

## Nicotine Usage on the Presence of Inattentional Blindness and Attention Among Smokers and Non-Smokers

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### ABSTRACT

Nicotine is a very commonly used substance in adults and one of the most widely researched effects of nicotine is its impact on attention and perception. Inattentional blindness is an important area of research in psychology, as it has implications for our understanding of perception, attention, and consciousness and is a very new variable in the field of research. This study aimed to study the difference of nicotine usage in the presence of Inattentional Blindness and on Attention of smokers and non-smokers. Purposive sampling was used to draw a sample of 30 participants, 15 smokers and 15 non-smokers across Bangalore, Karnataka aged between 18-25 years old. Cancellation task was used to assess Attention and Daniel Simons and Christopher Chabris Selective Attention Video (1999) was used to assess Inattentional blindness. Further ANOVA was done using SPSS and the findings of the study indicated that there was no significant difference in the presence of Inattentional blindness and attention amongst smokers and non-smokers.

**Keywords:** Attention, Inattentional blindness, Nicotine, Smoking, Perception

Nicotine is a psychoactive drug that is found in tobacco products and is known to have both stimulating and relaxing effects on the brain. According to a study by Jamal et al. (2018), they estimated 14.0% of adults aged 18–24 years reported current cigarette smoking and one of the most widely researched effects of nicotine is its impact on attention and perception. Studies have shown that nicotine can enhance cognitive performance and improve attention, especially in situations that require sustained focus Heishman et al (2010), Levin et al (1993), Knott et al (1980), Clare (2003) and Fossati (2002). However, there is also evidence that nicotine can cause inattentional blindness, a phenomenon in which individuals fail to notice unexpected stimuli in their environment Most et al (2005), Lavie et al (2004), Boggan et al (2018), In this paper, we will explore the effects of nicotine on attention and inattentional blindness, discussing the underlying mechanisms and implications for real-world situations.

Inattentional blindness refers to the phenomenon where people fail to notice an unexpected object or event in their visual field because their attention is so absorbed by a task or other stimuli that they do not register other information that is present in their environment. This

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phenomenon highlights the limited capacity of visual attention and the fact that even when we are looking directly at something, we may not actually see it if our attention is elsewhere. “Because this inability to perceive, this sighted blindness, seemed to be caused by the fact that subjects were not attending to the stimulus but instead were attending to something else.” (Mack & Rock, 1998)

Inattentional blindness is an important area of research in psychology, as it has implications for our understanding of perception, attention, and consciousness and is a very new variable in the field of research. Studies of inattentional blindness assert that without attention, the visual aspects of our surroundings are not perceived or only unconsciously perceived. This means that not only do people miss changes in their environment, but they also fail to perceive things altogether. This highlights the crucial role that attention plays in shaping our perceptions and demonstrates how our limited attentional resources can impact what we are able to consciously perceive.

The classic study on Inattentional blindness was conducted by Simons & Chabris (1999), “Gorillas in our midst: sustained inattentional blindness for dynamic events” aimed to examine the variables that affect inattentional blindness. Using 228 undergraduates for their study they found that 54% noticed the unexpected event and 46% failed to notice the unexpected event. In another study conducted by Brendan T Hutchinson (2019) “Toward a theory of consciousness: A review of the neural correlates of inattentional blindness” it has been pinpointed to particular brain areas and functions—such as the prefrontal cortex, parietal cortex, and superior colliculus that are involved in perception and attention. The study implies that attention and conscious perception are not the same thing and can be separated in some situations. For instance, when one task is the center of attention, unexpected inputs may pass unnoticed even though they are processed subconsciously. Change blindness and inattentional blindness are two related phenomena that are examined in another article by Rensink (2009). Change blindness is the inability to recognise visual changes in a situation, whereas inattentional blindness is the inability to recognise unexpected objects or events when one's attention is diverted to something else. According to the article, inattentional blindness and change blindness are caused by the way our brains allocate and prioritize our attentional resources rather than being simple failures of vision.

Thomsen et al. (2017) investigated the effects of nicotine on sustained attention and associated brain networks using functional magnetic resonance imaging (fMRI). The study involved 20 healthy non-smoking volunteers who were randomized to receive either nicotine (2 mg gum) or placebo gum in a double-blind, crossover design. They found that nicotine improved sustained attention, as measured by faster and more accurate responses to the target stimuli. In addition, nicotine enhances activity in a network of brain regions that are involved in attentional processing, including the thalamus, prefrontal cortex, and parietal cortex. However, the researchers did not find any significant effects of nicotine on inattentional blindness, as participants who received nicotine were just as likely as those who did not receive nicotine to miss unexpected stimuli that appeared in their visual field. Knudsen et al. (2016) investigated the effects of nicotine on visual search and inattentional blindness using a modified version of the classic Eriksen flanker task. The study involved 18 healthy non-smoking volunteers who were randomized to receive either nicotine (4 mg gum) or placebo gum in a double-blind, crossover design. The results showed that nicotine impaired the ability to reorient attention to unexpected stimuli, as measured by slower response times to the target letter when an unexpected stimulus was present. This suggests

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that nicotine may increase inattentional blindness by making it harder to shift attention away from the primary task and towards unexpected stimuli. In another study, Levin et al. (2006) investigated the effects of nicotine on visuospatial attentional orienting in non-smokers using a Posner cueing task. The results showed that nicotine improved the ability to detect the target object, as measured by faster response times and higher accuracy rates. However, nicotine did not have any significant effects on inattentional blindness.

These 3 studies suggest that nicotine can have complex effects on attention and perception. While nicotine may enhance certain aspects of attention, such as sustained focus or target detection, it can also impair other aspects of attention, such as the ability to reorient attention to unexpected stimuli in the environment. It is important to note that these studies were conducted with non-smokers and more research is needed to fully understand the effects of nicotine on inattentional blindness in smokers and other populations. Taken together there has not been enough research on the effects of nicotine on inattentional blindness and attention using 2 sample groups i.e., Smokers and Non-smokers. Hence this study aims to measure and compare attention of smokers and non-smokers and presence of inattentional blindness in both the groups.

### **METHOD**

#### *Design*

The study was a quantitative correlational design.

#### *Objectives*

To study if there is any significant difference of nicotine usage on presence of inattentional blindness.

To study if there is any significant difference of nicotine usage on attention.

#### *Hypothesis*

$H^{01}$  : There is no significant difference of nicotine usage in the presence of inattentional blindness.

$H^{02}$  : There is no significant difference of nicotine usage on attention.

#### *Sample*

In the present study, the sample size of 30 participants were selected from Bangalore, Karnataka who were between 18-25 years of age. Out of 30 participants 15 were non-smokers (Nicotine independent) and 15 were smokers (Nicotine dependent). For this research study, purposive sampling as the sampling technique was employed which is a non-probability sampling method that involves selecting specific individuals or groups based on predetermined criteria that are relevant to the research question (i.e smokers and non-smokers for this particular research). Participants who possessed the characteristics or qualities that were essential for this study were selected based on a few inclusions and exclusions. This method allowed the researcher to gather data from a targeted group of participants who could provide valuable insights into the research topic.

*Inclusion criteria:* Participants shall be between the ages of 18 to 25 years old. For non-smokers it was made sure that participants had never consumed any sort of nicotine in their lifetime and for smokers they should be consuming a minimum 1 packet of cigarettes in a week for 6 months minimum. They should be available in Bangalore city for the experiment conducted and shall not be aware of the Inattentional blindness video.

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*Exclusion criteria:* Participants shall not be from the Psychology department or the field of psychology. They should not have any past history of any brain injury, trauma or mental illness.

### *Tools*

Two instruments were used in this study,

1. Daniel Simons and Christopher Chabris, Selective Attention Video (2010)
2. Digit Vigilance Test by Ronald F. Lewis (1995)

### *Variables*

- **Inattentional Blindness.** “Because this inability to perceive, this sighted blindness, seemed to be caused by the fact that subjects were not attending to the stimulus but instead were attending to something else.” (Mack and Rock, 1998)
- **Attention.** According to an article (Nature, 2021) Attention is a cognitive process in which a person or animal concentrates on one thing in particular. To attend to something is to focus, heed or take notice of that thing irrespective of what else is going on in the surroundings.
- **Nicotine.** The National Cancer Institute defines nicotine as “An addictive, poisonous chemical found in tobacco. It can also be made in the laboratory. When it enters the body, nicotine causes an increased heart rate and use of oxygen by the heart, and a sense of well-being and relaxation” (National Cancer Institute, n.d.)

### *Ethical considerations*

**Informed Consent:** Informed consent was given to the participants to make sure they understand that their participation is completely voluntary and no mental and physical harm will be provided along with maintenance of anonymity and confidentiality and that their data will only be used for educational purposes. It was also made clear that they can withdraw from the experiment at any time.

**Anonymity and confidentiality:** While putting the data in the excel only initials were taken to maintain confidentiality and even in the research paper and results no where participants’ name is mentioned.

### *Procedure*

In the present study, 2 groups were selected ie. Nicotine independent and Nicotine use. Both the groups were given an informed consent followed by Inattentional task video and then Cancellation task. In the end the participants were briefed about the experiment’s aim.

In the Inattentional task the video by Daniel Simons and Christopher Chabris Selective Attention Video (1999) was played where the participants had to count the number of passes made by the players wearing white. Once done, they were asked questions to assess the presence of inattentional bias. The questions included, “if they noticed anything unusual in the video?”, was anything apart from the players noticed”. In the cancellation task, instructions were given and they could only go in a horizontal direction. As it was a time-based task, they were asked to do it as fast and as accurately as possible. After completion of both the tasks in all 30 participants, data was entered into an excel and was coded into SPSS and one-way ANOVA was run to test both the hypotheses. The results obtained are presented as well as discussed as follows:

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### RESULTS AND DISCUSSIONS

The present study aimed to study the differences of nicotine usage on presence of inattentional blindness and attention on population aged between 18-25 from Bangalore, Karnataka. The data collected was scored, tabulated and also their descriptive statistics were calculated and then the results were interpreted according to the hypotheses with the help of inferential statistics. The results obtained are presented as well as discussed as follows:

**$H^{01}$  : There is no significant difference of nicotine usage in the presence of inattentional blindness.**

In order to test the above hypothesis, the mean scores obtained by Nicotine independent and Nicotine use group was computed and the outcome was as followed:

***Table 1 Descriptive statistics of scores of inattentional blindness of nicotine independent group and nicotine use group.***

		N	Mean	Std. Deviation	Std. Error
Inattentional Blindness	Nicotine use	15	.53	.51	.13
	Nicotine independent	15	.40	.50	.13
	Total	30	.46	.50	.09

***Table 2 ANOVA results of both the groups' scores in Inattentional Blindness***

	Sum of Squares	df	Mean Square	F	Sig.
Inattentional Blindness	.13	29	.13	0.50	0.48

An analysis of the above tables indicates that there was no significant difference in the presence of inattentional blindness between the the groups ie. Nicotine use and Nicotine independent as the significant value is 0.481 which is greater than 0.05 from which we can infer and accept the null hypothesis. Therefore, there is no significant difference of nicotine usage in the presence of inattentional blindness. This can be supported by a study done by Stough et al (2005) where they found that nicotine had no impact on the prevalence of inattentional blindness.

**$H^{02}$  : There is no significant difference of nicotine usage on attention.**

In order to test the above hypothesis, the mean scores obtained by Nicotine independent and Nicotine use group was computed and the outcome was as followed:

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**Table 3 Descriptive statistics of scores of attention of nicotine independent group and nicotine use group.**

			<b>N</b>	<b>Mean (secs)</b>	<b>Std. Deviation</b>	<b>Std. Error</b>
Attention	Time Taken	Nicotine use	15	316.46	117.35	30.30
		Nicotine independent	15	315.80	124.88	32.24493
		Total	30	316.13	119.07	21.73
	Error Scores	Nicotine use	15	15.73	9.01	2.32
		Nicotine independent	15	14.00	7.33	1.89
		Total	30	14.86	8.12	1.48

**Table 4 ANOVA results of both the groups' scores in Attention task**

		<b>Sum of Squares</b>	<b>df</b>	<b>Mean Square</b>	<b>F</b>	<b>Sig.</b>
Attention	Time Taken	3.33	29	3.33	.00	.98
	Error Score	22.53	29	22.53	.33	.56

An analysis of the above tables indicates that there was no significant difference in the scores of attentions between the groups i.e., Nicotine use and Nicotine independent as the significant values are 0.988 and 0.568 for time taken and error scores respectively. As the value is greater than 0.05 from which we can infer and accept the null hypothesis. Therefore, there is no significant difference of nicotine usage on attention. This can be supported by a study done by Foulds et al (1996) found no significant differences in attention between smokers and non-smokers after nicotine administration. In another study Heishman et al (2010) conducted a meta-analysis and found that nicotine had small positive effects on some cognitive tasks, but the effects were not significant on measures of attention hence supporting the hypothesis that there is no significant difference of nicotine usage on attention.

**CONCLUSION AND IMPLICATIONS**

In conclusion, statistical analysis shows no significant difference of nicotine usage in the presence of inattentive blindness and attention among 18–25-year-olds. These finds fall in line with past research done by Stough et al (2005), Foulds et al (1996) and Heishman et al (2010).

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Further research is needed to deeply understand the effects of nicotine on inattentional blindness which a larger sample and hence further implications can be made.

This study suggests that nicotine use may not significantly affect attention and inattentional blindness in smokers and non-smokers. This would cast doubt on the notion that nicotine improves cognitive abilities (Levin et al (1993), Thomsen et al (2017) at least in terms of attention and inattentional blindness.

The findings may also shed light on the nuanced relationship between nicotine use and cognitive performance. Other elements, such as the degree of dependency of the person, might also be important. Future research could look into these issues and shed more light on how nicotine affects cognitive function. Overall, this study's lack of conclusive results indicates that further research is necessary to properly understand how nicotine affects cognitive function and attention. It also highlights the need of taking numerous factors into consideration.

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### **Conflict of Interest**

The author(s) declared no conflict of interest.

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