

## Does Smoking Fool You? The Smoking Habits Influence on the Cognitive Abilities of Indonesians

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### Abstract

This study aims to analyze the influence of smoking habits on adolescents' cognitive abilities. The data used in this research is cross-section data from the Indonesia Family Life Survey batch 5 2014. The high rate of cigarette consumption for the age range 15 years and over in Indonesia has become a very serious concern. The smoking habit has many negative impacts on human brain development which in the long term will affect the quality of human resources in Indonesia. by exploring IFLS 2014 data, we found 6,908 teenage respondents who smoke. This figure is quite large, reaching 8% of all respondents. This research uses logistic regression analysis to see the impact of the independent variable on the dependent variable. The research results show that together smoking habits, education, history of hypertension, sleep quality and age have a significant effect on a person's cognitive abilities. Partially, smoking habits, history of hypertension, and age have a significant negative effect on a person's cognitive abilities. Meanwhile, education and sleep quality have a significant positive effect on a person's cognitive abilities. Gender partially has no effect on cognitive abilities.

**Keywords:** Cognitive Ability; Smoking; IFLS; Probit and Logit

### INTRODUCTION

In the Great Dictionary of the Indonesian Language, it is stated that smoking is the inhalation and exhalation of rolled tobacco wrap in paper. In Indonesia itself, smoking is an activity commonly found anywhere. Smoking has been considered a part of everyday life. People often serve cigarettes as an accompaniment to food and drinks and as part of traditional ceremonies, and even giving cigarettes as a reward is also a common thing. Smoking habit is a world health problem because it can cause various chronic diseases and even death

The Tobacco Atlas (2015) states that the amount of cigarette consumption in the world in 2014 reached 5.8 trillion cigarettes and is still increasing every year. In the same

year, Indonesia was ranked fourth as the country with the largest cigarette consumption after China, Russia and America. Data from The Tobacco Atlas (2015) states that 66.6% of men and 2.1% of women are active smokers in Indonesia. Indonesia is in first place with the most smokers in ASEAN, with a percentage of 46.16%. The percentage of other smokers is spread across the Philippines (16.62%), Vietnam (14.11%), Myanmar (8.73%), Thailand (7.74%), Malaysia (2.90%), Cambodia (2.07 %), Laos (1.23%), Singapore (0.39%), and Brunei (0.04%) (InfoDATIN, 2015).

The lowest age for cigarette consumption occurs in the 15-24 year old age group and the 75 year old age group. Smoking behavior in Indonesia, especially teenagers, has become a problem that requires serious treatment because the prevalence is increasing and the age for starting smoking is getting younger, reaching 7 years old for teenage boys. The negative impacts of smoking on health are clearly written on every cigarette pack; cancer, heart attacks, impotence, and pregnancy and fetal disorders. Hausteine and Groneberg stated that smoking does not only affect physical health. Long-term smoking habits will have an impact on brain and psychological function. One of the ingredients in cigarettes named nicotine, has effects on the brain, including causing dependence and toxicity on cognitive function. This dependency effect is what results in continuous exposure to smokers which will result in a decline in cognitive function for teenagers. In line with this, Suprpto (2014) in his research using the Mini Mental State Examination (MMSE) questionnaire stated that smokers have a risk of experiencing impaired cognitive function compared to non-smokers. If teenagers continue to smoke cigarettes, there will be a buildup of nicotine in the brain. Prasadja (2012) said that the accumulation of nicotine possibly causes harm to health, Beginning of decreased motivation, decreased ability to concentrate and memory. Research conducted by Ayuningtyas (2011) states that there is an influence of smoking behavior memory in smokers, namely that smokers' memory when tested while smoking is lower than their memory without smoking. Low cognitive abilities will have an impact on reducing productivity for both students and workers. In the long term, this low cognitive ability will reduce the quality of human resources which will definitely have a negative impact on national development. This research wants to look at the impact of smoking habits on cognitive abilities in adolescents as measured by the question "how is your memory?" This research uses IFLS batch-5 data in 2014.

## LITERATURE REVIEW

Research on the influence of smoking habits on cognitive abilities has been widely carried out both in Indonesia and abroad with various methods and types of data used. Risky (2018) used a cross sectional study design using the standard Brinkman, Fagerstorm questionnaire and the Indonesian version of the Montreal Cognitive Assessment (MoCA-Ina) to examine the relationship between smoking and education on the cognitive function of the academic community in the Muhammadiyah University Jakarta environment. As a result, there was a significant relationship between the degree

of smoking, nicotine dependence and education with cognitive function. Sampling in this study was carried out by consecutive sampling where subjects who met the inclusion criteria were included until the required number was met. The total sample in this study was 96 respondents. The inclusion criteria in this study were people aged 18-50 years and who had a smoking habit.

Andrian Liem (2010) summarizes various empirical research reports from the latest international journals (2010) regarding the influence of nicotine dependence in cigarettes on brain activity and its function as seen with fMRI. A report states that nicotine entering the brain causes psychological disorders such as anxiety, depression/sadness, anger, restlessness, difficulty concentrating, and compulsive behavior. Apart from that, cigarette addicts have a risk of decreased prospective memory.

Apart from that, cigarette addicts have a risk of decreasing prospective memory which is thought to be in the prefrontal cortex, hippocampus and thalamus areas. Apart from the brain and psychological aspects, cigarette addiction also has physiological impacts, namely encouraging vasoconstriction and atherosclerosis which causes subclinical myocardial ischemia, as well as carbon monoxide which increases the risk of hypoxemia and myocardial hypoxia.

Different results were presented by Murray (2002) in an article entitled Nicotine's effect on neural and cognitive functioning in an aging population, stating that nicotine can have a positive effect on smokers. The function of nicotine can help in attention, learning and memory. In the cholinergic system, there are nicotinic acetylcholine receptors which can bind to nicotine. The use of nicotine as an agonist causes increased function of nicotinic acetylcholine receptors, such as improving memory, attention and learning processes. This increase in function only lasts a short time if consumption is stopped, so the user consumes cigarettes again to get the increased effect. This continuously increasing effect is thought to cause nicotinic acetylcholine receptors to become exhausted and decline with aging.

Shahid (2017), using experimental methods, tried to see the impact of smoking habits on the cognitive abilities of teenagers in Saudi Arabia. As a result, smoking empirically damages cognitive abilities. This experiment was carried out by creating a group of smokers and a control group, namely those who did not smoke. There were 22 members of the smoking group and 30 people in the control group with an age range of 18 to 29 years. Cognitive function was assessed using the Cambridge Neuropsychological Automated Battery (CANTAB).

## **DATA AND ANALYSIS METHODS**

This research uses cross-section data from the Indonesian Family Life Survey (IFLS) batch 5 of 2014. IFLS is a household survey regarding health and socio-economics that is carried out on an ongoing basis. This survey collects data from individual respondents, families, households, the communities where they live and the Health and Education facilities they use. This survey is based on a sample at the household level which represents 83% of the population in Indonesia, represented by 13 of the 26 provinces in 1993.

The IFLS data used in this research is IFLS batch 5 which was conducted in 2007. This data is used to see the probability that a smoker has good or bad cognitive abilities. The sample used was limited to the individual level with teenage respondents. In this study, the teenage category was respondents aged 14 to 24 years. The total number of respondents collected was 6,717 respondents.

The dependent variable in this research is cognitive ability. Cognitive abilities are the construction of thinking processes, including remembering, problem solving, and decision making, from childhood to adolescence to adulthood. This cognitive ability greatly influences a person's productivity. Good cognitive abilities will make someone who is studying produce good output. In the world of work, someone with good cognitive abilities will be more productive. Questions about cognition in IFLS are in book 3B with code co04aa. The question reads "How is your memory ability right now?" The answer to this question is categorical; worth 1 if perfect, worth 2 if very good, worth 3 if good, worth 4 if fair and worth 5 if bad. These categorical answers are then made binary or dummy. Scores 1-4 are categorized as respondents with good cognitive abilities and given a value of 1. Scores of 5 are categorized as respondents with poor cognitive abilities given a value of 0. The independent variable in this study is smoking habits. Questions about smoking habits in IFLS are in book 3B with code KM01a. To avoid the problem of omitted variables, this study added control variables in the form of: Education, age, gender, history of hypertension, and sleep quality.

This research uses logit and probit analysis techniques to see the effect of smoking habits on cognitive abilities. This analysis technique is used because the dependent variable is a qualitative response model that is binary or dichotomous. In a model with a binary response there are only two possible values, namely 1 and 0. The aim of this model is to find the probability of an event. Therefore, this regression model with a binary response is also called a probability model. The model uses an exponential equation to get probability values in the interval 0 and 1. The Logit Model equation is as follows:

$$\Pr(x) = \frac{1}{1 + e^{-z}} = \frac{1}{1 + e^{-1(\alpha + \beta_1 x_1 + \dots + \beta_n x_n)}}$$

Which the equation simplifies to:

$$\Pr(x) = \frac{1}{1 + e^{-z}} = \frac{e^z}{1 + e^z}$$

Where

$$Z = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + e$$

The model in this research was then formulated into:

$$Y = a + Q_1 \text{Smoking} + Q_2 \text{Education} + Q_3 \text{Hypertensi} \\ + Q_4 \text{Quality of Sleep} + Q_5 \text{Age} + Q_6 \text{gender} + e$$

Figure 1. Summary of Research Variables

Variable	Definition
Cognitive ability	1 if cognitive ability is good 0 otherwise
Smoking habit	1, if smoking, 0, if not smoking
Education	How long the respondent has been in education
Hypertension	1 if subject have a history of hypertension 0 if subject have no history of hypertension
Quality of Sleep	1 poor 2 bad 3 enough 4 good 5 very good
Age	Teenage Age (14-24 years old)
Gender	1 Male 0 Female

## RESULTS & DISCUSSION

Below are presented descriptive statistics for the variables in this study. The number of respondents examined in this research was 6,712 respondents follows:

Figure 2. Cognitive Ability. Summary of Research Variables

A person's cognitive ability is good	Freq.	Percent	Cum.
No	181	2.69	2.69
Yes	6,536	97.31	100.00
Total	6,717	100.00	

Table 2 shows that 6,536 respondents had good cognitive abilities or reached 97.31%, meaning that almost all of the respondents studied had good cognitive abilities. Meanwhile, there were 181 people with poor cognitive abilities or around 2.69% of the total respondents studied.

Figure 3. Smoking Habit

someone who has a smoking habit	Freq.	Percent	Cum.
No	5,097	75.88	75.88
Yes	1,620	24.12	100.00
Total	6,717	100.00	

Table 3 shows that as many as 1,620 respondents or around 24.12% have the habit of smoking. Meanwhile, 5,097 respondents or around 75.88% were non-smokers

Figure 4. Education and Age

Variable	Obs	Mean	Std. Dev.	Min	Max
Education	6,717	11.34033	2.714749	6	22
Age	6,717	19.32678	2.958561	14	24

Based on table 4 above, it is known that the average length of school for the respondents studied was 11 years with the shortest length of school being 6 years and the longest being 22 years. In this study the average age of respondents was 19 years with the smallest age being 14 years and the maximum age being 24 years. Respondents aged 14-24 years were taken because this is adolescence, which is the age of a person's cognitive formation

Figure 5. Hypertension

someone diagnosed with hypertension	Freq.	Percent	Cum.
No	6,515	96.99	96.99
Yes	202	3.01	100.00
Total	6,717	100.00	

The results of the descriptive analysis showed that as many as 6,515 respondents or around 96.99% of respondents did not have a history of hypertension. Meanwhile, around 202 respondents or around 3% had a history of hypertension.

Figure 6. Quality of Sleep

The quality of a person's sleep	Freq.	Percent	Cum.
Very Bad	143	2.13	2.13
2	723	10.76	12.89
3	3,676	54.73	67.62
4	1,654	24.62	92.24
Very Good	521	7.76	100.00
Total	6,717	100.00	

This research divides a person's sleep quality into 5 categories, namely: very bad, bad, fair, good and very good. Table 6 shows that 54.73% or around 3,676 or almost half of the respondents had sufficient quality sleep. As many as 12.89% or around 866 people had poor and very poor sleep quality. Meanwhile, 32.38% or around 2,175 respondents had good to very good sleep quality.

Figure 7. Gender

gender, 1=Male 0=Female	Freq.	Percent	Cum.
Female	3,673	54.68	54.68
Male	3,044	45.32	100.00
Total	6,717	100.00	

Table 8. Logit and Probit Estimation Results

	Logit	Probit
A person's cognitive abilities are good	-0.534**	-0.237**
Someone who has a smoking habit	(0.228)	(0.097)
respondent's last education	0.092***	0.040***
someone diagnosed with hypertension	-0.971***	-0.460***
The quality of a person's sleep	0.494***	0.202***

	(0.094)	(0.039)
Responden's Age	-0.044 (0.027)	-0.020* (0.012)
gender, 1=Male 0=Female	0.020 (0.217)	0.012 (0.090)
Constant	2.123*** (0.728)	1.332*** (0.310)
Observations	6717	6717

The results of the logit and probit estimation of the model provide a general picture of the influence of the independent variable on the dependent variable. The influence of smoking habits on cognitive abilities has a negative coefficient direction of -0.535 with a logit estimate and -0.237 with a probit estimate. These results show that the probability of a smoker having good cognitive abilities is 23% smaller than that of someone who does not have a smoking habit. This result is significantly negative with a standard error of 5%.

The effect of years of schooling on cognitive abilities has a significant effect. With probit estimation, the direction of the coefficient has a positive value of 0.040. These results indicate that an additional 1 year of education can increase a person's cognitive abilities by 4%. A person's history of hypertension significantly negatively affects their cognitive abilities. With a probit estimated coefficient that has a negative direction of -0.46. These results show that the probability that someone with a history of hypertension has good cognitive abilities is 46% smaller than those who do not have a history of hypertension. The quality of a person's sleep also significantly influences a person's cognitive abilities. With a probit estimated coefficient that has a positive direction of 0.2. These results show that the better the quality of a person's sleep, the higher their cognitive abilities will be by 20%.

Testing age on a person's cognitive abilities has a significant negative effect at the 10% level with probit estimation, but is not significant when using logit estimation. Because the respondents in this study were individuals aged 14 to 24 years, adding one year to a person's age will reduce cognitive abilities by 2%. Meanwhile, the gender of the individual with both estimates does not have a significant effect on a person's cognitive abilities.



## **CONCLUSION**

The research results show that together smoking habits, education, history of hypertension, sleep quality and age have a significant effect on a person's cognitive abilities. Partially, smoking habits, history of hypertension, and age have a significant negative effect on a person's cognitive abilities. Meanwhile, education and sleep quality have a significant positive effect on a person's cognitive abilities. Gender partially has no effect on cognitive abilities.

Increasing public awareness of the dangers of smoking must continue to be expressed by individuals, society and the government. Because smoking has a huge influence on reducing an individual's cognitive abilities. Decreased or weak cognitive abilities will cause an individual to be unproductive in his activities. In the long term, if the smoking rate among teenagers continues to increase, in the future the quality of Indonesia's human resources will be weak or of poor quality. Low quality human resources will certainly hamper national development and will make it difficult to achieve development successes targeted by the government.

There are many factors that can influence adolescent cognition that have not yet been researched and studied in this research. This research can be further developed by including these variables. Apart from that, additional references need to be made to support and perfect this research and writing.

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