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Exploring the Effects of Smoking Cessation Interventions for Asians and Asian Americans: A Meta-Analytic Review

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VITA

Amber Pham was born and raised in Fort Smith, Arkansas on January 16th, 1993. She attended the University of Arkansas, Fayetteville, majoring in Psychology and double minoring in Chinese and Social Work. She graduated in 2015 with a Bachelor of Arts. She then moved to Chicago, Illinois where she obtained her Master of Arts in Clinical Psychology from DePaul University. She is currently pursuing her doctoral degree and will begin her pre-doctoral internship at the Cincinnati VA Medical Center, with a specialization in neuropsychology, in July 2020.

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Abstract

Cigarette smoking continues to be a leading health problem in the United States and worldwide. Despite high prevalence rates among some subpopulations of Asians and Asian Americans, little attention has been focused on identifying effective smoking cessation interventions for this group. A meta-analysis examining effect sizes was conducted to test the hypothesis that smoking cessation interventions, overall, improve quit outcomes among Asians and Asian Americans. Factors associated with intervention effectiveness were explored through moderator analyses. Results show that overall, smoking cessation interventions are efficacious for Asians and Asian Americans (OR = 2.33). Moderator analyses revealed high intensity treatments and treatments with biochemical verification are associated with greater odds of cessation. Specific methods of cultural tailoring were not found to have a significant effect on smoking cessation outcomes. The present study has significant research, theoretical, and clinical implications for smoking cessation interventions targeting Asians and Asian Americans.

Keywords: smoking cessation, smoking, intervention, Asians, Asian Americans, tobacco

Exploring the Effectiveness of Smoking Cessation Interventions for Asians and Asian Americans: A Meta-Analytic Review

Smoking remains a leading health problem in the United States. Although effective empirically supported treatments are available, disparities in smoking prevalence remain among different racial, ethnic, and cultural groups. However, little attention has been focused on smoking cessation among Asians and Asian Americans (AAs). The current systematic review and meta-analysis examined: 1) the effectiveness of smoking cessation interventions for AAs; 2) whether culturally tailored smoking cessation interventions are more effective than non-culturally tailored smoking cessation interventions; and 3) moderating variables that strengthen outcomes.

Smoking in the United States

In 2014, the Centers for Disease Control and Prevention (CDC) reported cigarette smoking as the leading cause of preventable disease and death in the United States. In 2016, 37.8 million people identified as smokers in the United States; about 480,000 of these smokers will die of smoking-related health problems (CDC, 2018; U.S. Department of Health and Human Services (HHS), 2014). Mortality is three times higher for smokers than nonsmokers (HHS, 2014), and tobacco smoking is expected to lead to 450 million deaths worldwide in the next 50 years (CDC, 2005). Smoking is associated with many health consequences, such as increased risk for cancer, chronic obstructive pulmonary disease (COPD), strokes, diabetes, and heart disease (HHS, 2014).

Smoking in Asia

Male smoking prevalence in individual Asian countries is considerably higher than in the United States (Benowitz et al., 1998). The breakdown of adult male current smoking rates for a

few countries from 2016 are as follows: Korea (39.3%), Vietnam (45.3%), Philippines (40.3%), Indonesia (64.9%), Laos (50.8%), Thailand (40.5%), India (24.3%), Tonga (42.1%) and China (52.1%) (World Health Organization (WHO), 2017). China is the largest tobacco producer and consumer in the world (WHO, 2013). In 2016, China and India had the highest death rates in the world related to tobacco smoking and secondhand smoke exposure (Ritchie & Roser, 2018).

Smoking-Related Consequences among AAs

Although heart disease is the leading cause of death in the United States, lung and bronchus cancer are the leading cause of death for AAs (Heron, 2007). Unhealthy behaviors like smoking can contribute to cancer-related disparities. National studies estimate that AAs have the lowest prevalence of smoking among major ethnic groups in the United States (Substance Abuse and Mental Health Services Administration (SAMHSA), 2015). Current past-month cigarette smoking rates for major ethnic groups in the United Sates are as follows: Asian Americans (8.9%), Native Hawaiian/Pacific Islanders (18.3%), African Americans (21.4%), American Indians/Alaska Natives (33.9%), Hispanics/Latinos (16.6%), Caucasian (15.2%) (CDC, 2018). These estimates of smoking prevalence consider AAs in aggregate and often exclude some populations. Additionally, these studies fail to consider education, language, immigration status, age, socioeconomic status, and ethnic ancestry. For example, non-English-speaking populations may not be represented due to the use of English only language surveys, which is an important consideration since two-thirds of AAs are immigrants to the United States and 35% have low English proficiency (Chae et al., 2006; Davis et al., 2017). Sources of disparity, such as language, education, and immigration status, are important to examine as they may play a role in AAs' smoking (Zhang & Wang, 2008). A Chinese and Korean tobacco use survey reported Cantonese-speaking Chinese men had higher current smoking rates than Chinese men in general

(Carr et al., 2005). Additionally, the California Health Interview Survey found that 23.4% of Asian males who do not speak English well or at all were current smokers, compared to 4% of Asian males who do speak English well (UCLA Center for Health Policy Research, 2018). Analysis of 2000 Census data by the Asian American Federation of New York Census Information Center indicates that a large subset of New York Chinese smokers are foreign born (75%), have limited English proficiency (63%), and do not have a high school diploma (42%) (Asian American Federation of New York Census Information, 2004). These factors serve as additional barriers to smoking cessation (Ja & Aoki, 1993).

Tobacco Interventions

Many effective tobacco interventions exist with aims to reduce smoking and smoking-related health harms (Fiore, 2009). Tobacco interventions can be offered at the individual, family, and community level. Existing tobacco interventions include pharmacological products, behavioral counseling, self-help materials, and multicomponent interventions.

Pharmacological Interventions

Pharmacological cessation products include Nicotine Replacement Therapy (NRT) and oral medications such as bupropion and varenicline. NRT include nicotine patches, nicotine gum, nicotine nasal spray, nicotine inhaler, and nicotine lozenges. NRT works by delivering small doses of nicotine to the body via skin absorption or membranes of the mouth (Stead et al., 2012). NRT reduces withdrawal symptoms and cravings, increasing the likelihood of quitting (Stead et al., 2012). Bupropion is a smoking cessation aid that acts as an antagonist at nicotinic receptors to reduce cravings and withdrawal symptoms, while varenicline acts as an agonist to decrease cravings and pleasurable effects of tobacco. Both medications are taken orally. Three meta-analyses reported NRT as an effective smoking cessation intervention (Etter & Stapleton, 2006;

Hughes et al., 2003; Wu et al., 2006). Research has shown that bupropion and varenicline are also effective smoking cessation interventions (Eisenberg et al., 2008; Wu et al., 2006). These pharmacological interventions can reduce smoking substantially for AAs. The nicotine patch (Fu et al., 2008: Ma et al., 2005; Wu et al., 2009) and varenicline (Nakamura et al., 2007; Tsai et al., 2007) have preliminary evidence of short-term effectiveness among AAs. Ma et al. (2005) and Wu et al. (2009) supplemented nicotine patches with brief behavioral counseling.

Health Education and Cognitive-Behavioral Counseling

Health education and cognitive-behavioral counseling have also been found to be effective for smoking cessation. Health education and counseling consists of educating smokers about health harms, ways to quit, and how to change smoking behaviors and cognition (Fang et al., 2006). Counseling can be provided in an individual or group format. Meta-analyses examining randomized control trials show counseling as an effective form of treatment for smoking, with an odds ratio (OR) ranging from 1.20 to 1.64, which are modest effect sizes (Lichtenstein et al., 1996; Mojica et al., 2004). Similar results were apparent for AA smokers. A phone-counseling smoking cessation intervention showed effectiveness in a Chinese male smoker population, with 53.3% of men abstaining from smoking at the time they completed the program (Burton et al., 2010). Fang and colleagues (2006) found quit rates were higher for AA smokers in the health counseling intervention than the control group (56.3% vs 31.8%).

Other forms of counseling include physician advice and utilization of quitlines. Physicians often advise patients to quit smoking in order to improve their overall health. Physician advice can be brief or part of a more intensive intervention. Stead et al. (2008) conducted a meta-analysis examining physician advice and found a small effect size. Those receiving physician advice had a higher rate of quitting than those not receiving physician advice

(OR = 1.74). A national network of quitlines exist in which smokers can call a toll-free number to receive telephone counseling (Fiore, 2009; North American Quitline Consortium (NAQC), 2009). Tobacco cessation quitlines can be offered in multiple languages and have been found to be effective (Fiore, 2009; Lichtenstein et al., 2010; Zhu et al., 2002). Zhu et al. (2010) conclude that AAs are utilizing the quitline, with similar rates of successful smoking cessation (Zhu et al., 2012).

Self-Help Interventions

Self-help interventions are usually comprised of educational materials, and cessation and maintenance manuals (e.g., books, videos). Self-help materials can reach a large number of smokers, are cost effective and do not require attendance (Davis et al., 1984; Prochaska et al., 1993). Although cost effective, self-help interventions are less effective compared to other interventions (Davis et al., 1984). At this time, no published studies have examined the use of self-help materials in AAs.

Multicomponent Interventions

Multicomponent interventions consist of two or more different types of interventions. Quitlines offer over the phone counseling in addition to other services such as providing educational material and NRT material (Fiore, 2009). Often, NRT is paired with behavioral counseling, which has shown to be effective by increasing quit rates by two-fold (Mojica et al., 2004). However, most multicomponent interventions have a primary treatment, with supplemental treatments. If a primary treatment is apparent, it will be treated as a single component treatment.

Other Intervention Methods

Other smoking cessation interventions include media campaigns, community outreach, hypnosis, and acupuncture (Fiore et al., 2009). Currently there is insufficient evidence to support hypnosis and acupuncture as effective smoking cessation interventions (Fiore et al., 2009). Community outreach involves effort from the community to provide services to populations who have barriers to services or limited resources.

Rationale for Systematic Review and Meta-Analysis

Overall Effectiveness of Smoking Cessation Interventions Among AAs Across Studies is Unknown.

Although there is much evidence supporting the effectiveness of the aforementioned smoking cessation interventions in the general population, there is less work that has been done within the AA population specifically. There are few studies that tested various interventions for smoking cessation within AAs specifically, but, to our knowledge, there have been no systematic reviews to determine the overall effectiveness of these interventions for AAs. Although these interventions differ from each other in many ways, these interventions also share similarities that warrant the use of meta-analytic methods (Webb, 2008). First, the research goals are similar, aiming for smoking cessation in each study. Second, many of the studies are multicomponent (Ma et al., 2005; Prochaska et al., 1993; Wu et al., 2009). Third, these studies include participants who share similar cultural worldviews. Fourth, there is overlap in the designs of the studies. Many studies are longitudinal, include follow up, and have similar statistical design. Lastly, other scholars have conducted meta-analyses to determine the effectiveness of smoking cessation interventions in the general population (Baillie et al., 1994) as well as ethnic populations (e.g., African Americans, Latinos) (Webb, 2008; Webb et al., 2010). AAs are often excluded from recent studies and trials due to language barriers and many studies do not report

on the breakdown of ethnicity; therefore, it is important to review smoking cessation among them (Chae et al., 2006). Although there is great diversity among AAs, they also share numerous similarities. According to Kim et al. (2001), AAs have been found to share similar cultural values of collectivism, conformity to norms, emotional self-control, family recognition through achievement, filial piety, and humility. These shared cultural values may be due to these cultures being heavily rooted in the Buddhist and Confucian philosophies (Kim et al., 2001). In most AA cultures, men are reported to smoke more than women, and demonstrate the largest gap in smoking rates between genders, with 17.5% males and only 6.5% females smoking (CDC, 2005).

Differences in Effectiveness Across Tailored vs Non-tailored Interventions is Unknown.

Cultural responsiveness advocates argue that interventions are more effective when consistent with a population's cultural norms, beliefs, and other characteristics unique to the group (e.g., American Psychological Association, 2003; Baldwin, et al., 1996; Barrera Jr. et al., 2013; Bernal et al., 2009; Resnicow et al., 2000; Sue et al., 1991; Vega, 1992). Smoking cessation interventions can be and have been culturally tailored for AA populations. A meta-analysis conducted by Huey and Tilley (2018) found that mental health treatments adapted for Asian American subgroups showed the largest effects when compared to non-culturally tailored treatments. Cultural tailoring can include surface structure, which involves matching intervention materials to characteristics of a population, such as changing the language or translation of materials, ensuring race matched interventionists, using race relevant epidemiological data and testimonials, and editing material to match AA history or images (Bernal et al., 1995; Bernal et al., 2009; Resnicow et al., 2000; Webb, 2008). Cultural tailoring can also include deep structure, which involves incorporating cultural, social, historical, environmental, and psychological forces

that influence the health behavior in the population, such as considering peer or family influence, migration, and acculturational stress (Resnicow et al., 2000). It is important to note how interventions take into account smokers' cultural backgrounds and whether culturally tailored smoking cessation interventions are more effective for the AA population.

Rationale for Exploring Moderators

Smoking cessation interventions often differ in many ways, so it is important to examine different factors that may be associated with smoking cessation outcomes. Treatment intensity is the "dose" of intervention and varies across interventions. Low intensity treatments, such as self-help materials, are often more cost effective and easily disseminated, but tend to be less effective. Low intensity treatments are useful for reaching a greater population, especially underserved smokers who have less resources or would not seek assistance otherwise (Webb, 2008). High intensity treatments require more effort and engagement, such as visiting a clinic multiple times and frequent contact with health providers. High intensity treatments tend to yield better outcomes regarding smoking cessation, although they are often costly and difficult (Fiore et al., 2000). Treatment duration also varies from study to study and can play a role in the intensity of the treatment. However, longer treatment duration does not always equate to greater intensity. Overall, intense interventions tend to yield larger effects due to the robust dose-response relationship between treatment intensity and outcome (Fiore et al., 2000), therefore, treatment intensity should be considered a moderator.

Interventions for specific racial and ethnic groups often have some cultural adaptations. Culturally specific interventions consider culture throughout the development, implementation, and evaluation process. Researchers consider cultural values, beliefs, traditions, and characteristics that are specific to the racial/ethnic group. Cultural tailoring can include using

pictures and testimonials from other AAs, translating material into the group's primary language, and providing race matched interventionists (Harris et al., 2001; Kreuter et al., 2003). Clinical practice guidelines state support for cultural tailoring remains inconclusive (Fiore et al., 2008). However, research suggests that culturally tailored interventions yield greater effects (Fiore et al., 2000), therefore, cultural tailoring should be considered a potential moderator.

The term "smoking cessation" is operationalized differently in many studies. Research in this area has operationalized smoking cessation as no smoking at the time of assessment, point prevalence, prolonged abstinence, and continuous abstinence (Velicer et al., 1992). These measurements can also differ in time points (e.g., seven days, six months, etc). Additionally, smoking status can be self-reported or biologically validated via expired breath carbon monoxide, saliva/urine cotinine, or both. Biochemical verification is often preferred to reduce social desirability bias, response bias, and recall bias. Biochemical verification can increase smoking cessation as it holds smokers accountable compared to self-report; therefore, it could be a potential moderator.

Flay and Petraitis' (1994) Theory of Triadic Influence (TTI) is useful to better understand tobacco use (Flay & Petraitis, 1993). The TTI proposes that tobacco use can be influenced by three streams of influences: cultural environmental, intrapersonal, and social (Flay et al., 2009). Cultural environmental influences refer to "multiple sociocultural macro- environmental factors that contribute to attitudes toward specific behaviors" (Flay et al., 2009, p. 453). These macro-environmental factors include immediate surroundings such as local crime and employment rates, poor career and academic options, media depictions of cigarette smoking, and culture. Other factors include knowledge, expectancies, and attitudes toward cigarette smoking. Social influences refer to "the social situation/context or microenvironment that contribute to social

normative beliefs about specific behaviors" (Flay et al., 2009, p. 453). Social influences include relationships with peers, parents, and immediate and extended family members. Therefore, it is important to consider how culture and acculturation may affect smoking cessation outcomes.

The Theory of Planned Behavior can be used to understand health behavior; more specifically, it suggests that the likelihood of an individual engaging in a health behavior is correlated with his or her intention to engage in the behavior (Ajzen, 1991). Therefore, there is reason to believe that those who have intent to quit are more likely to successfully quit smoking.

Breslau and Johnson (2000) found that the Fagerstrom Test for Nicotine Dependence (FTND)-defined nicotine dependence predicted smoking cessation, with nondependent smokers four times more likely to quit smoking than dependent smokers. Not only that, the Diagnostic and Statistical Manual Third Edition - Revised (DSM-III-R) defined nicotine dependence also predicted cessation, with similar results (Breslau & Johnson, 2000). This indicates that nicotine dependency could have an effect on smoking cessation outcomes.

Current Study

Despite high smoking rates, the majority of AA smokers want to quit (Babb et al., 2017). Therefore, it is important to examine smoking cessation interventions to assist AAs with successful quitting, as smokers who use assistance have higher quit rates than those who do not (Zhu et al., 2000). To our knowledge, the current review is the first meta-analytic examination of smoking cessation interventions among AA adults. Meta-analyses typically examine a combination of studies that are diverse in approach and methodology, therefore heterogeneity in effect sizes is possible (Higgins et al., 2002). Using meta-analytic technique allows a cohesive picture of the phenomenon to be captured (Cooper, 2009). Meta-analytic procedures are useful for comparing study findings by study characteristics, such that sources of systematic differences

across studies can be identified. Because meta-analyses include multiple samples, analyses are more reliable and generalizable (Cohn & Becker, 2003; Cooper, 2009). The main objectives of this review were to: (1) evaluate the effectiveness of smoking cessation interventions compared with control groups; (2) evaluate the effectiveness of culturally tailored smoking cessation interventions compared with non-culturally tailored smoking cessation interventions; and (3) investigate moderator variables (e.g., acculturation, intentions to quit, cultural tailoring, nicotine dependence, treatment intensity and duration, component type) that may play a role in the relationship between treatment groups and smoking cessation. Results from this meta-analytic review will provide researchers, healthcare providers, and smokers with information on the most effective interventions to increase smoking abstinence among AAs.

Hypotheses

1. Smoking cessation interventions for AAs would be more effective relative to control conditions (Burton et al., 2010; Fang et al., 2006; Fiore et al., 2009; Fu et al., 2008: Ma et al., 2005; Wu et al., 2009).
2. Multicomponent interventions would have larger treatment effects than single component interventions (Fiore, 2009).
3. Culturally tailored interventions would have larger treatment effects than non-culturally tailored interventions (Bernal et al., 2009; Huey & Tilley, 2018; Sue et al., 1991; Vega, 1992).
4. Interventions culturally tailored for AA subgroups would have larger treatment effects than interventions culturally tailored for AA broadly (Huey & Tilley, 2018).

5. It was expected that certain participant and treatment variables would moderate the relationship between treatment and smoking cessation outcomes. It was hypothesized that treatment effects would be:
    a. Smaller for smokers with higher nicotine dependence (Fiore, 2009).
    b. Larger for treatments with greater treatment intensity (Fiore, 2009).
    c. Larger for treatments with longer treatment duration (Fiore, 2009).
    d. Larger for smokers with stronger intention to quit (Fiore, 2009).
    e. Larger for smokers with higher acculturation (Zhang & Wang, 2008).

Method

Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines are used to guide the reporting systematic reviews and meta-analyses of health care interventions (Liberati et al., 2009). The current study followed PRISMA guidelines, which include a 27-item checklist (Appendix A) and a four-phase information flow diagram (Figure 1). The PRISMA statement was used to assist with the appraisal of the literature, report findings, and to decrease report bias of systematic reviews and meta-analyses (Moher et al., 2009). The current study is registered in the Open Science Framework.

Literature Search

All articles were identified using these seven major databases: PsycINFO, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), ScienceDirect, Google Scholar, Health Source: Nursing/Academic Edition, and Cochrane Central Register of Controlled Trials (CENTRAL). Additionally, articles were found through the examination of reference lists in past research as well as the review of pertinent journals in the field (e.g., *Health Psychology)*. Clinical trial databases (e.g., clinicaltrials.gov), dissertation and thesis databases (e.g.,

Dissertation Direct), and unpublished manuscripts were also reviewed to minimize selection bias. Researchers were identified and emailed to ask for any unpublished research and manuscripts. The PICO (patient/problem, intervention, comparison, outcome) strategy was used to guide the development of search terms (Santos et al., 2007). The problem identified is smoking in the population of AAs. The interventions being evaluated are smoking cessation interventions. The treatment group is compared to a control group (no treatment, waitlist, standard treatment). The outcome of interest is success or failure to quit smoking at time one post intervention. Searches were conducted using Boolean operators (OR/AND) with a variation of these terms: "Asian," "Asian American," "smoking," "tobacco," "tobacco dependence," "cigarettes," "interventions," "programs," "cessation," and other related search terms. Furthermore, these search terms were used in combination with specified ethnicities, such as "Chinese," "Chinese American," and "Vietnamese." See Appendix B for more search terms.

Inclusion Criteria

Inclusion criteria included: (1) studies examining and/or evaluating interventions that aim to reduce smoking; (2) interventions targeting AA smokers or with an overrepresentation of AAs (i.e., about 50% of the sample); (3) adult participants (over age 17); (4) randomized controlled trials (RCTs) that provides quantitative outcomes; and (5) studies written in English.

Exclusion criteria

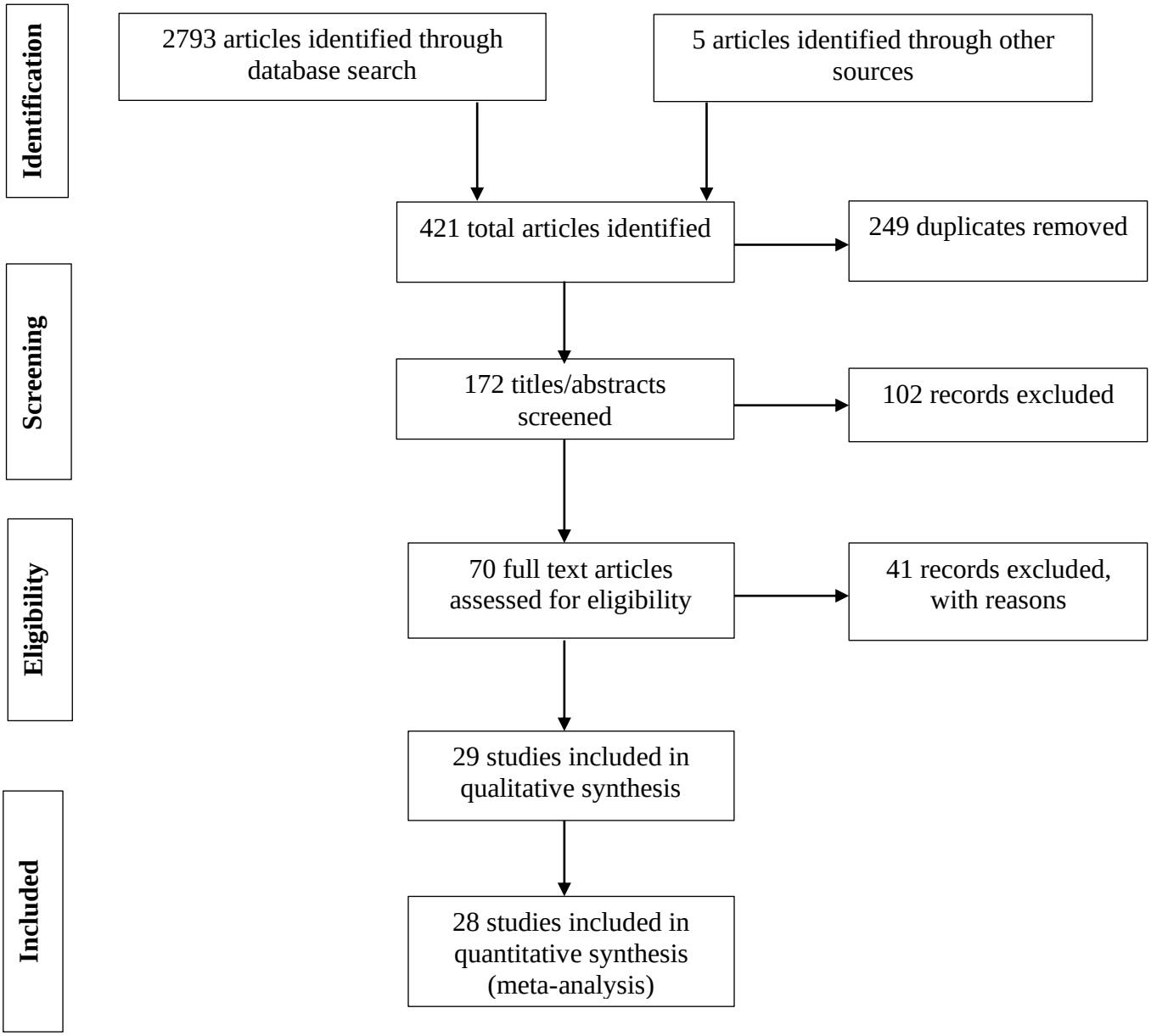
Exclusion criteria included: (1) interventions targeting nonsmokers; (2) interventions targeting non-AA smokers; (3) interventions including AA smokers younger than 18; (4) interventions targeting health behaviors other than smoking; (5) studies that are not written in English; (6) studies that are not RCTs and do not provide quantitative outcomes; and (7) meta-analyses and literature reviews.

Article Selection and Coding Procedures

Article screening and selection was conducted in March 2019. Article selection and data extraction started with the principal investigator screening articles based on titles, abstracts, and full text. Eligible articles were then screened by a team of researchers. Researchers independently screened articles based on the full text. A second researcher screened and verified 20% of the eligible references to minimize bias (Soilemezi & Linceviciute, 2018). Disagreements on the eligibility of articles were discussed during consensus meetings until consensus was reached.

Figure 1

Flow of Information as Recommended by PRISMA.



A coding manual and data extraction forms were created a priori and used to extract relevant information including: (1) the citation; (2) article characteristics (e.g., publication year); (3) study design; (4) sample; (5) predictor variables (e.g., treatment type, treatment intensity, treatment setting, treatment duration); (6) outcomes measured (e.g., smoking status, effect size); (7) unit of analysis; (8) cultural tailoring that were made primarily for AA smokers (e.g., language, translation of materials); (9) risk of bias (e.g., research design, how outcome is measured (self-report vs. biochemical verification)); and (10) coder characteristics (e.g., date coded) (Cooper, 2015; Higgins et al., 2011). Regarding cultural tailoring, we coded whether the intervention was tailored specifically for AA subgroups (e.g., inclusion of Chinese American-specific norms and beliefs), tailored broadly for AA (e.g., use of AA cultural values such as the importance of familial support), tailored broadly for ethnic/cultural minorities (e.g., reframed Western concepts of smoking), or not culturally tailored at all (Huey & Tilley, 2018). When effect sizes could not be calculated due to missing information, attempts were made to contact the author(s) of the article to obtain the information needed to calculate the effect size. Only studies with calculable effect sizes for AAs were included in this meta-analysis. When more than one study implemented the same intervention, but with a different sample, both studies were included and examined. The data screening and extraction form is presented in Appendix C.

Researchers used Microsoft Excel Online to code articles. Microsoft Excel Online allows coders to code simultaneously and be updated live online. A pilot test was conducted before initiating official coding by the team of trained researchers to ensure clarity of variables. Two studies were randomly selected and coded by researchers. Discrepancies were discussed and the coding manual was revised based on coders' feedback in order to have a shared understanding of the items in the manual and consistency among coders in using the manual. Articles were evenly

and randomly distributed to coders. Coder reliability was established by having 20% of the identified articles double coded by a second coder (Wilson et al., 2003). These reliability checks occurred throughout the coding process to ensure major discrepancies were resolved.

Statistical Analyses

Twenty-eight studies representing a sample of 17,660 participants were included in the analysis. Main effect sizes for each study were calculated in terms of the odds ratio (ES_{OR}). The ES_{OR} compared treatment and control groups on the relative odds of smoking cessation using a random effects model, which assumes that effect sizes vary for each study used in the meta-analysis, and allows for greater generalization of findings (Cooper, 2015). ES_{OR} of 1.0 were interpreted as no relationship. ES_{OR} less than 1.0 were interpreted as a negative relationship (the odds of cessation are greater in the control condition) and ES_{OR} greater than 1.0 were interpreted as a positive relationship (the odds of cessation are greater in the intervention condition) (Cooper, 2015). ORs were calculated using the Comprehensive Meta-Analysis (CMA) (Version 3.0) software. ORs are based on the non-normal chi-square distribution, therefore analyses were conducted on the logged-OR, which is an approximately normal distribution. All effect size estimates are reported with 95% confidence intervals (CIs). CIs that do not include 1.0 are considered statistically significant at the $p < .05$ level.

First, ES_{OR} were computed for each study. All studies reported proportions of smoking cessation, which were entered into a 2x2 table (Figure 2), with rows indicating the number of participants who successfully quit smoking and those who did not, and columns representing the number of participants who received the intervention and those who did not. Participants who dropped out of the intervention were assumed to have not quit smoking. Cell frequencies were then converted into ES_{OR} using the following formula: $ES_{OR} = ad/bc$, where *a* and *b* refer to the

number of participants with successful smoking cessation in the treatment and control groups, respectively; and *c* and *d* are the number of participants with unsuccessful cessation in the intervention and control groups, respectively (Cooper, 2015).

Figure 2

Proportions of Smoking Cessation

	Intervention (n)	**Control (n)**
Quit (n)	*a*	*b*
Not Quit (n)	*c*	*d*
Odds ratio: _____	>1 ☐ (intervention) 0 ☐ (no relationship) <1 ☐ (control)	

Second, ES_{OR} were transformed into logged odds ratios using CMA to correct for potential sample size bias. The logged odds-ratios were converted back into general odds ratios to compute descriptive statistics and CIs. Homogeneity tests were conducted based on the Q statistic developed by Hedges and Olkin (1985). The power to detect heterogeneity within a small number of studies can be low, therefore the I^2 statistic, an alternative to Q, was used to estimate the degree of inconsistency in studies' outcomes (Higgins & Thompson, 2002).

Third, after effect sizes for each study were calculated, an average effect size, combining all studies, was calculated using CMA. The average effect size was weighted based on the number of participants in each sample. To calculate the average effect size, each effect size was multiplied by the sample size. Then the sum of these products was divided by the sum of the sample sizes (Cooper, 2015).

Fourth, after analysis of overall effect size, moderator analyses were conducted to address sample and study characteristics that may alter the effect size. Moderators were analyzed if Q was significant, if moderators were characteristic of at least 10 studies (Borenstein et al., 2009), and if there was significant unexplained variability in effect sizes (Lipsey & Wilson, 2001).

Categorical variables were tested using meta-regression models in SPSS Statistics, Version 25, to test multiple moderators sequentially. Categorical moderator variables (such as "culturally tailored" vs. "not culturally tailored") were given binary codes (0 or 1). Meta-regression is similar to multiple regression in which effect sizes are evaluated as criterion variables and study characteristics are the predictors (Cooper, 2015; Hartung et al., 2008; Shelby & Vaske, 2008).

Lastly, a forest plot was created to illustrate the distribution of ES_{OR} and the CIs around the individual effect sizes. The forest plot also identifies any outliers that should be considered when interpreting the overall results.

Results

Sample Description

Characteristics of the individual studies included in the analysis and coding information are described in Table 1. All studies were RCTs. The sample size across studies ranged from 30 to 1860 participants (M = 630.71, SD = 510.78), the mean ages ranged from 20.7 to 58.3 years old (M = 43.42, SD = 7.26), and male percentage ranged from 60% to 100% (M = 88.08, SD = 10.18). Of the overall sample, 88% were males. Ethnicity breakdown is as follows: 72% Chinese, 17% Korean, 10% Japanese, 1% Thai.

Table 1

Characteristics of Individual Studies included in Meta-Analysis

Study	*ID*	*N*	*OR*	*DOE*	*TYPE*	*COM*	*CUL*	*LOC*	*INT*	*DUR*	*OUT*	*BIO*
Abdullah et al. (2005)	1	952	2.26	+	3	1	4	1	2	5	3	1
Chan et al. (2008)	15	1483	1.60	+	6	1	4	1	2	2	3	1
Chan et al. (2010)	12	719	4.83	+	3	1	4	1	3	3	3	0
Chan et al. (2011)	13	1154	1.87	+	3	1	4	1	3	4	3	0
Chan et al. (2012)	14	1860	1.06	+	3	0	4	1	2	3	3	1
Fagerstrom et al. (2010)	20	893	2.71	+	5	1	4	1	3	4	4	0
Fang et al. (2006)	21	66	2.37	+	1	1	1	0	2	1	3	1
Gu (2015)	23	900	25.63	+	3	1	4	1	3	3	–	–
Ito et al. (2006)	27	697	0.82	-	7	1	4	1	1	6	–	1
Kim et al. (2005)	32	401	2.13	+	3	0	4	1	2	–	2	0
Kim et al. (2012)	33	30	4.00	+	3	1	2	0	3	4	3	0
Kim et al. (2015)	36	109	4.94	+	3	1	2	0	3	4	6	0
Lam et al. (2012)	40	1154	3.36	+	3	1	4	1	3	5	3	0
Liao et al. (2018)	63	1369	3.43	+	7	0	4	1	3	5	5	0
McDonnell et al. (2011)	47	1409	0.85	-	7	0	2	0	2	–	4	1
Moskowitz et al. (2016)	49	403	1.11	+	7	0	2	0	2	5	4	1
Nakamura et al. (2007)	51	618	2.16	+	5	1	4	1	3	4	4	0
Nakamura et al. (2017)	50	210	2.19	+	5	0	4	1	2	5	–	0
Paek et al. (2014)	54	332	1.63	+	7	0	4	1	2	5	4	0
Sheng et al. (2012)	60	257	3.71	+	2	1	4	1	3	4	4	0
Sun et al. (2009)	61	211	4.68	+	1	1	4	1	3	4	–	0
Tong et al. (2018)	65	205	0.77	-	6	1	2	0	3	4	4	0
Tsai et al. (2007)	67	250	3.09	+	5	1	4	1	3	4	4	0
Wang et al. (2017)	53	1077	1.49	+	4	1	4	1	2	5	3	0
White et al. (2013)	41	201	1.78	+	3	1	4	1	1	–	3	0
Wu et al. (2005)	18	139	4.20	+	3	1	2	0	3	5	5	0
Wu et al. (2017)	10	369	2.09	+	4	1	4	1	1	6	5	1
Yang et al. (2018)	52	192	6.64	+	3	0	4	1	3	3	–	0

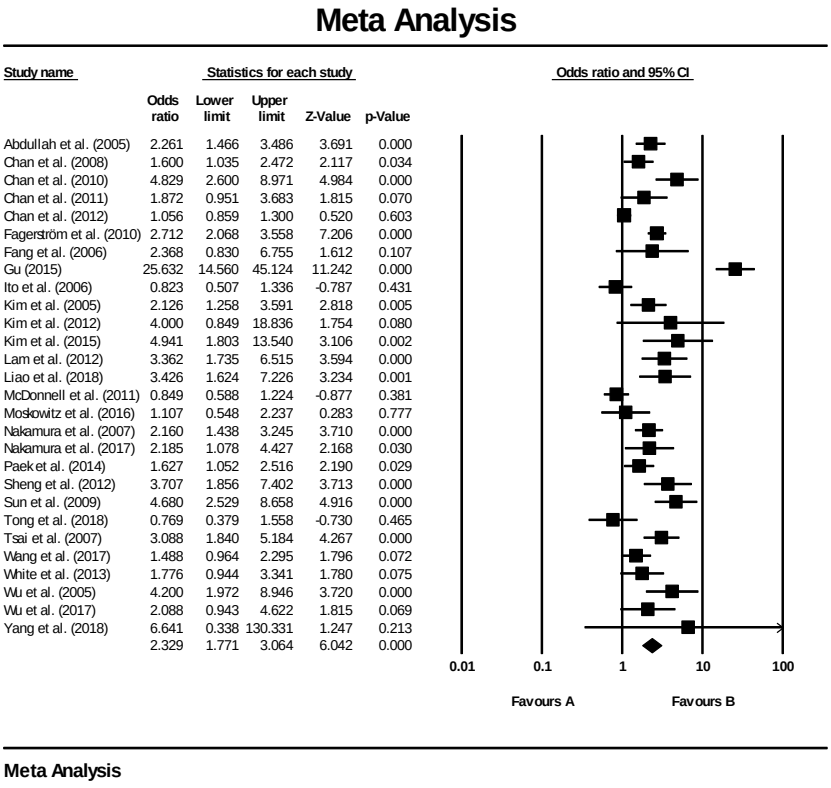
Note. – = missing data; N = number of participants in the analysis; OR = odds ratio; DOE = direction of effect (+ = treatment; - = control); TYPE = primary treatment type (1 = nicotine replacement; 2 = bupropion; 3 = individual counseling; 4 = physician advice; 5 = varenicline; 6 = health education; 7 = other); COM = component (0 = single; 1 = multiple); CUL = cultural tailoring (1 = AAs broadly; 2 = AA subgroups; 3 = ethnic/cultural minorities broadly; 4 = no cultural tailoring); LOC = location of intervention (0 = United States; 1 = Asian country); INT = treatment intensity (1 = low; 2 = moderate; 3 = high); DUR = treatment duration (1 = within a day; 2 = within a week; 3 = within a month; 4 = within 3 months; 5 = within 6 months; 6 = within 12 months); OUT = outcome measure (1 = no smoking at the time of the assessment/when interviewed; 2 = 24-hour point prevalence abstinence (no smoking for past 24 hours); 3 = 7-day point prevalence abstinence; 4 = 1 month (28-day) continuous abstinence; 5 = 6 month sustained abstinence; 6 = 12 month sustained abstinence); BIO = biochemical verification (0 = yes; 1 = no).

General Effects

The meta-analysis assessing smoking cessation effectiveness produced an average OR of 2.33 (95% CI = 1.77 to 3.06, n = 28), which is a small to medium effect size. This statistic indicates greater odds of smoking cessation in the treatment conditions compared to the control conditions. Figure 3 is a forest plot representing the effect sizes of each individual study included in the analysis. The homogeneity tests were significant, indicating variability in effect sizes (p = .00, I^2 = 86.48) due to factors other than sampling and treatment error. Overall, results suggest that smoking cessation interventions were more effective than control conditions for AAs.

Figure 3

Forest Plot of Effect Sizes of Studies



Note. The squares represent the odd ratios value. CI = confidence interval.

Demographics

Average age for each study was divided into four groups (21-30 years old, 31-40 years old, 41-50 years old, and 51-60 years old). A permutation test indicated there were no significant differences between age groups (χ_2 = 6.43, df = 3, p = 0.09). A Kruskal-Wallis rank sum test confirmed this conclusion, χ_2 = 6.01, df = 3, p = 0.11. The interaction between age and treatment effects was not statistically significant (Q(3) = 4.18, p = .24), therefore age did not moderate the odds of smoking cessation. Percentage of male participants in each study were also divided into four groups (50-70%, 71-80%, 81-90%, 91-100%). A permutation test indicated there were no significant differences between percentage of male participants per study, χ_2 = 1.41, df = 3, p = .70. A Kruskal-Wallis rank sum test confirmed this conclusion, χ_2 = 1.69, df = 3, p = 0.64; therefore percentage of males did not moderate the odds of smoking cessation (Q(3) = .9, p = .83). Ethnicity was divided into five groups (Chinese, Japanese, Korean, Thai, and mixed). A permutation test indicated there were no significant differences between ethnic groups, χ_2 = 2.05, df = 3, p = 0.56. A Kruskal-Wallis rank sum test confirmed this conclusion, χ_2 = 1.74, df = 3, p = 0.63. See Table 2 for characteristics of individual types of treatment.

Table 2

Odds Ratios, Confidence Intervals, and Significance Values by Moderator Variable for Smoking Cessation Interventions with Asians and Asian Americans

Variable	*N*	OR	CI	*P*
Total sample	28	2.33	(1.77, 3.06)	.00
Demographic/Clinical moderators				
Male percentage				
50-70%	2	1.30	(.50, 3.36)	.60
71-80	2	2.25	(1.52, 3.33)	.00
81-90	10	2.15	(1.51, 3.06)	.00
91-100%	12	2.70	(1.57, 4.65)	.00
Age				
21-30	1	2.37	(.83, 6.76)	.12
31-40	9	2.30	(1.56, 3.40)	.00

Variable	*N*	OR	CI	*p*
41-50	11	2.32	(1.61, 3.35)	.00
51-60	4	1.32	(.87, 2.00)	.20
Asian ethnicity				
Chinese	15	2.81	(1.77, 4.49)	.00
Korean	6	1.70	(1.04, .75)	.03
Japanese	3	1.55	(.79, 3.03)	.20
Thai	1	1.78	(.94, 3.34)	.08
Mixed	3	2.77	(2.19, 3.50)	.00
Theory relevant moderators				
Primary treatment type				
NRT	2	3.82	(2.08, 7.03)	.00
Bupropion	1	3.71	(1.86, 7.40)	.00
Counseling	12	3.34	(1.85, 6.04)	.00
Physician advice	2	1.61	(1.10, 2.35)	.01
Varenicline	4	2.57	(2.11, 3.14)	.00
Health education	2	1.17	(.58, 2.38)	.66
Other	5	1.27	(.81, 1.10)	.29
Treatment intensity				
Low	3	1.37	(.75, 2.52)	.31
Moderate	10	1.49	(1.17, 1.89)	.00
High	15	3.57	(2.42, 5.28)	.00
Treatment duration				
Within a day	1	2.37	(.83, 6.76)	.11
Within a week	1	1.6	(1.04, 2.47)	.03
Within a month	4	5.25	(.84, 32.83)	.08
Within 3 months	9	2.61	(1.91, 2.57)	.00
Within 6 months	8	2.13	(1.60, 2.84)	.00
Within 12 months	2	1.24	(.50, 3.07)	.64
Cultural tailoring				
Tailored specifically for AA subgroups	6	1.77	(.90, 3.48)	.10
Tailored broadly for AA	1	2.37	(.83, 6.76)	.11
Location				
United States	7	1.83	(.99, 3.36)	.05
Asia	21	2.50	(.84, 3.40)	.00
Intervention components				
Single	9	1.41	(1.03, 1.92)	.03
Multiple	19	2.87	(2.07, 3.96)	.00
Cessation verification				
Biochemical	19	2.52	(2.05, 3.10)	.00
Self-report	8	1.30	(.98, 1.72)	.07
Smoking status outcome				
24 Hour	1	2.13	(1.26, 3.59)	.01
7 Day	10	2.03	(1.45, 2.85)	.00
1 Month	8	1.75	(1.17, 2.60)	.01
6 Month	3	3.15	(2.03, 4.90)	.00

Variable	*N*	OR	CI	*p*
12 Month	1	4.94	(1.80, 13.54)	.00

Intervention Components

Multi-component interventions are defined as having more than one type of treatment (e.g., counseling and nicotine replacement therapy). The treatment effect for single component interventions was OR = 1.41 (95% CI 1.03 to 1.92, $p = .03$, $n = 9$). The effect for multi-component interventions was OR = 2.87 (95% CI 2.07 to 3.96, $p = .00$, $n = 19$), indicating a small to medium effect size. A permutation independence test was conducted to compare treatment effect between single component and multi-component interventions and found no significant differences between the two types of treatment, $Z = -1.58$, $p = 0.11$. A Wilcox test also confirmed the result, $W = 53$, $p = 0.12$. These results suggest multi-component interventions are not significantly more effective in treating smoking than single component interventions. The number of intervention components does not impact odds of smoking cessation ($Q(1) = .02$, $p = .88$).

Cultural Tailoring

Of the 28 studies included, seven studies were conducted in the United States and 21 studies were conducted in Asia. Of the seven U.S. studies, 100% were coded as culturally tailored. Cultural tailoring is conceptualized as designing or adapting intervention components to fit a cultural minority population (Pasick et al., 1996). Of the 21 Asian studies, none described cultural tailoring; therefore, studies conducted in Asia are not assessed as part of the analyses. Since all U.S. studies were coded as culturally tailored, a comparison of culturally tailored verses non-culturally tailored studies was not possible; therefore, the hypothesis regarding culturally tailoring could not be tested. A permutation test comparing U.S. studies that were tailored for

AAs broadly verses AA subgroups was not significant, $\chi_2 = 0.46$, df = 2, $p = 0.80$. A Kruskal-Wallis rank sum test also supports the above result, $\chi_2 = 0.16$, df = 2, $p = 0.92$. See Table 2 for ORs associated with each type of cultural tailoring. Furthermore, an independent permutation test revealed there were no differences between studies that were only linguistically tailored and studies that included cultural tailoring features in addition to being linguistic tailoring, $Z = -0.64$, $p = 0.52$. A Wilcoxon rank sum test confirms this finding, $W = 68$, $p = 0.92$.

Nicotine Dependency

The Fagerstrom Test for Nicotine Dependence was used to assess baseline nicotine dependency in 15 studies. Scores were rated on a scale from 1 to 4 (1 = low, 2 = low to moderate, 3 = moderate, 4 = high). A Mann-Whitney U test was conducted to compare the effect of smoking cessation between low, low to moderate, moderate, and high nicotine dependence. A non-parametric test was used as there were not enough observations to conduct a one-way ANOVA. There was not a significant effect of baseline severity of nicotine dependence on smoking cessation, $\chi_2 = 3.38$, df = 2, $p = .18$.

Treatment Intensity

Treatment intensity was rated on a scale from 1 to 3, where 1 = low intensity (e.g., passive receipt of materials, brief phone call, no clinic visit), 2 = moderate intensity (e.g., one clinic visit, telephone counseling sessions), 3 = high intensity (e.g., multiple clinic visits, frequent contact with staff, adherence monitoring). A nonparametric one-way between-studies Kruskal-Wallis was conducted to compare the effect of smoking cessation between low, moderate, and high intensity interventions. There was a significant effect of treatment intensity on smoking cessation for the three levels of intensity, $\chi_2 = 9.77$, df = 2, $p = .01$. Post hoc comparisons using the Tukey and Kramer test indicated that the ORs for the high intensity

treatment differed significantly from the moderate intensity group (p = .02). The low intensity treatment was not significantly different than the moderate (p = .95) or high intensity treatment (p = .09). See Table 2 for ORs associated with each type of intensity. Results suggest treatment intensity is a moderator, with higher intensity treatments predicting higher odds of smoking cessation ($Q(2) = 10.07$, p = .01).

Treatment Duration

Treatment duration varied from each study, ranging from one day to 12 months with 68% being three to six months long. A permutation test revealed there were not significant differences between the different durations of treatment, $\chi^2 = 3.71$, df = 5, p = 0.59. Results from a Kruskal-Wallis test confirmed this result, $\chi^2 = 3.41$, df = 5, p = 0.64. Moderation analyses revealed length of treatment does not impact the odds of smoking cessation ($Q(5) = 4.52$, p = .48). Table 2 provides characteristics of the treatment durations.

Other Factors

Hypotheses were made about intention to quit and acculturation predicting smoking cessation, however, there were not enough studies measuring these two variables to run moderation analyses. Average ES_{OR} for studies measuring intention to quit was 1.56 (95% CI 0.98 to 2.31, p = .06, n = 4), whereas average ES_{OR} for studies measuring acculturation was 1.69 (95% CI 0.74 to 4.30, p = .2, n = 4), with both indicating a small effect size.

Treatment Type

Primary treatment types included: NRT, bupropion, individual counseling, physician advice, varenicline, health education, or other. As previously mentioned, for multicomponent treatments, whatever treatment was stated as primary was coded as such. Table 2 shows ORs associated with each type of treatment. A permutation test indicated there were no significant

differences between treatment type, $\chi_2 = 8.27$, df = 6, $p = .22$. The type of treatment did not moderate the odds of smoking cessation ($Q(6) = 8.3$, $p = .27$).

Location of Intervention

The treatment effect for interventions conducted in the United States was OR = 1.83 (95% CI .99 to 3.36, $p = .05$, $n = 7$), indicating a small to medium effect size. The treatment effect for studies conducted in an Asian country (Japan, Thailand, Korea, China) was OR = 2.5 (95% CI 1.84 to 3.4, $p = .00$, $n = 21$), indicating a small to medium effect size. An independent permutation test and Mann Whitney U were conducted to compare treatment effect between interventions located in the United States and Asian countries. Results revealed there was not a significant difference between interventions conducted in the United States and interventions conducted in Asia, Z = -0.63613, p = 0.52 (W = 71, p = 0.91). These results suggest interventions for AAs are not significantly more effective in Asian countries than the United States. Location of the treatment did not impact treatment effects ($Q(1) = .61$, $p = .43$).

Cessation Verification

The effect size when smoking status was verified biochemically was 2.52 (95% CI 2.05 to 3.10, $p = .00$, $n = 20$), indicating a small to medium effect size. When smoking status was not biochemically verified, the effect size was 1.30 (95% CI 0.98 to 1.72, $p = .07$, $n = 8$), indicating a small effect size. An independent permutation test revealed there was a significant difference between studies with biochemical verification and studies with only self-report, Z = -2.40, $p = .02$. Moderation analyses suggest studies that include a biochemical verification component predict higher odds of smoking cessation than studies that use self-report ($Q(1) = .6.9$, $p = .01$).

Smoking Status Outcome Measure

Studies differed on the primary outcome measure. The differences between primary outcome measures were not significant ($\chi_2 = 5.84$, df = 4, $p = .21$.). Smoking status outcomes did not have an impact on odds of smoking cessation ($Q(4) = 5.31$, $p = .26$). See Table 2 for ORs.

Risk Bias

One hundred percent of studies used true randomization for allocation of participants, therefore eliminating selection bias. Regarding performance bias, only two studies were double blind experiments, 12 studies were single blind experiments, and 14 studies did not include a blinding component.

Discussion

The current meta-analysis aimed to examine the effectiveness of smoking cessation interventions for AAs and different factors that may influence treatment effectiveness. Twenty-eight trials of smoking cessation interventions were included, representing outcome data on 17,660 smokers. Results revealed a small to medium effect size (OR = 2.33), indicating smoking cessation interventions are effective for AAs compared to control, placebo, and waitlist groups.

USDHS' clinical practice guidelines (Fiore et al., 2008) for treating tobacco dependence state that there is strong evidence for the effectiveness of cessation interventions for all smokers, including different racial and ethnic minorities (Baillie et al., 2004; Fiore et al., 2008). Results from this meta-analysis are consistent with previous research showing that smoking cessation interventions are effective for the general population. All interventions included in this meta-analysis were found to be more effective than control conditions, except for health education ($p = .66$) and "other" types of interventions ($p = .29$), which included providing health risk appraisals and genetic feedback on cancer risk. This meta-analysis found a medium to large effect size (OR = 3.82) for NRT, which is higher than the what previous meta-analyses have found for the

general population (Etter & Stapleton, 2006; Wu et al., 2006). Regarding bupropion and varenicline, this study generated a large effect size (OR = 3.71) and a medium effect size (OR = 2.57) respectively, which is also higher than previously found (Wu et al., 2006). This study generated a medium to large effect size (OR = 3.34) for counseling while other meta-analyses found small effect sizes, with ORs ranging from 1.20 to 1.64 (Lichtenstein et al., 1996; Mojica et al., 2004). Overall, these results are consistent with previous research.

The current meta-analysis demonstrates that smoking cessation interventions are effective for AAs. This is particularly important given that AAs along with Native Americans have the least representation in clinical trials of smoking cessation interventions (Cox et al., 2011). Results from this meta-analysis (OR = 2.33, 95% CI = 1.77 to 3.06, *n* = 28) are comparable to other meta-analyses evaluating smoking cessation in ethnic/racial minority groups in the U.S. Webb (2008) conducted a meta-analysis with African Americans which yielded a small effect size, with an average OR of 1.41 (95% CI 1.16 to 1.73, *n* = 19). When evaluating smoking cessation for Hispanics, Webb et al. (2010) found an overall OR of 1.54 (95% CI 1.09 to 2.16, *n* = 5), which is a small effect size. This meta-analysis generated a higher OR and wider CIs than Webb (2008) and Webb et al. (2010). It could be related to all seven U.S. studies being culturally tailored, compared to just the majority studies of Webb (2008) and Webb et al. (2010) being culturally tailored, as researchers argue that interventions are more effective when consistent with a population's culture (e.g., American Psychological Association, 2003; Baldwin, et al., 1996; Barrera Jr. et al., 2013; Bernal et al., 2009; Resnicow et al., 2000; Sue et al., 1991; Vega, 1992).

Clinical practice guidelines (Fiore et al., 2008) graded research supporting cultural tailoring as "C," indicating "no recommendation for or against" the service (U.S. Preventative

Services Task Force, 2018). Because all studies conducted in the U.S. were culturally tailored, it was not possible to the test whether culturally tailored interventions were more effective than non-culturally tailored interventions. Moreover, the concept of cultural tailoring is researched within contexts where non-White individuals are minorities (Pasick et al., 1996), thus, the studies based in Asia did not describe tailoring elements. At the same time, it is reasonable to assume that intervention elements were specific to that cultural context. Contrary to our hypothesis, we did not find a significant difference between studies culturally tailored for AA subgroups (n = 6) and studies culturally tailored for AA broadly (n = 1). A small sample size (n = 7) could explain the non-significance. Also, cultural tailoring can be widespread, ranging from using culturally syntonic language, to using correct content like cultural values, knowledge, and traditions, to considering context, such as acculturative stress (Bernal et al., 1995). Hall et al. (2016) suggest that some cultural modifications, such as cultural content and values, will more strongly impact outcomes compared to more minor modifications, such as language translation, as it encompasses more of the specific cultural characteristics. The majority of studies (n = 4) that were coded as culturally tailored only had a tailored language component, which is needed for non-English speaking populations. There were three studies that included more cultural components, such as using race related statistics and addressing cultural beliefs. Future studies should compare interventions using surface structure and deep structure cultural tailoring (Resnicow et al., 2000).

In the current meta-analysis, the majority of interventions were of high treatment intensity, and treatment intensity moderated treatment effectiveness. These findings support previous research (Raw et al., 1998). High intensity treatments require more patient engagement, as it often involves patients visiting the clinic, contacting providers, and actively participating

(e.g., group therapy, using NRT every day). Patient engagement, defined as patients and healthcare providers working in active partnerships at various levels across the healthcare system, has been shown to improve health outcomes and health care (Carman et al., 2013; Epstein & Street, 2008). A study conducted by Cunningham (2014) found that patients who were highly engaged were more likely to try to stop smoking than patients who were less engaged. Patient engagement allows smokers to track their progress, ask questions, and receive extra support (Carman et al., 2013). Patient engagement can also affect how providers interact with smokers. If smokers seem engaged and interested, physicians may be more likely to offer assistance and resources (Carman et al., 2013). In the current meta-analysis, treatment duration did not have a significant effect on smoking cessation outcomes. It is important to clarify that longer duration interventions do not equate greater intensity treatments or greater patient engagement; in fact, two interventions had a duration of 12 months but were coded as low intensity.

The Society for Research on Nicotine and Tobacco developed recommendations for outcome assessment, including outcome measures and outcome verification (Benowitz et al., 2002; Hughes et al., 2003). The recommended primary outcome is prolonged abstinence, defined as continuous abstinence following a 2-week grace period (Hughes et al., 2003). Secondary outcomes should be seven- and 30- day point prevalence; six and/or 12 month follow up should be used to examine long term treatment effects (Hughes et al., 2003). The majority of studies in this meta-analysis used seven-day point prevalence as the primary outcome whereas one month (28 days) continuous abstinence was the second most used outcome measure. The measure of smoking status was not shown to moderate the overall effectiveness of treatment. The odds of

smoking cessation were higher when 12 month sustained abstinence was the definition of quitting, however, only one study used this outcome measure.

Biochemical verification, such as expired breath carbon monoxide or cotinine in urine, plasma, or saliva, is recommended compared to only self-report (Benowitz et al., 2002) due to possible underreporting (Patrick et al., 1994; Velicer et al., 1992) and bias (Dolcini et al., 1996). Over half of the studies in this meta-analysis used biochemical verification, specifically expired breath carbon monoxide. The use of biochemical verification moderated the overall effect of smoking cessation treatment. Studies that verified smoking status via biochemical verification had larger effect sizes. Knowledge that smoking cessation would be biologically validated may serve as an incentive to quit, as there is more accountability than self-report. Participant feedback on an intervention using biochemical feedback as an intervention component found that receiving information on smoker and nonsmoker smoke exposure motivated cessation in the short term (Saw et al., 2018; Tong et al., 2018).

In this study, approximately 88% of participants were male, with five studies including only males. The overall sample was majority Chinese, older adult, and male, which is representative of the AA smoking population. Therefore, results implicate that smoking cessation interventions can improve the odds of cessation for majority AA smokers. Results revealed age and gender did not have a significant effect on smoking cessation. These results align with previous literature (Abdullah et al., 2006; Jarvis et al., 2013; Wetter et al., 1995). Although there were not significant differences, previous research has found that females are less likely to successfully quit smoking, more likely to relapse after quitting, and more likely to experience withdrawal symptoms compared to males (Abdullah, et al., 2006; Wetter et al., 1995).

Limitations

There were several limitations to this meta-analysis that should be noted. First, there was a limited number of treatment studies (n = 28), therefore the results of this meta-analysis will need to be updated as more research is conducted. This also affected the moderator analyses, as there were insufficient observations of each moderator across studies to conduct a metaregression. Bornstein et al. (2009) recommends moderators being characterized in at least 10 studies, whereas Fu et al. (2010) suggests four observations are needed in each group to run a moderator analysis. These moderator analyses should be considered preliminary due to the limited number of studies. Second, although these results are geared towards AAs, these results are not generalizable to all AAs. AAs are divided into subgroups, each with their own ethnic ancestry and cultural values. Specifically, this meta-analysis only included Chinese, Japanese, Korean, and Thai smokers. However, majority of the sample was Chinese, male, and older. Therefore, these findings may not generalize broadly to the AA population. Additionally, these findings may not generalize to populations with specific characteristics, such as pregnant women, adolescents/young adults, or individuals with medical or psychiatric problems. Third, cultural tailoring was difficult to assess as all studies targeted AA populations and many interventions were conducted in an Asian country. Additionally, researchers do not always provide information on cultural responsiveness, making it difficult to detect an effect of cultural tailoring (Huey & Polo, 2008). It is important for studies to highlight how interventions were culturally tailored to prevent mis- or underreporting of cultural tailoring. The studies included in this meta-analysis were all published in English, therefore studies published in another language with possible meaningful data were not able to be analyzed. Next, the methodological reporting of some studies made it difficult to extract demographic information. For example, some studies did not report the gender ratio or length of treatment. Some demographic information was

reported in different units across studies. For example, FTND scores were reported as frequencies, percentages, and average scores. Another limitation is that intention to quit was not assessed as a moderator. Research shows that intention to quit smoking predicts smoking cessation in the general population (Godin et al., 1992) as well as in subpopulations (Armitage, 2007; Johnston et al., 2004; Norman et al., 1999). The Theory of Planned Behavior also indicates that intention to perform a behavior, predicts that behavior (Ajzen, 1991). Along with intention to quit, there are many other factors that are associated with intention to quit and smoking cessation that were not assessed, such as positive attitudes and perceived behavioral control (Bennet & Clatworthy,1999; Borland et al., 1991; Hu & Lanese, 1998; Maher & Rickwood, 1997). Use of emerging tobacco products, such as electronic cigarettes, is increasing among young adults (Dai & Leventhal, 2019), yet, no intervention studies involving these products were available at the time of review. Lastly, to determine effectiveness, smoking cessation interventions often compare the intervention group to an active control group (Johnston et al., 2020). It is possible that the variability of the comparator group impacted findings, as comparator groups could receive no behavioral support, usual care, or self-help materials. A study conducted by Johnston et al. (2020) gives support to the idea that researchers need to consider variability in comparator interventions when interpreting, comparing, and generalizing trial effect sizes.

Implications

These findings have clinical, research, and theoretical implications regarding smoking cessation in AAs. Clinically, healthcare providers should continue to encourage AAs to use smoking cessation interventions. Information from this meta-analysis should be incorporated into existing interventions, as well as considered when developing new interventions to increase the

odds of smoking cessation among AAs. Theoretically, this information can inform researchers on treatment methods among AAs.

This meta-analysis paves way for more research in this area. First, more research comparing culturally tailored and non-culturally tailored interventions is needed to understand the role of culture with regards to smoking cessation in AAs. More specifically, research should investigate surface structure (e.g., language, relevant statistics) and deep structure (e.g., acculturative stress) components. Additionally, although cultural tailoring is conceptualized as modifications or adaptations for minority groups, future intervention studies—irrespective of implementation in a majority or minority culture—should describe key intervention components that are tailored for their target population. By doing so, others may more readily discern whether the intervention may be useful for a culturally similar population. Researchers should also consider using the same units or operational definitions to increase ability to identify and compare possible moderators. Researchers should also aim to examine cessation interventions for emerging tobacco products as well as nontraditional intervention methods, such as those with a technological component (e.g. online interventions, texting interventions, smartphone applications, etc). As more studies in this area are conducted, this meta-analysis should be updated with the new information.

Conclusion

To summarize, findings show that overall, smoking cessation interventions are effective for AAs; therefore, AAs should be encouraged to engage in cessation interventions. However, it is imperative that more intervention research is conducted with this diverse population. In particular, increased research attention is needed for currently underresearched high disparity subpopulations, such as Vietnamese, Filipino, and Indian male smokers. Finally, more research

examining cultural factors that contribute to use and cessation and testing effectiveness of culturally tailored interventions would help reduce disparities, and potentially increase smoking cessation and improve health outcomes both in the short and long term.

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References marked with an asterisk indicate studies included in the meta-analysis.

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Appendix A

PRISMA Statement

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be	

		used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I_2) for each meta-analysis.	

Appendix B

Search Terms

Searches will be conducted using a combination of these key search terms

1. Asian	2. Native Hawaiian
3. Asian American	4. Hawaiian
5. Pacific Islander	6. Tongan
7. Vietnamese	8. Chamorran
9. Vietnamese American	10. Samoan
11. Chinese	12. Polynesian
13. Chinese American	14. Micronesian
15. Korean	16. Melanesian
17. Korean American	18. South Asian
19. Japanese	20. Southeast Asian
21. Japanese American	22. East Asian
23. Filipino	24. Asian immigrants
25. Filipino American	26. Smoking
27. Indian	28. Tobacco
29. Indian American	30. Tobacco dependence
31. Cambodian	32. Cigarettes
33. Cambodian American	34. Tobacco intervention
35. Thai	36. Tobacco cessation
37. Thai American	38. Smoking cessation
39. Laotian	40. Smoking intervention
41. Laotian American	42. Tobacco programs
43. Tahitians	44. Smoking dependence
45. Maori	46. Smoking programs
47. Fijians	48. Nicotine dependence

Appendix C

Data Screening and Extraction Form

Study ID:	**Study Title:**	
Year of study:	Date of screening:	Date of data extraction:
Person who screened:	Person who extracted data:	
Citation:		

1. General Information

Publication type: Journal Article ☐ Book chapter ☐ Other (specify e.g., manual) _____	
Country of study:	Language of the article:

2. Study Eligibility

Study Characteristics *(Even if a study does not meet the inclusion criteria, all study characteristics still need to be documented)*			**Page/ Para/ Figure #**
Aim of study	To examine or evaluate an intervention that aims to reduce smoking	☐ Yes ☐ No →**Exclude** ☐ Unclear	
Participants	Does the study primarily target Asian and/or Asian American smokers?	☐ Yes ☐ No →**Exclude** ☐ Unclear	
	Does the study include a sample of adult (18+) Asian and/or Asian American smokers?	☐ Yes ☐ No →**Exclude** ☐ Unclear	
	Does the study include a specific sample (e.g., medical issues, pregnancies)?	☐ Yes ☐ No →**Exclude** ☐ Unclear	
Sample size	If the study targets Asian and/or Asian American smokers, what is the sample size (for Asian/Asian Americans only)?	Sample size: _____	
	Does the study include non-Asian sample? If yes, what is the non-Asian sample size?	Sample size: _____	
	What is the total (both Asian and non-Asian) sample size of the study?	Total Sample: _____	

Type of study	☐ Original, peer reviewed and empirical articles ☐ Dissertation/Thesis ☐ Intervention protocols ☐ Intervention pilot/feasibility studies ☐ Intervention evaluation studies - ☐ Randomized Controlled Trial (RCT) - ☐ Cluster Randomized Controlled Trial (cluster RCT) - ☐ Pre-post single group comparison - ☐ Others: _____	☐ Yes ☐ No →**Exclude** ☐ Unclear	
	☐ Systematic review/meta-analyses ☐ Non-peer reviewed articles ☐ Others: _____	No →**Exclude**	
Methodology	Does the study provide quantitative outcomes?	☐ Yes ☐ No →**Exclude** ☐ Unclear	
	Does the study compare against a control group?	☐ Yes ☐ No →**Exclude** ☐ Unclear	
Language	Is the article written in English?	☐ Yes ☐ No →**Exclude**	
Intervention description	Does the study include a description of the intervention studied or tested?	☐ Yes ☐ No →**Email author** ☐ Unclear	

Summary of Assessment for Inclusion

Include in review ☐	**Exclude from review** ☐
Independently assessed, and then compared? Yes ☐ No ☐	Differences resolved Yes ☐ No ☐
Request further details? Yes ☐ No ☐	Contact details of authors: (if further details needed)
Notes: (i.e. What details are missing?)	

DO NOT PROCEED IF PAPER EXCLUDED FROM REVIEW

3. Intervention details *(*If the article mentions more than 1 intervention, for example an RCT, then we will code each of the intervention, including the treatment-as usual group)*

Dimensions	**Descriptions as stated in the report/paper**	**Page/ Para/ Figure #**
Name of intervention (if applicable)	*What was the name of the intervention?*	
Aim of intervention	*What was the problem that this intervention was designed to address?*	
Aim of study	*What was the study designed to assess? Are these clearly stated?*	
# of groups	*How many groups were there (control and intervention)?*	
Total study duration		
Setting	*Where did the intervention take place? (e.g., academic medical center, university teaching hospitals, rural, metropolitan, school, workplace, community, GP clinic)*	
Providers	*Who were the providers? (e.g., number, profession, education/training, ethnicity)*	
Participants	*Where were participants recruited from?*	
	Mean/range of participants' age: _____	
	Gender composition of participants sample: *Males (n):_____ Females (n):_____* *Males (%):_____ Females (%):_____*	
	Number of participants sample: *Asian/Asian American: (n):_____ (%):_____* *Non-Asian (if any): (n):_____ (%):_____*	
	Ethnicity breakdown (n):_____ (%):_____	
	Other participants' characteristics: (e.g., US born vs. Foreign born, English proficiency, SES)	
Study numbers	*Eligible for inclusion: _____*	
	Excluded: _____	
	Refused to take part: _____	
	Randomized to intervention group(s): _____	

	Randomized to control group(s): _____	
	Excluded post randomization (for each group; with reasons if relevant): _____	
	Withdrawn (for each group; with reasons if relevant): _____	
	Lost to follow up (for each group; with reasons): _____	
	Included in the analysis (for each group; for each outcome:	
	How often did the intervention take place?	
	How long did the intervention last?	
	If there were follow-up sessions/activities post interventions, what were they and how long did they last?	
Intervention types	☐ Health education ☐ Counseling -☐ Individual -☐ Group -☐ Family ☐ Multicomponent Intervention (Check all that apply) ☐ Social support/mutual support/peer support groups ☐ Consultation/physician advice ☐ Pharmacological (Check all that apply) -☐ Buproprion -☐ Clonodine -☐ Nortiptyline -☐ Nicotine Replacement Therapy (NRT) -☐ NRT: patches -☐ NRT: gum -☐ NRT: nasal spray -☐ NRT: inhaler -☐ NRT: lozenges -☐ NRT: Varenicline ☐ Self-help material (i.e. brochures, pamphlets, books, videos) ☐ Quitline ☐ Community outreach ☐ Others: _____	
Delivery	*How was the intervention delivered? (Check all that apply)* ☐ Face-to-face (i.e. classes, workshops, small groups) ☐ Telephone ☐ Website ☐ Mobile apps	

	☐ Media (i.e. radio, TV, pamphlet) ☐ Others: _____	
Structure	*How was the intervention structured? (Check all that apply)* ☐ One-on-one ☐ In groups ☐ Smokers-only ☐ Nonsmoker-only ☐ Smoker and nonsmoker dyads ☐ Family as a whole	
Frequency	*How often did the intervention take place?*	
Duration	*How long did the intervention last?*	
	How long was each session?	
Intensity	*What was the level of treatment intensity? Consider session length, total amount of contact time, and number of sessions.* ☐ Low (e.g., brief phone call, no clinic visits, passive receipt of materials) ☐ Moderate (e.g., one clinic visit, telephone counseling sessions) ☐ High (e.g., multiple clinic visits, frequent contact with staff, adherence monitoring)	
Follow up	*If there were follow-up sessions/activities post interventions, what were they and how long did they last?*	
Cultural adaptations (if applicable)	*Was there cultural tailoring to the intervention?* Yes ☐ No ☐ Unclear ☐	
	How was the intervention culturally tailored? ☐ Tailored to Asian Americans broadly ☐ Tailored specifically to Asian American subgroups ☐ Tailored broadly for ethnic/cultural minorities	
Unit of Analysis	*What was the unit of analysis?* ☐ Individual ☐ Group ☐ Community	
Outcome	*How was smoking abstinence measured?* ☐ Self-report ☐ Biochemical verification -☐ Saliva cotinine -☐ Breath carbon monoxide ☐ Both ☐ Other: _____	
	What self-reported smoking abstinence outcome was used? ☐ Day of (no smoking at time of assessment/interview)	

	☐ 24-hour point prevalence (no smoking in the past 24 hours) ☐ 7-day point prevalence (no smoking in the past 7 days) ☐ 1 month continuous abstinence (no smoking in the past 28 days) ☐ 6 month sustained abstinence (no smoking in the past 6 months) ☐ 12 month sustained abstinence (no smoking in the past 12 months) ☐ 5-year sustained abstinence (no smoking in the past 5 years) ☐ Other: _____	
	What was the average duration of abstinence (in weeks): _____	
Risk of Bias	*Selection bias:* *Was there true randomization?* ☐ Yes ☐ No ☐ Unclear	
	Was the intervention standardized? ☐ Yes ☐ No ☐ Unclear	
	Performance bias: *Were intervention conditions known to:* ☐ No one ☐ Participants ☐ Providers ☐ Data collectors ☐ Others	
	Detection bias: Was there blinding of outcome assessment? ☐ Yes ☐ No ☐ Unclear	
	Attrition bias: *Did they study explain participant attrition and exclusion from analyses?* ☐ Yes ☐ No ☐ Unclear	
	Reporting bias: *How was smoking abstinence measured?* ☐ Self-report ☐ Biochemical verification -☐ Saliva cotinine -☐ Breath carbon monoxide ☐ Both ☐ Other: _____	

4. Data and results

Odds ratio

	Intervention (n)	**Control (n)**

Quit (n)		
Not Quit (n)		
Odds ratio: _____	>1 ☐ (intervention) 0 ☐ (no relationship) <1 ☐ (control)	

Dichotomous variables

Outcomes measured	**Timing of outcome assessment (days/months)**	Intervention group*		Comparison group or Control group (if any)		**Notes**
		Observed (n)	Total (N)	Observed (n)	Total (N)	

*add additional columns if there is more than one intervention group

Continuous variables

Outcomes measured	**Timing of outcome assessment (days/months)**	Intervention group		Comparison group or Control group (if any)		**Notes**
		Mean/Mean change	Standard deviation	Mean/Mean change	Standard deviation	

Summary of Data Extraction

Completed data extraction ☐	**Request further details?** Yes ☐ No ☐
Verified by second coder? Yes ☐ No ☐	Second coder: _____
Verification completed on: _____	Differences resolved Yes ☐ No ☐
Notes:	