966) theory, the item is assumed to have been accessed but is then trapped somewhere along the path from partial recall to complete retrieval.

Finally, the transmission deficit model has been proposed by Burke, MacKay, Worthley, and Wade (1991). They expounded upon the incomplete-activation model by suggesting that the bottleneck occurred when the semantic information about the target item was unable to prime the phonological representation. Thus, the person was able to "feel" the idea of the item, but could not remember what it was called.

Much evidence has been found to support direct-access theories, specifically the incomplete-activation and transmission deficit models (Schwartz, 1999). Research has shown that participants are able to recognize the target answer when it is presented to them, and describe a feeling of intense relief after resolution (Burke, et al., 1991). This suggests that the target answer was indeed accessed at some point, rather than having been subverted entirely by an interloper. Moreover, phonological priming has been shown to increase resolution rates, as would be expected if the bottleneck was indeed caused by incomplete activation of the phonological aspects of the item. McWeeny, Young, Hay and Ellis (1987) also suggested that semantic information might be less affected by retrieval errors than phonological information. Using photos of famous people as

stimuli much like Yarmey (1973), McWeeny, et al. asked participants to identify the person's name and, when a TOT state would occur, try to recall any partial information they could about the person. They found that recalling semantic information, such as occupation or area of expertise, was easier to recall than phonological information such as the target's actual name.

Hanley and Chapman (2008) used short essays with biographical information about a famous person to look at the same effects. Participants were asked to identify that person's name and, if they reported being in a TOT state, they were asked to guess if the person's name had two or three words. Results showed that, even when unable to resolve their TOT state, people could access such partial information accurately and consistently. This research suggests that the TOTs are of a phonological nature, lending greater evidence towards the transmission deficit model.

However, the existence of cue priming and the ability of TOT sufferers to recall tangential information about the item suggest that there is an inferential element to the phenomenon. Two main inferential theories seek to fill in the gaps. The cue familiarity theory (Metcalfe, Schwartz, &

Joaquim, 1993) proposes that TOTs are formed when the cue that has prompted the memory retrieval is insufficient. This can be the case if the cue is vague, convoluted, or simply not connected strongly enough to the target answer in the person's memory system. Using repetitive definitions (many ways of describing the same item), Koriat and Leiblich (1977) found that the more superfluous the cues were, the more likely it was that the participant would end up in a TOT state. On the other hand, clear, simple definitions were more effective at cuing the participant to retrieve the target answer.

Metcalfe, Schwartz and Joaquim (1993) used a modified paired-associate learning task to further study the effects of cues on retrieval and TOT moments. They primed participants with a pair of words, then either displayed the same pair, the first word with a new partner, or two completely new words. They discovered that TOTs were significantly more likely to occur when the original first word was paired with a novel one. Hanley and Cowell (1988) went even further, looking at the effects of different types of cues for subsequent retrieval, using pictures of famous people as stimuli. They noted that when participants in a TOT state were given semantic information about the

target answer, they were more likely to find that information helpful if they didn't inadvertently recall other semantic information concurrently. This implies there might be a blocking effect when cues given to assist in retrieval have to compete with other spontaneously incurring information, and that cues are indeed an integral element of the TOT phenomenon.

Another inferential theory is based on the accessibility heuristic (Koriat, 1993). According to this theory, TOTs occur when peripheral information about the target answer is so prevalent that it is projected to the forefront of our thoughts and interferes with our ability to access the target information. Schwartz and Smith (1997) experimented with real/nonsense word pairings to study this possibility. They gave participants in a control condition the name of a fictional animal and the name of a real country, while participants in the experimental conditions were given additional, tangential information. Results showed that the more redundant information presented concurrent with the relevant items, the more likely the participants were to report a TOT state during the recollection phase. At first glance, this might seem to provide support for inferential theories, because it seems

to be the nature of the cues that cause the TOTs. However, these results can be explained by the direct-access theories just as easily (Schwartz, 1999). Cue familiarity could be the result of the semantic bottleneck suggested by the transmission deficit model.

A third comprehensive theory has been proposed by Schwartz (1999) which combines the direct-access and inferential theories. His metacognitive model considers retrieval to be just one step out of a multi-layered process. According to the metacognitive approach, information retrieval is the result of many different departments within the brain collaborating together, and errors in retrieval are a function of mistakes in the process, rather than an actual inability to remember the information (Schwartz, 1999). The metacognitive theory has also been crucial in showing that TOTs are distinct events, rather than merely strong FOKs (Schwartz, 2008). An example of such an integrated approach to the question came first from Yarmey (1973), who used pictures of famous people's faces as semantic stimuli, and then compared phonological and semantic cues. Brennen, Baguley, Bright and Bruce (1990) also used various semantic stimuli to induce TOT, including both trivia questions and photos of famous people

or places. In their experiment, participants in a TOT state were given phonological experimenter-generated cues (the initials of the target answer). This was found to lead to a significant increase in resolution. Their results provided further evidence for the effectiveness of phonological cues over semantic in the successful relieving of TOT states.

Perhaps one of the most convincing arguments for the metacognitive model comes from Cleary (2006), who noticed that participants who were given suggestions for recalling semantic information about the target answer were more likely to resolve the TOT than participants who were simply given extraneous information by the experimenter. When stuck on a word, their instinct seemed to be to skirt the bottleneck by accessing the knowledge via an alternative pathway; namely, a semantic one. This would correspond with the metacognitive proposal that it is our own individual method of mental record-keeping that allows us to circumvent occasional blocks to successful retrieval. This would seem to suggest that the semantic information about a particular item is directly connected to its phonological information at a recognition level. In other words, we innately link contextual knowledge to our phonological

stores, in order to secure alternate pathways in the event of a TOT or other such retrieval failure.

To date, there is still no singular, unifying theory that definitively explains the cognitive mechanisms behind the TOT phenomenon. Both direct access and inferential theories have evidence that seems to support them. However, the metacognitive perspective seems to combine the best of both viewpoints. Still, one thing is clear. Whether it's a lapse in semantic memory or a gap in the necessary phonological connections, these theories all agree that TOT and FOK are complicated retrieval errors caused by access problems rather than the result of simple failure to properly store information in the memory. Thus, further research delving into potential solutions or "cures" at least has a strong starting point. The two experiments in this thesis will focus on learning how to prevent TOT moments by looking at better retrieval strategies, rather than better storage procedures.

CHAPTER TWO

EXPERIMENT ONE

Introduction

The first experiment explores the efficacy of different strategies in assisting the retrieval of TOT moments. The methodology is drawn from previous studies by Yarmey (1973), Brennen, et al. (1990) and Riefer (2002). The partitioning of strategies is adopted from Yarmey's landmark design, where he offered participants both semantic and phonological cues which they could use to assist in retrieval when they found themselves in a TOT state. However, Yarmey was primarily interested, not so much in whether the cues were effective, but in whether people were inherently drawn to one type or another. For example, he stressed that these cues were not in any particular order, and that participants could choose any or none of them, in any combination they liked.

The current experiment sets semantic and phonological strategies in a direct comparison against each other, with participants being directed to use only one or the other. There is also a no-strategy control group, where participants are given a distractor task to prevent either

of the experimental strategies from being used. The stimuli and methodology used have been adapted from a study conducted by Riefer (2002), who used television cast photos to induce TOTs. Similarly, Experiment 1 uses cast photos that have been updated from Riefer's original set to include more current shows. Finally, the types of strategies used have been adapted from the study by Brennen, et al. (1990), with experimenter-generated cues for the Phonological condition and self-generated cues for the Semantic condition.

Hypothesis

Because of the strong link between phonological information and TOTs (Abrams, 2008; Abrams & Rodriguez, 2005; Brown & McNeill, 1966; James & Burke, 2000), it is expected that participants in a TOT state who use phonological strategies will experience more resolutions than participants who use semantic strategies. However, because semantic information has been found to be particularly salient during retrieval attempts (Brennen, Baguley, Bright & Bruce, 1990; Cleary, 2006; Hanley & Chapman, 2008; Ryan, Petty & Wenzlaff, 1982), it is also

predicted that semantic strategies will be found to be more effective at achieving resolution than no strategy at all.

Method

Participants

A total of 78 undergraduate psychology students from California State University San Bernardino participated in the experiment. They each received extra credit for their voluntary participation. All participants were randomly assigned into one of three conditions: the Semantic Strategy Group (N=26), the Phonological Strategy Group (N=26) and the No-Strategy (Control) Group (N=26).

Materials

Thirty-five cast photos from popular television shows were used as stimuli. The full set of photos can be found in the Appendix. The shows ranged in era from the 1960's to current times, and covered a wide range of genres. They were adopted from a pilot study previously conducted to assess recognizability and the likelihood of inducing TOT states. The sequence of images was randomly determined and was the same for each participant.

Procedure

Participants were tested individually. They were first given a description of the TOT and FOK states, again adopted from the pilot study. This description was given in both written and verbal form, as follows:

> Feeling-of-knowing is when you feel like you are familiar with the answer, but can't quite place it. However, you are confident that you could recognize the correct answer if it were presented to you. You are not necessarily close to recalling the answer, but you definitely knew it once. A tip of the tongue state, on the other hand, has more of a sense of immediacy. You are in the tip-of-the-tongue state whenever you are *certain* that you know the answer to something and are right on the verge of retrieving it, but just can't for some reason. It's almost like it's on the tip of your tongue. You are only in a tip-of-the-tongue state if you are sure you know the correct answer, and can almost *feel* it, but you can't seem to get it out.

At this point, the participants were asked to confirm that they understood the difference between the FOK and TOT

states, and were given an opportunity to ask questions about these states.

Participants were then told that the experiment would consist of the presentation of a series of cast photos, and their task was to identify the television show each one represented. All photos were shown on a computer monitor one at a time, and remained on the screen for as long as necessary for the participant to come up with a response. They were told that they could give one of four possible responses: "Know", "Don't Know", "FOK", or "TOT". If they knew the answer, they were asked to state it out loud; if they were positive that they did not know the answer, they were asked to say so. For either response, the experimenter then moved on to the next photo. However, in the event that the participant felt as though they might know the answer but were unable to retrieve it, they were asked if they felt they were in either a FOK or TOT state. At this point, the subsequent steps varied depending on the experimental condition.

Prior to the onset of the task, participants in the Semantic Strategy group were given a written list of five cues designed to assist them in resolving a FOK or TOT

state. These cues prompted the participants to try to recall the following information about the show:

1) the plot or premise of the show
2) the character's names
3) the actor's names
4) the era the show first came out
5) the genre (such as drama, sit-com, sci-fi, etc.)

They were instructed to use these cues in any order they wished in an attempt to recall the correct answer, and were given as much time as they wanted to do so. If necessary the experimenter prompted them, as was sometimes the case when a participant became flustered by the TOT and forgot to utilize the cues.

Participants in the Phonological Strategy group who experienced TOT or FOK states were told the first initial(s) of the title of the show in question. For example, if they were stuck on the show *Mad About You*, the experimenter would inform them that the first initials of the target answer were *M.A.Y.* The participant was then given as much time as necessary to use this additional information to jog their memory.

Participants in the Control group weren't given any strategies at all. When in either a FOK or TOT state, they were instead given a distractor task which varied from photo to photo and involved focusing on various meaningless aspects of the photo, such as the ratio of children to adults, the number of people with blonde hair, the number of visible shoes, etc. The purpose of this distractor task was to prevent the participants from inadvertently using either phonological or semantic cues. As with the experimental groups, they were given as much time as they wanted to attempt to resolve the FOK or TOT state on their own.

Results

All statistical tests were conducted at the .05 significance level. For each photo shown, participants gave one of four possible responses: "Know", "Don't Know", "FOK", or "TOT". 1) The response "Know" was recorded in two circumstances: when the participant correctly identified the title of the show, or when the participant confidently named the show but made an incorrect response (a false positive). The majority of these false positives occurred for the same three shows- *Mash* for *The A-Team*, *Tool Time*

for *Home Improvement*, and *Law and Order* for *The West Wing*; but overall, the proportion of false positives compared to true positives was small (6% in the Semantic Strategy condition, 5% in the Phonological Strategy condition, and 5% in the control condition). 2) The response "Don't Know" was selected if the participant expressed no familiarity with the show or cast photo at all. 3) The "FOK" response was marked if the participant felt as though they were familiar with the show's title, but did not think they would be able to come up with it any time soon. 4) A "TOT" response was recorded when the participant was positive that they knew the answer and felt as if they were right on the verge of retrieving it.

In order to determine if the stimuli were evenly regarded across different strategy conditions, the mean number of times participants reported each of these 4 responses was calculated. Figure 1 shows the average number of "Know" and "Don't Know" responses for each of the three conditions. No significant differences between groups occurred for either the "Know" or "Don't Know" responses, [$F(2,75) = 1.20$, $\omega^2 = .01$ and $F(2,75) = 0.33$, $\omega^2 = .03$,

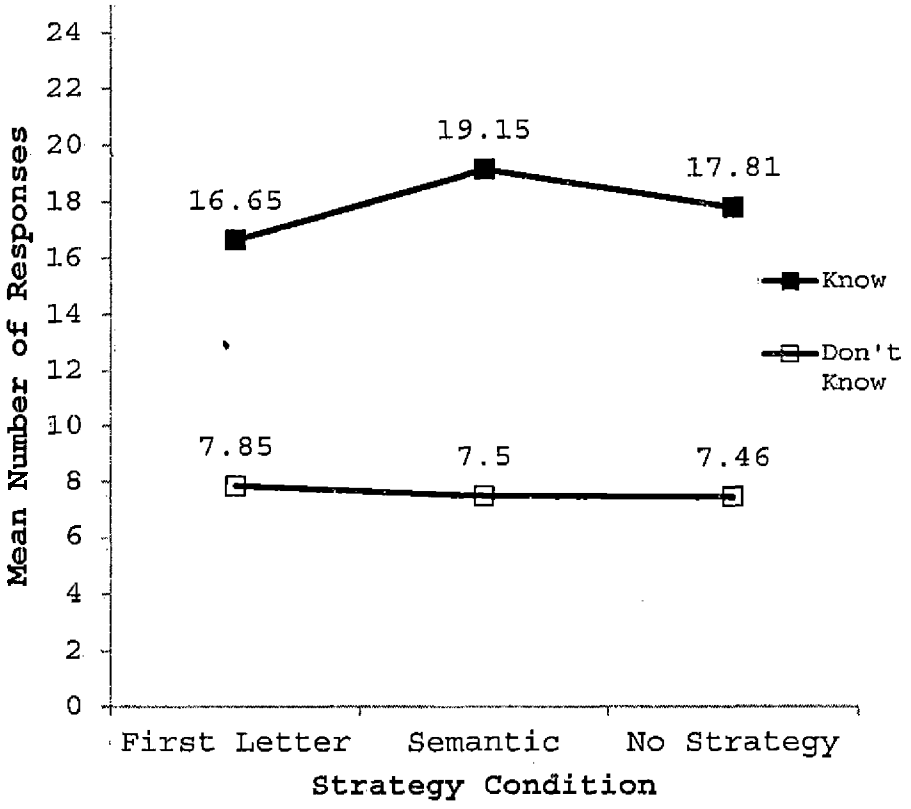


Figure 1. Mean number of times in each condition that participants came up with either a Know or Don't Know response.

respectively]. This suggests that the stimuli were equally recognizable across the three conditions.

Figure 2 displays the overall number of times participants in each condition were in either the TOT or FOK state. This number included both resolved and unresolved TOTs and FOKs. As can be seen, there were significantly more FOKs reported than TOTs across all conditions, $t(77) = 7.81$, $\omega^2 = .43$. There were also no significant differences in the number of TOTs experienced by participants, regardless of condition, $F(2,75) = 2.12$, $\omega^2 = .07$. There were, however, significant differences found between conditions for the number of total FOKs reported, $F(2,75) = 3.23$, $\omega^2 = .17$. Orthogonal contrasts revealed that participants in the Phonological Strategy condition reported significantly more FOKs than participants in the Semantic Strategy and Control conditions combined, $t(75) = 2.48$. However, there was no significant difference between the Phonological Strategy and Control conditions, $t(75) = 0.56$.

Finally, Figure 3 presents the total percentage of FOKs and TOTs resolved across conditions. This was calculated by dividing the total number of FOKs or TOTs

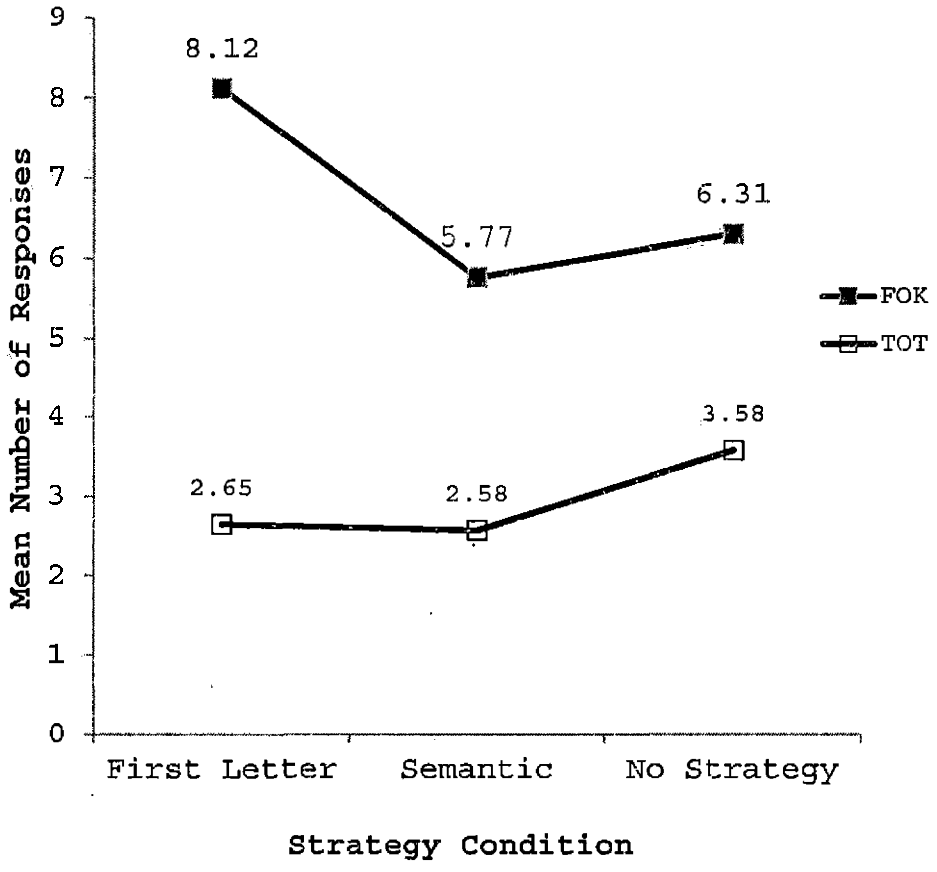


Figure 2. Mean number of times participants in each condition reported experiencing either Tip-of-the- Tongue or Feeling of Knowing.

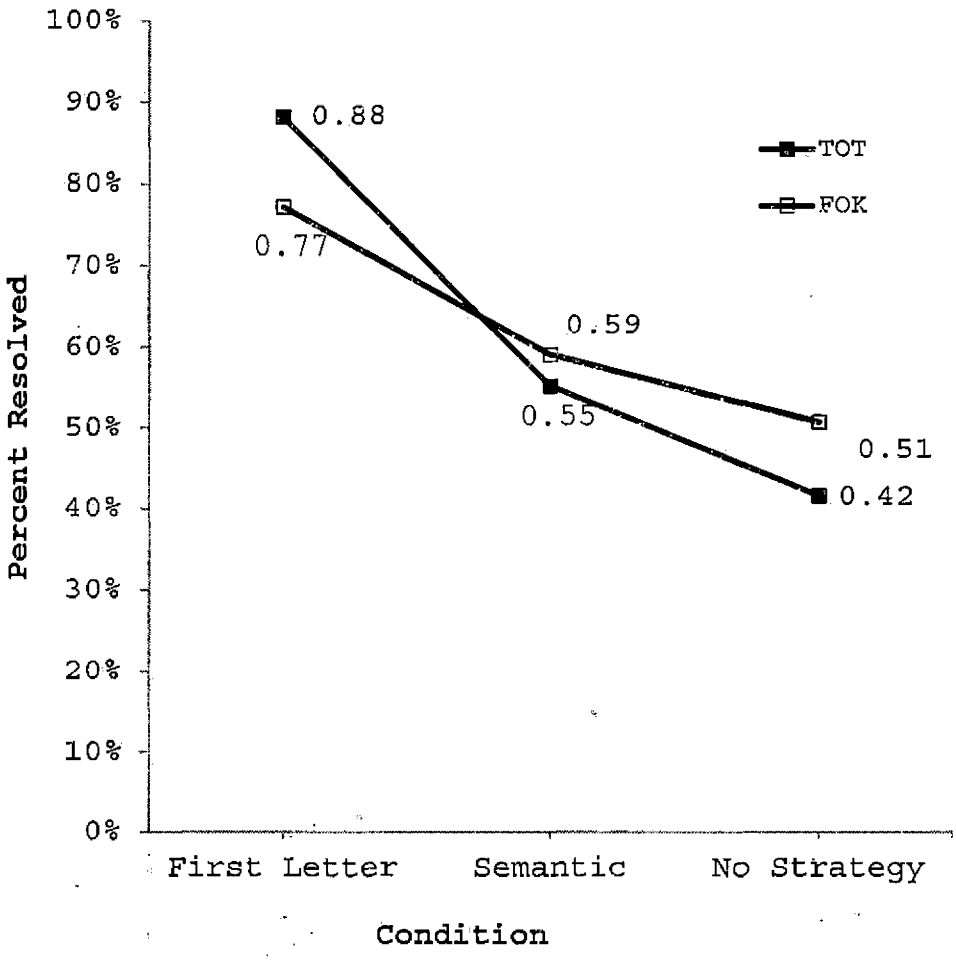


Figure 3. Percentage of Tip-of-the-Tongues and Feeling of Knowings resolved by condition.

resolved by the total number reported. All FOK and TOT moments were counted in the analysis, even if they were only brief. FOKs or TOTs resolved before the use of a strategy were also included. All participants reported at least one TOT and FOK moment each, so all data were used in the TOT and FOK analysis.

As can be seen, there was a significant difference in how well the strategies assisted in resolution for FOK moments, $F(2,75) = 6.57$, $\omega^2 = .12$. Planned orthogonal contrasts revealed that using a phonological strategy was significantly more likely than either a semantic strategy or no strategy at all to aid in recall, $t(75) = 3.45$. There was no significant difference in number of resolutions between the Semantic Strategy and Control conditions, $t(75) = 1.12$. This same pattern can be seen with the resolution of TOT moments. Type of strategy was found to be significantly different, $F(2,75) = 14.20$, $\omega^2 = .25$. Planned orthogonal contrasts again revealed that the Phonological Strategy condition was more likely to assist in the resolution of the TOT moment, as compared to the Semantic Strategy and Control conditions, $t(75) = 5.11$. No

significant difference was found between the Semantic Strategy and Control conditions, $t(75) = 1.51$.

Discussion

Because the same stimuli were used in all three conditions, it was expected that there would be no differences in the number of times each of the four possible responses were reported across these conditions. This was found to be true for the "Know", "Don't Know" and "TOT" responses. However, participants in the Phonological Strategy condition reported significantly more "FOK" responses than participants in the Semantic Strategy condition, though this difference was not significant when the Phonological Strategy condition was compared to the Control condition. Because people have been shown to seek semantic connections when identifying things (Brennen, Baguley, Bright & Bruce, 1990; Cleary, 2006), it is possible that the participants in the Semantic Strategy condition, being primed to allow this natural inclination to occur, were able to more quickly come up with the answer without ever experiencing that FOK state. Participants in the Phonological Strategy and Control conditions, on the other hand, were not focusing on the semantic aspects of

the target answer. This unnatural blocking of the normal internal recognition process might have caused them to experience a FOK before they were able to come up with the name. This same pattern was noticed during an undergraduate pilot study, and has occurred consistently in two follow-up studies by this author.

FOKs were reported more often than TOTs in all conditions. This is consistent with prior research that has shown FOKs to be a milder, and therefore more common, version of the TOT state (Hart, 1965). It is also consistent with research that argues that FOK is its own entity and not just an extension of TOT, therefore having its own prevalence rate (Schwartz, 2008; Widner, Otani & Winkleman, 2005).

Another possible explanation is the nature of the FOK moment itself. While TOT moments are specific to a particular target answer, and thus require a feeling of imminent recognition of an exact word or words, FOK moments can occur even when only a part of the total stimuli is familiar. Since many of the actors in the photos have worked on other projects, participants might have recognized the actor, rather than the show itself. Similarly, many shows share common sets, themes or designs.

This recognizability factor might have caused false FOKs for shows such as *The West Wing* (similar to *Law and Order*), and *Just Shoot Me* (starring movie actor David Spade). This could also explain the false positives experienced by participants.

Although it was not expected that there would be differences between the types of responses reported across conditions, it was expected that the Phonological Strategy condition would show significantly more TOT and FOK resolutions, compared to the Semantic Strategy and Control conditions. Prior research has shown that TOT moments are most likely caused by a failure to fully retrieve the complete phonological structure of the target answer (Brown, 1991). Therefore, because people have been shown to have access to partial phonological knowledge (Abrams & Rodriguez, 2005; Brown & McNeill, 1966; Bruce & Young, 1986), it was predicted that encouraging them to draw on that access would increase the likelihood of resolution. Results confirmed this hypothesis.

It was also hypothesized that the Semantic Strategy condition would be better than no strategy at all; however, the difference was not significant. It is possible that semantic cues, though automatic, are simply not useful

recall tools. Experiment 2 provides another test of the effectiveness of semantic strategies.

CHAPTER THREE

EXPERIMENT TWO

Changes in Methodology

The results from Experiment 1 revealed that phonological strategies were more effective than the semantic strategies at assisting in recall. However, a true comparison between these two conditions was not possible, because of the difference in the structure of the strategies themselves. The semantic strategy was designed to be self-generated; that is, it was up to the participant to come up with the peripheral semantic information about the target item. In contrast, the phonological strategy was experimenter-generated, consisting of a "hint" in the form of the first letter was simply given to the participant. In this follow-up experiment, the conditions are more comparable, with the phonological group receiving a list of five suggestions to assist in recall, much as is given to their semantic counterparts. In this way, the strategies are more ecologically valid; they are tested for their effectiveness in real-life situations, rather than only within an experimental framework.

Further, a new condition is added to Experiment 2: an episodic strategy. During informal, post-experiment interviews with the participants in Experiment 1, many of them revealed that their eventual resolution occurred after they had thought of where, when, and with whom they used to watch the show. In other words, they used episodic memories in an attempt to place the TOT into a familiar context. This seemed to come naturally to the participants- they had not been formally introduced to the suggestion that they should try episodic strategies by the researchers.

Though Ryan and Petty (1981) concluded that episodic cues did not aid retrieval efforts, the cues used and the manner in which they were introduced were vastly different from the current study. Ryan and Petty used a paired-associate learning task with common, everyday words as stimuli. To test episodic knowledge, they instructed participants to try to make associations between the words based on the situation in which they learned them. However, the current experiment, using semantic stimuli, asks participants to employ an episodic memory task by giving them a list of cues meant to help them recall the specific circumstances of their own personal experience with the stimuli. Further, the Ryan and Petty study was a two-phase

trial, where participants were first familiarized with each stimulus item and then later asked to recall it. In this recall phase, they were only given the options of either "Don't Know" or "TOT", where any feeling of familiarity was included in the TOT category. Because of this forced-choice paradigm, FOKs were lumped in with TOTs, so the effectiveness of using episodic strategies to relieve TOT moments was not able to be truly measured. In the current experiment, both FOKs and TOTs are recorded.

Another change in Experiment 2 is that the strategies are not used for FOK responses. The results from Experiment 1 showed that the pattern of resolution was the same for both TOT and FOK, so it is unnecessary to repeat an analysis of both. FOK moments are still recorded, however. The primary purpose for this is to ensure that participants are able to select from all possible responses, rather than being forced to choose from an incomplete list. If the only options were "TOT", "Know", or "Don't Know", participants in an FOK state would be forced to choose "TOT" or "Don't Know", neither of which would accurately describe how they were truly feeling. As Widner, Otani and Winkelman (2005) discovered, TOT and FOK experiences are not the same thing, nor do they occur because of the same retrieval process.

Further, because FOKs occur more often than true TOT moments, giving participants the option of declaring that they are in an FOK state instead of forcing them to choose either "TOT" or "Don't Know" makes the total count of TOTs reported more accurate.

Learning to Fail

The primary change from Experiment 1, however, is that Experiment 2 examines recurring TOTs. This is when a person becomes stuck on the same word on multiple occasions. To explore this, Experiment 2 tests participants on the same photos on two separate occasions. This is adopted from a TOT study by Warriner and Humphreys (2008), who theorized that the process of attempting to retrieve a word while in a TOT state can amount to a form of procedural learning. To test their theory, which they christened "Learning to Fail", Warriner and Humphreys gave participants uncommon word definitions and tested them on the same stimuli twice over a two-day period. Results showed that participants who were given 30 seconds to resolve their TOTs were significantly more successful than those who were only given 10 seconds. However, when a TOT remained unresolved, participants in the 30 second condition were more likely to

experience recurring TOTs during the second day. In other words, having more time to think of the answer led to more successful retrievals on the first recall attempt, but if those retrieval attempts were unsuccessful, they led to more permanent, recurring TOTs on the second recall attempt.

Warriner and Humphreys (2008) surmised that recurring TOTs might be the result of the sufferer accessing incorrect retrieval pathways. Specifically, they thought that the more time spent searching such wrong pathways for the target answer, the stronger the connection between that stimuli and the incorrect pathway would become. While searching through the various mental databanks of stored information about a particular word, people have to navigate numerous pathways in the hopes of reaching the target answer, often leading to semantically or phonologically similar, but incorrect, words. Since an unresolved TOT suggests that incorrect pathways were chosen, it follows that this could lead to the reinforcement of an incorrect recall procedure for that particular word.

General studies on memory call this "Hebbian Learning", and have given it the catchy explanation that

"units that fire together wire together" (Munakata & Pfaffly, 2004). That is, repetitive learning strengthens the connections between the neurons involved in the process, building a strong association (Ohlsson, 1996). These stronger associations streamline the search process, so that words, actions, or ideas that we use often can be more efficiently located. Unfortunately, the Hebbian learning mechanism does not differentiate between correct and incorrect associations. As Warriner and Humphreys (2008) point out, practicing incorrect notes on a piano will cause you to become just as skilled at playing that song incorrectly as practicing the correct notes would have caused you to play it well. In the same fashion, repeatedly spelling a word incorrectly will still result in the connection between the verbal representation of the word (hearing it) and the visual representation (seeing it written down) to become strong, but in this case, the brain will only register the connection when it's spelled the way it was learned (Ohlsson, 1996).

Warriner and Humphreys (2008) showed that simply being given more time (30 seconds rather than 10 seconds) can strengthen incorrect connections and lead to more recurring TOTs. The question posed in the current study is: can other

factors besides time lead to these reinforced pathways and recurring TOTs? In particular, can recurring TOTs come about as a result of different retrieval strategies?

The specific pathways that are accessed during retrieval attempts are likely to vary significantly from person to person. Research has shown that people react to TOT moments in numerous ways. For example, some begin thinking of semantic information related to the target answer in the hopes that they are able to find an alternate, back-door pathway to the word (Cleary, 2006; Hanley & Cowell, 1988). Rather than try to specifically remember a person's name, the focus might be on where they worked, what type of job they held, who they associated with, or even what kind of car they drove (Brennen, Baguley, Bright & Bruce, 1990). Other people are more likely to use various phonological strategies, such as "alphabet surfing", where a person systematically goes through each letter in order, hoping that one of them will jog the memory. This leads to the specific question: are different types of retrieval strategies equally effective or harmful, or is one particular type of strategy more likely to access incorrect pathways and thus lead to more recurring TOTs?

There is reason to hypothesize that phonological strategies might increase the likelihood of a recurring TOT. According to the multistage model of spoken word production (Levelt, Roelofs & Meyer, 1999), this might be because TOTs are thought to be the result of a failure in the phoneme assembly stage of the process. In other words, a TOT is the result of the wrong phonemes being selected as part of the target word (blockers) or the correct phonemes being combined in the wrong order (interlopers) (Choi & Smith, 2005).

According to the blocking hypothesis (Jones, 1989), interlopers are most often phonological in nature, which means that incorrect phonological information is already salient in the person's mind. Using a phonological strategy in this instance, then, would most likely simply strengthen the connection between the stimuli and the interloper, essentially helping the person learn the incorrect association. The transmission-deficit model (Burke, MacKay, Worthley & Wade, 1991) also suggests that a phonological strategy might be harmful in the long-run. According to this model, retrieval begins with accessing semantic information, which acts to narrow down the subsets of possible answers. Only then is a phonological

identification attempted, essentially making the phonological information the "last stand" before recall.

If this phonological information is flawed, a person might become unable to complete the retrieval process, unlike flawed semantic information, from which the person can still recover during the phonological stage. If a person can recall partial phonological information, especially the first letter or number of syllables, then the connection between this correct information and the missing data becomes stronger, eventually leading to quicker recall for that word in the future. However, if a person cannot recall such partial information, but still attempts to use phonological cues to induce recall, the results can be just the opposite. All the false information the person sifts through can inadvertently strengthen incorrect connections, increasing the likelihood that that word will induce recurring unresolved TOTs.

In Experiment 2, participants were tested on the same set of cast photos in two different sessions, 48 hours apart. The semantic, episodic and phonological strategies invoked when a participant is in a TOT moment were examined separately, in order to determine if using a strategy ineffectively (i.e. not achieving resolution) would result

in the strengthening of incorrect connections and the increased likelihood of recurring TOTs at a later time. The experiment also attempts to ascertain if this occurs more often for any particular type of strategy.

Hypotheses

Because of previous findings showing a strong connection between phonological information and the formation of TOTs, it was expected that the phonological strategy would be more effective at resolution overall on the first day, compared to the semantic or episodic conditions. However, in the event that the phonological strategy was ineffective (i.e., if the TOT remains unresolved), it was also hypothesized that it would be more likely to create incorrect connections to interlopers or blockers. Therefore, if a participant was unable to resolve a TOT on the first day by using the phonological strategies, they would be more likely to experience a recurring TOT on that same item when it was presented during the second day, compared to participants who used either the semantic or the episodic strategies. Because the semantic strategies were found in Experiment 1 to be no more effective than no strategy at all, and because

episodic strategies are still exploratory in nature, no specific prediction was made in regards to the relationship between them.

Method

Participants

A total of 78 undergraduate psychology students from California State University San Bernardino participated in this experiment. They each received extra credit for their voluntary participation. All participants were randomly assigned into one of three conditions: the Semantic Strategy group (N=26), the Phonological Strategy group (N=26) and the Episodic Strategy group (N=26).

Materials

Stimuli consisted of the same 35 cast photos used in Experiment 1.

Procedure

Participants were tested individually. They were given the same instructions and descriptions of FOK and TOT as in Experiment 1. The participants were given an opportunity to ask any questions and confirm that they understood the difference between FOKs and TOTs. The method of the

presentation of the cast photos was also the same as in Experiment 1.

Day 1. The general instructions and procedure for the participants was almost identical to those given in Experiment 1, with the following exceptions: a) they were not asked to use a strategy when they reported being in an FOK state, and b) the control condition was replaced with a new strategy condition, episodic. The subsequent steps varied depending on whether the participant was given semantic, phonological or episodic strategies.

Participants in the Semantic Strategy condition followed the same procedure as used in Experiment 1. They were given a written list of five cues designed to assist them, and were instructed to use these cues to help come up with the correct answer when they found themselves in a TOT state. These cues prompted the participants to try to recall the following information about the show:

1) the plot or premise of the show
2) the character's names
3) the actor's names
4) the era the show first came out
5) the genre (such as drama, sit-com, sci-fi, etc.)

In contrast to Experiment 1, in which participants in the Phonological Strategy group were simply given the first initials of the target answer, for Experiment 2 they followed a procedure more comparable to that of the Semantic Strategy group. When in a TOT state, they were prompted to try to recall phonological information about the title of the show using a list of suggested cues, as follows:

1) the first initial(s) of the title
2) the number of syllables
3) words that rhyme with the target word
4) the location of the final stress
5) any other partial phonological information about the title

Participants in the Episodic Strategy group were also given a written list of memory cues, this time focusing on episodic aspects of the show in question. These cues prompted the participants to try to recall the following information about the show:

1) what day the show was on
2) who you watched the show with
3) what other shows were on at the same time/that you associate with the show
4) how old you were when you watched the show
5) what was going on in your life at the time you watched the show

Prior to the display of the first photo, participants in all conditions were given a few minutes to familiarize themselves with their respective strategy, so that they could effectively implement it during the tasks. Once they felt comfortable with their strategy, the task began. They were asked to use any or all of the cues in their category to attempt to jog their memory as to the name of the show in question when in a TOT moment.

Throughout the task, the experimenter recorded the participants' responses. Correct and confidently expressed incorrect answers were recorded as "Know". The response "Don't Know" was selected when the participant indicated that he or she was unfamiliar with the show. The response "FOK" was recorded if the participant was familiar with the show but did not feel close to recalling the title. If the

FOK moment was resolved prior to the next slide being shown, it was recorded as a correct answer, and if it was not resolved, it was simply recorded as an FOK. The response "TOT resolved" was selected if the participant indicated that they were in a TOT moment, but managed to come up with the target answer. Finally, the response "TOT not resolved" was marked when the participant experienced a TOT moment but could not recall the show's name.

During informal post-experiment interviews with participants from an earlier pilot study, it was revealed that learning the target answers to unresolved FOKs or TOTs during the course of the slide show caused participants to give up attempts of self-resolution more quickly. The most common reason given for this behavior was that they just wanted to be rid of the discomfort, and they knew they could achieve this most quickly by asking for the answer. To prevent this problem, participants were informed prior to the onset of the experiment that a brief review of the correct answers would be given after all 35 slides have been completed. By doing this, it was hoped that they would then be able to focus on each photo as it was shown, and not be preoccupied with any previous, unresolved photos.

At the end of the Day 1 session, participants were told that they had completed the first portion of the study, and would be scheduled to attend the second session in 48 hours. They were told that the second portion of the study involved new stimuli unrelated to the television shows they had just seen. The purpose of this deception was to prevent them from concentrating on and memorizing the stimuli they had just seen.

Day 2. When the participants arrived back for their second session, they were informed of the nature of the previous deception and the purpose for it, and reminded that they were free to quit the experiment if they felt uncomfortable. Twelve participants did not return for the Day 2 session, and their data were thrown out before analysis. However, all participants who did return chose to remain for the second session. The experimenter repeated the definitions of TOT and FOK and the basic instructions for the task. The participants were informed that during this session, they would not be asked to use cues or attempt to resolve the TOT moment, but would be told the correct answers at the end of the experiment. The procedure and recording processes were similar to Day 1, with each participant given the same 35 cast photos. However, to

prevent order effects, the photos were displayed in a different randomly determined order, although the order was the same for all participants. Also, all TOTs were recorded together, without separate categories for TOT resolved and unresolved.

Results

All results were analyzed at a .05 significance level. For each participant, there were 20 possible response combinations for each cast photo. On Day 1, participants had the option of five possible responses: "Know", "Don't Know", "FOK", "TOT resolved", and "TOT unresolved". On Day 2, the participants were asked to choose between the following 4 options: "Know", "Don't Know", "FOK", or "TOT". All responses were selected according to the same criteria as in Experiment 1. The combination created 20 total responses when combined across the two sessions. Table 1 presents the mean number of responses (out of 35) for each of these 20 data events. These means are shown for each strategy condition, along with the F-score for testing if the differences between conditions were statistically significant.

Table 1. Means and F-scores by Condition for the Twenty Possible Response Combinations in Experiment 2

Response		Condition			F-score
Day 1	Day 2	Phonological	Episodic	Semantic	
Know	Know	14.65	14.12	15.00	0.12
Know	Don't Know	0.08	0.08	0.08	0.00
Know	FOK	0.08	0.19	0.08	0.55
Know	TOT	0.46	0.88	0.73	1.21
Don't Know	Know	3.38	3.08	3.54	0.20
Don't Know	Don't Know	8.46	8.62	7.54	0.22
Don't Know	FOK	0.54	0.81	0.65	0.54
Don't Know	TOT	0.50	0.62	0.19	2.09
FOK	Know	1.58	1.81	1.96	0.35
FOK	Don't Know	0.23	0.19	0.27	0.13
FOK	FOK	0.27	0.27	0.58	0.19
FOK	TOT	0.23	0.46	0.12	2.18
TOT resolved	Know	1.96	2.62	2.38	0.91
TOT resolved	Don't Know	0.00	0.12	0.00	1.00
TOT resolved	FOK	0.00	0.04	0.00	1.00
TOT resolved	TOT	0.27	0.12	0.31	1.17
TOT unresolved	Know	1.15	0.50	1.19	3.28*
TOT unresolved	Don't Know	0.04	0.12	0.15	0.75
TOT unresolved	FOK	0.12	0.08	0.04	0.53
TOT unresolved	TOT	1.00	0.27	0.19	8.58*

*significant at a .05 level

No significant differences were found between groups for the combined responses, with two exceptions. There was a significant difference in the number of "Know" responses on Day 2 given a TOT-unresolved response on Day 1, $F(2,75) = 3.28$, $\omega^2 = .06$. Participants in the Episodic Strategy condition were significantly less likely to report a "Know" answer on Day 2 when they had been unable to resolve their TOT moment on Day 1. This unexpected finding may be a Type I error, and is likely an artifact resulting from the fact that there were more resolved TOTs in the Episodic Strategy condition (see Figure 4) and thus fewer unresolved TOTs in general with the episodic strategy. If there are fewer unresolved TOTs in general for the Episodic Strategy condition, this can account for why there are significantly fewer unresolved TOTs on Day 1 that result in a "Know" response on Day 2.

There was also a significant difference between strategy conditions in the number of TOT responses on Day 2 given that a participant had experienced an unresolved TOT on Day 1, $F(2,75) = 8.58$, $\omega^2 = .16$. The phonological strategy produced significantly more recurring TOTs than the episodic or semantic strategies. This finding is

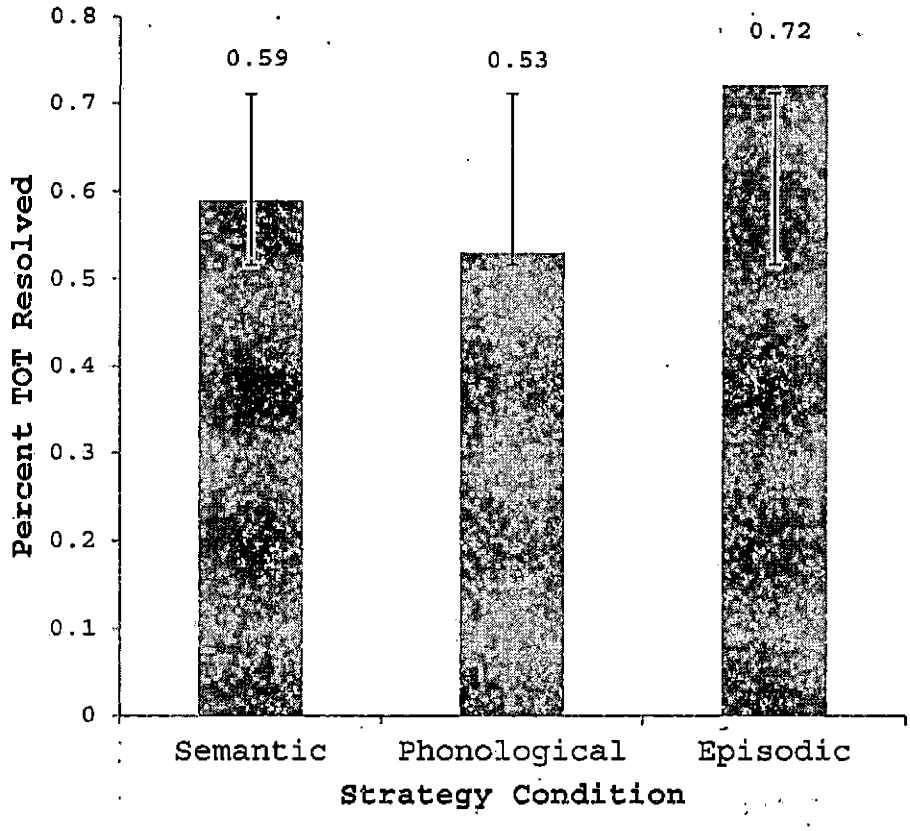


Figure 4. Percentage of Tip-of-the-Tongues resolved on Day 1 by strategy condition. Error bars represent one standard deviation for each condition.

consistent with the second hypothesis of this experiment and will be discussed later.

To ensure that there were no variations between the strategy conditions due to the stimuli, "Know" and "Don't Know" responses were analyzed individually for Day 1. Results for "Know" and "Don't "Know" were both nonsignificant ($F's < 1$), showing that there was no difference in how well participants recognized the shows, consistent with the results of Experiment 1. To further ascertain if participants responded to the stimuli consistently across conditions, the total number of TOTs reported was compared. No significant difference was found, ($F < 1$), again consistent with Experiment 1.

Hypothesis One

The first hypothesis predicted that the phonological strategy would be more effective at resolution overall on the first day, compared to the semantic or episodic strategies. As all participants reported at least one TOT moment, all were used in this analysis. Figure 4 presents the proportion of resolved TOTs on Day 1 across the three strategy conditions. Results showed that the overall

difference was not statistically significant, $F(2,75) = 2.06$, $\omega^2 = .03$. Planned orthogonal contrasts based on Hypothesis One compared the Phonological Strategy condition to the Semantic and Episodic conditions combined. No significant difference was found, $t(75) = -1.51$. There was also no difference between The Episodic and Semantic Strategy conditions, $t(75) = 1.35$.

However, it can be seen in Figure 4 that participants tended to resolve more TOTs in the Episodic Strategy condition. For this reason, additional orthogonal contrasts were conducted comparing the episodic strategy with the semantic and phonological strategies combined. This comparison was only marginally nonsignificant, $t(75) = 1.93$, $p = .058$. No significant difference was found between the semantic and phonological strategies, $t(75) = 0.64$.

Hypothesis Two

The second hypothesis stated that if the phonological strategy was ineffective on Day 1 (in other words, if the TOT remained unresolved), it would be more likely to lead to repeat TOTs for the same items when they were presented again on Day 2, compared to the other two strategies. To

explore this, the proportion of unresolved TOTs on Day 1 that resulted in TOTs on Day 2 was calculated for each participant. Of the 78 participants in the study, 21 did not experience this event, and thus were not used in this analysis. The results for the remaining 57 participants are shown in Figure 5, plotted across the three strategy conditions. The overall difference between the three strategy conditions was statistically significant, $F(2,54) = 4.60$, $\omega^2 = .11$. Planned orthogonal contrasts revealed that the Phonological Strategy condition was significantly more likely to result in recurring TOTs compared to the Episodic and Semantic conditions combined, $t(54) = 2.34$, which was consistent with the hypothesis. No significant difference was found between the episodic and semantic strategies, $t(54) = 1.81$.

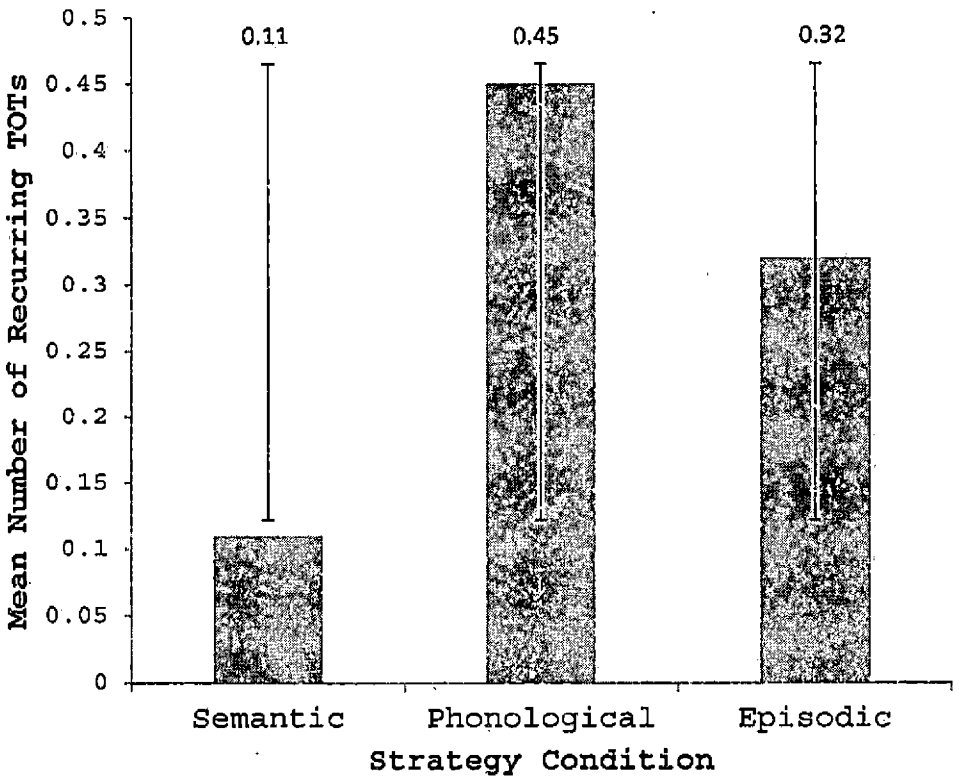


Figure 5. Mean number of Tip-of-the-Tongues reported on Day 2 given an unresolved Tip-of-the-Tongue on Day 1, plotted for three strategy conditions. Error bars represent one standard deviation for each condition.

CHAPTER FOUR

DISCUSSION

Retrieval Strategies

The main focus of this thesis has been to compare the effectiveness of different strategies for resolving the TOT experience. As has been found in past research (Brown & McNeill, 1966; Yarmey, 1973) a person experiencing a TOT moment can often access partial phonological information. It has also been argued that TOTs are primarily the result of the incomplete activation of the phonological components of the target answer (Brown and McNeill, 1966; Burke, MacKay, Worthley & Wade, 1991; Schwartz, 1999). For these reasons, it was hypothesized that using phonologically-based strategies would be the most effective way to retrieve the missing information. Results from Experiment 1 showed this to be the case. However, as discussed earlier, there was not a true comparison between the different strategies, because while the semantic strategies were controlled by the participant, the phonological strategy was dependent on the experimenter. The purpose of Experiment 2 was to confirm the previous results while

using a more balanced design where all strategies were self-generated. With the new, more realistic phonological strategies, however, no significant differences were found between the groups, though the Episodic Strategy condition was seen to be marginally more effective than the others.

There are many possible reasons why focusing on partial phonological information might have been detrimental in Experiment 2, rather than helpful. One problem might have been the methods participants chose to employ. During informal, post-experiment interviews with participants, many admitted to utilized a strategy known as "alphabet surfing", where a person systematically rifles through each letter looking for a sense of familiarity that will lead them to the solution. This can be helpful if the target answer begins with a letter near the front of the alphabet. However, if the target word started with a letter that was not near the beginning of the alphabet, unrelated letters would be accidentally introduced. This could start a vain search through stores of irrelevant information that could possibly cause incorrect connections with the partial information available about the target.

Also, basic phonological strategies (trying to recall the first letter and number of syllables) may only be

helpful in selected circumstances, such as when the answer is only one or two words long. Since the stimuli used in this experiment were photos of television shows that often had longer phrases as titles (for example, *Saved by the Bell* and *Little House on the Prairie*), such strategies might have been more confusing than helpful.

In Experiment 1, there were no significant differences found between the Semantic Strategy condition and the Control condition. To reinforce these findings, the Semantic Strategy condition was again tested in Experiment 2. Results showed that semantic strategies were once again not found to be an effective tool, reconfirming the results of Experiment 1.

With regards to the episodic strategy, there is very little research available about the episodic aspects of TOT moments, and even less concerning the use of episodic retrieval strategies. It was observed, however, that participants in Experiment 1 were using such strategies informally, and often effectively. To study this in a more formal manner, an Episodic condition was thus created for Experiment 2. As such, this condition was treated as exploratory and no specific predictions were made. Results showed that, though not statistically significant, the

participants in the Episodic Strategy condition did resolve more TOTs on Day 1 compared to the other conditions. This is promising for future research on the effect that episodic memories might have on relieving TOT moments.

One direction such research might explore is the effect of various levels of processing (Craik & Lockhart, 1972), because in this experiment, only shallow episodic retrieval cues were used. It is possible that due to the way personal memories are encoded, they might be effective tools at recalling some of the minor details all but lost in the semantic and phonological storage systems. This could ostensively include the titles of long-forgotten television shows. Because it is interconnected with so much other information, one episodic memory might be stored in multiple places. For example, the memory of tripping over your robe at your graduation might be classified and stored under the categories of *embarrassing moments, high school events, wardrobe malfunctions* and *physical injuries.* Because of this network of personal memories, Conway (1992) has proposed that there are also multiple levels of retrieval cues that increase in depth as they progress: lifetime periods (*during high school*); general events (*my high school graduation*); and specific events (*tripping as I*

walked across the stage). According to Conway, the deepest level of processing results in the strongest memory trace. While this current experiment asked participants to employ only cues meant to prompt the shallowest level (lifetime periods), it would be interesting to study this further, comparing different types of episodic strategies tailored to trigger possibly deeper levels of processing.

Recurring Tip-of-the-Tongue Moments

In addition to exploring the effectiveness of TOT strategies, another goal of this thesis was to examine what factors might influence the frequency of recurring TOTs. This was explored in Experiment 2, in which participants identified television cast photos on two separate occasions. It was hypothesized that, in the event that the phonological strategy was ineffective, it would be more likely to lead to repeat TOTs on the same items when they were presented again on the second day, compared to the other two strategies.

The hypothesis was an extension of the "Learning to Fail" theory proposed by Warriner and Humphreys (2008) which proposed that the more time spent focusing on incorrect information, the more likely a person would be to

essentially "learn" it. This theory was combined with the supposition that accessing phonological information is the final step in the recall process. The transmission-deficit model (Burke, et al., 1991) suggests that this process begins with accessing semantic information about the target item first, and then narrowing down the resulting subset of possibilities until final recall is achieved through a completed phonological connection. If focusing on incorrect phonological information were to create an impassable bottleneck preventing complete recall (resulting in an unresolved TOT) the wrong information would remain salient in the future, thus becoming "learned". The inability to come up with the answer using semantic or episodic strategies, on the other hand, was expected to be less permanent. Jones (1989) found that partial semantic information was less likely to result in a bottleneck, compared to partial phonological information. It is possible that this is due to the fact that there are multiple pathways available for these more open-ended and personal memories to circumvent the block.

Results showed that there was indeed a difference in the number of recurring TOTs based on condition, and as predicted, the phonological strategy was seen to be

significantly more likely to result in repeated memory failure. This is consistent with the blocking hypothesis proposed by Jones (1989). For Experiment 2, the participants in the Phonological Strategy condition were instructed to focus on recalling any partial phonological information they could about the target answer. If they were not able to recall any partial information, they still had to make the attempt. However, randomly searching through the alphabet or considering numerous phonemes, hoping for a feeling of familiarity, could have resulted in the incorrect letter, sound or number of syllables becoming an interloper. This is consistent with research by Choi and Smith (2005), who concluded that TOTs were the results of incorrect phonemes being accessed or the correct phonemes being combined in the wrong order. Once the participant selected a phoneme combination as being most likely to be the correct one, they might have inadvertently started to rehearse it, but if it was incorrect, it would have resulted in an unresolved TOT. According to Hebbian learning theory (Munakata & Pfaffly, 2004; Ohlsson, 1996), this rehearsal would strengthen the pathway between the stimuli and the incorrect information. When faced with the same stimuli again on Day 2, the incorrect phonological

information would be more likely to present itself first, resulting in the target answer once again becoming blocked.

The results from the first hypothesis showed that phonological strategies were not any more effective than other types of strategies at relieving initial TOT moments; indeed, though not statistically significant, the mean number of resolutions was lower in the phonological condition than in either of the others. Further, using phonological strategies was found to result in more recurring TOTs. The results of Experiment 2 suggest that attempting to access phonological information is not only unhelpful in resolving TOT moments, but can actually be harmful in the long run. This seems to contradict prior research showing that phonological cuing can help resolve the TOT state. However, as pointed out earlier, prior research has typically presented strong phonological cues in the form of experimenter-generated hints such as first letters. These types of cues are not generally available in real-world situations.

Experiment 2 shows that when people must generate their own strategies, a purely phonological strategy is not effective. This might be due to the placement of phonological information in the overall recall process. As

Burke, et al. (1991) and Yarmey (1973) suggested, successful retrieval is the result of a series of events which starts with the access of semantic information. This information then cues phonological information which, if correct and complete enough, results in total recall of the target answer. Since the phonological information must be accessed correctly in order to proceed to full recall, any interference or failure in this area would be more detrimental than a similar semantic interference or failure, which could still be skipped or circumvented.

The semantic and episodic strategies might also not have been as likely to result in recurring TOTs due to the more nebulous memory pathways they can introduce. Cleary (2006) found that when encoding new items, people innately link contextual information to its phonological components, in order to secure alternate pathways in the event of a bottleneck or blockage during a future retrieval attempt. Participants using semantic strategies were told to focus on any peripheral information related to the condition that they could recall about the target answer. Often this took the form of identifying the characters' names, the actors' names, and other shows which they were in. Unlike in the Phonological Strategy condition, participants in the

Episodic and Semantic conditions were not concentrating on finding just one correct letter, phoneme, or syllable, but instead on multiple bits of information, which they then had to try to connect. Essentially, they were encouraged to access the alternate routes they had previously created. If the Hebbian learning phenomenon occurred, it would have resulted in many of those pathways being strengthened, rather than just one. However, the nature of semantic information is such that there are an almost infinite number of connections leading from any one bit of information to others that are related to it in some way. Thus, the salience of any one particular incorrect semantic pathway would not be as strong as the singular, direct phonological counterpart.

For example, if a person were attempting to recall the name "Madonna" but became stuck on the letter "J", they would be inclined to search the set of "J" words again the next time they encountered that stimulus, and might find themselves in a recurring TOT moment. If, on the other hand, they focused on contextual information, they might think of her songs, appearance, movies, or personal memories about her. Again, each bit of information, even if it did not lead to resolution, would be strengthened in

connection to that stimulus. However, the next time, even the unsuccessful pathways could still connect to the right path. Therefore, participants who were unable to successfully resolve a TOT on Day 1 by using either semantic or episodic strategies would not have been as inclined to repeat the same mistakes on Day 2.

Conclusion

This thesis explored the effectiveness of different strategies for resolving the TOT experience. In practice, however, expecting one particular strategy to be universally effective for resolving TOTs might well be unrealistic. The foundations that allow us to recall memories actually begin with the original encoding process. Tulving and Thompson's (1973) concept of encoding specificity suggests that an item is not placed into memory as a separate, distinct chunk but is attached to other bits of peripheral information that happened to surround it at the moment it was encoded (Ashcroft, 2006). This suggests that recall is more likely to occur if the retrieval cues are tailored to the conditions present during the original acquisition of the information. In other words, peripheral information that was accidentally stored along with the

target information can become a springboard towards eventual total retrieval. This incidental information is, by its very nature, unpredictable and inadvertent; therefore, the cues or strategies used to relieve any particular TOT might be most effective if tailored to the particular circumstance surrounding the initial memory.

The findings of Brown and McNeill (1966) suggest the same thing. They regarded memory as a "mental dictionary", with infinite sets and subsets where each item of information was stored in numerous locations. One particular bit of information, then, can be accessed from many different directions, or pathways. When in a TOT moment, we instinctively try to circumvent the problem by accessing these alternate pathways, which will vary depending on the nature of the information, how it was encoded, and where the block or interference is.

It therefore may be impractical to separate the strategies or attempt to stop the natural progression of the retrieval process. Intentionally eliminating or blocking any of the steps necessary for complete recall might be as detrimental as whatever caused the TOT moment in the first place. Rather, a combination of all the strategies might prove to be the best, if immediate

resolution is imperative (as in during a short-answer exam, for example). Otherwise, incubation and a dash of patience might be the best strategies of all.

APPENDIX

TELEVISION CAST PHOTOS


1. Baywatch


2. Just shoot me


3. Gilligan's Island


4. Cheers


5. 7th Heaven


6. Home Improvement


7. That 70's show


8. Charmed


9. King of Queens


10. Saved by the bell


11. I dream of Jeanie


12. Mad about you


13. Smallville


14. Family Matters


15. The A-team


16. Bewitched


17. Sex & the city


18. The golden girls


19. Married w/children


20. The west wing


21. BeverlyHills90210


22. Desperate Housewives


23. Charlie's angels


24. 2 ½ men


25. Family ties


26. Knight rider


27. Little house on the prarie


28. The wonder years

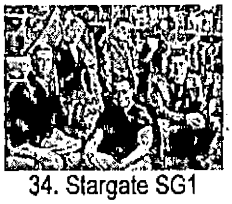

29. Scrubs


30. Full house


31. 3's company


32. Fresh prince of Bel Air


33. Growing Pains


34. Stargate SG1


35. Happy Days

APPENDIX B

IRB DISPOSITION

Human Subjects Review Board
Department of Psychology
California State University,
San Bernardino

PI: Riefer, Davidf & Emery, Cheryl

From: Donna Garcia

Project Title: The Effect of Strategies on Relieving Initial and Recurring Tip-of-the-Tongue States

Project ID: H-11WI-29

Date: Monday, April 18, 2011

Disposition: Administrative Review

Your IRB proposal is approved. This approval is valid until 4/18/2012.

Good luck with your research!

Donna M. Garcia, Chair
Psychology IRB Sub-Committee

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