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Illusory Tip-of-the-tongue States

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The tip-of-the-tongue state (TOT) is the phenomenological experience that a target word is on the verge of being recalled. An illusory TOT occurs when a person experiences a TOT, but the actual target is either unavailable, forgotten, or never learned. Illusory TOTs were induced by asking participants to answer questions that did not have correct answers. In Experiment 1, an episodic-memory paradigm, participants were shown fictional animals, some of which were accompanied by the animal's name (identified targets) and some of which were not (unidentified targets). Some participants experienced TOTs for unidentified targets. In Experiment 2, a semantic-memory paradigm, participants were asked general-information questions, some of which were questions with no correct answer. Every one of the 31 participants experienced at least one illusory TOT. The characteristics of illusory TOTs are discussed in light of inferential and direct-access views of TOTS.

INTRODUCTION

During a tip-of-the-tongue state (TOT), a person feels that the retrieval of an unrecalled target is imminent (A. Brown, 1991; R. Brown & McNeill, 1966). Numerous methods have been devised to elicit TOTs, starting with Brown and McNeill's classic study. They gave participants definitions of low-frequency words and asked the participants to retrieve the target word (e.g. crepuscular, recalcitrant). If participants could not retrieve the target word, they indicated whether or not they had experienced a TOT. Since that time, numerous other stimuli have been used to induce TOTs, ranging from naturalistic stimuli such as rare-word definitions (Jones & Langford, 1987; Perfect & Hanley, 1992); descriptions of famous people (Brennen, Baguley, Bright, & Bruce, 1990); general-information questions (Finley & Sharp, 1989; Freedman & Landauer, 1966); line drawings of objects (Wellman, 1977); pictures of fictional animals

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(Smith, 1994); and laboratory-based stimuli, such as paired associates (Metcalfe, Schwartz, & Joaquim, 1993; Ryan, Petty, & Wenzlaff, 1982). These studies have looked at various aspects of the TOT such as its causes, the information accessible when in a TOT, what cues are necessary to recover the sought-for memory, and what information blocks retrieval of TOT items (see A. Brown, 1991; Schwartz, 1994; Smith, 1994 for reviews).

TOTS are of interest to researchers who study memory and to researchers who study language. For memory research, TOTs represent cases in which there is a phenomenological experience that an item is, in fact, represented in memory, but an objective failure to retrieve it. For language research, the TOT represents an instance in which a known word cannot be spoken. Both research efforts assume that the target word is in the person's lexicon, but the speaker cannot access it (memory) or speak it (language). Nonetheless, the person is aware that he or she knows the word. Indeed, when we experience a TOT, there arises the subjective certainty that the target is known, combined with the frustrating inaccessibility of the target. Traditionally, memory and language have taken this subjective certainty as the starting point for research, assuming that TOTs are indeed a function of an inaccessible, but available, target. This position will be referred to as the *direct-access view*.

Based on new theory and data accumulating from researchers in metamemory, this assumption that the phenomenological experience of a TOT is always associated with a known target word is being challenged. Recent theory within the domain of metamemory suggests that feelings of knowing may arise from inferential processes (Koriat, 1993; Metcalfe, 1993). Inferential processes mean that judgements are based on heuristic information other than the specific to-be-remembered target. Such heuristics may involve familiarity of the cue (Metcalfe et al., 1993), partial information about the target (Koriat, 1993), or information related to the target (Schwartz & Smith, 1997). This view is commonly known as the *inferential view*.

The direct-access approach postulates that the TOT reflects activation of an unrecalled target. This view contends that the TOT represents slowed retrieval from semantic (or lexical) memory. Because this research assumes that TOTs reflect unrecalled but activated knowledge, the research focus is seldom on the TOT itself, but rather on what the TOT can tell us about word retrieval (e.g. Burke, MacKay, Worthley, & Wade, 1991; Harley & Bown, 1998; Meyer & Bock, 1992; Rastle & Burke, 1996). Thus, Kohn et al. (1987) refer to the TOT as a ''window'' on retrieval.

The ''TOT as window'' approach has generated an important knowledge base concerning the TOT phenomena (see A. Brown, 1991; Smith, 1994 for reviews.) Most of this data support the direct-access approach to TOTs. For example, R. Brown and McNeill (1966) found that participants were able to generate words that sounded similar to the missing target word or meant something similar to the target word. Harley and Bown (1998) found that low-

frequency words were more likely to induce TOTs than high-frequency words. Rastle and Burke (1996) found that phonological priming of the target led to an increase in retrieved targets and a decrease in TOTs, suggesting that the increased phonological activation pushed items that might have been TOTs towards sufficient activation for retrieval. Moreover, older people, known to have difficulties with retrieval, have shown consistently higher TOT rates (e.g. Burke et al., 1991; A. Brown & Nix, 1996; Maylor, 1990; Rastle & Burke, 1996). Finally, the phenomenological experience supports the direct-access view. Subjectively, a TOT feels as if retrieval is about to happen, and it feels as if the state is being caused by the unretrieved target. This research supports such statements as ''A TOT word is in the lexicon of the afflicted person but it is temporarily inaccessible'' (Burke et al., 1991. p.542).

In metacognitive research, the phenomenological experience of the TOT is paramount. From this perspective, a TOT means the *feeling* that a particular word will be recalled. In contrast, some research has used the term TOT to encompass any temporary inaccessibility (e.g. Kohn et al., 1987). Therefore, to metacognition researchers, the etiology of TOTs and why TOTs are accurate at predicting performance is of critical concern. This has led researchers to challenge the notion that TOTs are based on direct access to the target. Indeed, Koriat and Lieblich (1977) suggested that many TOTs may arise because of characteristics of the cue, not the target. This has been further substantiated by research in the 1990s. Metcalfe et al. (1993) found that making the cues more familiar led to more TOTs than did less familiar, but equally memorable, cues in a paired-associated paradigm. Widner, Smith, and Graziano (1996) have shown that TOTs were affected by demand characteristics of the experiment, suggesting inferential processes. Schwartz and Smith (1997) dissociated TOTs with recall performance. Related information boosted the number of TOTs for a particular target without affecting recall or recognition for the target.

If the TOT experience can be dissociated from memory retrieval, it may be that TOTs are derived via different processes than those by which participants retrieve words, thus challenging the ''TOT as window on retrieval'' view. If the inferential view is correct, it should be possible, under some circumstances, to produce illusory TOTs. Illusory TOTs are phenomenological experiences in which the person feels that the target is memorable, but the target memory is either unavailable, forgotten, or, indeed *was never learned* (see Smith, 1994). In this paper, the first documented illusory TOTs are presented.

Illusory TOTs expand on the earlier concept of subjective TOTs (Burke et al., 1991; Jones & Langford, 1987; Perfect & Hanley, 1992). Subjective TOTs refer to TOTs reported by the participants, but not followed by successful memory performance. The target is neither resolved nor recognised, nor is any partial information retrieved. Subjective TOTs may be contrasted with objective TOTs, in which there is evidence of target knowledge. However,

with a subjective TOT it is possible that, under the right retrieval conditions, participants may be able to evidence knowledge of the target. In an illusory TOT no knowledge of the target at all is possible. Therefore, some subjective TOTs, but not all, may be illusory.

Illusory TOTs represent a potentially difficult problem for direct-access approaches to TOTs. In an illusory TOT, there can be no activation and no slowed retrieval because there is no target word to be retrieved. Therefore, documenting illusory TOTs implies that, at least under some circumstances, some TOTs must arise from processes other than activation of the correct target (see Koriat, 1993). The goal of the research presented here is to document illusory TOTs for both episodic and semantic memory.

Finally, it is important to note that the direct-access and inferential approaches to TOTs are not mutually exclusive. It is likely that some TOTs arise from incomplete activation or slowed retrieval, and that others arise from a variety of inferential processes. The relative importance of direct-access and inferential processes in eliciting TOTs is indeed an important topic for future research. In this paper, however, I will demonstrate the existence of illusory TOTs and reiterate the critical importance of considering the inferential view.

EXPERIMENT 1

The goal of Experiment 1 was to document the existence of illusory TOTs, using an episodic-memory paradigm. I chose to employ the experimental paradigm developed by Smith and his colleagues called the TOTimal paradigm (see Smith, 1994). In this paradigm, participants study novel fictional animals (called TOTimals) for a later memory test. Smith, J. Brown, and Balfour (1991) showed that TOTs for TOTimals are phenomenologically similar to naturally occurring TOTs, but occur at particularly high rates. Schwartz and Smith (1997) using the TOTimal paradigm to demonstrate the importance of related information in TOT judgements.

In Experiment 1, participants were presented with the pictures of six TOTimals, complete with biographical information about the animal's diet, size, and habitat. However, the names of the animals accompanied only four of the six animals. Therefore, two animals, complete with biographical information, were presented without telling the participants what the animals were called. These will be referred to as the *unidentified TOTimals*. Those for which names were provided will be referred to as the *identified TOTimals*. Participants were instructed to study all presented information about each animal. Later the pictures of the animals were presented as cues for the retrieval of the animal's name, including the pictures of the unidentified TOTimals. The question, then, was whether participants would experience illusory TOTs for the unidentified TOTimals.

Method

Participants. The participants were 101 Florida International University students who received partial course credit for their participation. They were tested in two large groups during class demonstrations of the TOT phenomena. The testing lasted approximately half an hour.

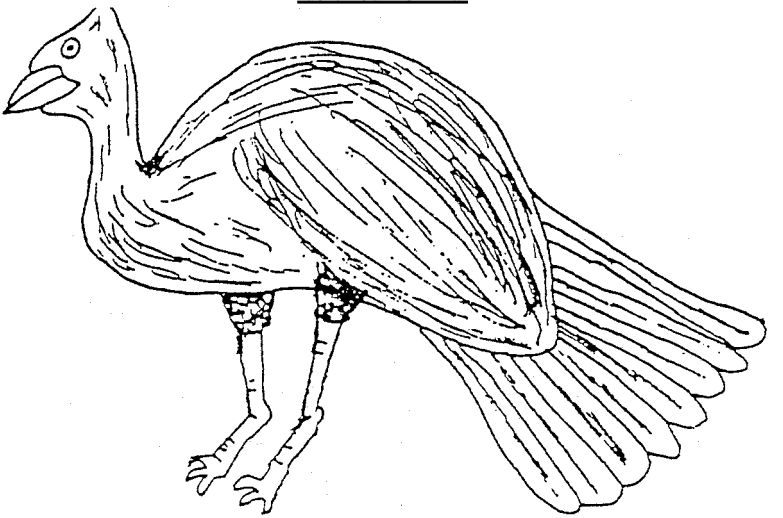
Materials. We used six TOTimals (see Fig. 1). These TOTimals were similar to those used by Schwartz and Smith (1997), Smith et al. (1991), and Smith, Balfour, and J. Brown, (1994). The TOTimal pictures were line drawings that were printed onto transparencies for use in the experiment. These pictures were then paired with a two-syllable name, country (the animal's ''habitat''), size, and diet. The names, pictures, and descriptions were created to resemble real animals in order that the TOTimals could be learned more easily. The first letter of the name of each TOTimal was unique. The descriptions, countries, and diets were unique for each TOTimal. In order to document illusory TOTs, two of the TOTimals were not presented with the name of the animal—the unidentified TOTimals. The two unidentified TOTimals were randomly chosen for each group, provided new TOTimals were selected for the second group.

Procedure. The procedure consisted of three phases: target learning, recall testing/TOT judgements, and recognition testing. Instructions prior to the learning phase directed participants to learn the names of the TOTimals. Participants were explicitly told that they would later receive the pictures as cues to recall the names of animals, their diet, and their size. They were told to still try to remember diet and size for those without names. They were not told at the time of study, however, that they would later make TOT judgements.

Participants were given an initial 10-second presentation of each TOTimal. The experimenter showed the TOTimal on an overhead projector and read the information aloud as the participants read it silently. After participants had viewed each of the six TOTimals, the experimenter presented the TOTimals again, exposing each one for an additional five seconds. Both presentation orders were the same. Thus, participants saw each TOTimal twice for a total of 15 seconds each. A five-minute interval occurred before testing commenced.

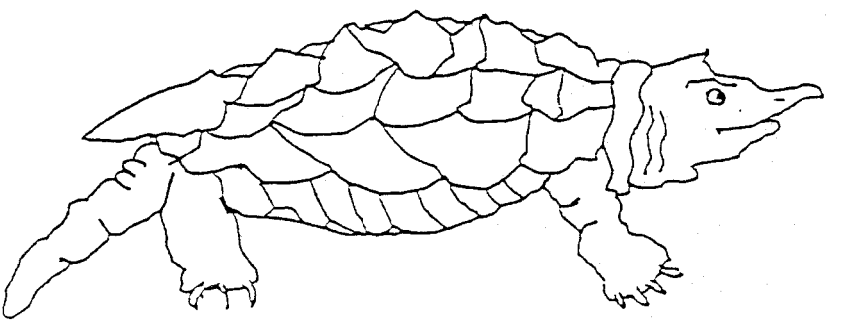
After completion of the study session, the experimenter handed out a written test to the participants. The test had six sets of questions, one for each TOTimal. The picture of the animal was presented on the overhead projector, and the participants were required to write the name of the animal. On the answer sheet, a prompt for a TOT state was included. If participants were unable to recall the correct name, they indicated whether or not they were experiencing a TOT state. The experimenter defined a TOT state in the following manner; ''A tip-of-the-tongue state is a feeling that you can recall the answer. It is the feeling of being on the verge of being able to recall the answer that you cannot now recall''. If

Identified TOTimal



Panama – Yelkey
2′
berries

Unidentified TOTimal



France
6″
moss

FIG 1. Examples of TOTimals used in Experiment 1.

participants could not recall the name of the TOTimal, they were asked to report the first letter of the TOTimal and diet, size, and habitat information. Participants then attempted recall of the next target item. The test phase was self-paced. After all participants had completed the recall/TOT phase, the recognition test was distributed to the participants. A four-alternative forced-choice recognition test was used. Again, participants saw the picture of the TOTimal, and were provided with four potential names for each stimulus. The correct answer was always present, and the other choices were names of other TOTimals. Participants made recognition judgements for all six items, regardless of whether the target had been recalled correctly earlier. Each name appeared once as a correct answer and one or two times as an incorrect distractor. Recognition was not scored for the unidentified TOTimals.

Results

In all analyses in both Experiments 1 and 2 significance was tested at the .05 level, except when noted. Within-subject ANOVAs were conducted with appropriate corrections for sphericity.

Retrieval. Participants recalled 50% of the names of the identified TOTimals. In the recognition test, they were able to recognise 81% of the target names of the identified TOTimals. Not surprisingly, the advantage for recognition was statistically significant, $F(1, 100) = 78.57$, $MS_e = .06$. Because recall equalled 50%, there were approximately the same number of identified and unidentified TOTimals on which to make TOT judgements.

TOT Judgements. Participants were more likely to indicate that they were in a TOT state for an identified TOTimal than for unidentified TOTimal, although this did not reach a level of statistical significance, $F(1,100) = 3.55$, $MS_e = .31$, $P = .06$. On unrecalled identified TOTimals, participants indicated that they were in a TOT for 23% of the identified targets. For unidentified TOTimals, participants indicated that they were experiencing a TOT 16% of the time. Thus, although people were marginally more likely to indicate that they were experiencing a TOT for a real target, on 16% of non-named targets, illusory TOTs occurred (see Table 1).

TOT Accuracy. Participants were more likely to correctly recognise an unrecalled identified TOTimal when they were in a TOT state, than when they were not, $F(1, 30) = 6.31$, $MS_e = 09$. Participants correctly recognised 81% when in a TOT, whereas they recognised 63% when not in one (see Smith et al., 1994 for similar results).

TABLE 1
Percentages of TOTs

	Identified TOTimals	*Unidentified TOTimals*
TOTs	23	16
	Answerable Questions	*Unanswerable Questions*
TOTs at Judgement 1	44	18
TOTs at Judgement 2	34	15

Percentage of TOTs for identified and unidentified TOTimals in Experiment 1. Percentage of TOTs for answerable questions and unanswerable questions at Judgement 1 and Judgement 2 in Experiment 2.

Discussion

In Experiment 1, we found that participants indicated that they were experiencing TOTs for 16% of the unidentified TOTimals. This was slightly less, but not significantly so, than the rate of TOTs for the identified targets. Thus, Experiment 1 indicates that, at least under the present episodic conditions, illusory TOTs do occur. Nonetheless, when the TOTs were directed at real target names, the TOTs were predictive of recognition.

The observed results can be interpreted in a number of ways. First, the illusory TOTs may reflect the demand characteristics of the experimental situation. The participants were given careful and lengthy explanations of what a TOT is and when they should indicate that they were experiencing one. Thus, many participants may have expected to experience one, and may have felt ''obligated'' to experience one. This interpretation cannot be ruled out. However, with similar stimuli, Smith et al. (1991) found much higher TOT rates for TOTimals when all the TOTimals were identified targets. Moreover, participants in this experiment knew that 33% of the pictures did not have names. Therefore, both the results themselves and the knowledge that a third of the stimuli did not have names suggest that demand characteristics may have actually reduced the likelihood that participants indicated TOTs simply because they thought that they were expected to.

A second alternative explanation is that some TOTs may result from a source-monitoring deficit (Johnson, Hashtroudi, & Lindsay, 1993). This explanation suggests that a TOT for an unidentified TOTimal may occur because of activation of a real TOTimal name, but that the name has been associated with the wrong picture stimulus. According to this hypothesis, the participant is confronted with an unidentified stimulus and may either access or infer information about the name of an identified stimulus. Accessing the identified stimulus may trigger the TOT experience.

Both the demand characteristics and the source-monitoring explanation predict the presence of TOT illusions in the current experiments. A third explanation, consistent with Schwartz and Smith (1997), also explains the results. That is, it is possible that participants retrieve related information such as the size, diet, and habitat of the unidentified TOTimal. When participants retrieve a certain level of this information, a TOT is triggered, regardless of whether the participant has any access to the name of the TOTimal. Indeed, Schwartz and Smith (1997) found more TOTs for TOTimals about which more information had been presented. Because equal amounts of information were presented for the unidentified TOTimals and for the identified TOTimals, an equal number of TOTs should occur for the unidentified TOTimals. Indeed, the difference between TOTs for identified and unidentified TOTimals was small. Thus, the inferential view also provides an adequate explanation for the illusory TOTs observed in Experiment 1.

EXPERIMENT 2

In Experiment 1, illusory TOTs occurred for recently learned stimuli. However, most TOTs occur for well learned information that we have known for some time (A. Brown, 1991; Rastle & Burke, 1996). Thus, it is possible that the illusory TOTs observed in Experiment 1 are simply a product of the experimental situation and not representative of TOTs in general (but see Smith, 1994, for a justification of the use of TOTimals). Therefore, in Experiment 2, general-information questions were used to induce TOTs, both real and illusory.

In Experiment 2, we asked participants to answer 100 general-information questions. Of the questions, 80 were taken from the Nelson–Narens norms (Nelson & Narens, 1980) and consisted of question such as ''What is the last name of the man who invented the theory of relativity?'' (Einstein). To this set of 80 questions, 20 questions were added to induce illusory TOTs. These were fictional questions for which there was no answer (see Appendix). For example, one unanswerable question was ''What is the name of the legendary floating island in ancient Greece?''. The questions sounded plausible, and they were made to appear similar to the Nelson–Narens questions.

If TOTs are caused only by direct access to an unactivated target, the unanswerable questions should not induce a TOT because there is no target representation to activate. However, if inferential or other non-direct processes are at work, an occasional illusory TOT may just occur, as indeed they did. Thus, Experiment 2 affords the detection of illusory TOTs in a semantic-memory paradigm to complement the TOTs observed in the episodic-memory paradigm of Experiment 1.

In Experiment 2, a secondary goal was explored as well. Changes in TOTs over repeated retrieval attempts were tracked. In Experiment 2, we repeated the

questions later and if participants could not recall the second time, they were asked to make a second TOT judgement. Thus, we can look at whether the presence of a TOT at first retrieval predicts the likelihood of a TOT at the second retrieval. I know of no experiment that has previously done this.

If inferential processes are at work during the TOT, a previously unasked question arises. What happens to the TOT itself after resolution (i.e. eventual retrieval) does *not* occur? Resolution rates differ depending on the materials and study (A. Brown, 1991), but in all studies, some TOTs remain unresolved. Failure to eventually retrieve may reduce or eliminate the subjective experience that characterises the TOT. Therefore, the question we ask is, if the TOT target is not retrieved, does the subjective experience of the TOT eventually vanish? On the other hand, the bases for TOTs may be constant from one retrieval attempt to another, and TOTs may remain stable over time.

Method

Participants. The participants were 32 Florida International University students who received partial course credit for their participation. Each participant was tested individually on a Macintosh computer during a session that lasted approximately one hour.

Materials. The stimuli for the experiment were 80 general-information questions taken from the Nelson–Narens norms (Nelson & Narens, 1980). These questions will be referred to as the answerable questions. The 20 unanswerable questions were devised by the author (see Appendix). The unanswerable questions were constructed to sound plausible, but did not have any possible answer. They were also constructed to appear similar to the questions from the Nelson–Narens norms. Thus, one answerable question was ''For which country is the rupee the monetary unit?''. The corresponding unanswerable question was ''For which country is the jaque the monetary unit?''. Pilot testing indicated that the 80 answerable questions were neither too easy nor too difficult for the student population (36% correct in the pilot study). During testing, only one participant spontaneously realised that an unanswerable question was unanswerable (the participant was an astronomy student and knew that the planet Mercury has no moons). This participant's results were not included. Several other students reported that they had been puzzled by some of the odd questions, but had not noticed that they were unanswerable. The list of items was randomised for each participant. Each participant responded to each of the 100 questions (80 answerable plus 20 unanswerable).

Procedure. Participants were first given detailed instructions about the procedure. They were told that they would be answering a series of general-information questions, some of which would be easy and some more difficult.

They were given an explanation of what the term ''tip of the tongue'' meant. All participants reported being familiar with the experience and with the term. The instructions were as follows:

> If you do not answer the question correctly or indicate that you do not know, you will be asked whether or not you are in a tip-of-the-tongue state for the target answer. A tip-of-the-tongue state (abbreviated TOT) means that you feel as if it is possible that you could recall the target answer, and that you feel as if its recall is imminent.

This was explained first by the experimenter and then was repeated on the computer just before the experiment began. The experimenter then started the computer program that ran the experiment. The participant had the opportunity to ask for clarification concerning the definition, if it was not clear.

Each question appeared in the middle of the screen, and a prompt appeared beneath the question. The question remained on the screen until the participants typed in their responses. Participants typed in their responses, or they indicated that they did not know by typing in a question mark. If the participant typed in the correct response, they simply moved on to the next question. If they indicated that they did not know (omission error) or answered incorrectly (commission error), they were asked whether or not they were in a TOT. Participants typed in ''Y'' when they were in a TOT and ''N'' when they were not.

After participants had attempted retrieval and made TOT judgements for all 100 questions, they were given more instructions. They were told that they would be asked again whether they could answer the general-information questions. If they could not, they would again be queried about whether or not they were in a TOT. They were also asked to make a feeling-of-knowing judgement for that item. A feeling-of-knowing judgement was defined as a prediction of successful recognition (see Metcalfe, 1993; Nelson, 1988). Participants were told that they would see the correct answer to the question among seven alternatives, and they were to judge on a 0–100 scale whether they would be able to select the correct answer. This second recall/TOT/feeling-of-knowing judgement phase included both the answerable and the unanswerable questions.

Finally, after completing the recall/TOT/feeling-of-knowing judgement phase, participants were given a final recognition test for the answerable questions, but not for the unanswerable ones. They were again shown the question followed by seven alternatives (Wilkinson & Nelson, 1984). Each alternative was accompanied by a number. Participants typed in the number associated with the answer that they thought was correct. They were then presented with the next question. This continued for all the originally missed questions, regardless of whether each had been successfully recalled on the

second recall test. At the end of the session, the participants were thanked for their participation, fully debriefed, and given credit in their Introductory Psychology course.

Results

Recall and Recognition. Correct recall at the first test was 38%. The scores ranged from a minimum of 11% correct to a maximum of 66% correct. Correct recall was computed with a weak criterion for spelling. The computer program was set up to accept many misspellings. However, it could not catch all misspellings (e.g. ''Sixteen'' for ''Sistine''); these odd misspellings were counted as incorrect by the computer, and thus maintained in the set. They were removed post-experimentally by hand.

We also tracked response time in this initial recall phase as a function of whether the response was correct, a commission error, or an omission error. There was an overall main effect of response type, $F(2,60) = 11.41$, $MS_e = 6.13$. Post-hoc tests indicated that this effect was due to long response times for commission errors (11.54 seconds) relative to correct responses (8.98 seconds) and omission error responses (i.e. ''don't know'' responses) (9.08 seconds). The mean number of commission errors was 20.10 per participant, whereas the mean number of omission errors was 29.53 per participant (see Krinsky & Nelson, 1985, for a similar analysis). Overall, recognition of initially unrecalled items was 38%.

TOT Summary. The first TOTs (those given initially) will be considered first. Unlike other studies (e.g. Schwartz & Smith, 1997), we elicited TOT judgements after commission errors as well as omission errors. All analyses conducted on TOTs were conducted originally on the omission and commission errors separately. Differences are noted when they occurred, but for the most part the TOTs for omission and commission errors have been collapsed because there were few differences between them. Overall, TOT rates were high relative to other studies (see A. Brown, 1991; Smith, 1994), at 26 per participant or 37%. TOTs were more likely to be reported after a commission error (65% of all commission errors) than an omission error (33% of all omission errors), $F(1,30) = 50.61$, $MS_e = .03$.

TOTs for Answerable and Unanswerable Questions. As in Experiment 1, the participants experienced TOTs for the unanswerable questions at approximately the same rate as the answerable questions. For the 20 unanswerable questions, participants experienced an average of 3.58 TOTs or 18%. For answerable questions, the TOT rate was higher at 22.4 TOTs or 44% (see Table 1). An ANOVA showed that participants were statistically more likely to experience a TOT for the answerable questions than for the

unanswerable questions, $F(1,30) = 64.34$, $MS_e = .02$. Thus, although TOTs were more likely to occur after answerable questions, illusory TOTs were still experienced for nearly one-fifth of the unanswerable questions.

In Experiment 2, participants were shown the questions again later, given a chance to recall them a second time, and then asked to judge whether or not they were still experiencing a TOT. The second TOT results mirrored the results of the first TOT judgement, although the overall TOT rate went down, $F(1,30) = 17.33$, $MS_e = 01$. Participants made 16.8 (or 34%) TOTs on answerable questions and 3.0 (or 15%) on unanswerable questions. Overall, this represents a decrease in the TOT rates from Judgement 1 to Judgement 2 for the unanswerable questions, $F(1,30) = 16.19$, $MS_e = .01$ (see Table 1).

Accuracy of TOTs for Answerable Questions. TOTs are predictions of recall. Therefore, the purest way of measuring the accuracy of TOT is to compare resolution rates of TOTs and n-TOTs (questions for which neither correct recall nor a TOT occurred). Resolution refers to the likelihood that a TOT experience is followed by subsequent recall of the target word. Resolution here was measured by looking at the likelihood of recalling the target on the second recall test. Resolution was only slightly higher following a TOT (12%) than following a n-TOT (9%), but the difference was statistically significant, $F(1,28) - 7.28$, $MS_e = .003$. Resolution was also more likely to occur after a commission error (18%) than after an omission error (4%), $F(1,28) = 32.9$, $MS_e = .02$. The two factors did not interact ($F < 1$).

The final recognition test can also be used as a measure of accuracy. If TOTs are accurate predictors of memory storage, recognition should be higher following a TOT than a n-TOT. Indeed, this was observed in the current experiment, $F(1,30) = 149.17$, $MS_e = .02$. Recognition of unrecalled items was 40% following a TOT, but only 11% following a n-TOT. This pattern was found when either the first TOTs or the second TOTs were used to predict recognition. A parallel method of examining accuracy of the TOTs is to look at the gamma correlation between the TOTs and the likelihood of subsequent recognition (see Nelson, 1984) for a justification of the gamma correlation). The first TOT judgements showed a .65 gamma correlation with recognition; the second TOT judgements showed a .67 correlation with recognition. Both gamma correlations were significantly higher than chance.

Consistency of TOTs From First to Second Judgement. Participants made two TOT judgements, which will be referred to as Judgement 1 and Judgement 2, respectively, in this section. The question that was addressed here was whether participants would experience TOTs for the same items on Judgement 2 as they did on Judgement 1. The likelihood of a TOT at Judgement 2 was measured for items that were TOTs at Judgement 1 and items that were n-TOTs at Judgement 1 (see Table 2). There are three possibilities for an item assigned a

TABLE 2
Phenomenological Status

	Resolved	*TOTs*	*n-TOTs*
Answerable Questions			
TOTs at Judgement 1	12%	52	36
n-TOTs at Judgement 1	9	7	84
Unanswerable Questions			
TOTs at Judgement 1	—	50	50
n-TOTs at Judgement 1	—	8	92

Phenomenological status at the time of Judgement 2 for questions that were originally assigned either a TOT (tip-of-the-tongue state) or n-TOT (not in a tip-of-the-tongue state). Resolved means that target was successfully recalled at judgement 2.

TOT at Judgement 1. At Judgement 2, the item can be resolved (recalled), the item can be assigned a TOT again, or it can be assigned a n-TOT (a TOT was not experienced). For those items given a TOT initially, 12% were resolved, and participants did not make TOT judgements at Judgement 2. For those items given a TOT initially, 52% remained in the TOT state at Judgement 2. For those items given n-TOTs at Judgement 1, 9% were resolved, and only 7% were given TOT judgements (see Table 2). For the unanswerable questions, TOTs at Judgement 1 were followed by a TOT 8% of the time. These values did not differ from those observed with the TOTs for answerable items (Fs < 1). Therefore, illusory TOTs are both observable and stable in semantic memory. The uneven fluctuation—more items fluctuating out of the TOT state than into the TOT state—may account for the fact that the overall TOT rate decreased from Judgement 1 to Judgement 2.

Consistency of the TOT state also predicted final recognition performance for the answerable questions, $F(3, 75) = 19.49$, $MS_e = .03$. Recognition was highest following a TOT at both Judgement 1 and Judgement 2 (.50). Recognition was lowest when a TOT was never assigned (.12). When a TOT occurred at Judgement 1, but not Judgement 2 (.25) and when a TOT occurred at Judgement 2, but not Judgement 1 (.37), recognition was intermediate.

Feeling-of-knowing Judgements. The mean feeling-of-knowing judgement was 35% for the answerable questions and 16% for the unanswerable questions. The feeling-of-knowing judgements were a prediction of recognition and were therefore well calibrated, as the recognition of unrecalled items was .38. The gamma correlation between the feeling-of-knowing judgements and recognition was .35, typical for feeling-of-knowing judgements in this paradigm (see Nelson, 1988). This correlation was significantly different from zero. Feeling-of-knowing judgements were also significantly correlated with TOTs at

Judgement 1 (gamma = .18) and at Judgement 2 (gamma = .25). Although TOTs and feeling-of-knowing judgements were positively correlated, the magnitude of the correlation was far from 1. This rules out explanations of the TOT that equate it with feeling of knowing (e.g. Miner & Reder, 1994).

Discussion

Two major findings emerge from Experiment 2. First, illusory TOTs occur for semantic-memory stimuli. Thus, illusory TOTs occur in both episodic and semantic memory. Second, although TOTs tend to be stable over time (50% of original TOTs remained TOTs at the time of the second judgement), there was a moderate degree of fluctuation, with many TOTs becoming n-TOTs (36%), but only some n-TOTs becoming TOTs (7%). This fluctuation was predictive of recognition performance. Stable TOTs were followed by better recognition performance.

As in Experiment 1, illusory TOTs are explicable in several different ways. First, illusory TOTs may result from demand characteristics (Widner et al., 1996). The participants may wish to avoid appearing uneducated, and indicate that they do know an answer that in fact they do not. Second, illusory TOTs may occur because of the activation of a wrong answer. Indeed, several of the unanswerable questions led to characteristic commission errors. For example, for the unanswerable question ''What is the name of the African religion founded by Obi Haalagi?'', several participants answered ''Rastafarianism'' for the Jamaican religion with African roots. This is consistent with the hypothesis that illusory TOTs may arise from direct access to a target followed by a failure to attribute the memory to the appropriate source. Third, illusory TOTs may occur because participants retrieve information related to the question or to a presumed answer. In the previous example, because participants may recall the practices of a particular religion, and perhaps form mental images of famous believers, they may non-consciously infer that they know the particular religion.

A second goal of this experiment was to explore the nature of the subjective experience of the TOT. Specifically, the interest was whether TOTs remain stable over time. This is the first study to do so, and therefore, the results here cannot be evaluated comparatively. Nor can inferential statistics be appropriately used on the data. Nonetheless, we found a high degree of stability from Judgement 1 to Judgement 2 (50%) for TOTs. There was a very low likelihood of an item originally not in a TOT fluctuating into a TOT (7%). Stability in the TOT state was also associated with successful recognition for the answerable questions.

It is premature to offer explanations concerning the relative stability and fluctuation of TOTs. One tentative and admittedly post-hoc hypothesis will be introduced here. TOTs are highly memorable experiences (Gardiner, Craik, & Bleasdale, 1973). Therefore, participants are likely to re-experience the TOT

partially because they remember being in that state earlier. However, participants' decision at Judgement 2 may also be influenced by the realisation that they were in a TOT earlier but have been unable to resolve the TOT. This may result in a fluctuation out of a TOT, as happened on 36% of the original TOTs.

GENERAL DISCUSSION

The results of these experiments demonstrate that some, but clearly not all, TOT experiences may be illusory. In each of the experiments, questions were asked concerning target answers that the participant did not and could not know because there was, in fact, no answer to the question. Yet participants experienced TOTs on over 15% of these unanswerable questions. The basic finding emerged in episodic memory in Experiment 1 and in semantic memory in Experiment 2.

The existence of illusory TOTs is explicable according to the inferential theory of TOTs. According to the inferential view, people infer that they are in a TOT based on information other than the specific unrecalled target. Non-target information may include the familiarity of the cue or question (Koriat & Lieblich, 1977; Metcalfe et al., 1993), retrieved information related to the target or question (Koriat, 1993; Schwartz & Smith, 1997), or even demand characteristics of the situation (Widner et al., 1996). Although the participant cannot possibly know the answer to the unanswerable questions, the cue or question may be sufficiently familiar, or enough related information may be retrieved, to induce a TOT, which the outside observer knows to be illusory. Illusory TOTs may also occur naturally for real questions when the rememberer has sufficient inferential information to induce a TOT when he or she does not know the target.

It is important to note that the data here are interpretable within a modified direct-access view of TOTs. Direct-access views argue that the TOT experience results from the activation but failure to retrieve a target word. However, it is not necessary for the activated but unretrieved word to be the correct answer (see Koriat, 1993). Therefore, it is possible that on the unanswerable questions, participants were experiencing a TOT because a related word had been activated and was driving the TOT. In this view, illusory TOTs are not the product of misguided inference, but rather a failure in source monitoring (e.g. Johnson et al., 1993). This explanation is similar to the traditional blocking view of TOTs, in which the cue elicits a similar but incorrect target. The incorrect target interferes with correct retrieval and induces a TOT (Jones & Langford, 1987; Meyer & Bock, 1992; Perfect & Hanley, 1992).

There is a greater implication of the current data in how TOTs should be interpreted. Regardless of whether an inferential account or direct-access view is

assumed, TOTs can be dissociated from the process of target retrieval. This finding suggests the use of caution when one is using the TOT paradigm to study the retrieval process. Some research has distinguished between subjective and objective TOTs (Jones & Langford, 1987; Perfect & Hanley, 1992) and other researchers have carefully excluded TOTs for words that are not the correct target of the presented definitions (e.g. Koriat & Lieblich, 1974; Rastle & Burke, 1996; see A. Brown, 1991, p.207), but this is not the norm. Because TOTs may sometimes arise through inferential processes or through failures of source monitoring, the TOT may not always indicate target knowledge.

Furthermore, the term TOT has been used by researchers in two distinctly different ways. Some researchers have equated the term TOT with a particular retrieval state—temporary inaccessibility (e.g. Kohn et al., 1987). However, temporary inaccessibility may occur without an accompanying TOT (e.g. Tulving & Pearlstone, 1966). In the current paper, TOTs refer to the rememberer's experience; that is, a feeling that an item can be retrieved. The data presented here support the second usage. In these experiments, participants experienced TOTs for targets they did not know. The participants experienced a feeling of TOT even though the target was not available to them.

A second implication of dissociations between TOTs and the process of target retrieval is the emphasis on the subjective or phenomenological experience involved in each TOT. The dissociation suggests that the processes that cause TOT experience need to be studied so that we can disentangle the processes of retrieval from the processes that produce phenomenological experience and consciousness. Surprisingly, despite widespread acknowledgement of the uniqueness of TOT phenomenology, there has not been much research directed towards that phenomenology.

This study represents a preliminary attempt to investigate the phenomenology of the TOT experience. In most previous work, TOTs have been used to investigate retrieval, or, when the TOT is of interest in and of itself, the emphasis has been on its etiology and its accuracy. However, consistent with a growing interest in phenomenology and consciousness in cognitive psychology (i.e. Wheeler, Stuss, & Tulving, 1997), this study examined whether TOTs fluctuate from one retrieval attempt to another. Indeed, they do. When the questions were repeated, many of the items that were originally TOTs no longer were, and some that were originally n-TOTs became TOTs. Moreover, this fluctuation was predictive of accuracy. Stable TOTs across time correlated with high recognition performance.

This finding raises several phenomenological questions. For example, are all TOTs alike, or are some stronger and more likely to remain stable? In this study, a high degree of stability was observed but with some fluctuation. Another question is whether TOTs differ for episodic-and semantic-memory materials. In this study, it was found that illusory TOTs were observed for both episodic-and semantic-memory stimuli. However, are there experiential dimensions along

which episodic-and semantic-memory TOTs differ, or are all TOTs cut from the same cloth? These questions remain unanswered.

Tulving (1989) issued a warning about dangers of the *doctrine of concordance*. He argued that memory researchers have ignored the issue of phenomenological experience because of a tacit endorsement that behaviour, cognition, and conscious experience are perfectly correlated. For example, behaviour may be influenced by implicit memory, but we need not be consciously aware of the processes that drive implicit memory. Similarly, a conscious feeling of ''pastness' may, in fact, result from fluent processing of stimuli. Indeed, there has been a surge of interest in illusions in memory (Jacoby, Kelley, & Dywan, 1989; see Roediger, 1996). The current data are also inconsistent with the doctrine of concordance. Illusory TOTs demonstrate that the process that elicits the phenomenological experience associated with reported TOTs is not perfectly correlated with the process of retrieval.

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APPENDIX 1

1. What is the capital of Karakistan?
2. What is the capital of Lagaria?
3. What is the capital of Bormea?
4. Of which country is Minervia the capital?
5. For which country is the jaque the monetary unit?
6. What is the name of the only kind of sea turtle that lays its eggs under water?
7. What is the name of the planet Mercury's moon?
8. What is the last name of the composer who wrote the opera L'Eglise Blanche?
9. What is the last name of the only woman to sign the Declaration of Independence?
10. What is the last name of the Nobel-winning scientist who discovered the element tryinium?
11. What is the last name of the Canadian author who wrote the novel The Last Bucket?
12. What is the name of the African religion founded by Obi Haalagi?
13. What is the name of the legendary floating island in ancient Greece?
14. In which major European city is Glandine Airport located?
15. What is the name of the only kind of living reptile that flies?
16. What is the last name of the basketball player who hit the three-point shot in overtime to win the championship in 1993?
17. What is the unit of measurement that refers to the weight of 2 cubic feet of iron?
18. What is the name of the heroic innkeeper in the movie Seems like Old Times Again?
19. What is the last name of the astronomer who discovered the Great Crater on Jupiter?
20. What is the name of the only type of cat native to Australia?