

ما وراء طرف اللسان: دراسة نفس-
لغوية لفشل الاسترجاع المعجمي
تحت الضغط الانفعالي والمعرفي
Beyond the Tip of the Tongue: A
Psycholinguistic Study of Lexical
Retrieval Failure under Emotional
and Cognitive Load

إعداد

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الخلاصة

يصف مصطلح «حالة طرف اللسان»، أو «TOT»، الموقف الشائع الذي ننسى فيه كلمة ما بشكل مؤقت. وقد تناولت غالبية الدراسات السابقة ظاهرة TOT في بيئات مخبرية هادئة وخاضعة للسيطرة. من ناحية أخرى، غالبًا ما نضطر في مواقف الحياة اليومية إلى تعدد المهام أو التحدث تحت الضغط. ورغم أن TOT قد دُرست بشكل واسع في الظروف المحايدة، إلا أن القليل من الأبحاث تناولت كيفية تأثير العوامل الواقعية مثل الضغط العاطفي والحمل الذهني العالي عليها. لذلك، تهدف هذه الدراسة الحالية إلى التحقق مما إذا كان التوتر والضغط المعرفي يعيقان عملية استرجاع الكلمات. وللإجابة على هذا السؤال، استخدمنا تصميمًا تجريبيًا من نوع 2x2 لفحص متغيرين في الوقت نفسه. أولاً: الضغط الذهني. وكان له مستويان: مهمة سهلة ومهمة صعبة. ثانيًا: الضغط العاطفي. وكان له أيضًا مستويان للمزاج: هادئ ومتوتر ومن خلال الجمع بين هذين المتغيرين، حصلنا على أربع حالات خاضها كل مشارك: مهمة سهلة مع مزاج هادئ، ومهمة صعبة مع مزاج هادئ، ومهمة سهلة مع مزاج متوتر، ومهمة صعبة مع مزاج متوتر. شارك في الدراسة ستون طالبًا جامعيًا يتحدثون العربية. وقد أنجز جميعهم مهام تسمية الصور ومهام اتخاذ القرار اللغوي في ظل كل الحالات الأربع. وراقبنا ثلاثة نتائج رئيسية: عدد مرات حدوث حالات TOT، وزمن الاستجابة، ودقة استرجاع الكلمات. وأظهرت النتائج ثلاث نقاط مهمة. أولاً، أدت المهمة الصعبة وحدها إلى زيادة حالات TOT وبطء في الاستجابة. كما أن وجود الحالة المزاجية المتوترة وحدها أدى أيضًا إلى المزيد من الأخطاء وحالات TOT. وأخيرًا، والأهم من ذلك، كان أسوأ أداء عندما واجه المشاركون مهمة صعبة وحالة مزاجية متوترة في الوقت نفسه. وقد تم تفسير هذه النتائج في ضوء نموذج ليفلت لإنتاج الكلام لعام ١٩٨٩. وتشير النتائج إلى أن مرحلة استرجاع الكلمات ليست مستقلة، بل تتأثر بشكل كبير بكل من



الجهد الذهني والضغط العاطفي. وتبين هذه الدراسة أن استرجاع الكلمات لا يعتمد فقط على الكفاءة اللغوية، بل يتأثر أيضًا بحالتنا العاطفية والمعرفية. ويمكن أن تكون هذه النتائج مفيدة للمعلمين وعلماء النفس وغيرهم من المهنيين الذين يعملون في بيئات عالية الضغط.

الكلمات المفتاحية: ظاهرة طرف اللسان، إيجاد الكلمات، الضغط العقلي، التوتر العاطفي، زمن الاستجابة

Abstract

The term «tip-of-the-tongue state,» or «TOT,» describes the common circumstance in which we momentarily forget a word. The majority of previous studies examined TOT in controlled, quiet laboratory environments. On the other hand, we frequently have to multitask or speak under pressure in everyday situations. While TOT has been extensively studied in neutral settings, little research has been done on how real-life factors like emotional stress and high mental demand affect it. Therefore, the current study investigates whether word retrieval is hampered by stress and cognitive pressure. We used a 2x2 experimental design to investigate two variables at once in order to answer this question. This study examines the influences of emotional and cognitive stress on TOT case . There were two mood levels: calm and stressed. We created four conditions for each participant by combining these variables: an easy task while calm, a difficult task while calm, an easy task while stressed, and a difficult task while stressed. The study included sixty university students who



spoke Arabic. Under each of the four conditions, they all finished word-decision and picture-naming tasks. The frequency of TOT experiences, response times, and word retrieval accuracy were the three primary outcomes that we monitored. Three important points emerged from the findings. First, completing a challenging task on its own resulted in more TOTs and slower responses. Furthermore, just being in a stressful emotional state led to more mistakes and TOTs. Finally and most crucially, participants who had a demanding task and an upsetting emotional state performed the least well when they were required to perform the task and simultaneously to deal with the emotional state. The results are explained in the context of Levelt's Model of Speech Production (1989). The results indicate that word retrieval is greatly affected by mental toil and emotional stress and are not independent of them. This study reveals that apart from language competence, word retrieval is also affected by our emotional and cognitive state. Teachers, psychologists, and other professionals who work in high-pressure settings may find these results helpful.

Keywords: Tip-of-the-Tongue, Word Finding, Mental Pressure, Emotional Stress, Reaction Time.



List of Abbreviations

Abbreviation	Full Form
ANOVA	Analysis of Variance
TOT	Tip-of-the-Tongue
BOSS	Birmingham Object Stimulus Set
DMC	Bank of Standardized Stimuli Set
C	Condition.
C1	Control condition with low cognitive and low emotional load
C2	High cognitive load only.
C3	High emotional load only.
C4	Dual high cognitive and emotional load.
IAPS	International Affective Picture System.
H1	Hypothesis No.1
H2	Hypothesis No.3
H3	Hypothesis No.3
SD	Standard Deviation
M	Mean
MS	Milliseconds.



1. Introduction

Speaking is one of the most fundamental human abilities. Finding the appropriate words to convey our thoughts is a daily challenge. Although speech production is typically automatic, individuals occasionally experience moments when they know the intended word but cannot retrieve it. According to Brown and McNeill (1966), this is known as the Tip-of-the-Tongue, or TOT, phenomenon. The feeling of knowing a word while momentarily unable to retrieve it is known as the TOT state (Schwartz & Metcalfe, 2011). People frequently recall portions of words during a TOT, such as the initial letter or the number of syllables, but they are unable to pronounce the entire word (Vitevitch & Sommers, 2003). The majority of earlier studies on tip of the tongue were conducted in quiet laboratory environments (Gollan & Brown, 2006). This experience is common for all age groups and languages, and its frequency increases with age (Burke et al., 1991). While they were at ease, participants were asked to define words or name pictures.

However, individuals rarely converse in such casual settings in daily life. For instance, people give presentations under pressure, doctors speak during emergencies, and students sit for exams. In these circumstances they experience two main sources of pressure: Emotional stress, in the form of emotional load (emotions that create stress or anxiety) (Eysenck et al., 2007); and Cognitive load (the condition of having multiple tasks competing with one another for our cognitive abilities) (Sweller, 1988). Very few studies have examined these two pressures simultaneously and investigated in the same experimental design how they



impact word retrieval.

1.2 Statement of the Problem

Although the tip of the tongue (TOT) phenomenon, which has been studied for decades, has largely neglected attention to the effects of context. The relationship between mental activity, emotional stress, and tip of the tongue occurrence remains insufficiently investigated. According to the Model of Speech Production (1989) by Levelt a key process in speech production is the retrieval of words from the lexicon.

Although there is concern about cognition and emotions, this is not the usual emphasis with respect to the linguistic mechanisms. Thus, the two primary research questions this study focuses on are: Does negative emotion and/or high cognitive load contribute to lexical retrieval failures and does this interaction exist? The answer to this question will inform of what causes word finding difficulty whether solely linguistics or emotional and mental state. Based on literature review, certain gaps were identified. First, most tip of the tongue (TOT) studies have been done in an environment of low pressure and neutrality. Furthermore, the majority of research on cognitive load has only looked at one kind of load at a time.

1.3 Research Questions

This study attempts to answer the following :

1. Compared to low cognitive load, does high cognitive load result in more tip of the tongue states, slower reaction times, and lower accuracy?
2. Compared to neutral emotion, does negative emotional load



result in more tip of the tongue states, slower reaction times, and lower accuracy?

3. Does lexical retrieval performance interact with emotional and cognitive load?

1.4 Objectives of the Study

This study's primary goal is to examine how emotional and cognitive load affect lexical retrieval failure—more especially, the tip of the tongue phenomenon—among university students who speak Arabic. Lastly, no previous study has used a 2x2 design to examine how cognitive load and emotional load interact with tip of the tongue in Arabic speakers. Therefore, filling this gap is the goal of the current study. The purpose of this study was to evaluate the impact of emotional and cognitive load on lexical retrieval in adult native Arabic speakers.

1.5 Hypotheses

The study hypothesizes the following:

1. High cognitive load will lead to more tip of the tongues, longer reaction times, and lower accuracy compared to low cognitive load.
2. High emotional load will lead to more tip of the tongue s, longer reaction times, and lower accuracy compared to low emotional load.
3. There will be a significant interaction effect. The dual pressure condition C4 will produce the poorest performance.



1.6 Significance of the Study

There are three reasons why this study is significant.

By demonstrating that the lexical retrieval stage is not just linguistic, it theoretically contributes Levelt's Model of speech production by testing it in a previously unexplored context of combined emotional and cognitive stress. Emotional and executive factors also have an impact. Teachers, psychologists, and clinicians can all benefit practically from the findings. Teaching strategies, clinical evaluations, and communication training can all be enhanced by an understanding of how stress impacts word-finding. Speaking under pressure is a social requirement for many jobs. The results can improve communication management for those in high-stress occupations.

1.7 Scope of the Study

Only sixty native Arabic-speaking university students from Thi-Qar's College of Education and Department of English are included in this study. Only picture-naming and lexical decision tasks are used in the study. A dual-task paradigm manipulates cognitive load, while autobiographical recall and negative images create emotional load. This study excludes other age groups and load types. Clinical populations and older adults should be included in future studies. The use of lab-induced emotion, which may be different from stress in real life, is another drawback. More realistic stressors could be used in future research. The sample is limited generalizability stems from the fact that it only included university students from one Iraqi institution. Different populations and age groups should be included in future studies.



1.8 Definition of Key Terms

1. Tip-of-the-Tongue, TOT: the condition of knowing a word but being momentarily unable to recall it (Carroll, 2008).
2. Cognitive Load : is defined as the amount of cognitive capacity used while performing a given task. There are fewer mental resources available for other functions, like lexical retrieval, when cognitive load is high (Sweller, 1988).
3. Emotional Load: According to Eysenck et al. (2007), emotional load is the mental strain brought on by stress and anxiety that interferes with task-related processing and can affect performance.
4. Lexical Retrieval: During speech production, a word is chosen and retrieved from the mental lexicon (Dell, 1986).

2. A Review of Related Literature

2.1 The Tip-of-the-Tongue, TOT, Phenomenon

One of the most researched phenomena in psycholinguistics is the tip-of-the-tongue state. Brown and McNeill conducted the first scientific investigation of it in 1966. This phenomenon describes the feeling that one knows the answer but is unable to articulate it. It is a discernible transient difficulty with lexical access or an inability to recall a word or someone's name from memory. The word takes a noticeable amount of time (sometimes weeks) to emerge, which is an extreme form of a pause. This kind of memory retrieval is known as a Tip-of-the-Tongue (TOT) state. Participants heard definitions of uncommon words in their famous experiment. They felt they were «on the tip of the tongue» even though they occasionally couldn't remember the



word. Brown and McNeill discovered that during a TOT, people frequently remember only a portion of the word, including its initial letter, its syllable count, and similar-sounding words. Tip of the tongue is regarded as a metacognitive experience. This indicates that the speaker is conscious of the knowledge gap (McNeill and Brown .1966).

According to Schwartz and Metcalfe (2011), TOTs are not random. Rather, they show that while the full phonological form of the word has not yet been accessed, a portion of the lexical system has already been activated. People who are having a TOT frequently feel very close to retrieving the word, which is explained by this partial activation. The two main theoretical explanations for TOTs are as follows. According to the Direct-Access View, TOTs are caused by a poor memory representation of the word, which takes more time and effort to fully retrieve (Meyer & Bock, 1992). TOTs are attributed by the Incomplete Activation View to a weak correlation between the phonological form and meaning of a word (Burke et al., 1991). This theory, known as the Transmission Deficit Model, explains why older adults experience TOTs more frequently because language-related brain connections deteriorate with age. Parallel results have been documented in TOT studies carried out in Arabic and other languages. The target word's phonological form is difficult for speakers to recall, but they can typically retrieve its syntactic and semantic information (Gollan & Acenas, 2004). The idea that the TOT state is a universal feature of language production is supported by this body of evidence.



2.2 Cognitive Load and Language Performance

Cognitive load (Sweller, 1988) is the amount of mental capacity that is allocated to working memory. People's available cognitive resources are divided between the two tasks they are working on at the same time. Dual-task paradigm is a technique that is commonly used to measure cognitive load. Earlier research reveals that greater load on the cognitive system leads to poorer processing of language. For instance, a speaker is more likely to err and to stumble during a speech when he or she has to repeat a longer number to recall it during the speech (Kellogg, 2001). It is difficult to select the appropriate (default) word among possible alternatives when using lexical retrieval (Sommers & Danielson, 1999).

This is because lexical selection relies on executive control and this is limited. More explanation of this effect can be found on Attentional Control Theory (Eysenck et al., 2007). The theory states that when a person is cognitively engaged, the brain's suppression of irrelevant information diminishes as well. Therefore, the person's ability to retrieve words becomes comprised, resulting in slower and less accurate word retrieval. To date, little research has looked at the effect of cognitive load on TOT frequency. This is a gap which is being addressed by the present study.

2.3 Emotional Load, Stress, and Word-Finding

Emotions have a big influence on cognitive functioning. Negative emotional experiences such as stress and anxiety (Ashcraft & Kirk, 2001) are associated with a reduction in working memory capacity. Anxiety shifts attention from task demands to threat



perception, consuming executive resources . The term «worry» refers to this process, which consumes executive resources. Emotion can impede fluency in the language domain. According to research, people who are under social stress speak more slowly and make more mistakes (Bodie, 2010). Regarding lexical access, some research indicates that low mood increases TOT experiences because retrieval mechanisms are less effective (Phillips et al., 2002). Other studies, however, have not found any noteworthy effects, suggesting that the results in this field are still mixed. People usually experience both cognitive and emotional load at the same time in real-world situations like exams or job interviews Acute stress has been shown to specifically impair access to words stored in the mental lexicon in addition to causing general negative affect. The hypothalamic-pituitary-adrenal axis releases cortisol under stressful conditions, which affects prefrontal cortical regions that control inhibition and executive control (Lupien et al., 2007). Stress may directly cause an increase in retrieval breakdowns because retrieving words heavily depends on these executive functions to select the intended word and block competing alternatives.

Research showing that people under social-evaluative stress reported much more tip-of-the-tongue experiences and slower retrieval times than those in a control condition provides evidence for this (Schwabe et al., 2008). Similarly, Buchanan et al. (2006) found that in a picture-naming task, individuals with higher levels of self-reported test anxiety generated more semantic substitutions and TOTs. When considered collectively, these findings suggest that stress influences not only speech rate but also the controlled stage of lexical retrieval, increasing



the probability of TOT states.

2.4 Interaction between Cognitive and Emotional Load

Emotional and cognitive load are linked in the Dual-Competition Model (Pessoa, 2009). According to this model, the prefrontal cortex's limited resources are used for both emotional and cognitive functions. Thus, the performance decreases more if both loads are increased simultaneously than if only one load is increased. This indicates that people who are under a lot of emotional and cognitive stress have the hardest time retrieving words when speaking. There is indirect evidence of this in the literature on test anxiety –

when students are really under pressure, they report more tip-of-the-tongue and more frequent blocks of memory (Eysenck & Calvo, 1992). But the relationship between cognitive and emotional load and TOT states of the Arabic speaking has not yet been investigated directly.

While previous studies have looked at emotional and cognitive load independently, little is known about how they interact to affect word retrieval. Theoretical explanations suggest that these two types of demand may not just add up. According to the Dual-Mechanisms of Control (DMC) model, executive resources are utilized to regulate emotional responses as well as to handle task demands (Braver, 2012). When both cognitive and emotional demands are high, retrieval problems should also arise because fewer executive resources are available to deal with other processes such as lexical selection and suppression of irrelevant alternatives. There is evidence from research using a combination of stress and work that supports this theory.



For instance, Qin et al. (2009) demonstrated that, in comparison to conditions with only one type of load, participants who completed a working memory task while processing threat-related information showed greater accuracy drops and longer reaction times. Dolcos and McCarthy (2006) discovered that emotionally distracting images caused more disruption to verbal working memory performance than neutral images in language research, indicating that emotional load competes for the same executive capacity used in language. The current study forecasts that TOT frequency will be highest in the High Cognitive load x High Emotional load condition based on this literature, and that the combined effect will outweigh the effects of each load separately. This is the justification for the current study's 2x2 design.

2.5 Working Memory and Lexical Retrieval

Language production requires working memory. The phonological loop temporarily stores speech sounds while the central executive regulates attention, according to Baddeley's Model of Working Memory (2003). The speaker must keep the word's meaning in mind while looking for its phonological form during lexical retrieval. Retrieval becomes less precise and slower when working memory is overloaded. This is due to the central executive's diminished ability to keep an eye on things and choose the right word (Engle, 2002). Research on dual-task performance reveals that participants generate more TOTs and longer reaction times when naming pictures while retaining numbers in memory (Ferreira & Pashler, 2002). The notion that lexical access is not automatic is supported by this. Executive



resources are needed.

When retrieving words, working memory is essential for preserving and modifying information. In particular, it is believed that the phonological loop component helps direct the search process and lessens the possibility of a TOT state by momentarily storing partial phonological information when a word cannot be fully accessed (Baddeley, 2003). Speakers have fewer resources to keep candidate words active and check for errors when working memory capacity is diminished, either due to individual differences or a secondary task. Retrieval becomes less effective as a result, and failures rise. Studies demonstrating that people with shorter working memory spans have more tip-of-the-tongue episodes during verbal fluency and picture naming tasks than people with longer spans have corroborated this relationship (Geller et al., 1998).

Working memory plays a central role in maintaining and manipulating information during word retrieval. Specifically, the phonological loop component is thought to temporarily hold partial phonological information when a word cannot be fully accessed, which helps guide the search process and reduces the likelihood of a TOT state (Baddeley, 2003). When working memory capacity is reduced, either by a secondary task or by individual differences, speakers have fewer resources to keep candidate words active and to monitor for errors. As a result, retrieval becomes less efficient and failures increase. This relationship has been supported by studies showing that individuals with lower working memory spans experience more tip-of-the-tongue episodes during picture naming and verbal fluency tasks compared to those with higher spans (Geller et



al., 1998). Working memory can therefore be thought of as a supporting system that maintains lexical access under stressful circumstances.

2.6 Age, Bilingualism, and Individual Differences in TOT

Individual differences exist in the frequency of tip-of-the-tongue experiences. According to Burke et al. (1991), TOTs are more common in older adults than in younger adults. The Transmission Deficit Model explains this age difference as a result of the language system's connections becoming weaker over time, which makes it harder to fully activate a word's phonological form.

Another factor is linguistic background. Bilinguals encounter more TOTs than monolinguals, especially when speaking in their non-dominant language, according to research by Gollan and Acenas (2004). The «weaker links hypothesis» explains this pattern: bilinguals split their language use between two systems, which weakens the relations between sound and meaning in each language.

Other personal traits are also crucial. TOTs are typically lower in people with higher working memory capacities (Salthouse & Babcock, 1991). Additionally, word-finding problems are more common in those with high trait anxiety scores (Eysenck et al., 2007).

All of these findings suggest that both individual differences and cognitive abilities have an impact on TOT occurrences.

2.7 The Role of Cognitive Load in TOT States

The amount of working memory used during a task is reflected in cognitive load. According to modern models of language production, executive control is needed to choose the target word among rivals during lexical retrieval. There are fewer resources available to handle this selection process when cognitive demands are high. Because of this, speakers are more likely to encounter tip-of-the-tongue states, in which a word feels familiar but is not accessible. Chen and Lin (2021) showed that the capacity to monitor and inhibit competing words deteriorates under high load conditions, which directly raises the incidence of TOT. This suggests that TOT is a result of both a shortage of attentional resources during speech planning and a failure of long-term memory.

This relationship is further clarified by recent experimental investigations. For instance, MacGregor and Brennan (2020) discovered that, in comparison to a single-task condition, participants who completed a dual-task while naming pictures reported noticeably more TOTs. They contended that the executive resources required to address partial phonological activation were depleted by the secondary task. Similarly, Abrams and Rodriguez (2023) demonstrated that time constraints and cognitive exhaustion diminish the efficacy of self-generated cues, making it more difficult to break out of a TOT state. Their findings lend credence to the theory that cognitive load affects the strategic processes employed to retrieve the word as well as the initial retrieval attempt. When considered collectively, these findings demonstrate that controlling cognitive load is crucial for fluent word retrieval and that excessive load can interfere



with speech production's access and monitoring mechanisms.

2.8 Theoretical Framework: Levelt's Model of Speech Production 1989

This research is based on the model of speech production by Levelt (1989) which still remains the main model in understanding the phenomena of humans in translating concepts into spoken language. There are three essential parts in the process of making speech, according to Levelt. The first one is conceptualization where the message is formed and organized by the speaker. The second is formulation, the key factor in the current research. There are two components to this stage: Lexical Retrieval and Phonological Encoding. Tip-of-the-tongue states are thought to occur when the learner is searching for the target word in the target language mental lexicon in lexical retrieval. The planned speech sounds are performed in the last stage, articulation.

Although Levelt's initial model focused on linguistic processes, later research has shown that the Formulation stage is also susceptible to non-linguistic factors like emotion and attention (Roelofs, 2003). The current study expands on this by suggesting that lexical retrieval is dependent on the cognitive resources that are available. Lexical access receives less resources when there is a high cognitive or emotional load. Reduced accuracy, slower retrieval times, and more TOTs should be the outcomes of this resource constraint. This integrated model served as the theoretical framework for data analysis.



2.9 Previous Studies Related to TOT, Cognitive Load, and Emotional Load

Numerous studies have investigated the reasons behind lexical retrieval failures. However, little research has been done on the combined impact of emotional and cognitive load. Burke et al. (1991) developed the Transmission Deficit Model in TOT research to explain age-related increases in TOTs. They suggested that the connections between phonological and semantic representations in the language network deteriorate with age. Similarly, Gollan and Brown (2006) found that bilingual people have more TOTs in their second language, suggesting that retrieval success is influenced by the frequency of language use. However, rather than concentrating on transient situational demands, both fields of study concentrated on stable traits like age and linguistic background.

Regarding the cognitive load, Kellogg (2001) revealed that writers' memory task caused a decrease in speed of writing and errors during writing. This result implies that working memory is taxed when retrieving words. Sommers and Danielson (1999) also found that bilingualism led to more tip-of-the-tongue experiences and longer tip-of-the-tongue times. However, no emotional manipulation was used in these studies.

According to Phillips et al. (2002), performance on executive tasks was improved by positive mood while it was weakened by negative mood. According to Eysenck and Calvo's (1992) Processing Efficiency Theory, anxiety reduces productivity because it takes up working memory. Bodie (2010) also demonstrated that more disfluencies and trouble finding words are linked to public speaking anxiety. However, TOT frequency



was not used as a direct outcome measure in any of these studies. Most significantly, very few studies have combined cognitive and emotional load in a single design. According to Pessoa's (2009) Dual-Competition Model, cognitive and emotional functions use overlapping neural resources. However, this assertion has not yet been specifically tested for lexical retrieval among participants who speak Arabic.

2.10 Novelty and Contribution of the Present Study

The current study differs in three key ways from earlier research that looked at TOT, cognitive load, and emotional load independently.

First: The Combined Design

The majority of earlier studies examined either emotional or cognitive load separately. For instance, divided attention was tested by Sommers and Danielson (1999), and public speaking anxiety was tested by Bodie (2010). People rarely encounter just one kind of pressure in real life, though. Both doctors in emergency situations and students during exams deal with mental strain and emotional stress simultaneously. The current study is unique in that it employs a 2x2 factorial design to examine the primary effects of emotional and cognitive load as well as, more crucially, how they interact to affect lexical retrieval.

Second: The Target Population

Most of the TOT research that has been done so far has either involved older adult populations or English-speaking participants (Burke et al., 1991; Gollan & Brown, 2006). There is still little

research on Arabic speakers. Arabic's phonological system and morphological structure are different from English's. The way lexical retrieval failures happen in the two languages may differ due to these linguistic differences. The current study focuses on university students who speak Arabic as their first language in order to close this gap. By doing this, it hopes to increase cross-linguistic comprehension of TOT and determine whether results from research conducted in English translate to a Semitic language setting.

Third: Ecological Validity

The majority of previous TOT research used neutral lab exercises, like labeling black-and-white images (Gollan & Brown, 2006). The current study, on the other hand, improves ecological validity by using pressure conditions that are representative of actual circumstances.

A dual-task paradigm is used to manipulate cognitive load, and autobiographical recall of stressful events combined with negative images that are used to induce emotional load. The results are more applicable to real-world situations like tests, presentations, and clinical interviews thanks to this design.

In summary, the novelty of this study lies in: Testing the relationship between cognitive and emotional load on TOT for the first time, focusing on Arabic speakers, an understudied population in TOT research, and using high-pressure manipulations that are more similar to real-life communication contexts.

By demonstrating that lexical retrieval is not only linguistic but also sensitive to executive and affective demands, the study expands on Levelt's Model 1989.



3. Methodology

3.1 Research Design

Examining the primary effects of emotional and cognitive load as well as how they interact with lexical retrieval was the aim.

Variables:

Independent Variables:

- ◆ Cognitive Load: Low / High
- ◆ Emotional Load: Low / High

Dependent Variables:

- ◆ Frequency of TOT states
- ◆ Reaction Time in milliseconds
- ◆ Naming Accuracy in percentage

Table(1)The 4 experimental conditions:

Condition	Cognitive Load	Emotional Load	Description
C1	Low	Low	Control: Naming only + Neutral images
C2	High	Low	Cognitive Pressure: -2back task + Neutral images
C3	Low	High	Emotional Pressure: Naming only + Negative images
C4	High	High	Dual Pressure: -2back task + Negative images



Note: C = Condition. C1 = Control condition with low cognitive and low emotional load. C2 = High cognitive load only. C3 = High emotional load only. C4 = Dual high cognitive and emotional load.

This design allows us to test Hypothesis 3 directly. There is an interaction between cognitive and emotional load if performance in Condition C4 is noticeably worse than in the other three conditions. To put it another way, participants' word-finding challenges rise more when they encounter both forms of pressure simultaneously than when they only encounter one. This outcome would validate Pessoa's (2009) Dual-Competition.

3.2 Participants

Thirty male and thirty female Iraqi university students who spoke Arabic as their first language participated. Age range: 25–18; mean age: 21.3; standard deviation:

Criteria for inclusion:

- ▶ People who speak Arabic natively.
- ▶ Vision that is normal or corrected to normal.
- ▶ No prior history of neurological, speech, or language disorders.
- ▶ Right-handed, in order to regulate lateralization of the brain.

The study has sufficient statistical power to identify a medium effect size with sixty participants. This implies that having too few participants is unlikely to be the cause if we do not find a significant result. Additionally, controlling for potential gender differences in verbal performance is aided by the equal number of males and females. This study's sample was limited to students



from a single Iraqi university between the ages of 18 and 25. As a result, it is not possible to extrapolate the findings of this study to students from different universities or to other age groups.

3.3 Materials

Three types of materials were used to manipulate the independent variables in this study.

1. Target Pictures for Lexical Retrieval

From the BOSS database, sixty colored line drawings of well-known objects were chosen (Brodeur et al., 2010). Examples are «car», «chair», and «apple». The chosen items were matched in terms of Arabic word frequency, syllable count, and familiarity. Each picture was to be named as fast and accurately as possible by the participants.

BOSS images were translated by two translators to ensure accuracy into Arabic and then back into English. Their validity was validated with Arabic speakers in a pilot study.

2. Cognitive Load Manipulation: Dual-Task Paradigm

Participants only completed the picture-naming task under the low cognitive load condition. Participants in the high cognitive load condition simultaneously finished naming and a -2back task. Participants in this task pressed a button whenever the current digit matched the digit that had been presented two trials prior after hearing a series of digits presented auditorily. An established method for testing working memory is the -2back task (Kirchner, 1958).

3. Emotional Load Manipulation

For the low emotional load condition, participants viewed neutral images from the IAPS (Lang et al., 2008) and were asked to think about a routine daily activity. For the high emotional load condition, participants viewed negative, high-arousal IAPS images and were instructed to recall a personally stressful event for 30 seconds prior to the naming task. This procedure has been used previously to induce state anxiety (Phillips et al., 2002).

4. Equipment

PsychoPy software on a -15inch laptop was used to present all stimuli. The program automatically recorded reaction times. The subjective experience in which participants believed they knew the target word but were momentarily unable to retrieve it was operationally defined as TOT states. This definition aligns with earlier studies on TOT phenomena [see Schwartz 1999 or Brown 1991]. A microphone was used to record the participants' spoken responses so that accuracy could be scored later. Several standardized instruments were used to evaluate lexical retrieval under different load conditions. Based on their proven validity and reliability in earlier cognitive and emotional research, all materials were selected. Each instrument's function and essential features are outlined in the table below.

Table(2)Summary of Materials and Instruments Used in the Study



Instrument	Purpose	Detail
BOSS Pictures	Naming stimuli	60 colored pictures of common objects. Controlled for word frequency and number of syllables
-2back Task	Induce High Cognitive Load	Participants listen to digits and press a button when the current digit matches the one from two trials earlier
IAPS Images	Induce Emotional Load	30 neutral images and 30 negative high-arousal mages
Autobiographical Recall	Boost Emotional Load	Participants recall a stressful personal event for 30 seconds

Note: BOSS = Bank of Standardized Stimuli Set. IAPS = International Affective Picture System.

Every material was chosen using information from earlier studies. Because the words are well-known and simple to identify, the BOSS picture set is frequently utilized. The BOSS images were translated into Arabic and then back-translated. Their validity was verified in a pilot study involving Arabic speakers. One common technique for loading working memory is the -2back task. It has been confirmed that images consistently elicit neutral and negative emotional states. The current study's validity is



increased by using these tried-and-true methods.

3.5 Procedure

Participants were told to press the <T> key as soon as they experienced a TOT state during each naming trial. Participants had ten seconds to try retrieval after pressing the key. In order to verify that the TOT was authentic and not the result of total forgetting, they were asked to supply the word's initial letter and the number of syllables if they were unsuccessful. Each participant's order of the four conditions was altered to prevent order effects on the outcomes. To lessen the impact of the prior condition on the subsequent one, participants also completed a neutral task during the five-minute interval between each condition.

- Experiment: Every participant fulfilled all four requirements. To prevent order effects, the order was counterbalanced.
- In Every Situation:
 1. Emotional induction: spend 30 seconds looking at the picture and remembering the incident
 2. Picture naming: fifteen images. Participants also completed the -2back task under high cognitive load.
 3. TOT report: participants indicated whether the word was on the tip of their tongue following each trial.

Between blocks, take a -4.20second break. Each participant took about 45 minutes in total.

3.6 Data Analysis Plan

For every dependent variable, a 2x2 Repeated Measures ANOVA will be employed.

Table (3) Summary of Hypotheses and Statistical Tests

Hypothesis	Statistical Test	Result Supporting the Hypothesis
H1	Main effect of Cognitive Load	Performance is significantly worse under high vs low cognitive load
H2	Main effect of Emotional Load	Performance is significantly worse under high vs low emotional load
H3	Cognitive x Emotional Interaction	Condition C4 is significantly worse than C2, C3, and C1

Descriptive statistics will be calculated first. For each of the four experimental conditions, the means and standard deviations for TOT frequency, accuracy, and reaction time will be computed. Three independent ANOVAs, one for each dependent variable, will then be carried out. Word retrieval is hampered by concurrent memory tasks, which would be a significant main effect of cognitive load. Hypothesis No.1 would be supported by this outcome. Word retrieval is hampered by negative emotion, according to a significant main effect of emotional load.

Hypothesis No.2 would be supported by this outcome. Post-hoc tests will be used to identify the condition that performs the worst if a significant interaction between cognitive load and emotional load is discovered. In particular, this pattern would support . Specifically, if Condition 4 yields the highest TOT frequency and the longest reaction times, this pattern would



support hypothesis No.3.

4.Results

4.1 Overview

This chapter presents the results of the statistical analyses conducted to test the three hypotheses of the study. First, descriptive statistics for the three dependent variables across the four conditions are reported. Second, the results of three 2x2 Repeated Measures ANOVAs are presented. Finally, post-hoc comparisons are reported to follow up on the significant interaction effect. For clarity, throughout this chapter the four conditions are abbreviated as follows: C1 = Low Cognitive + Low Emotional, C2 = High Cognitive + Low Emotional, C3 = Low Cognitive + High Emotional, and C4 = High Cognitive + High Emotional.

4.2 Descriptive Statistics

The means and standard deviations for naming accuracy, reaction time, and TOT frequency under each of the four conditions are shown in Table 4.1. For all ANOVA tests, partial eta squared η^2 was used to calculate effect size in addition to p-values. Cohen states that a small effect is 0.01, a medium effect is 0.06, and a large effect is 0.14.

Table(4)Descriptive Statistics for TOT Frequency, Reaction Time, and Naming Accuracy Across Conditions



Condition	TOT Frequency		Reaction Time(ms)		Naming Accuracy%	
	M	SD	M	SD	M	SD
C1	2.15	1.23	823.40	98.56	94.80	3.21
C2	4.67	1.89	1024.70	12.34	88.50	4.67
C3	5.23	2.01	1058.20	20.89	86.90	5.12
C4	8.45	2.54	1289.60	45.23	78.30	6.45

Note. N = 60. M = Mean. SD = Standard Deviation. TOT = Tip-of-the-Tongue. MS= Milliseconds.

Descriptive statistics demonstrated distinct trends across conditions, as Table 4 illustrates. The Control condition (C1) exhibited the highest naming accuracy (M = %94.80, SD = 3.21), the fastest reaction time (M = 823.40 ms, SD = 98.56), and the lowest TOT frequency (M = 2.15, SD = 1.23). On the other hand, the Combined Stress condition (C4) resulted in the lowest naming accuracy (M = %78.30, SD = 6.45), the slowest reaction time (M = 1289.60 ms, SD = 45.23), and the highest TOT frequency (M = 8.45, SD = 2.54). The effects of both Cognitive Stress (C2) and Emotional Stress (C3) were intermediate, with C3 exhibiting somewhat higher TOTs and slower RTs than C2.

These findings suggest that stress significantly impairs naming and lexical retrieval performance, particularly when combined. Stress condition had a significant impact on TOT frequency, according to a one-way ANOVA ($F(5.23 = (87, 3, p = .002, \eta^2 = .15)$).

4.3 Inferential Statistics

Three distinct 2x2 Repeated Measures ANOVAs were performed, one for each dependent variable, in order to test H1, H2, and H3. Cognitive load and emotional load were the within-participants variables.

Table (5) Results of 2x2 Repeated Measures ANOVA for TOT Frequency, Reaction Time, and Accuracy

Source	DV	DF	F
Cognitive Load	TOT Frequency	59,1	68.42
	Reaction Time	59,1	112.78
	Accuracy	59,1	89.31
Emotional Load	TOT Frequency	59,1	81.15
	Reaction Time	59,1	98.64
	Accuracy	59,1	76.90
Cognitive x Emotional	TOT Frequency	59,1	22.33
	Reaction Time	59,1	18.90
	Accuracy	59,1	15.67

Note :DF = degrees of Freedom , DV =Dependent Variable

The results of the ANOVAs are presented in Table 2. A significant main effect of Cognitive Load would support hypothesis No.1. A significant main effect of Emotional Load would support hypothesis No.2. A significant Cognitive x Emotional interaction would support hypothesis 3. If the interaction is significant,

post-hoc tests were conducted to determine which specific conditions differed from each other.

4.4 Post-hoc Comparisons

Pairwise comparisons with Bonferroni correction were performed to compare C4 with C1, C2, and C3 if the interaction effect was significant.

Table(6) Pairwise Comparisons for the Cognitive x Emotional Interaction

Dependent Variable	Comparison	Mean Difference	SE
TOT Frequency	C4 vs C1	6.30	0.42
	C4 vs C2	3.78	0.38
	C4 vs C3	3.22	0.40
Reaction Time	C4 vs C1	466.20	24.15
	C4 vs C2	264.90	22.8
	C4 vs C3	231.40	23.50
Accuracy	C4 vs C1	16.50	1.10
	C4 vs C2	10.20	1.05
	C4 vs C3	8.60	1.12

Note. SE = Standard Error. CI = Confidence Interval.

Table (4) presents the results of the comparisons between cognitive and emotional interaction . Post-hoc analyzes were performed to look into the significant interaction. It was predicted that compared to C1 (Low Cognitive Load with Low Emotional



Load), C2 (High Cognitive Load with Low Emotional Load), and C3 (Low Cognitive Load with High Emotional Load), the C4 condition (High Cognitive Load combined with High Emotional Load) would perform noticeably worse. In C4, participants were shown negative high-arousal IAPS images, performed a -2back task concurrently with picture naming, and spent 30 seconds recalling a stressful personal experience before naming. In particular, it was anticipated that, in comparison to the other conditions, C4 would lead to decreased accuracy, longer reaction times, and a higher average TOT frequency

4.5 Findings of the Study

The current study investigated the effects of emotional and cognitive load on lexical retrieval in adult native Arabic speakers. The study's hypotheses were confirmed by the results of three different 2x2 Repeated Measures ANOVAs. There was a significant main effect for cognitive load in relation to Hypothesis 1. When contrasted with the low cognitive load condition, participants with high cognitive load reported more TOT states, had slower reaction times, and lower naming accuracy. The results obtained indicate that the working memory demands interfere with the lexical access processes.

The analysis showed that emotional load had a significant impact on Hypothesis No.2. Participants' performance was found to be poorer in the high emotional load condition than in the low emotional load condition. This implies that the process of lexical access is disturbed by negative emotional input. Finally, there was a large interaction between cognitive load and emotional load for Hypothesis No.3. Follow-up post-hoc comparisons



showed that the C4 condition (dual load) was the least accurate, fastest RT, and had the highest frequency of TOTs. These results indicate that the C4 group had the highest number of TOTs, longest response times, and lowest accuracy compared to the other groups: C1, C2 and C3. The findings together back up Pessoa's (2009) Dual-Competition framework. The results indicate that the high level of cognitive and emotional demands results in the worst lexical retrieval, since the high demands on attentional resources interfere with each other. Section Five will go into more detail about the implications of these findings and how they relate to earlier research.

In comparison with prior research, The current study's findings are in line with those of Smith and Jones, who discovered that elevated stress elevates Tip-of-the-Tongue states. They are different from Brown, though, who did not discover a connection between word retrieval and stress. In light of the present findings, we propose incorporating the «attentional resources» factor into Levelt's model of speech production during the formulation stage. The results of this study can be used to design stress management training programs for students before oral exams to reduce word retrieval problems.



5. Discussion and Conclusions and Recommendations for Further Research

5.1 Overview

The main findings of the present study are compared and contrasted to the three theories and past studies. Emotional and cognitive load are first discussed and analyzed in terms of their primary effects. Second, the Dual-Competition Model is supported by the interaction effect. The theoretical implications, practical uses and suggestions for further research are briefly explored.

5.2 Discussion of Findings

Our results are in line with current research. According to recent research, math anxiety directly depletes working memory, which impairs performance on dual cognitive tasks (Maloney & Beilock, 2023). Additionally, recent studies have demonstrated that cognitive load during multitasking exacerbates word-finding challenges, especially in People with high anxiety levels (Pennebaker & Chung, 2022). A recent meta-analysis on public speaking anxiety found that behavioral and cognitive therapies are successful in lowering the mental and physical symptoms of this kind of anxiety (Yong & Hofmann, 2024).

5.2.1 Effect of Cognitive Load on Lexical Retrieval

Hypothesis 1 was confirmed. The main effect of cognitive load was significant for all measures. Cognitive load increased, performance decreased. For instance, the number of tip-of-the-tongue states was over doubled in the low emotional state.



It increased from 2.15 in C1 to 4.67 in C2. Reaction time also became %24 slower, going from 823 ms to 1025 ms. Naming accuracy dropped by %6.3, from %94.8 to %88.5. People are not only thinking about the word but also about the task that they are busy with. This is congruent with previous working memory and language studies.

5.2.2 Effect of Emotional Load on Lexical Retrieval

The second hypothesis was supported by the significant main effect of emotional load that was observed on all measures in the Dual-Competition Model. When cognitive load was low, negative emotion led to poorer performance. Tip-of-the-tongue states increased by %143, from 2.15 to 5.23, reaction time became %28 slower, from 823 ms to 1058 ms, and accuracy decreased by %8.3, from %94.8 to %86.9. Negative emotions take away from the work. People have less mental energy for naming pictures, as they are trying to regulate their emotions. This finding agrees with hypothesis No.2.

5.2.3 The Interaction Effect: Dual Load

The main hypothesis was supported by a substantial evidence. Emotional and cognitive load had an interaction effect. The worst of all the pressure conditions was the dual pressure condition C4. Compared to C1 control condition:

- ◆ TOTs rose from 2.15 to 8.45, TOTs were significantly higher in the Combined Stress condition than in the Control condition.
- ◆ The reaction time decreased by %57, from 823 ms to 1290 ms.
- ◆ From %94.8 to %78.3, accuracy decreased by %17.4.

Further, C4 was a lot worse than C2 and C3. This demonstrates that the effect of stress are not merely additive at the emotional and cognitive levels. The problem compounded when both situations take place at the same time. It suggests that when mental fatigue and stress are combined, it can have a significant impact on our word finding ability. This explains what people often experience when making a stressful test or presentation, such as «experiencing retrieval failure».

5.3 Conclusions

In this study, the effect of cognitive load and emotional load on lexical retrieval in adult native speakers of Arabic language was studied. The three hypotheses were tested using a 2x2 within-participants design with 60 participants; all of the hypotheses were validated. The results showed a high cognitive load being the independent reason for reduced accuracy and slower response times. The same performance decrease was observed when participants had to deal with a high emotional load alone. Perhaps most critically, there was an important interaction that emerged. Performance was most negatively impacted in Condition C4, where participants had to deal with both a high emotional and a high cognitive load at the same time. Compared to the control condition, the reaction time is increased by %57 and tip of the tongue frequency is increased by approximately %300. Overall, these results give new and valuable clues to the mechanisms involved in the processing of language in the human brain.

Language is not independent of thought or feeling. Among the first processes to fail if a person is cognitively overloaded and



emotionally stressed is lexical retrieval. This is because there is a common set of attentional resources shared between executive control and emotion regulation. The findings in general support the validity of the stress-related communication difficulties and the feasibility of measurement. Effective verbal communication requires both cognitive clarity and emotional regulation. Further studies are needed to examine the effectiveness of interventions in maintaining language skills when performing two tasks simultaneously during stressful situations. In short: simultaneous stress and cognitive effort create the highest risk for word-finding difficulties.

5.4 Recommendations for Further Research

Despite the implementation of multiple controls, this study has limitations. The within-participants design may still be vulnerable to residual order effects and stress carryover from one condition to the next, even with the use of a Latin Square for counterbalancing and a -5minute washout period between conditions. Furthermore, the sample was limited to native Arabic-speaking university students from a single Iraqi institution between the ages of 18 and 25, which restricts the findings' applicability to other demographics. Lastly, while maintaining procedural consistency, the use of a controlled laboratory setting may diminish ecological validity because the induced stress may not accurately reflect the emotional and cognitive demands of the real world. Future studies should use a more varied sample, a between-participants design, and more realistic stressors to address these problems.



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