

Correlation between Theory of Planned Behavior and Smoking Cessation: A Meta-Analysis

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ABSTRACT

Background: The increasing consumption of cigarettes that continues to occur among the community has an impact on the higher rates of morbidity and mortality. Active smokers who have a tendency to quit smoking can be identified by measuring their intentions. The theory of planned behavior is a concept that influences the study of an individual's behavior. This study aims to estimate the magnitude of attitudes towards behavior, subjective norms, and perceptions of behavioral control with behavior to stop smoking.

Subjects and Method: This study is a systematic review and meta-analysis with the acronym PICO, namely population: smokers. Intervention: positive attitude toward behavior, supportive subjective norm, strong perception of behavioral control. Comparison: attitude towards negative behavior, subjective norms do not support, perception of behavior control is weak. Outcome: smoking cessation behavior. Data collection was obtained from 4 databases, namely: Google Scholar, PubMed, Science Direct and ProQuest with the keywords used "attitude toward behavior" AND "subjective norm" AND "perceived behavior control" AND "quit smoking" OR "quit smoke" OR "smoking cessation". The inclusion criteria used were full English paper with cross sectional design in 2012-2022. The analysis of this study used RevMan 5.3 software.

Results: A total of 7 articles originating from the Asian and American continents were included in this study. Based on the results of the analysis of smokers who had positive behavior (aOR = 2.77; 95% CI = 1.06 to 1.37; p < 0.001), subjective norms were supportive (aOR = 1.08; 95% CI = 0.98 to 1.18; p < 0.001), as well as perceived control behavioral (aOR = 1.19; 95% CI = 1.00 to 1.42; p < 0.001) were more likely to quit smoking compared to smokers who had negative behavior, unsupportive subjective norms, and weak perceptions of behavioral control.

Conclusion: Positive behavior, supportive subjective norms, perception of strong behavioral control increase the likelihood of smoking cessation in active smokers.

Keywords: theory of planned behavior, stop smoking, adjusted odds ratio.

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BACKGROUND

Smoking is one of the habits commonly encountered in everyday life carried out by various groups in the world. Smoking

habits do not look at age from childhood, adolescence to adulthood. Smoking behavior is carried out by burning one of the tobacco products by burning, smoking and

inhalation including kretek cigarettes, white cigarettes, cigars or other forms produced from the plants *Nicotina tabacum*, *Nicotina rustica* and other species or their synthetics whose smoke contains nicotine and tar, with or without additives (Atmojo et al., 2017).

The increase in cigarette consumption that continues to occur among the community has an impact on the higher burden of disease caused by smoking and increasing mortality due to smoking. Currently, smoking behavior that occurs in society is still difficult to stop, even though cigarettes contain more than 4,000 toxic chemicals contained in tobacco and are not needed for the human body (Marsanti et al., 2021). Factors that cause individuals to continue smoking, especially among teenage students based on research (Arifianti et al. 2019) are pressure from environmental factors, namely friends, relatives, various advertisements, and easy access to cigarettes at affordable prices.

The risk that occurs in smokers from young to adult is very complex because cigarettes contain addictive substances. It causes addiction and dependence like naza. Active smokers who are addicted to cigarettes if immediately stopped will cause tobacco withdrawal syndrome and addictive substances contained in cigarettes (Fitri, 2022). Given these conditions, the risk posed by smoking is very fatal, so smoking behavior is very important to stop among the public.

Various interventions by the government in terms of reducing the number of smokers have been carried out. Based on research from (Sibarani and Perbawaning-sih, 2018) that countries in the Asia Pacific region have a high commitment to reducing the number of smokers in their country. This high commitment is carried out with social campaign products. The social

campaign program has a policy strategy to create a national campaign with the aim that the public has the correct source of information regarding the dangers of smoking and behavior to stop smoking.

Individual stages to quit smoking start from pre-contemplation, contemplation, preparation, smoking cessation action, rehabilitation from smoking cessation, the desire to relapse from smoking (Prasetya, 2016). Active smokers who have a tendency to quit smoking can be identified by measuring their intentions. The intention in question is the possibility of individuals to do certain things, namely smoking. Individual readiness to do and bring up smoking behavior can be interpreted with an intention. One of the theoretical models that can analyze the emergence of a behavior is the Theory of Planned Behavior (TPB). The theory is considered to be able to be used in health behavior.

Theory of Planned Behavior which is a concept with the aim of predicting individual behavior based on their intentions. TPB is considered to be one of the most well-known and influential concepts in the study of individual behavior. The constructs in TPB are attitudes towards behavior, subjective norms, and perceptions of behavioral control (Ardelia and Dewi, 2012).

The assumption in the Theory of Planned Behavior theory is that behavior is determined by a person's desire to do or not to perform a behavior or vice versa. Individual intentions to behave can be predicted with three things, namely attitude toward the behavior (attitude towards behavior) is an individual's evaluation of the positive or negative to display a certain behavior, then subjective norm (subjective norm) is an individual belief that explains the demands of others who are considered important to him and willing to display a

certain behavior in accordance with these demands, and the last is perceived behavioral control (perception of behavior control) which is an individual's perception of the ability to show a certain behavior.

SUBJECTS AND METHOD

1. Study Design

This research is a systematic review and meta-analysis. Data collection was obtained from 4 databases, namely: Google Scholar, PubMed, Science Direct and ProQuest. Analysis of this research using software RevMan 5.3. The keywords in this study were: "attitude toward behavior" AND "subjective norm" AND "perceived behavior control" AND "quit smoking" OR "quit smoke" OR "smoking cessation".

2. Inclusion Criteria

The inclusion criteria in this study were full paper articles using a cross sectional study design, the size of the relationship used was the adjusted Odds Ratio (aOR), the research subjects were individual smokers who had the intention to quit smoking, the comparison was attitudes towards negative behavior, norms subjective does not support, perception of behavior control is weak.

3. Exclusion Criteria

Exclusion criteria in this study were studies conducted with an RCT study design, cohort and case control, articles that did not use multivariate analysis, articles published before 2010.

4. Operational Definition of Variables

The search for articles was carried out by considering the eligibility criteria determined using the PICO model. The population of this study were smokers, the intervention used was strong attitude towards behavior, supportive subjective norms, strong perception of behavioral control. The comparison criteria are attitudes towards weak behavior, subjective norms

do not support, perception of behavior control is weak, the outcome of this study is smoking cessation.

Attitudes towards behavior are behaviors that are believed to give positive results to smoking cessation behavior.

Subjective norms are a person's perception or view of the beliefs of others that will affect the intention to quit smoking.

Perception of behavioral control is the individual's perception of the ease or difficulty of showing the desired attitude, namely smoking cessation behavior.

Smoking cessation behavior is a form of smoking cessation activity that can harm individual smokers and those around them.

5. Instruments

The instrument used in this research is to use a quality assessment using the Critical Appraisal checklist For Cross-Sectional study from the Center for Evidence Based Management (2014).

6. Data Analysis

The data in this study were analyzed using the Review Manager application (RevMan 5.3). Forest plots and funnel plots were used to determine the size of the relationship and the heterogeneity of the data. Fixed effects model was used for homogeneous data, whereas random effects model was used for heterogeneous data across studies.

RESULTS

Process of searching article was carried out by searching several journal databases PubMed and Google Scholar, Science Direct, and ProQuest it can be seen using the PRISMA FLOW flowchart shown in Figure 1.

The initial search process resulted in a total of 1692 articles, after deleting the duplicated articles, 1121 articles were found, of which 573 articles were eligible for a full text review. A total of 7 articles that meet

the criteria according to the quantitative synthesis meta-analysis.

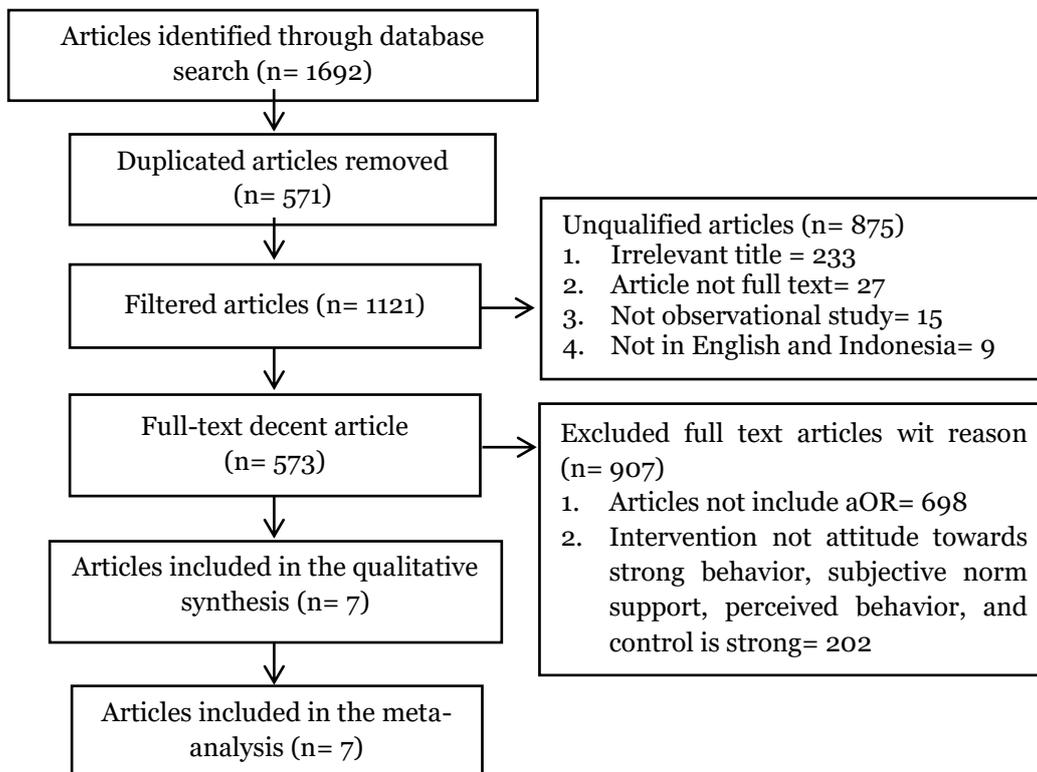


Figure 1. Results of Prisma Flow Diagrams

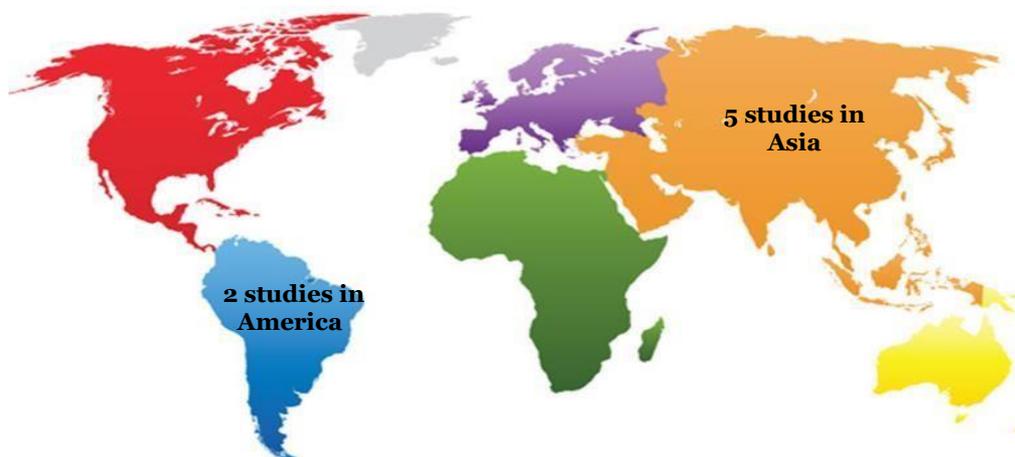


Figure 2. Research Distribution Map

It can be seen in figure 2 that the research articles come from two continents such as Asia, and America.

An assessment of the quality of the articles with cross-sectional study design

used in this study can be seen in table 1, and quality of the articles with cross-sectional study it can be seen in table 2.

Table 1. Critical Appraisal Checklist for Cross-Sectional study (CEBM)

No	Indicator	Publication (Author and Year)						
		Tapera et al. (2020)	Choudhury Robin & Noosorn (2019)	Athamneh et al. (2017)	Tseng et al. (2018)	Chen-Li Lin et al. (2019)	Alanaa et al. (2017)	Jalilian et al. (2016)
1	Do the research objectives clearly address the focus/problem of the research?	1	1	1	1	1	1	1
2	Is the research method (research design) suitable to answer the research question?	1	1	1	1	1	1	1
3	Is the research subject selection method clearly written?	1	1	1	1	1	0	1
4	Does the sampling method give rise to bias (selection)?	1	1	0	1	1	1	1
5	Does the research sample taken represent the designated population?	1	1	1	1	1	1	1
6	Was the sample size based on pre-study considerations?	1	1	1	1	1	1	1
7	Is the measurement method achievable?	1	1	1	1	1	1	1
8	Are the research instruments valid and reliable?	1	1	1	1	1	1	1
9	Was statistical significance assessed?	1	1	1	1	1	1	1
10	Was a confidence interval given for the main outcome?	1	1	1	1	1	1	1
11	Are there any confounding factors that have not been taken into account?	1	1	1	0	0	1	1
12	Are the results applicable to your research?	1	1	1	1	1	1	1
	Total	12	12	11	11	11	11	12

Table 2. Summary of Articles Source of Theory of Planned Behavior on Quitting Smoking Behavior.

No	Author (Year)	Country	Study Design	Sample	Population (P)	Intervention (I)	Comparison (C)	Outcome (O)	aOR (95 % CI)
1	Tapera et al. (2020)	Botswana	Cross-sectional	2554	Schoolboy smoker (2554)	positive attitude toward behavior, supportive subjective norm, strong PBC	negative attitude towards behavior, subjective norms are not supportive, strong PBC	Smoking cessation	1.81, 95% CI: 1.67-2.11 1.31, 95% CI: 1.10-1.57 1.69, 95% CI: 1.52-1.91
2	Choudhury Robin & Noosorn (2019)	Amerika	Cross-sectional	340	Male smoker (340)	positive attitude toward behavior, supportive subjective norm, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation	0.95, 95% CI:0.80–1.14 0.80,95% CI:0.69-0.93 1.04,95% CI 0.88–1.22
3	Athamneh et al (2017)	Bangladesh	Cross-sectional	410	Child smokers (410)	positive attitude toward behavior, supportive subjective norm, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation behavior	1.131, 95% CI: 0.746, 1.714 1.064, 95% CI: 0.946-1.198 0.979, 95% CI: 0.789-1.214
4	Tseng et al (2018)	Taiwan	Cross-sectional	145	Male smoker (145)	positive attitude toward behavior, supportive subjective norm, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation	1.212, 95% CI: 0.95–1.54 1.157, 95% CI: 1.02–1.32 1.149, 95% CI: 1.00–1.32
5	Chen-Li Lin et.al (2019)	Taiwan	Cross-sectional	72	Female Smoker (72)	positive attitude toward behavior, supportive subjective norm, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation	1.03,95% CI: 1.00-1.06 1.01, 95% CI: 0.96-1.07 0.99, 95% CI:0.98-1.00
6	Alanaa et. al (2017)	Riyadh	Cross-sectional	406	Teen smoker (406)	positive attitude toward behavior, supportive subjective norm, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation	1.571,95% CI: 1.133-2.177 0.993, 95% CI: 722-1.367 2.274, 95% CI: 1.509- 3.426
7	Jalilian et. al (2016)	Iran	Cross-sectional	620	Male smoker (620)	attitude towards positive behavior, supportive subjective norms, strong PBC	attitude towards negative behavior, subjective norms are not supportive, strong PBC	Smoking cessation	1.042, 95% CI: 1.025-1.059 1.367, 95% CI: 1. 220- 1. 532 1.013, 95% CI; 0.910- 1.128

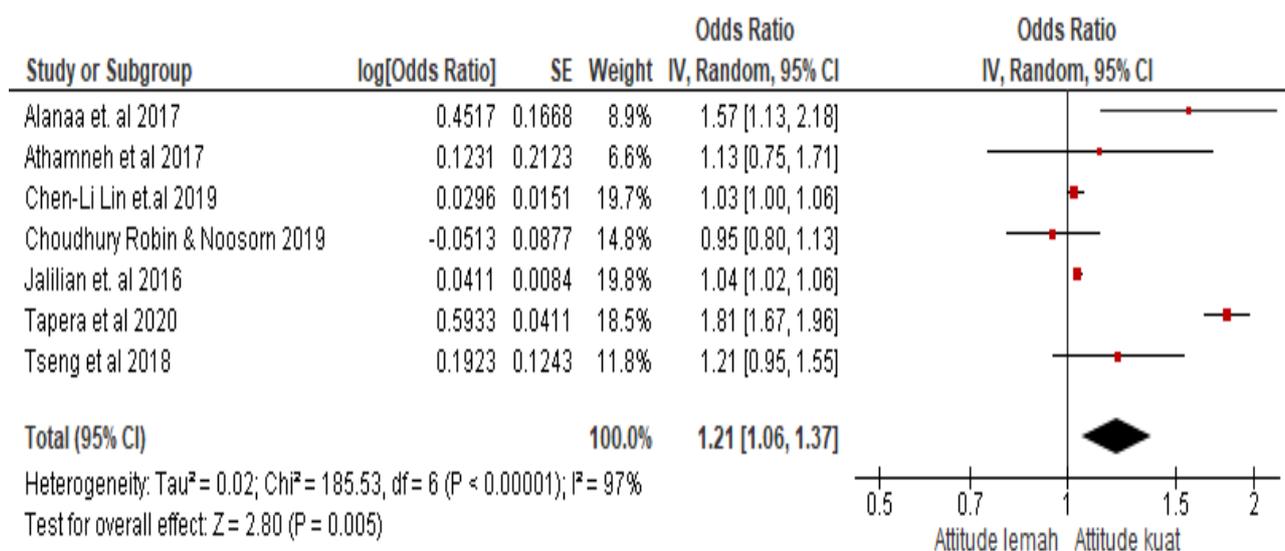


Figure 3. Forest plot of the relationship between attitudes towards smoking behavior and smoking cessation

Figure 3 showed that the interpretation of the forest plot of smokers with positive attitudes toward smoking behavior is 2.77 times more likely to have a smoking cessa-

tion behavior than smokers with negative attitudes. The results were statistically significant as indicated by (aOR= 2.77; 95% CI = 1.06 to 1.37; p < 0.001).

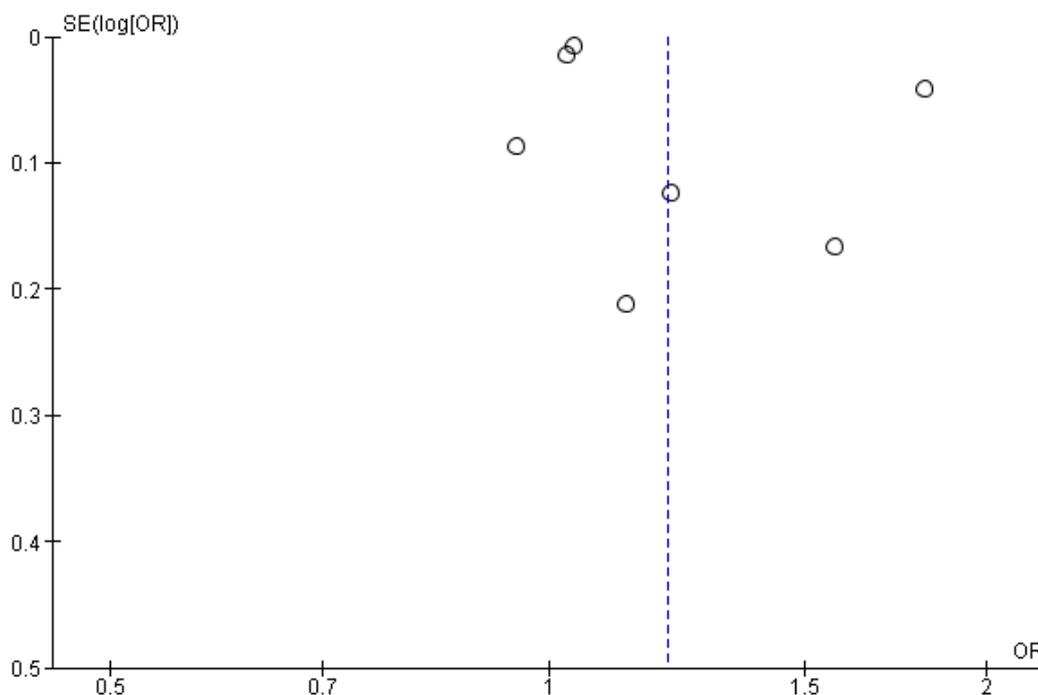


Figure 4. Funnel plot of the relationship between attitudes towards smoking behavior and smoking cessation

Figure 4 shows that the interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an

asymmetric distribution between the right and left plots. The plot on the right has 2, then the plot on the left has 4, and 1 plot touches the vertical line.

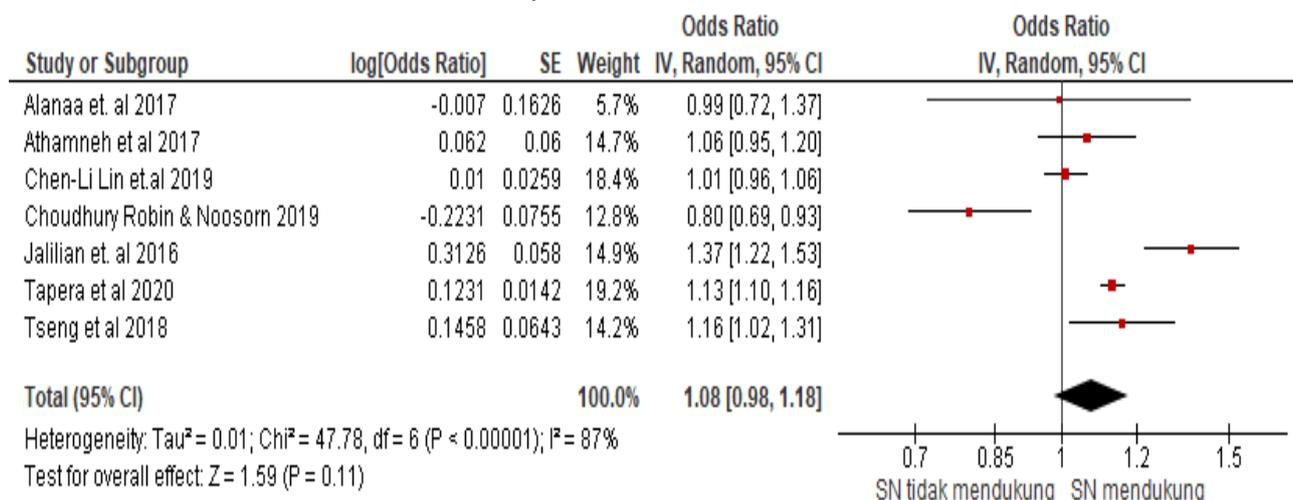


Figure 5. Forest plot of the relationship between subjective norms and smoking cessation behavior

Figure 5 shows that the forest plot interpretation of smokers with favorable subjective norms are 1.08 times more likely to stop smoking behavior than smokers with

non-supportive subjective norms. The results were statistically significant as indicated by (aOR= 1.08; 95% CI= 0.98 to 1.18; p < 0.001).

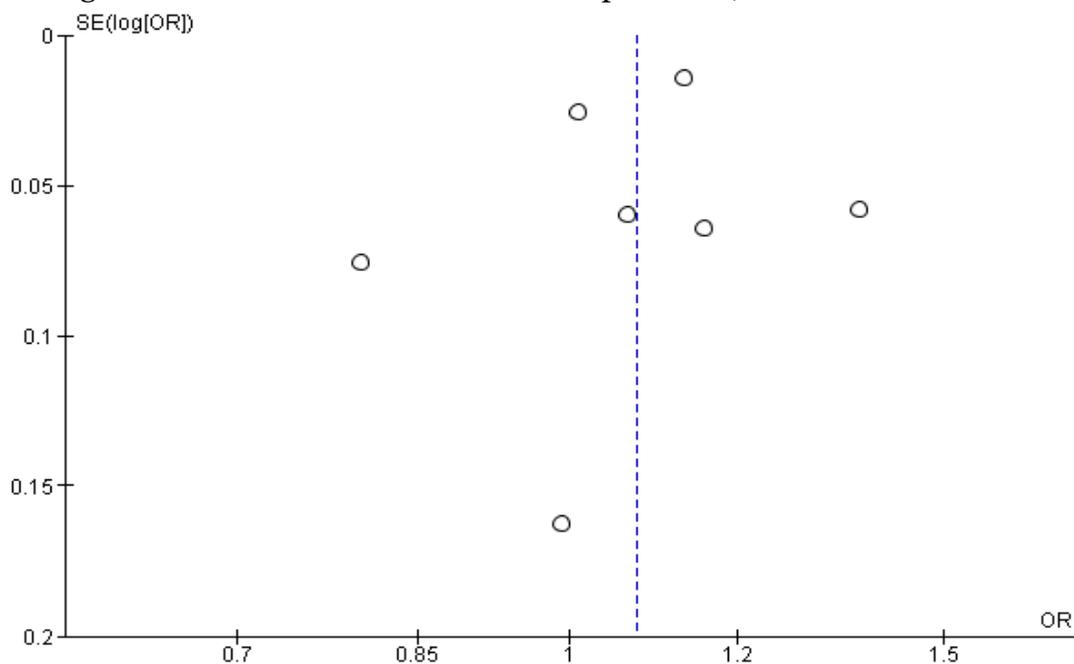


Figure 6. Funnel plot of the relationship between subjective norms and smoking cessation behavior

Based on Figure 6, the interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an asymmetric distribu-

tion between the right and left plots. The plot on the right has 3, then the plot on the left has 3, and 1 plot touches the vertical line.

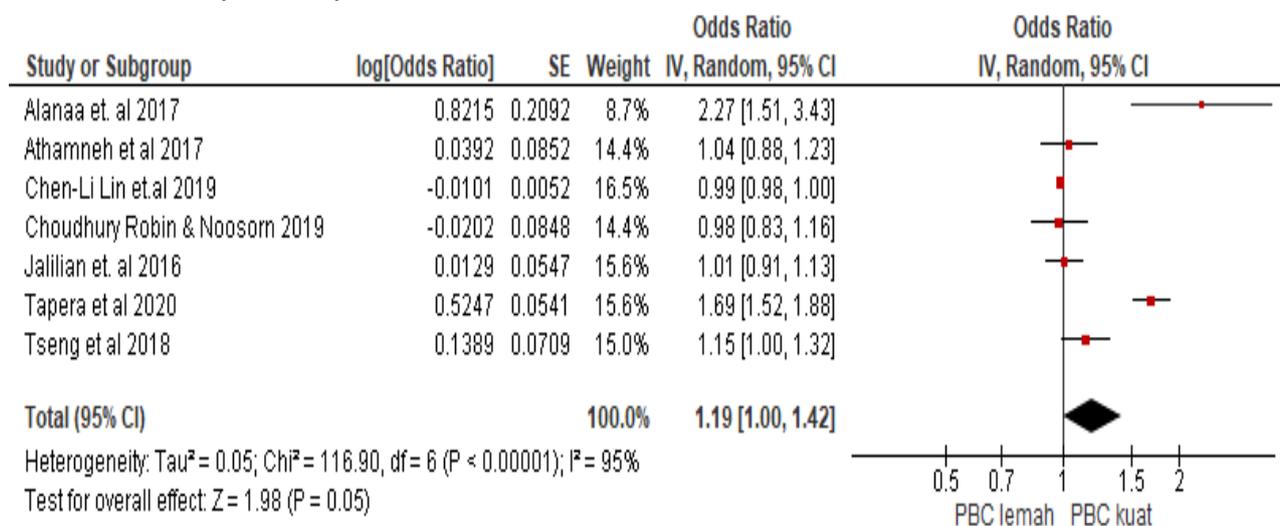


Figure 7. Forest plot of the relationship between perceived behavioral control and smoking cessation behavior

Figure 7 shows that the forest plot interpretation of smokers with strong PBC is 1.19 times more likely to quit smoking behavior than smokers with weak PBC.

The results were statistically significant as indicated by (aOR = 1.19; 95% CI = 1.00 to 1.42; p < 0.001).

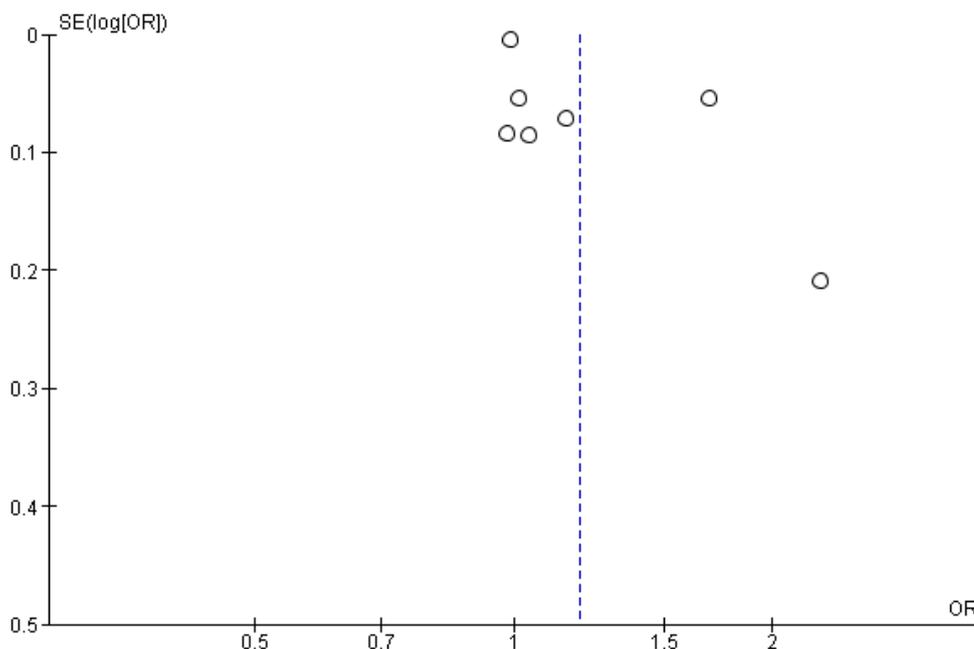


Figure 8. Funnel plot of the relationship between perceived behavioral control and smoking cessation behavior

Based on Figure 8, the interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an asymmetric distribution between the right and left plots. The plot on the right has 2, then the plot on the left has 5.

DISCUSSION

This study is based on a systematic study and meta-analysis related to the relationship between the theory of planned behavior and smoking cessation behavior. This study discusses the constructs that exist in the TPB theory, namely attitudes towards behavior, subjective norms, and perceptions of behavioral control in smokers who have the intention to quit smoking.

The importance of research on smoking cessation behavior is because the risk factors resulting from smoking activity among the community are very complex. Smoking cessation behavior can be assessed by the intention or intention that is described through a concept in the Theory of Planned Behavior (TPB). (Ajzen and Fishbein, 1975).

The results of the 7 relevant studies can be measured based on the reported statistical values. The statistical value is the adjusted odds ratio (aOR) which in these studies controls for confounding factors. The adjusted odds ratio value is the statistical result of the Odds Ratio (OR) value generated in the multivariate analysis.

Confounding factor is the influence of the relationship or effect of exposure on the occurrence of diseases that have been predicted by research that is not the same as the relationship or effect that actually occurs in the target population or can be declared invalid results (Murthi, 2018).

1. Relationship between attitude and smoking cessation

There are 7 research articles with a cross sectional study design that match the inclusion criteria regarding the relationship between attitudes towards behavior and smoking cessation behavior. The interpretation of the forest plot based on the results of a meta-analysis of 7 relevant research articles means that smokers with positive attitudes toward behavior are 2.77 times more likely to quit smoking than smokers with negative attitudes. The results were statistically significant (aOR= 2.77; 95% CI= 1.06 to 1.37; $p < 0.001$). The forest plot results also show $I^2 = 97\%$. That is, the estimates of the effect of attitudes on behavior from the primary studies performed by meta-analyses are very heterogeneous. Thus, the approach chosen to combine these various estimates is to use a random effects model.

The funnel plot diagram shows possible publication bias. The funnel plot shows the effect size of the study and the sample size or standard error of the effect sizes of various studies. The interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an asymmetric distribution between the right and left plots. The plot on the right has 2, then the plot on the left has 4, and 1 plot touches the vertical line. Because the direction of the distribution of the estimated effect of all studies is opposite to the average of all study effects, this publication bias reduces the true effect (under estimate). Research relevant to attitude toward behavior is strongly related to smoking cessation behavior described in other relevant studies.

Attitudes towards strong behavior related to smoking cessation behavior are

also described in the research of Tseng et al (2018). The study was related to individual intention to quit smoking in Taiwan by applying the theory of planned behavior which was carried out on 145 active smokers who had the intention to quit smoking. The results of this study indicate that attitude towards behavior has a value of $aOR = 1.15$ $CI\ 95\% = 1.02-1.32$. The interpretation is that smokers with a strong attitude towards behavior have a behavior to stop smoking 1.15 times compared to smokers with a weak attitude towards behavior. Attitude towards behavior has a significant direct impact on actually quitting smoking. Based on research by Tseng et al. (2018) that the strongest predictor of intention to quit smoking is attitude towards behavior.

2. Relationship between subjective norm and smoking cessation

There are 7 research articles with a cross sectional study design that match the inclusion criteria regarding the relationship between attitude toward behavior and smoking cessation behavior. The interpretation of the forest plot based on the results of a meta-analysis of 7 relevant research articles means that smokers with supportive subjective norms are 1.08 times more likely to quit smoking behavior than smokers with non-supportive subjective norms. The results were statistically significant as indicated by ($aOR = 1.08$; $95\% CI = 0.98$ to 1.18 ; $p < 0.001$).

The forest plot results also show $I^2 = 87\%$. That is, the estimates of subjective norm effects from the primary studies performed by meta-analyses are highly heterogeneous. Thus, the approach chosen to combine these various estimates is to use a random effects model.

The funnel plot diagram shows possible publication bias. The funnel plot shows the effect size of the study and the sample

size or standard error of the effect sizes of various studies. The interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an asymmetric distribution between the right and left plots. The plot on the right has 3, then the plot on the left has 3, and 1 plot touches the vertical line. Because the direction of the distribution of the estimated effect of all studies is opposite to the average of all study effects, this publication bias reduces the true effect (under estimate). Research relevant to strong subjective norms for smoking cessation behavior is related to those described in other relevant studies.

Droomers et al. (2016) conducted a study on individual intentions to stop smoking in China, namely in the cities of Shanghai, Nanning and Mudanjiang by applying the theory of planned behavior which was carried out on 3,676 active smokers who had the intention to quit smoking, which was carried out from September to December 2013. The results were that subjective norm has a value of ($aOR = 2.48$ $95\% CI = 1.98$ to 3.11). The interpretation is that smokers with supportive subjective norms have 2.48 times the behavior to stop smoking compared to smokers with non-supportive subjective norms.

In this study the application of subjective norms that an individual will perform a certain behavior if his behavior can be accepted by the people around him. So smoking cessation behavior will arise if the individual has a person's perception or view of smoking cessation behavior.

3. Relationship between perceived behavior control and smoking cessation

There are 7 research articles with a cross sectional study design that match the inclusion criteria regarding the relationship

between attitude toward behavior and smoking cessation behavior. The interpretation of the forest plot based on the results of a meta-analysis of 7 relevant research articles means that smokers with strong perceived behavioral control are 1.19 times more likely to stop smoking behavior than smokers with weak perceived behavioral control. The results were statistically significant as indicated by (aOR = 1.19; 95% CI = 1.00 to 1.42; $p < 0.001$). The forest plot results also show $I^2 = 95\%$. That is, the estimates of the effects of perceived behavioral control from the primary studies performed by meta-analyses are highly heterogeneous. Thus, the approach chosen to combine these various estimates is to use a random effects model.

The funnel plot diagram shows possible publication bias. The funnel plot shows the effect size of the study and the sample size or standard error of the effect sizes of various studies. The interpretation of the funnel plot results from the meta-analysis of 7 relevant research articles indicates that there is a potential for publication bias. It is characterized by an asymmetric distribution between the right and left plots. The plot on the right has 2, then the plot on the left has 5. Because the distribution direction of the estimated effects of all studies is opposite to the average of all study effects, this publication bias reduces the actual effect (under estimate). Research relevant to the perception of strong behavioral control on smoking cessation behavior is related to those described in other relevant studies.

Research from Tapera et al. (2020) on individual intention to quit smoking in Gaborone and Francistown, the largest city of Botswana by applying the theory of planned behavior which was conducted on 2554 active smokers who had the intention to quit smoking, conducted in January

2014. The results of the study by Tapera et al. (2020) shows that the perceived behavioral control (PBC) is aOR= 1.69; 95% CI= 1.52 - 1.91.

The interpretation of this is that smokers with strong perceived behavioral control have 1.52 times the behavior to quit smoking compared to smokers with weak perceived behavioral control. Perception of behavioral control is people's perception of the ease or difficulty of showing an attitude of interest, the intention of ease of quitting smoking in an individual can be created if the behavior is of interest. The interpretation of these results is that there is a relationship between perceived behavioral control and smoking cessation behavior. The perception of behavioral control can control and manage behavioral factors according to situations and conditions to control behavior.

AUTHOR CONTRIBUTION

Mitha Amelia Rahmawati is the main researcher who selects the topic, searches for and collects research data.

FUNDING AND SPONSORSHIP

This study is self-funded.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

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