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Do the Cues that Relieve a Tip of the Tongue State
Depend on the Cues that Elicit Them?

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Abstract

This experiment focused on whether or not the cues that relieve a tip of the tongue (TOT) state are dependent upon the cues that elicit TOT states. A TOT state is described as an experience in which there is a strong feeling that a word can be retrieved from memory but at that particular moment it is inaccessible. Participants included 120 undergraduate students. They were randomly assigned to 6 groups of 20 people, with each group differing in the type of cues used to elicit and resolve the TOT states. Stimuli consisted of 36 target-word definitions, each with corresponding semantic cues (cues similar to the target in meaning) and phonological cues (cues similar to the target in sound), borrowed from Meyer and Bock (1992). The procedure was a modified version of that used by Meyer and Bock (1992). It was expected that the type of cue resolving the TOT state would depend on the type of cue that elicited the TOT state. There are two theories that explain this: the partial activation theory and the blocking theory. The partial-activation theory suggests that since there is not enough information to retrieve the target word from memory, acquiring more information that is related to the target word will aid in retrieval. The blocking theory suggests that since there is information preventing retrieval, a change in the retrieval conditions may help to resolve the TOT state. Analysis of participants feeling-of-knowing (FOK) ratings supports the blocking theory.

Do the Cues that Relieve a Tip of the Tongue State

Depend on the Cues that Elicit Them?

The tip of the tongue is something that almost everyone has experienced at some point in their lives. This experience is so common that many people report having them at least weekly and some even have them daily (Brown, 1991). A tip of the tongue state (TOT) is described as an experience in which there is a strong feeling that a word can be retrieved from memory but at that particular moment it is inaccessible (James & Burke, 2000; Schwartz, Travis, Castro, & Smith, 2000). For example, you have seen a movie several times, yet when trying to recall a character's name you are unable to recall it at that time, but you are sure that you know it. This retrieval failure you are experiencing is a TOT state. No one is completely sure as to how TOTs come about, but there are theories that try to explain this. Also in question is how TOTs are relieved. There have been many past studies on this aspect of TOTs as well.

To better understand TOTs, it is necessary to know how long-term memory works. Long-term memory is an information storage system that seems to have an unlimited capacity and may hold information permanently. It is part of a larger entity that also contains short-term memory, which is a memory storage system that holds memory for a brief period of time and has a limited capacity. Information from short-term memory is passed on to long-term memory through rehearsal which is the repeated exposure to that information. Once information is stored in long-term memory, one can then retrieve that information. There are two types of information retrieval: recall and recognition. In recall, one is able to correctly retrieve the information in its entirety. In recognition one may retrieve pieces of information, known as cues. These cues may help recall take place (http://www.cc.gatech.edu/classes/cs6751_97_winter/Topics/human-cap/memory.html). It is when the retrieval process fails that we find ourselves in a TOT state (Ashcraft, 1994).

Sometimes information will not be fully retrieved from memory but instead it will be activated. Activation determines how probable it is that the information will be accessed and how fast it will be accessed. Right after thinking about certain information, it is highly active in memory (Anderson, 2000). When certain information is activated, it can trigger related information in one's memory. Information in the brain is linked together as a network so that if certain information is presented to you, it may also trigger (or activate) other information. This is known as spreading activation (Anderson, 2000). An example of a network in a person's memory that may be used to retrieve the word "Lilliputian" is presented in Appendix A. When given the definition, "very small in size as in Gulliver's Travels," the words "small" and "Gulliver's Travels" will be active in one's memory. These words may activate other related words, such as "petite" or maybe the word "Lilliputian," which is the actual word being described in the definition. Spreading activation is an important concept that underlies the two main theories that explain TOT states.

There are two main theories that explain TOT states: the partial-activation theory and the blocking theory. The partial-activation (or incomplete activation) theory suggests that the word-finding process is slowed down because of insufficient target-word information (Brown, 1991). For example, when trying to think of the target word, one may only be able to recall the sound it starts with, its length, or the number of syllables the word contains. These are all examples of phonological information. Or it is possible that the only information one knows about the target word is its definition or some type of description about it. These are examples of semantic information. According to Meyer and Bock (1992), the target word may be activated along with related words but actual retrieval of the target word depends on how strongly the target word is activated. When the related words are more strongly activated than the target word, they may be retrieved instead, causing a TOT state. With regard to the relief of TOT states, the partial-activation theory predicts that if phonological cuing elicited the TOT state then phonological

cuing should also elicit correct target word retrieval (Meyer & Bock, 1992). Similarly, if semantic cuing elicited the TOT state, then semantic cuing should relieve the TOT state. This is because the partial-activation theory assumes that one simply does not have the sufficient amount of information required to retrieve the target word; with more relevant information, the target word can be retrieved (Brown, 1991).

Blocking is also a theory that explains TOT states. Blocking occurs during word retrieval when instead of retrieving the correct target word, another word known to be incorrect, comes to mind. This word may be similar to the target word, but instead of aiding in target word retrieval this incorrect word prevents it (Maylor, 1990). The incorrect word diverts attention away from the target word and competes with it (Brown, 1991). With regard to the relief of a TOT state, the blocking theory predicts that a change in retrieval conditions may eliminate the processes that are preventing retrieval (Schwartz, 1999). Thus, if semantic cuing elicited the TOT state, then phonological cuing should relieve the TOT state. If phonological cuing elicited the TOT state, then semantic cuing should elicit target word retrieval (Brown, 1991; Meyer & Bock, 1992).

There have been many studies that seek to explain how TOTs are elicited. Jones and Langford (1987) observed how phonological blocking plays a role in eliciting TOT states. They presented each of their subjects with a definition of a rare word. The subjects were then presented with a word that may or may not be phonologically or semantically related to the target word (blocking words). The researchers focused on which, if any, of the factors affected the occurrence of TOTs. Jones and Langford (1987) found that TOT states were more likely to occur when subjects were given a blocking word phonologically related to the target word than when they were given a blocking word that was not phonologically related. They found that the probability of entering a TOT state was not significantly affected by whether or not the blocking word was semantically related to the target word.

Later, Jones (1989) extended this research and modified it by making the phonologically related blocking words more closely related to the target word. In his study, the phonologically related words were similar to the target words by sharing the same first letter and the same number of syllables. He also modified the study by presenting the blocking words either before or after the definition of the target word was read. Jones found that related words presented after the definition resulted in more TOTs than when they were provided before the definition. He also found that phonological blockers caused significantly more TOTs than phonologically related blockers and that a semantic relationship between the target and blocking word showed no effect. This supports the findings of Jones and Langford (1987). These findings present evidence for the blocking theory and against the partial activation theory (Brown, 1991).

Meyer and Bock (1992) did a similar study regarding the etiology of TOT states; however, their findings contradict those previously mentioned. Meyer and Bock (1992) adapted the procedure used by Jones (1989). The subjects were given a definition of a rare word, followed by a cue that was phonologically related, semantically related, or unrelated to the target word. Their results showed that phonological cues helped in the retrieval of the target word, rather than prevented it. Semantic cues were more likely to yield fewer correct responses and more TOTs than phonological cues. These findings support the partial-activation theory (Meyer & Bock, 1992).

In this experiment, the effects that phonological and semantic cues have on word retrieval, depending on the cues that elicited the TOT state, are being tested. The design of this experiment is a 2x3 factorial design, with one dependent variable and two independent variables. The dependent variable is the percent of correct resolutions of a TOT state. The independent variables are the cues that elicit the TOT state and the cues that relieve the TOT state. The cues that elicit the TOT states are semantic cues and phonological cues. There are three levels of cues that relieve the TOT state: same modality/similar, same modality/different, and different

modality. Same modality/similar refers to the cues that are the same modality (phonologic or semantic) as the cues that elicited the TOT states and are related to the cues that elicited the TOT state. For example if a semantic cue elicited the TOT state, then a same modality/similar cue would be a semantic cue that is related in meaning to the cue that elicited the TOT state. Same modality/different refers to the cues that are the same modality as the cues that elicited the TOT state and but are different than the cues that elicited the TOT state. For example if a phonological cue (such as the first letter of the target word) elicited the TOT state, then a same modality/different cue would be a phonological cue that is different than the cue that elicited the TOT state (such as a word that rhymes with the target word). Different modality refers to a cue that is different phonologically or semantically from the cue that elicited the TOT state. For example if a semantic cue elicited the TOT state, then a different modality cue would be a phonologic cue.

The purpose of this study is to find out if the types of cues that relieve a TOT state depend on the type of cues that elicit the TOT state. Based on previous research I predict that with the partial-activation theory the percent of correct responses will be the highest for participants in the same modality/similar condition when given either phonological or semantic cues. The percent of correct responses will be the lowest for participants in the different modality condition when presented with either phonological or semantic cues.

With the blocking theory, I predict that the percent of correct responses will be the highest for participants in the different modality condition when given either phonological or semantic cues. The percent of correct responses will be the lowest for participants in the same modality/similar condition when given wither phonological or semantic cues.

Method

Participants

Participants included 59 undergraduate students who received credits for completing the experiment. They were randomly assigned to five groups: the phonological similar group, containing 12 participants, the semantic similar group, containing 10 participants, the semantic different group, containing 13 participants, the different modality phonological group, containing 12 participants, and the different modality semantic group, containing 12 participants (see Table 1).

Materials

Stimuli consisted of 36 target-word definitions (see Appendix B). These target-word definitions are the same as those used by Meyer and Bock (1992). Each target word has five single-word cues – one phonologically related cue and one semantically related cue, each to elicit the tip-of-the-tongue (TOT) state, and one semantic cue that is similar to its corresponding eliciting cue, one semantic cue that is different from its corresponding eliciting cue, and one phonologic cue that is similar to its eliciting cue, each to resolve the TOT state.

Design

There is one dependent variable and two independent variables in this experiment. The dependent variable is the percentage of correct resolutions of a TOT state. The independent variables are the cues that elicit the TOT state and the cues that resolve the TOT state. The cues that elicit the TOT state are semantic cues and phonological cues. The cues that resolve TOT states are same modality/similar, same modality/different, and different modality for the semantic cues and same modality/similar and different modality for the phonological cues.

Procedure

The procedure was similar to that used by Meyer and Bock (1992). First, each participant sat at a computer station that had each definition with its corresponding eliciting cues, resolving cues, and rating scales loaded into a PowerPoint file. Each participant was given a response sheet on which to write their responses. At the start of the experiment, the experimenter instructed the

participants to proceed to the first slide which contained the instructions by pressing the spacebar on the keyboard. The experimenter read aloud the printed instructions which described TOT states and the procedure for responding on the response sheet (see Appendix C). After the instructions were read, the experimenter instructed the participants to proceed to the next slide containing an example. The experimenter did the example along with the participants so that they could better understand the procedure of the experiment. Next, the participants did a second example, this time on their own. When they finished the example, the experimenter looked at their response sheets to make sure that the participants filled them out correctly. Next, the experimenter answered any questions that the participants had and then the experiment began. The participants were instructed to proceed to the next slide which contained the first definition. The experimenter read aloud the first definition and then instructed the participants to proceed to the next slide which contained a cue. The cue was either semantic or phonological, depending on the group in which the participants belonged. The participants had 30 seconds to write a response on their response sheet. When the 30 seconds were up, the experimenter instructed the participants to proceed to the next slide which contained the rating scales (see Appendix D). The participants that wrote a response rated themselves on how confident they are that their response is correct. This scale ranged from one to seven with one being “very sure the answer is not correct” and seven being “very confident the answer is correct.” The participants who did not respond indicated whether or not they felt as if they were in a TOT state. The participants that did not respond also rated themselves on how likely they are to recognize the target word. This scale ranged from one to seven with one being “will definitely not be able to recognize the target” and seven being “will definitely be able to recognize the target.” Next, all of the participants were told to proceed to the next slide which contained a resolving cue. They had 30 seconds to make another response. Next, the experimenter instructed the participants to proceed to the next slide which contained the rating scales. The participants rated themselves on the

appropriate rating scale again and waited for the next definition. This procedure was repeated for each of the definitions.

Results

Although phonological eliciting cues appeared to lead to a greater proportion of initial TOTs (.25) than did semantic eliciting cues (.19) as observed by Jones and Langford (1987) and Jones (1989), the difference was not statistically significant, $t(44)=1.62$, $p=.11$. There was also no difference in the proportion of initial correct responses produced by phonological eliciting cues (.07) and semantic eliciting cues (.08), $t(57)=-.49$, $p=.63$. This means that initial accuracy did not differ due to the type of eliciting cue presented to the participants. Tables 2 and 3 show the proportion of tip of tongue states and correct responses following the eliciting cues.

Both the blocking theory and the partial-activation theory predict that the relationship between resolving cues and eliciting cues will affect the resolution of TOT states. The effectiveness of the resolving cues can be examined by looking at the proportion of times TOT states are resolved following the presentation of a resolving cue. Figure 1 shows the proportion of responses made (whether correct or not) after receiving the resolving cue when the participants were in a TOT state after receiving the eliciting cue. A 2x2 between-subjects ANOVA with modality of the eliciting cue (phonological or semantic) and modality of the resolving cue (same or different) was used to examine the effects of resolving cues on proportion of responses. (Note that the condition which presented semantic resolving cues which were less similar to the semantic eliciting cues is not included in this analysis, due to the fact that there is no corresponding less similar phonological resolving cue.) One is equally as likely to make a response whether he or she was given a phonological eliciting cue (.26) or a semantic eliciting cue (.24), $F(1,40)=.01$, $p=.93$. The proportion of responses made does not change whether one is given a same modality/similar resolving cue (.29) or a resolving cue from a different modality (.22), $F(1,40)=.47$, $p=.50$. There was no interaction of eliciting cue and resolving cue on

proportion of responses, $F(1,40)=.05$, $p=.82$. The proportion of responses following the resolving cues is also shown in Table 4.

Figure 2 shows the proportion of participants not in a TOT state after receiving a resolving cue when they were in a TOT state initially. A 2x2 between-subjects ANOVA shows that there was no effect of type of eliciting cue, phonological (.50) or semantic (.46), on resolving a TOT state, $F(1,40)=.16$, $p=.69$. There was no main effect of type of resolving cue, same modality (.48) and different modality (.49), on resolving a TOT state, $F(1,40)=.01$, $p=.91$. Also, there was no interaction shown between eliciting cues and resolving cues on resolving a TOT state, $F(1,40)=.66$, $p=.42$. The proportion of non-TOT states following the resolving cues when participants were initially in a TOT state is also shown in Table 5. There are no statistically significant effects of the resolving cues when proportions are examined (possibly due to the small number of participants in each condition). Therefore, analyses of the feeling-of-knowing (FOK) ratings and confidence ratings are used to better describe this aspect of the study.

The first analysis examines whether the FOK ratings were valid. Figure 3 shows the average FOK scores for participants in a TOT state versus those in a non-TOT state after receiving the eliciting cue. A 2x2 mixed-model ANOVA with eliciting cue (phonological or semantic) as a between-subjects factor and TOT-state (present or absent) as a within-subjects factor was used to examine the FOK ratings. Participants have a higher feeling of knowing when they are in a TOT state (5.30) than when they are not in a TOT state (3.51), $F(1,53)=113.53$, $p<.05$. This is what is expected if TOT states occur when one feels that the correct response is known. Also, FOK scores are higher when participants received a semantic eliciting cue (4.69), than when they received a phonological eliciting cue (4.12), $F(1,53)=4.93$, $p<.05$. There was no interaction of type of eliciting cue and TOT status on FOK scores, $F(1,53)=.12$, $p=.73$. Table 6 shows the average FOK scores for participants in a TOT state after receiving the eliciting cue.

Table 7 shows the average FOK scores for participants not in a TOT state after receiving the eliciting cue

The top of Figure 4 shows the average FOK scores for participants still in a TOT state after receiving a resolving cue. The bottom of Figure 4 shows the average FOK score for participants who were not in a TOT state after receiving a resolving cue. A 2x2x2 mixed-model ANOVA with eliciting cue (phonological or semantic) and resolving cue (same modality or different modality) as between-subjects factors and TOT-state (present or absent) as a within-subjects factor was used to examine the FOK ratings. Consistent with the above analysis, FOK scores were higher when participants were in a TOT state (5.43) than when they were not in a TOT state (3.30), $F(1,38)=123.69$, $p<.05$. Also consistent with the above analysis, FOK scores were significantly higher when the participants were given a semantic eliciting cue (4.71) than when they were given a phonological eliciting cue (4.02), $F(1,38)=4.56$, $p<.05$. There was no main effect of type of resolving cue, same modality (4.30) and different modality (4.43), on FOK scores after receiving the resolving cue, $F(1,38)=.15$, $p=.70$. There were no interactions present. Table 8 shows the average FOK scores of participants in a TOT state after receiving a resolving cue. Table 9 shows the average FOK score for participants who were not in a TOT state after receiving a resolving cue.

We now look at whether the FOK ratings provide some evidence that resolving cues may have led to the resolution of TOT states. Table 10 shows the averages of confidence ratings when participants gave a correct response after receiving an eliciting cue. Table 11 shows the averages of confidence ratings when participants responded incorrectly after receiving an eliciting cue. A 2x2 mixed-model ANOVA with eliciting cue (phonological or semantic) as a between-subjects factor and response accuracy (correct or incorrect) as a within-subjects factor was used to examine the confidence ratings for responses made after receiving an eliciting cue (resolving cues were not yet presented to the participants). The ANOVA shows that there was no main

effect of type of eliciting cue, phonological (3.80) or semantic (3.82), on confidence ratings after making a first response, $F(1,51)=0.00$, $p=.96$. The ANOVA also shows no main effect of response accuracy, responding correctly (4.04) and responding incorrectly (3.58), on confidence ratings after making a first response, $F(1,51)=2.17$, $p=.15$. However, an interaction between type of eliciting cue and response accuracy, phonological correct (4.33), phonological incorrect (3.27), semantic correct (3.76), and semantic incorrect (3.88), approaches significance, $F(1,51)=3.52$, $p=.07$. This is shown in Figure 5. Confidence ratings are higher for a correct response than for an incorrect response when the participants were given a phonological eliciting cue. Confidence ratings remained the same regardless of whether the response was correct or incorrect when the participants were shown a semantic eliciting cue.

Table 12 shows the averages of confidence ratings when participants made a correct response after receiving a resolving cue. Table 13 shows the averages of confidence ratings when participants responded incorrectly after receiving a resolving cue. A 2x2x2 within-subjects ANOVA with factors being the eliciting cue (phonological or semantic), resolving cue (same modality or different modality), and response accuracy (correct or incorrect) was used to examine the confidence ratings for responses made after the participants were shown a resolving cue. The ANOVA shows a main effect of response accuracy, responding correctly (5.04) and responding incorrectly (4.02), on confidence rating after receiving a resolving cue, $F(1,29)=9.89$, $p<.05$. This means that confidence ratings were higher for correct responses (see Figure 6 Top) than they were for incorrect responses (see Figure 6 Bottom). There was no main effect of eliciting cue, phonological (4.49) and semantic (4.57), on confidence rating for the second response (response made after receiving a resolving cue), $F(1,29)=.04$, $p=.85$. There was no main effect of type of resolving cue, same modality/similar (4.31) and different modality (4.76), on confidence rating for the second response, $F(1,29)=1.41$, $p=.24$. However, the ANOVA showed an interaction of type of eliciting cue and type of resolving cue, phonological similar (4.82),

phonological different (4.16), semantic similar (3.79), and semantic different (5.34), on confidence rating for the second response, $F(1,29)=8.56, p<.05$. When participants were initially given a phonological eliciting cue, their confidence ratings decreased from when they were shown a same modality/similar resolving cue to when they were given a resolving cue of a different modality. Conversely, when participants were initially shown a semantic eliciting cue, their confidence ratings increased from when they were shown a same modality/similar resolving cue to when they were shown a resolving cue of a different modality (see Figure 6). There was no interaction between response accuracy and any other variables on confidence ratings for the second response. This means that participants yielded higher confidence ratings and more correct responses when the resolving cues were phonological, regardless of the type of eliciting cue they were initially given. Thus, phonological resolving cues were more effective.

Table 14 shows the averages of FOK scores for responses made after receiving a resolving cue for participants who were initially in a TOT state. A between-subjects ANOVA shows that there was no main effect of type of eliciting cue, phonological (3.43) and semantic (4.48), on FOK scores for responses made after receiving a resolving cue, $F(1,22)=2.62, p=.12$. There was also no main effect of type of resolving cue, same modality/similar (3.88) and different modality (3.86), on FOK scores after receiving a resolving cue, $F(1,22)=.02, p=.88$. However, there was an interaction between type of eliciting cue and type of resolving cue, phonological similar (4.00), phonological different (2.77), semantic similar (3.70), and semantic different (5.13), on FOK scores for responses made after receiving a resolving cue, $F(1,22)=4.38, p<.05$. This means that when the resolving cue is the same modality as the eliciting cue, phonological (4.00) or semantic (3.70), there is no effect of resolving cue on FOK scores. However, if the resolving cue is of a different modality than the eliciting cue, then going from a semantic eliciting cue to a phonological resolving cue is more effective than going from a phonological eliciting cue to a semantic resolving cue (see Figure 7).

Discussion

The purpose of this experiment was to find out if the types of cues that relieve a TOT state depend on the type of cues that elicit the TOT state. Two theories, the partial activation theory and the blocking theory are also being tested. Based on previous research (Jones & Langford, 1987; Jones, 1989) it was predicted that phonological cues would elicit the most TOT states. Also based on previous research (Meyer & Bock, 1992), it was predicted that phonological resolving cues would yield more correct responses than semantic resolving cues.

Figure 6 shows an interaction between eliciting cues and resolving cues on confidence ratings. The confidence rating decreases slightly from getting a same modality/similar resolving cue to getting a resolving cue of a different modality for participants who were initially given a phonological eliciting cue. This means that when given a phonological eliciting cue, confidence rating is higher when one is given a phonological resolving cue than when one is given a semantic resolving cue. When given a semantic eliciting cue, a semantic resolving cue yields much lower confidence ratings than does a phonological resolving cue. This finding is consistent with the blocking theory. The blocking theory suggests that information of the same modality to the target will prevent the target word's retrieval. Thus, if one was shown a semantic eliciting cue, then a semantic resolving cue would inhibit target word retrieval. However, a change in modality could aid in the target word retrieval. These findings indicate that this may have happened. When given a semantic eliciting cue, phonological resolving cues lead to higher confidence ratings, suggesting that participants were no longer in a TOT state and were sure that their response was correct.

Unfortunately other results show no effect of resolving cue. Figure 1 shows that there was no effect of resolving cues on relieving a TOT state. Similarly, Figure 4 (Top) shows that there was no main effect of resolving cue on FOK ratings for a response made after receiving a resolving cue. The FOK scores stayed the same across the three resolving cue conditions for both

phonological and semantic eliciting cues. Figure 7 also shows that there was no main effect of resolving cues on FOK ratings when a response was made by participants who were initially in a TOT state.

The data shows that phonological eliciting cues appeared to lead to a greater proportion of initial TOTs than did semantic eliciting cues, although the difference was not significant. This observation is consistent with Jones and Langford (1987) and Jones (1989). They found that TOT states were more likely to occur after receiving a cue phonologically related to the target word.

Figure 5 shows that confidence ratings are higher for correct responses than for incorrect responses when a phonological eliciting cue was presented to the participants. However, confidence ratings remain the same regardless of response accuracy when participants were presented with a semantic eliciting cue. This shows that participants were able to better predict their response accuracy when they were shown a phonological cue.

In conclusion, there is some support for the blocking theory, but it is not conclusive. Most of the effects were based on the FOK and confidence ratings because the proportions did not yield any significant effects. The main finding is the interaction between eliciting cues and resolving cues on confidence ratings, indicating that a change in modality could aid in the target word retrieval. Another main finding that is consistent with previous research is that, although not significant, phonological cues seemed to elicit a greater proportion of initial TOTs than did semantic cues. It is also important to note that participants were able to better predict their response accuracy when they were shown a phonological eliciting cue opposed to when they were shown a semantic eliciting cue. A major limitation of this experiment was mainly the sample size being so small. Further research with a much larger population could produce more findings.

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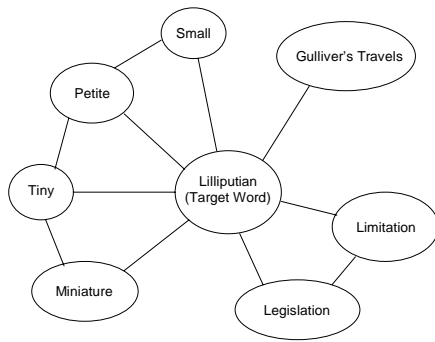
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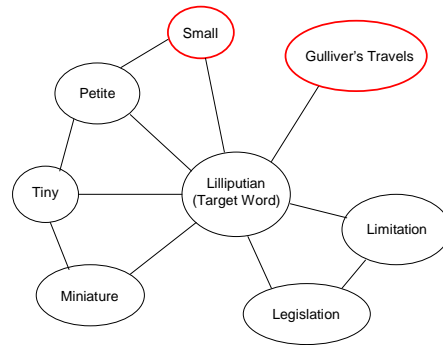
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Appendix A

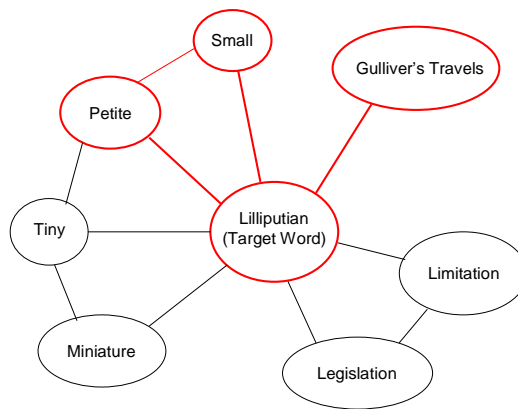
Spreading Activation



Network in memory for Lilliputian



Some words from the definition are activated



This information may then activate other related words such as “petite” or “Lilliputian”

Appendix B

	Target Definition	Target	Eliciting Cues		Resolving Cues		
			Semantic	Phonological	Semantic Similar	Semantic Different	Phonological Similar
Ex.1	Very small in size, as in "Gulliver's Travels"	lilliputian	petite	legislation	miniature	tiny	limitation
Ex.2	Stoppered glass vessel in which spirits are brought to the table	decanter	carafe	depression	flask	pot	deceptive
1	Of, on, or with two sides	bilateral	double	bewilderment	twofold	paired	bimestrial
2	Hollow or, as regards people, unintelligent, expressionless	vacuous	blank	victory	empty	plain	vaccinate
3	Long close garment worn particularly by clergy and choir singers, often under a surplice	cassock	robe	careless	gown	garment	casket
4	Something out of keeping with the times in which it exists	anachronism	premature	accelerator	early	inopportune	anathematic
5	To make calm or serene or to reduce agitation, especially by use of a drug	tranquilize	soothe	tropical	pacify	soften	transudate
6	Adherent of the view that human action is not free but directed by external forces acting on the will	determinist	fatalist	diminutive	necessitarian	stoic	desocialize
7	The desire to do evil, or for others to have ill fortune	malevolence	hostile	molecular	unfriendly	unfavorable	malingerer
8	The study of the developing fetus before birth	embryology	cellular	electricity	amoebic	primary	emphysematous
9	Female spirit whose wail portends death	banshee	ghoul	background	demon	ghost	banquet
10	Referring to a phrase or way of expression natural or peculiar to a particular language	idiomatic	euphemism	imagination	dialectal	colloquial	induplication
11	To listen (someone who listens) to other people's conversations	eavesdrop(per)	sleuth	eager	spy	investigate	easy
12	Saying little, reserved, uncommunicative	taciturn	withdrawn	tolerance	aloof	uninterested	tabaret

13	State of mind in which one takes or treats things lightly or with lack of respect	flippant(cy)	sarcastic	flicker	caustic	mocking	flitting
14	A young goose	gosling	pelican	goblet	chick	bird	gospel
15	A person unnecessarily anxious about their health	hypochondriac	invalid	hemispherical	sickly	weak	hydrometrical
16	To (stupefy), bewilder or confuse	bemuse	stupefy	bouquet	dumbfound	faze	bestow
17	The escape of blood from vessels, including internal as well as external bleeding	hemorrhage	anemia	hurricane	ooze	drain	hemisphere
18	Lover of books	bibliophile	reader	barbarism	lector	publisher	bigheartedly
19	To steam food, particularly meat, slowly in a closed container	braise	sauté	bridge	fry	cook	broom
20	Obvious or trite	banal	commonplace	bizarre	cliché	prose	bacon

Appendix C

Instructions

This is an experiment on tip of the tongue experiences. When these occur, people know that they know a particular word but cannot recall it. This frustrating feeling is embodied in the expression “It’s on the tip of my tongue.”

Throughout the experiment I will ask you to view a series of power point slides. You will view each slide by pressing the space bar. I will tell you when to view each slide. **DO NOT PROCEED TO THE NEXT SLIDE UNTIL YOU ARE TOLD TO DO SO!**

I am going to read you the definitions for 20 words. After each one, I will ask you to proceed to the next slide where you will find a cue word. The cue word will be related to the target word, either in meaning or in sound. Read the cue word and then, if you know the target word, write it down immediately in the space provided on the response sheet. You will have 30 seconds to do this.

After the response phase, you must rate yourself according to the rating scale. If you have written a word, you must rate yourself on how confident you are that the word is correct. This scale ranges from one to seven with one being “very sure the answer is not correct” and seven being “very confident the answer is correct.”

Sometimes, you will not know what the target word is. You may be having a tip of the tongue experience; knowing that you do know the word without being able to bring it to mind. When this happens, you should indicate it by responding “yes” to the question:

Are you in a tip of the tongue state? Yes_____ No_____

You will also rate yourself on how likely you would be to recognize the target word if it were shown to you. The scale will range from one to seven with one being “will definitely not be able to recognize the target” and seven being “will definitely be able to recognize the target.”

After you rate yourself, I will ask you to proceed to the next slide which contains another cue word. Read the cue word and then, if you know the target word, write it down in the space provided on the response sheet. You will have 30 seconds to do this. Once again, you must rate yourself on the appropriate rating scale. When you are done, please wait for the next definition to be read.

Appendix D

*Rating Scales***If you have come up with a word:**

A. How confident are you that the word is correct?

very sure answer is not correct	probably not correct	possibly not correct	unsure if answer is correct	possibly correct	probably correct	very confident answer is correct
1	2	3	4	5	6	7

If you have not come up with a word:

- Are you in a tip of the tongue (TOT) state? yes_____ no_____

B. How likely are you to recognize the target word?

definitely not able to recognize it	not likely that it will be recognized	possibly won't be recognized	unsure if it will be recognized	possibly will be recognized	likely that it will be recognized	definitely will be able to recognize it
1	2	3	4	5	6	7

Table 1

The Groups/Conditions of the Participants

		Cues that Resolve TOT States		
		Same Modality/similar	Same Modality/different	Different Modality
Cues that Elicit TOT States	Semantic Cues	Group 1 Semantic Cue Similar	Group 2 Semantic Cue Different	Group 3 Phonological Cue
	Phonological Cues	Group 4 Phonological Cue Similar		Group 5 Semantic Cue

Table 2

Proportion of Tip-of-Tongue States Experienced by the Participants after Receiving an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	0.22		0.28	0.25
Semantic	0.15	0.06	0.23	0.19

Table 3

Proportion of Correct Responses after Receiving an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	0.08		0.06	0.07
Semantic	0.10	0.06	0.09	0.08

Table 4

Proportion of Responses after Receiving a Resolving Cue by Participants Initially in a TOT State

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	0.28		0.24	0.26
Semantic	0.29	0.39	0.21	0.30
Marginal Means	0.29		0.22	

Table 5

Proportion of non-TOT States after Receiving a Resolving Cue when Participants were in a TOT State Initially

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	0.54		0.46	0.50
Semantic	0.41	0.49	0.51	0.48
Marginal Means	0.48		0.49	

Table 6

Average of FOK Scores for Participants in a TOT State after Receiving an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	4.70		5.28	4.99
Semantic	5.56	5.65	5.75	5.66
Marginal Means	5.08		5.52	

Table 7

Average of FOK Scores for Participants in a non-TOT State after Receiving an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	3.14		3.40	3.27
Semantic	3.59	3.99	3.63	3.76
Marginal Means	3.33		3.52	

Table 8

Average of FOK Scores for Participants in a TOT State after Receiving a Resolving Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	4.84		5.21	5.02
Semantic	5.85	5.99	5.82	5.90
Marginal Means	5.29		5.52	

Table 9

Average of FOK Scores for Participants in a non-TOT State after Receiving a Resolving Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	2.69		3.35	3.02
Semantic	3.85	4.12	3.41	3.80
Marginal Means	3.22		3.38	

Table 10

Average of Confidence Ratings for Correct Responses after Participants Received an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	3.75		4.85	4.25
Semantic	3.67	3.22	4.63	3.76

Table 11

Average of Confidence Ratings for Incorrect Responses Made by Participants after Receiving an Eliciting Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	3.46		2.90	3.20
Semantic	3.69	4.03	3.55	3.77

Table 12

Average of Confidence Ratings for Correct Responses Made after Receiving a Resolving Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	5.34		4.81	5.09
Semantic	4.25	5.70	5.75	5.31
Marginal Means	4.91		5.33	

Table 13

Average of Confidence Ratings for Incorrect Responses Made after Receiving a Resolving Cue

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	4.05		3.36	3.72
Semantic	3.71	4.22	4.94	4.30
Marginal Means	3.89		4.15	

Table 14

Averages of FOK Scores for Responses Made after Receiving a Resolving Cue for Participants

Initially in a TOT State

	Same Modality Similar	Same Modality Different	Different Modality	Marginal Means
Phonological	4.00		2.77	3.43
Semantic	3.70	3.19	5.13	3.93
Marginal Means	3.88		3.86	

Figure Captions

Figure 1. Proportion of guesses made after receiving a resolving cue when the subject was initially in a TOT state.

Figure 2. Proportion of non-TOT states after receiving a resolving cue when participants were in a TOT state initially.

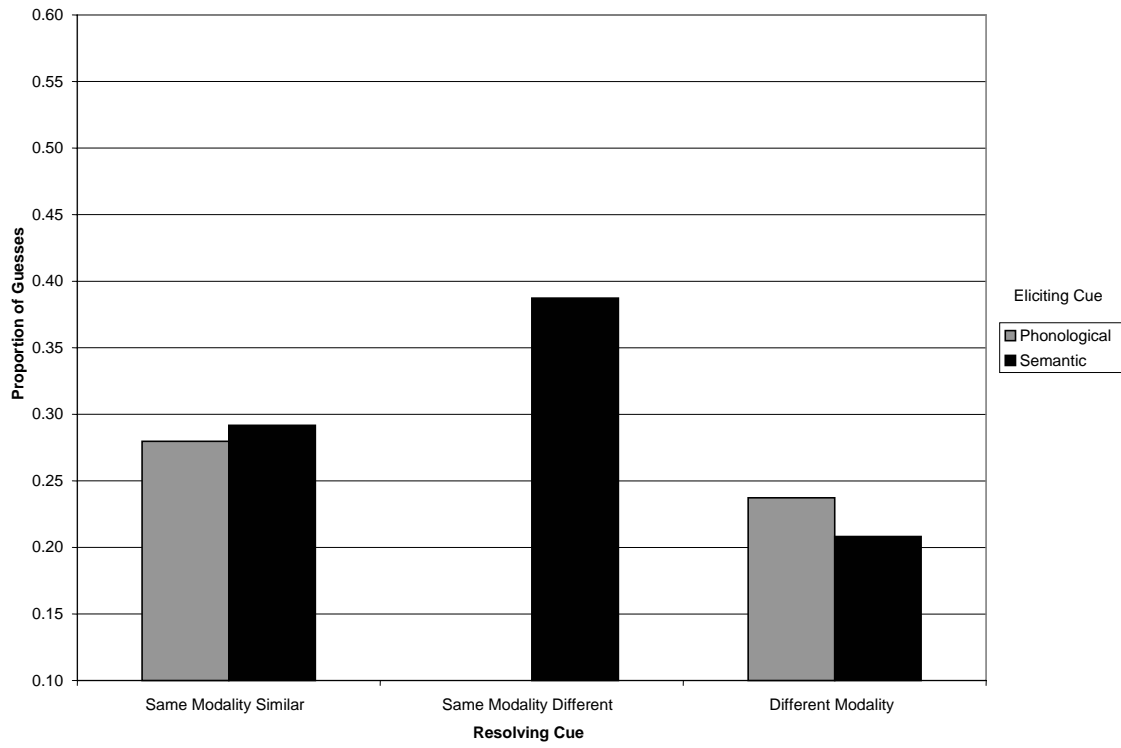
Figure 3. Average FOK scores for participants in TOT states versus non-TOT states after receiving the eliciting cue.

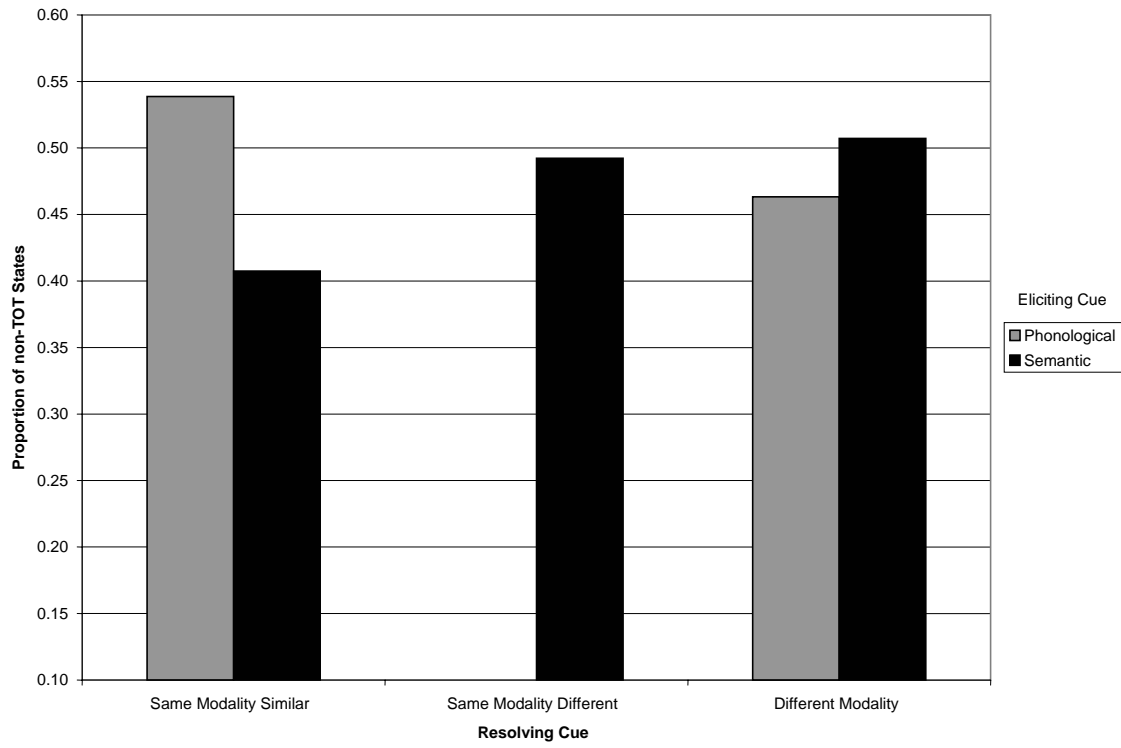
Figure 4 (Top). Average FOK scores of participants in a TOT state after receiving a resolving cue. *(Bottom).* Average FOK scores of participants who were not in a TOT state after receiving a resolving cue.

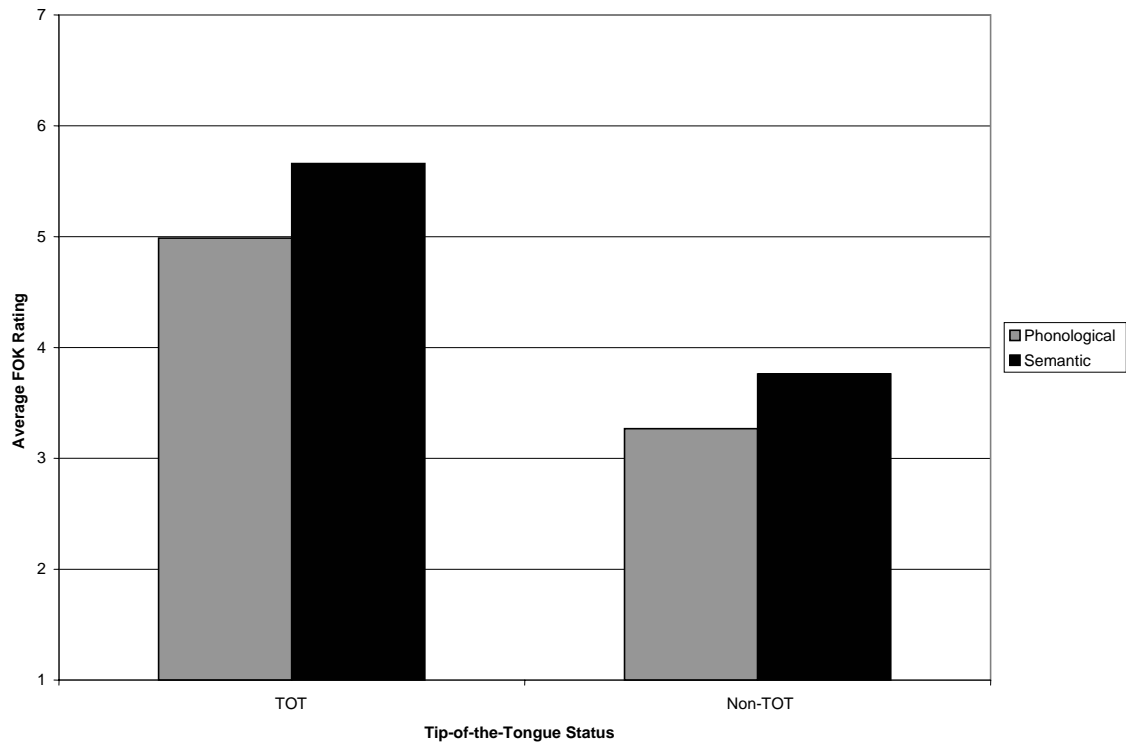
Figure 5. Average confidence ratings of correct responses and incorrect responses made by participants after receiving an eliciting cue.

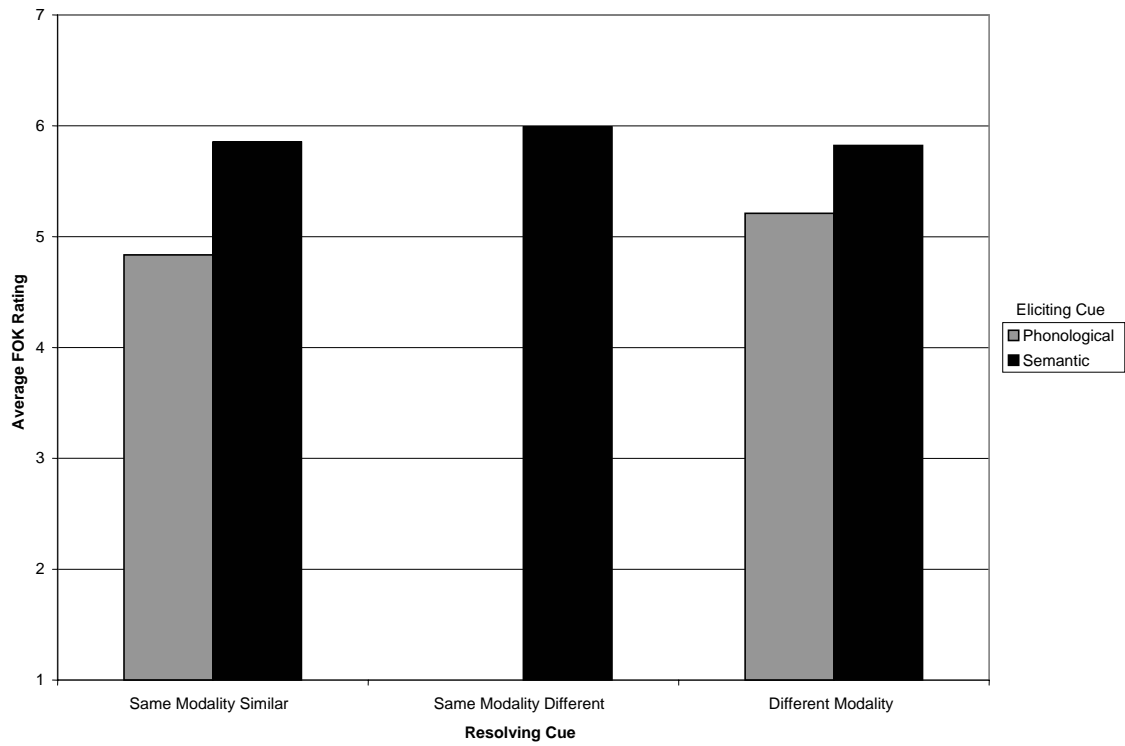
Figure 6 (Top). Average confidence ratings of correct responses given by participants after receiving a resolving cue. *(Bottom).* Average confidence ratings of incorrect responses given by participants after receiving a resolving cue.

Figure 7. Average FOK scores for responses made after receiving a resolving cue for participants who were initially in a TOT state.

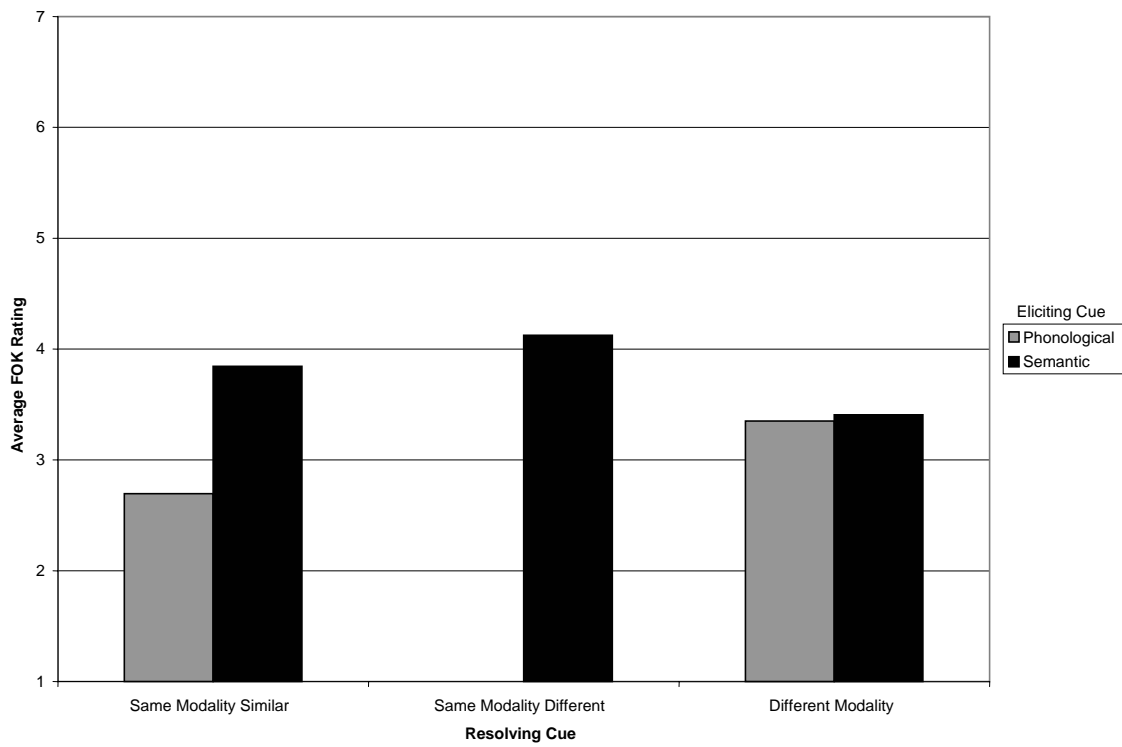


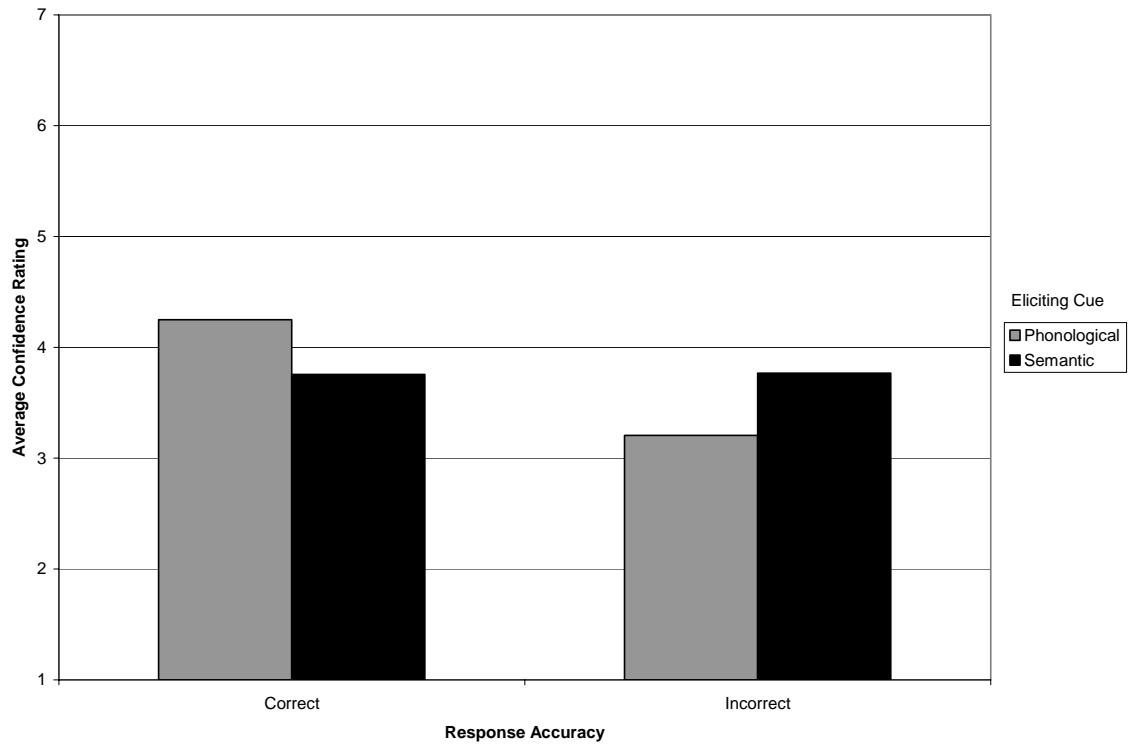


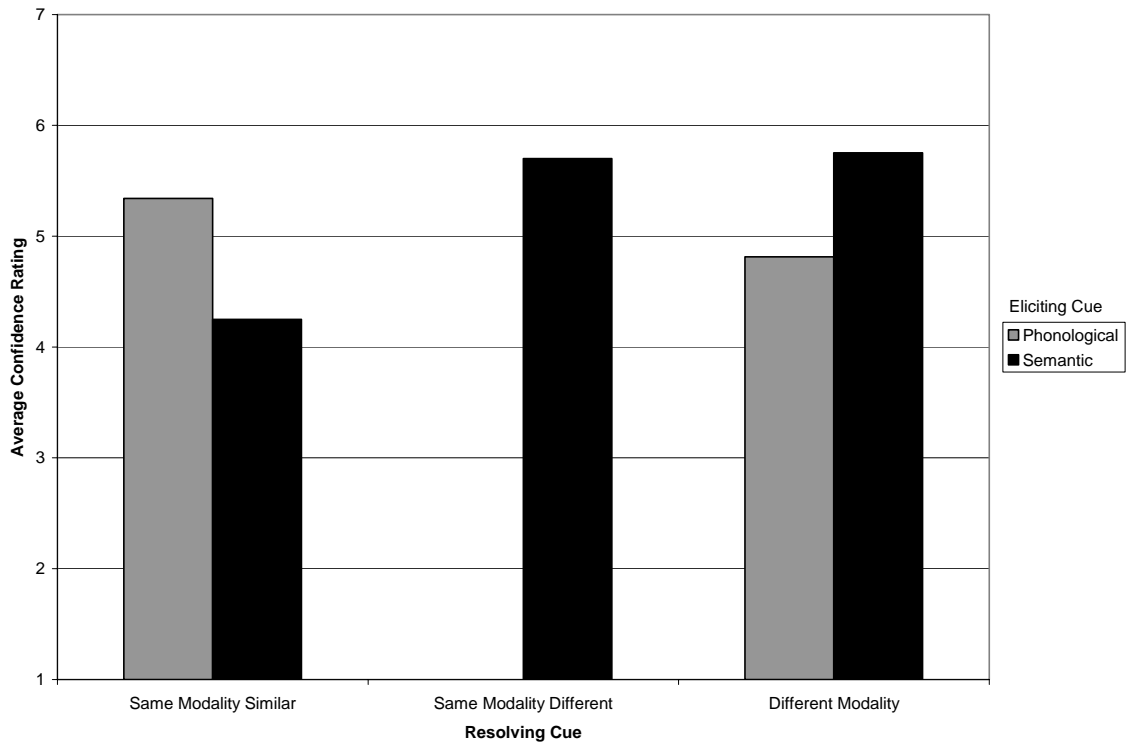




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