

ARTICLE

The Effects of Cigarette Cravings on Word Retrieval among Smokers

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ABSTRACT

Cigarette craving refers to the intense desire to smoke, which almost 90% of smokers experience, making it one of the fundamental issues that cause smokers attempting to quit to relapse. Thus, craving for cigarettes thwarts efforts to stop smoking, which can have a detrimental impact on various cognitive processes, such as impaired attention or decision-making. However, one aspect of intellectual-verbal efficiency that has received little to no attention in previous studies is smokers' ability to retrieve words when experiencing cigarette craving. Therefore, this study is an investigation of the impact of cigarette craving on word retrieval among smokers. An anonymous Google form survey was sent to various social media platforms, and 160 self-identified cigarette smokers completed the survey. The survey elicited respondents' demographic information, history of smoking, and experiences related to cigarette craving, and its impact on word retrieval. The results revealed that cigarette craving may have a significant impact on word retrieval and that a significant proportion (43.75%) of participants reported marked improvements in word retrieval following the satisfaction of their cigarette craving. The findings from this study provide valuable insights into the impact of cigarette craving on word retrieval abilities among smokers. Future research is needed to explore the underlying mechanisms of cigarette craving and its relationship to word retrieval and to identify such factors as craving intensity, smoking history, and psychological factors that may play a role in this relationship.

Keywords: Cigarette Cravings; Word Retrieval; Intellectual-Verbal Efficiency; Smokers

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ARTICLE INFO

Received: 15 March 2025 | Revised: 7 April 2025 | Accepted: 18 April 2025 | Published Online: 21 April 2025
DOI: <https://doi.org/10.30564/fls.v7i5.9101>

CITATION

Aljafen, A.A., 2025. The Effects of Cigarette Cravings on Word Retrieval among Smokers. *Forum for Linguistic Studies*. 7(5): 16–24. DOI: <https://doi.org/10.30564/fls.v7i5.9101>

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1. Background

Cigarette smoking is a serious public health concern that most nations face since more than 1.8 billion people indulge in smoking across the planet^[1]. Statistics indicate that the global number of smokers has declined significantly since 1990, with females reducing by 37.7% and males by 27.5%^[2]. Unfortunately, despite the reduction in usage, cigarette smoking still contributes to 8 million deaths annually^[3]. Major life-threatening diseases such as cerebrovascular disease, coronary heart disease, lung cancer, and stroke result from cigarette smoking^[4]. Usually, the illnesses appear as long-term engaging in smoking. On the other hand, short-term or immediate concerns that result from engaging in smoking include oxidative stress, respiratory symptoms, compromised immune status, and increased inflammation^[4]. Because of the health challenges associated with cigarette smoking, over 70% of smokers demonstrate a willingness to quit, but around 5 to 17% of those involved succeed by getting the needed help^[5].

Given that most people who smoke lack the capacity to control their cigarette cravings, it becomes challenging for them to quit the habit^[6]. People with cigarette cravings manifest a strong internal desire and are intensely motivated to engage in smoking for fulfillment^[5]. Having a craving for cigarettes can be a serious concern as it increases relapse for people who have decided to quit, and the cycle continues where relapse promotes greater cravings^[7]. Empirical research has shown that among former smokers, one of the significant predictors of relapse is having strong cravings^[8]. Moreover, nearly ninety percent of active smokers indicate that they encounter intense craving again just a few hours after leaving the habit, which shows its addictive nature^[9]. Exposure to certain signals and triggers, like observing images of people smoking can initialize cigarette craving^[10], and this can also involve talking or listening to someone talking about smoking cigarettes^[11]; Moreover, exposure of a smoker to a favorite brand or smell thereof can also contribute trigger these cravings^[12]. Stress also plays a significant role in increasing the urge to smoke cigarettes because the desire to smoke can be fueled by exposure to stressful social situations or circumstances^[13, 14].

The cognitive functioning and processes of individuals who crave cigarettes are negatively affected, which can be detrimental in the long term. For example, McEwen et

al. (2006) mentioned that nearly 60% of all smokers experience impaired concentration^[15]. Similarly, Van Rensburg and Taylor (2008) found that due to cravings, smokers reported poor concentration^[16]. Cigarette craving also compromises the ability of a smoker's memory to encode information correctly, which can reduce productive communication^[17]. Research by Mendrek et al. (2006) has further indicated that cravings disrupt cognitive task performance and negatively affect working memory^[18]. Moreover, smokers who have strong cravings have shown little resilience when subjected to tasks that require complex thinking and concentration^[19]. People who crave cigarettes make poor decisions and judgments because they may decide to seek convenience and relief from immediate urges over viable alternatives like proper care for body hygiene and eating^[20]. Another study found that when smokers experience cravings, they are more inclined to make hasty decisions that prioritize immediate benefits over waiting for a larger, delayed reward^[21].

Fewer studies have examined the effect of cigarette cravings on language functions. For instance, a study by Zwaan and Truitt (1998) shows that cigarette cravings harm reading comprehension accuracy among smokers, particularly when reading complex sentences^[22]. The authors speculated that smokers may not have been aware of the influence of cigarette cravings on their comprehension ability as they read. Consequently, they continued reading at their typical pace without slowing down to compensate for their reduced working memory capacity. In addition, the results of this study showed that smokers read sentences, on average, 13% faster than nonsmokers^[22]. Another study by Sayette et al. (2010) reveals that cigarette cravings exacerbate mental lapses during a mindless reading task while at the same time diminishing smokers' capacity to notice these lapses^[23]. The authors suggest that cigarette cravings may hinder sustained attention and lower meta-awareness^[23]. Another study conducted by Zuj et al. (2015) required participants to read a transcript and then measure their ability to recall the content^[24]. The results revealed that participants in the high-craving group recalled fewer correct facts. According to the authors, cigarette cravings can influence cognition in various contexts.

However, word retrieval is one of the crucial aspects of intellectual-verbal efficiency that has not received direct

attention in relation to cigarette cravings. It is commonly defined as the ability to convoke words from the lexicon once they have been stored in memory^[25]. The use of vocabulary words is essential for efficient language use^[26]. Therefore, effortlessly retrieving words is crucial. Many factors can affect an individual's word retrieval capacity, which includes the word's phonetic properties, grammatical features, semantic features, and frequency^[27]. Despite prior studies having focused on the impact of cigarette craving and smoking on cognitive functioning^[28], a considerable gap remains in understanding how cravings for cigarettes affect the word retrieval abilities of smokers. As a result, the current study intends to examine how smokers' cravings for cigarettes affect their word retrieval abilities. Additionally, the study seeks to assess whether smokers experience improvements in word retrieval abilities after satisfying their cravings. In focusing on the objectives of this study, a better understanding of the impact of cigarette cravings on word retrieval impairment for smokers will be gained, and vast knowledge of cognition and cravings enhance current literature.

Additionally, the results of the study may be used to enhance smokers' awareness of how cigarette craving can impact their cognitive performance including their ability to retrieve words and eventually impact their quality of life, which can encourage self-monitoring and strengthen smokers' resolve to quit smoking. Furthermore, the findings of this study may benefit clinicians and therapists by increasing their understanding of the mechanism of craving and ways to apply effective practical techniques to assist smokers in quitting smoking. Also, neuroscientists could gain from the study's findings by examining the brain area responsible for cigarette craving and exploring if it plays a part in word retrieval processes. In our best level of knowledge as per previous research, this study is the first to have focused on cigarette cravings and their impact on word retrieval. The study is guided by the research questions stated below;

Research Questions:

- 1- Is there a significant impact of cigarette cravings on word retrieval among smokers?
- 2- Do smokers notice an improvement in word retrieval abilities after satisfying their cigarette cravings?

2. Method

2.1. Data Collection

An online Google Forms survey was conducted to collect data for this study for the purpose of investigating the impact of cigarette cravings on word retrieval. The survey was distributed to multiple social media platforms and community forums to target a wide range of smokers. The participants were informed about the study's main purpose, and a written consent form was obtained from all of them before participation. Also, the researcher anonymized the survey responses to maintain confidentiality and did not include any personal information about the smokers. The data collection process was done in three months. Microsoft Excel software aided in quantitatively analyzing the data to understand the effect of cravings on smokers' word retrieval abilities.

The questions incorporated in the survey questionnaire touch on essential aspects like the respondent's demographics, such as gender, sex, history of smoking, and educational attainment. A specific focus was directed to the participant's behavior in smoking cigarettes. In particular, the respondents had to mention their smoking duration, experience, and response to cigarette cravings through the online survey. Following those questions, a section was incorporated that sought to compare the impact of cigarette cravings on smokers' word retrieval abilities. Here are some of the questions: Have you noticed any changes in your word retrieval abilities since you began experiencing cigarette cravings? Do you often pause or hesitate during conversations while searching for a word when experiencing cravings? Have you noticed an increase in word-finding errors, such as using incorrect or nonspecific words during intense cravings for cigarettes? How would you rate the effort required to retrieve words during conversations when experiencing these cravings? At the end of the survey, the author included a question regarding the satisfaction of cigarette cravings and the impact of this satisfaction on word retrieval.

2.2. Sample Characteristics and Descriptive Statistics

A total of 160 participants self-identified as cigarette smokers who were mainly male and demographically young, as summarized in (Table 1) below. The respondents were 93.75% male, and the remaining 6.25% of those involved

were females. Most participants, or 43.13%, were between 25 and 39 years old, with those closely following them being 36.88% and aged between 40 and 60 years. Moreover, 16.88% of the participants were young people between 18 and 24 years old, and an insignificant number (3.13%) involved those aged 60 years and older. A closer look at the

sample revealed that the participants are highly educated with 46.88% or almost half having a Bachelor's degree and 29.38% having completed high school education. The data also indicated that some of the respondents have a graduate-level education, with an insignificant portion (3.75%) having a Doctorate and 12.50% having a Master's degree.

Table 1. Demographic Characteristics of the Participants.

		N (160)	Percentage
Gender	Female	10	6.25%
	Male	150	93.75%
Age Group	18–24	27	16.88%
	25–39	69	43.13%
	40–60	59	36.88%
	Higher than 60	5	3.13%
Educational Attainment	Less than high school	12	7.50%
	High school	47	29.38%
	Bachelor's degree	75	46.88%
	Master's Degree	20	12.50%
	Doctorate	6	3.75%

An assessment of smoking history and behavioral characteristics of the 160 respondents showed that most of them have long-term smoking habits. In particular, as indicated in (Table 2) around 42.50% of the participants stated they had smoked for more than 15 years. The data also showed

a chronic smoking trend and behavior given that a substantial portion (18.75%) of the participants indicated they have smoked for 10 to 15 years, 18.13% for 6 to 10 years, which is a significant concern.

Table 2. Behavioral Characteristics of the Participants.

How long have you been smoking cigarettes?		
	N	%
Less than a year	17	10.63%
1–2 years	3	1.88%
3–5 years	13	8.13%
6–10 years	29	18.13%
10–15 years	30	18.75%
More than 15 years	68	42.50%
How often do you experience cravings for cigarettes?		
	N	%
Never	13	8.13%
Rarely (once in a while)	7	4.38%
Occasionally (a few times a month)	4	2.50%
Once a week	7	4.38%
Several times a week	16	10.00%
Daily	113	70.63%

The statistics indicate that only 10.63% of the participants have engaged in the habit for less than one year,

suggesting that most are experienced smokers rather than novices. Most of the respondents, or 70.63%, stated that

they encounter cigarette cravings daily, which is a higher craving frequency, and 10% further stated they have cravings several times a week. This indicates a high level of nicotine dependence within the sample. The tendency to be addicted and show greater nicotine dependency was affirmed by a small percentage (12.50%) of respondents stating they never or rarely experienced smoking cravings at various occasions. According to the results, it can be inferred that this sample signals a large population who are struggling with smoking cravings and habits, and this can inform various treatments and interventions intended to aid them in quitting smoking.

3. Results

The current study was designed to help investigate the impact cigarette cravings have on smokers' ability to retrieve words. In particular, the following two questions orient this study and investigate: (1) whether cigarette cravings significantly influence word retrieval abilities, and (2)

whether smokers experience any word retrieval improvements after satisfying their cravings. An ordinal regression analysis was employed to test the questions and understand the impact of cigarette cravings on smokers' word retrieval, and this produced descriptive statistics that demonstrate word retrieval levels following satisfaction with their cravings.

Research Question 1: Is there a significant impact of cigarette cravings on word retrieval among smokers?

Assessing the cravings for cigarettes and their impact on word retrieval decline for smokers was done by applying ordinal logistic regression. The independent variable, craving frequency, was significant in predicting word retrieval decline, $\beta = 0.56$ (0.21), $t = 2.60$ (Table 3). The results suggest that a higher frequency of cigarette cravings is associated with a greater likelihood of reporting a decline in word retrieval performance. Specifically, as craving frequency increases, the odds of experiencing a more significant decline in word retrieval increase.

Table 3. The Impact of Cigarette Cravings on Word Retrieval: Ordinal Logistic Regression.

Variable	Coefficient	Standard Error	t Value
Overall	0.56	0.21	2.60
No noticeable change Yes, slight decline	3.03	1.01	2.99
Yes, slight decline Yes, significant decline	3.94	1.03	3.82
Residual Deviance		213.7717	
AIC		219.7717	

The intercepts for the thresholds between categories of word retrieval decline (No noticeable change | Yes, slight decline and Yes, slight decline | Yes, significant decline) were also significant, with $\beta = 3.03$ (1.01), $t = 2.99$, and $\beta = 3.94$ (1.03), $t = 3.82$, respectively. The model fit indicated a residual deviance of 213.7717 and an AIC of 219.7717, which is reliable and reasonable for this kind of model. Because of the missing data, about thirty-six of the observations were eliminated. As a result, the analysis shows that cigarette cravings may significantly affect cognitive performance, especially in the word retrieval domain. The underlying mechanisms and functioning of these relationships can be under-

stood by further investigations.

Research Question 2: Do smokers notice an improvement in word retrieval abilities after satisfying their cigarette cravings?

The results indicated that a substantial portion of participants (41.88%) reported no noticeable change in their word retrieval after satisfying their cravings. 14.38% of participants were unsure whether any improvement occurred. On the other hand, 21.88% of participants observed a slight improvement, and another 21.88% noticed a significant improvement in their word retrieval following the satisfaction of their cigarette cravings (Table 4).

Table 4. Perceived Changes in Word Retrieval After Satisfying Cigarette Cravings.

Category	N	%
No noticeable change	67	41.88%
Not sure	23	14.38%
Yes, a slight improvement	35	21.88%
Yes, a significant improvement	35	21.88%

These findings suggest that while a significant portion of participants did not experience any noticeable change, a notable proportion (43.75%) reported some level of improvement in word retrieval. The variation in responses indicates that the effect of satisfying cigarette cravings on cognitive functions, such as word retrieval, may vary across individuals. Future research might explore factors that influence the variability in these experiences.

4. Discussion

This study aimed to investigate the impact of cigarette cravings on word retrieval among smokers. Key findings suggest that cigarette cravings may significantly impair word retrieval. Also, the results indicated that a significant proportion (43.75%) of participants reported marked improvements in word retrieval after satisfying their cigarette cravings. The findings extend our knowledge about the impacts of cravings on cognitive tasks, such as working memory^[11], attention^[29], and information recall tasks^[24]. However, the current findings show that cigarette cravings can impair smokers' ability to retrieve words, which may disrupt their speech fluency and consequently have a detrimental impact on the quality of their lives. Native speakers of a diglossic language like Arabic tend to have word retrieval impairment as smokers because of increased cognitive demands in processing diglossic language^[30].

One possible explanation for the impact of cigarette cravings on word retrieval among smokers is that cravings may induce cognitive load. Since information processing has a limited capacity^[31], smokers may find it difficult to retrieve words under high cognitive load. An increase in cognitive load that prevents or slows smokers' process of recalling words reduces their ability to retrieve words. The retrieval may also be dependent on the craving intensity or level, with strong cigarette cravings impairing word retrieval significantly and word retrieval ability becoming better as the cravings grow mild. This is consistent with the

results of Camos and Portrait (2015)^[32], which indicate that the recall of information depends on how much cognitive effort is required to execute concurrent tasks. This might explain why a significant proportion of the participants in this study reported improved word retrieval ability after satisfying their cigarette cravings.

Due to the potentially high cognitive load caused by cigarette cravings, which impacts word retrieval, working memory efficiency may not function effectively. According to Pearson et al. (2014)^[33], working memory precision declines with increased memory load, leading to significantly prolonged retrieval times. Therefore, it is possible that cigarette cravings may not completely obstruct word retrieval but rather slow it down. On the other hand, retrieving a non-common word is more difficult in the presence of cigarette cravings than retrieving a common word. As a result, when cigarette cravings are present, working memory must exert additional effort to manage these cravings while retrieving a non-common word since effortful information retrieval typically demands working memory resources^[34]. These explanations agree with the research conducted by Anderson et al. (1996)^[35], which found that limits on source activation constrain working memory. Specifically, when two tasks require activation and one task becomes more complex, the efficiency of information retrieval diminishes. This competition in working memory between the two tasks may lead to potential interference^[35]. Therefore, the interference in working memory may be more significant during cigarette cravings when attempting to retrieve a non-common word.

Another key aspect that should be addressed, which could further clarify the findings of this study, is the neurological pathways related to cigarette cravings and word retrieval. During cigarette cravings, most studies have indicated that the anterior cingulate cortex (ACC) gets activated^[23]. As a result, the results suggest that ACC compromises the process of word retrieval, stopping it when encountering words that are uncommon or slowing down the

process. The process of word retrieval, as per research, is controlled by the left prefrontal cortex (PFC), and any damage inflicted on this part of the brain can cause challenges in the filtration of irrelevant words and focusing on what matters^[36]. The anterior cingulate cortex linked with cigarette cravings has been shown to collaborate on different tasks with the left prefrontal cortex that regulates the process of word retrieval. For instance, neuroimaging studies show that these two areas are active when participants engage in cognitively demanding tasks^[37]. An experiment conducted by Fincham and Anderson (2006) indicates that there is synchronized increased activity in the ACC and PFC regions when cognitive demand is heightened^[38]. This finding provides a plausible explanation for why cigarette cravings may impact word retrieval abilities in smokers, particularly as the neurological relationship between the ACC and PFC becomes evident during intense cravings or when retrieving uncommon words.

Although this current study has shown that an essential connection exists between smokers' word retrieval abilities and cigarette cravings, it has key limitations that should be recognized. The first limitation is that it is difficult to generalize the results since the online sample size (n=160) chosen may not accurately capture the tendency of many smokers who may engage in it secretly and are not willing to engage in surveys to protect their identity. The second shortcoming is that the respondents self-affirmed that they are cigarette smokers with cravings and gave a history of smoking that is not based on official records but self-reports. The utilization of a survey questionnaire in the collection of self-reported data is another limitation because some respondents may not represent their actual state to assume a positive outlook, which can lead to underreporting of cravings and exaggeration of cognitive functioning. The last limitation of this study is that it sought to understand word retrieval from a rather general sense without focusing on specific aspects like uncommon and academic words.

A longitudinal study or research is recommended in the future to help provide better knowledge on the effect of cigarette smoking on the word retrieval abilities of smokers by permitting the recruitment of a large number of respondents for easy generalization. Data reliability can also be enhanced in the future by the researcher combining self-reports concerning the behavior of smokers with cognitive

assessments. Additionally, including nicotine tests to measure participants' nicotine levels is essential for the study's reliability. Furthermore, it is suggested that future studies examine smokers' capacity to retrieve both uncommon and common words, allowing for measurement and comparison of their word retrieval abilities under two different conditions. Finally, it is highly recommended in future studies for research to incorporate neuroimaging scans to detect any abnormalities in the brain during cravings and how these cravings impact the areas responsible for word retrieval.

5. Conclusions

The study sought to investigate the impact of cigarette craving on cigarette smokers' word retrieval among. The findings indicate that cigarette cravings can significantly impact word retrieval. Additionally, the results revealed that a considerable percentage of participants experienced improvement in word retrieval after satisfying their cigarette cravings. These findings have significant implications for healthcare providers and people who work in smoking cessation programs by showing that cigarette cravings can negatively affect the ability of smokers to retrieve words, which can degrade the quality of their lives. Therefore, it is recommended that the treatment plans for cigarette smokers should include strategies not only to alleviate craving but also to protect their ability to retrieve words effortlessly. For example, cigarette cessation counselors can explain the negative impact of cigarette craving on word retrieval along with the overall consequences of smoking and how they can negatively impact communication abilities. Thus, providing cigarette smokers with evidence-based information about the impact of smoking and how craving can impact their language fluency by obstructing their word retrieval ability may help convince smokers to persist in their efforts to quit.

Another important implication of this study is that its results add to knowledge about the neural pathways involved in cigarette craving and word retrieval. Thus, the findings might enhance understanding of brain functions and how the brain processes and activates word retrieval when under high cognitive load, such as during cigarette cravings. Additionally, understanding the neural mechanisms underlying cravings and word retrieval could con-

tribute to the existing body of literature and increase knowledge in the field of neuroscience. Thus, this study might help both neuroscientists and health care providers and encourage their collaboration on developing strategies to help individuals overcome craving and support smokers in their journey to quit.

Funding

This work was supported by the Deanship of Postgraduate Studies & Scientific Research at Majmaah University grant number [No. R-2025-1753].

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data that support the findings of this study are available from the author upon reasonable request.

Acknowledgements

The author would like to thank the Deanship of Postgraduate Studies & Scientific Research at Majmaah University for supporting this research under project No. R-2025-1753.

Conflicts of Interest

The author declares no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

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