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REVIEW

ADDICTION SSA

Effectiveness of culturally tailoring smoking cessation interventions for reducing or quitting combustible tobacco: A systematic review and meta-analyses

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Abstract

Background and Aims: Standard approaches to smoking cessation may not be as effective for certain populations, and tailoring on cultural factors could improve their effectiveness. This systematic review measured the effectiveness of culturally tailoring smoking cessation interventions on quitting or reducing smoking combustible tobacco.

Method: We searched MEDLINE, PsychInfo, Embase and Cochrane Central Register from inception to 21 June 2023 for randomized controlled trials (RCTs) of community-based, primary care or web-based interventions for smoking cessation in adults who smoked tobacco, with measurement of smoking abstinence or reduction at least 3 months following baseline. We examined comparisons between either an intensity-matched culturally tailored intervention and a non-tailored intervention or a standard non-tailored intervention and the same intervention plus a culturally tailored adjunct. We sub-grouped studies according to the level of tailoring and performed subgroup analyses where appropriate. We assessed risk of bias and certainty of evidence.

Results: We identified 43 studies, 33 of which were meta-analyzed (n = 12 346 participants). We found moderate certainty evidence, limited by heterogeneity, that intensity-matched culturally tailored cessation interventions increased quit success when compared with non-tailored interventions at 3-month follow-up or longer (n = 5602, risk ratio [RR] = 1.29 95% confidence interval [CI] 1.10, 1.51, I^2 = 47%, 14 studies). We found a positive effect of adding a culturally tailored component to a standard intervention compared with the standard intervention alone (n = 6674, RR = 1.47, 95% CI 1.10, 1.95, I^2 = 74%, 18 studies), but our certainty in this effect was low due to imprecision and substantial statistical heterogeneity.

Conclusion: Culturally tailored smoking cessation interventions may help more people to quit smoking than a non-tailored intervention. Adapting or adding cultural components to smoking cessation interventions originally developed for majority populations could improve cessation rates in populations who do not fully identify with majority cultural norms.

KEYWORDS
culturally tailored, meta-analysis, smoking cessation, smoking reduction, systematic review, tobacco

INTRODUCTION

Many people who smoke want to quit; however, few are successful in the long-term. Behavioral therapies in conjunction with pharmacotherapy can further improve people's chances of quitting and remaining abstinent over the long-term [1–3]. Despite the proven effectiveness of these therapies, there are groups for whom these therapies have been less successful [4, 5]. It is possible that some of the reasons for these differences in outcomes could be related to the reach of the intervention; that is, did the cessation intervention appropriately engage the target population? Alternatively, it is possible that, in the case of behavioral interventions, the messaging and format may not resonate with the target population. Most randomized controlled smoking cessation trials have been conducted in majority culture populations, therefore, targeting these groups. The interventions tested and designed with these populations in mind may not be as effective in populations from different cultures [6, 7].

Smoking behaviors and their predictors can be rooted in culture [8]. Many definitions of culture exist, but for our purposes we define culture as a collective or shared understanding of values and beliefs that may correspond to shared ethnicity or racial identity, but may also transcend this to include people grouped on the basis of shared lived experience [9–11]. Interventions designed to promote health, such as smoking cessation, can incorporate these unique values, beliefs and shared practices into the framework and content to improve the likelihood that it will be accepted by the target population. Such adaptation, or tailoring, of an intervention on the basis of culture has become more widely practiced in a number of areas of health promotion, including smoking cessation [10, 12–17].

Approaches to tailoring health interventions to address the needs of cultural communities can be described on two levels: addressing surface and/or deeper structures [8]. Adaptations that address surface structures adapt aspects that contribute to an intervention's acceptability by the relevant community or population; for example, language, imagery or messenger [8]. Deep tailored intervention elements adapt the intervention content to identify culturally or historically significant factors that may modify the behaviors of the target population. These interventions go beyond aesthetic changes to intervention materials and introduce new information that may influence a person's behaviors [8, 18].

Culturally tailoring or adapting an intervention may address some of the culturally specific risk factors or social norms for members of the target population [8, 19]. Some approaches have incorporated messaging about family as a way to draw on an individual's cultural values in relation to their smoking behavior [20–22]. Other interventions have adopted the use of messengers with whom the individual may identify, either through common ancestral background, or shared experiences [23, 24]. Additionally, some interventions have tailored the channels through which the intervention is delivered to reach individuals who may have been more difficult to reach through other methods.

Although cultural tailoring may improve the appeal of, and aid recruitment into, interventions for specific populations, it is unclear if cultural tailoring of smoking cessation interventions has an effect on quitting or reducing smoking [25, 26]. Because of the complexity of the interventions, previous reviews of cultural tailoring of smoking cessation interventions have been limited to narrative descriptions or focused on specific racial/ethnic groups and have not been clear on the evidence of effects [5, 25, 27, 28]. We sought to examine the impact of culturally tailoring combustible tobacco use cessation interventions to determine if culturally tailored interventions are more effective than non-tailored interventions in helping people quit or reduce their smoking. We used a broad definition of culturally tailored interventions to capture studies across contexts and applied specific comparisons to evaluate the effectiveness of tailored compared to standard approaches.

METHODOLOGY

We prospectively registered our protocol on PROSPERO (CRD42022318579). We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist when writing this report [29].

Study inclusion

Search strategy

We searched Medline, Embase, PsychINFO, and the Cochrane Central Register of Clinical Trials (CENTRAL), which included the following trial registries: clinicaltrials.gov, and the World Health Organization International Clinical Trials Registry Platform in 21 June 2023, with no date restrictions.

The search strategy included terms and MeSH headings that described RCTs aimed at smoking cessation, stopping smoking or quitting smoking. The search also targeted studies that used cultural-tailoring techniques. Supporting Information S1 contains the syntax for each database search.

Eligibility criteria

We included RCTs, including factorial, cluster and pragmatic RCTs, enrolling adults smoking at baseline, age 18 years or older, who were willing or unwilling to quit smoking. Studies enrolling participants under the age of 18 were also included if the studies were primarily aimed at adults.

Studies had to test a culturally tailored intervention, namely one that modified components of an intervention originally developed and tested for a general population. Studies that described the culturally tailored intervention as 'tailored,' 'culturally adapted' or 'culturally relevant' for racial/ethnic, religious or other marginalized status (i.e. sexual minority or people living with HIV) groups were included. We examined individual or group-level interventions that were designed to help people quit smoking tobacco, and measured

outcomes related to smoking cessation or reduction at 3 months or longer. Interventions incorporating smoking cessation pharmacotherapies or e-cigarettes in combination with behavioral therapies were also included. We planned to include tailored interventions aimed at quitting use of non-combustible tobacco (i.e. chew tobacco) that also secondarily addressed quitting or reducing smoking, but none met our inclusion criteria.

We investigated two types of comparison. The first was between intensity-matched culturally tailored and non-tailored interventions designed to help people quit or reduce their smoking. This allowed us to isolate the effects of the cultural tailoring on the outcomes of interest. The second was between a standard smoking cessation or reduction intervention plus additional culturally tailored components and the standard smoking cessation or reduction intervention on its own. With this, we were able to isolate and test the effect of the addition of a culturally tailored component. We excluded studies that compared tailored and untailored interventions where the interventions were of differing intensities and studies investigating a tailored adjunct component where the untailored intervention components were not matched between arms.

We included papers written in any language, full-length papers, trial registries and conference abstracts as long as they met our eligibility criteria.

Types of outcome measurements

The primary outcomes were abstinence from or reduction in tobacco smoking at the longest follow-up period reported (minimum 3 months). Although shorter periods of abstinence do not necessarily predict longer-term abstinence, we allowed for slightly shorter follow up because we were not sure whether sufficient studies would be included to draw conclusions if we imposed the Russell Standard (i.e. a minimum of 6 months follow-up) [30]. We used the strictest criteria to report abstinence in the study (e.g. continuous over point prevalence; biochemically verified over self-report) in-line with the Russell Standard [30]. We defined reduction as a decrease, compared to baseline, in the number of cigarettes smoked per day (CPD) or other forms of smoked tobacco used (i.e. number of shisha sessions per week). We used the most stringent measures of reduction reported in the study, that is, biochemical verification over self-report and longest follow-up point. This is similar to methodology previously reported for reviews examining smoking reduction outcomes [31].

Where available we also examined the acceptability of the intervention using measures of satisfaction, as defined by the authors.

DATA COLLECTION AND ANALYSIS

Selection of studies

Two independent reviewers screened 10% of titles and abstracts in duplicate (A.L.J. and M.G.); the remainder were screened by one reviewer (A.L.J.) using a pre-specified screening tool. Disagreements were discussed and resolved via discussion or referred to a third author (N.L. and J.H.B.). We obtained full-texts for all studies deemed potentially eligible at the first stage of screening. Two authors independently screened 10% of these (A.L.J. and M.G.), with any disagreements discussed and referred to a third author where necessary (N.L. and J.H.B.). We calculated a κ score at both screening stages to investigate interrater agreement. Abstract and full text screening was managed in Rayyan [32].

Data extraction and management

We extracted data on study characteristics, including funding and potential conflicts of interest, population characteristics, intervention and comparator methods, including intervention tailoring, study outcomes, and risk of bias for each of the included studies. Two authors independently extracted study characteristics, outcome data and information needed for risk of bias assessments for 10% of the studies included (A.L.J. and M.G.). Disagreements were resolved by one of the other authors (J.H.B. and N.L.). A single author extracted the data from the remaining studies (A.L.J.). We used a pre-determined and piloted data extraction form.

Risk of bias assessment

We assessed risk of bias for each included study according to the guidelines detailed in the Cochrane Handbook version 6.2 using the Risk of Bias 1 (RoB1) tool [33]. We assessed random sequence generation, allocation concealment, bias in the measurement of the outcome, attrition bias because of missing outcome data and bias in the selection of outcome data reported. Because all of the interventions in this review incorporated behavioral components, we did not evaluate performance bias, because blinding participants or researchers to the intervention in these studies is impossible. We also evaluated cluster RCTs for recruitment bias and imbalance in baseline statistics, because of their unique considerations related to randomization and timing of allocation to study arms, as recommended in the Cochrane Handbook [34].

Two independent reviewers assessed each domain for 10% of the studies included (A.L.J. and M.G.) and the remaining studies were assessed by one reviewer (A.L.J.). When there was disagreement between the two reviewers, a third reviewer (N.L. and J.H.B.) was asked to assess the study.

Cluster randomized trials

Cluster randomized trials (cRCTs) included in this review were analyzed according to the protocol described in the Cochrane Handbook (Chapter 23.1.3–23.1.5) [34]. If the average cluster size was not reported, we calculated the average cluster size by dividing the total

number of participants enrolled in the study by the number of clusters. If the study did not report the intraclass correlation coefficient (ICC), we assumed a common ICC of 0.01 as this was the ICC estimated for two of the included studies [35, 36]. We adjusted for the effective sample size and study weighting using the formula provided in the Cochrane Handbook [34]. We, then, applied the design effect to calculate the effective sample size for each study and included the adjusted figures in the meta-analysis according to the Cochrane Handbook [34].

Measurement of treatment effects

Analyses were performed using RevMan 5.4 [37]. We produced a risk ratio (RR) and 95% CI for each study to measure the effect on abstinence. We used an intention-to-treat analytic approach, and assumed individuals lost to follow up were smoking at the time of follow-up.

For the studies reporting change in CPD from baseline to follow up for both the intervention and control groups, we calculated the mean difference (MD) between groups and the corresponding 95% CI. This effect estimate represents the MD in the change in CPD between the tailored intervention arm and the standard control arm. A negative integer indicates that the mean change was greater (larger reduction) for the culturally tailored arm. We included reported change from baseline data in our meta-analysis; however, where baseline and follow-up means and SDs were reported we calculated the change from baseline for each treatment arm before including these in our meta-analysis.

Data synthesis

For both outcomes we grouped studies that were intensity-matched separately to studies where the tailored intervention was provided as an adjunct intervention. We pooled RRs from individual studies with dichotomous outcomes using random-effects Mantel–Haenszel methods to calculate the pooled RR and 95% CI per the protocol described in the Cochrane Handbook [31]. For our reduction outcome, some studies included quitters in the denominator (i.e. those smoking 0 CPD) and some excluded quitters from the analysis. We meta-analyzed these groups of studies separately. Where it was unclear if quitters were included in the denominator, we contacted the authors to clarify. We combined MDs using random-effects inverse variance methods to calculate pooled MDs and 95% CI. We summarized the data for each comparison and outcome using forest plots.

For each comparison and outcome, studies were sub-grouped by the level of tailoring assessed according to the features present in the culturally tailored intervention. Interventions could be classified as having surface, deep or a combination of both surface and deep tailored features. Criteria for these classifications were derived from previous work by Resnicow and Ahluwalia [8, 18]. Examples of surface tailoring included adapting the setting to a more culturally acceptable location, ensuring the person delivering the intervention is culturally congruent or selecting imagery for materials that are culturally acceptable. Deep tailoring included adaptation of intervention content to address social norms, values or historically significant issues that would affect tobacco use behaviors [18].

We assessed statistical heterogeneity using the I^2 statistic, which measures the proportion of variation in the included studies because of statistical heterogeneity and not because of chance [38]. We judged an I^2 over 50% to represent substantial heterogeneity in line with Cochrane guidance [39, 40].

We performed a sensitivity analysis for each analysis, removing studies deemed to be at high risk of bias.

Studies that could not be incorporated into the meta-analysis because either they did not provide all of the data needed to calculate relative effects, or results were not available at the time of the analysis, were narratively described. Because of differences in the type of satisfaction measures used across studies, this outcome was synthesized narratively.

Assessing the certainty of the evidence

We produced a summary of findings table using GRADEpro GDT for total abstinence and reduction of tobacco use for both comparisons [41]. We used GRADE criteria risk of bias, inconsistency, indirectness, imprecision and publication bias, to assess the certainty of the evidence [42]. To assess publication bias, we generated funnel plots for meta-analyses with 10 or more studies.

RESULTS

Study participants and recruitment

Our searches identified 284 reports. After title/abstract and full-text screening we identified 43 studies eligible for inclusion in this review, 33 of which were included in the meta-analyses (n = 12 346 participants). The details of the flow of studies are provided in the PRISMA diagram in Figure 1, characteristics of included studies are reported in Table 1. Six ongoing studies are described in Supporting Information S2. Excluded studies with reasons are reported in Supporting Information S3. The κ for interrater agreement for title and abstract screen was 0.77 (SE = 0.05) and for full text screen was 0.93 (SE = 0.19).

Most included studies were conducted in North America (78%). These studies recruited participants from various racial, ethnic or other culturally defined groups including African Americans (36%), Latino/Hispanic (20%), Asian (20%) and Indigenous (11%) [22, 23, 43–69]. Additional cultural communities included lesbian, gay, bisexual and transgender (LGBT) or sexual gender minority (SGM) (5%) and people living with HIV (PLWH) (2%) [70, 71]. Few studies were conducted in populations outside of North America or Europe. Most of the studies conducted in Australia and New Zealand were in

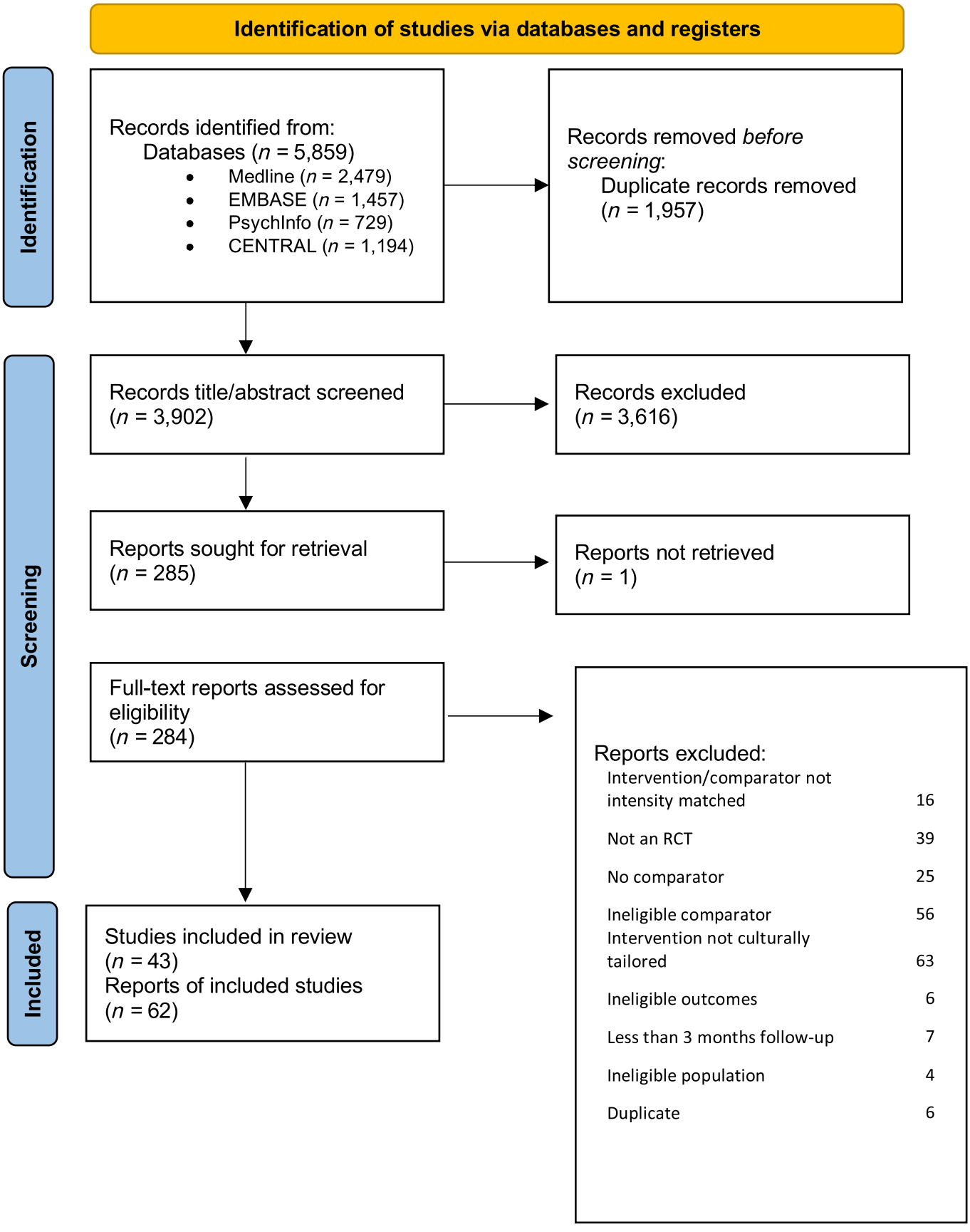

FIGURE 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) diagram.

TABLE 1 Characteristics of included studies.

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
Ahluwalia *et al*. [43]	IM	Surface	7-day point prevalence abstinence	Health Education (HE) + NRT or HE + placebo. HE incorporated the 'KIS II Quit Smoking Guide' and semistructured scripts	Motivational interviewing (MI) + NRT or MI + placebo MI sessions in the study were conducted by trained counselors	26 weeks	None reported	USA
Aida Maziha *et al*. [76]	IM	Deep	Reduction	The Al-Quran recitation group was taught to recite four chapters of the Quran while concentrating on the meaning of the verses; participants were asked to practice the methods and record their practices in a diary	The counselling group was taught the 12 'M' method. The 'M' refers to several Malaysian words used as instructions to distract the individual from their smoking craving. (control)	4 weeks, 12 weeks	None reported	Malaysia
Asfar *et al*. [44]	Adjunct	Surface	Prolonged abstinence, reduction	One face-to-face group counseling session, two phone calls, fax referral to tobacco quitline, NRT for 8 weeks	Fax referral to the quitline and provision of 8 weeks of free NRT	3 mo, 6 mo	None reported	USA
Begh *et al*. [79]	Adjunct	Surface	Abstinence proportions	Culturally congruent outreach workers referred people to existing services that included pharmacies, drop-in clinics and general practices; they used culturally specific advertising (e.g. posters and leaflets with relevant images and messages, but written in English)	Smokers living in control areas were offered NHS smoking cessation support as normal, which included advertising the availability of treatment through media campaigns	4 weeks, 3 mo, 6 mo	None reported	UK
Borrelli *et al*. [45]	IM	Deep	Continuous abstinence	The goal of the PAM intervention used tailored MI plus three home visits and a 5- to 10-min follow-up call from a bilingual Latina health educator; a self-help manual	The BAM intervention followed standard clinical guidelines for smoking cessation plus three home visits and a 5- to 10-min follow-up call from a bilingual Latina health educator; a self-help manual	EOT, 2 mo, 3 mo post treatment	None reported	USA
Cene *et al*. [46]	IM	Surface	Abstinence (proportion not smoking)	CHW counseling plus access to community resources including medication therapy	Control condition received same counselling, but through primary care and access to medication and resources	1 y, 5 y	Pharmaceutical funding	USA
	Adjunct	Surface				6 mo	None reported	

TABLE 1 (Continued)

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
Chan *et al.* [36]			7-day point prevalence abstinence	Brief advice using the AWAR protocol delivered by youth counselors plus a 12-page self-help smoking cessation booklet	The control participants received the same self-help smoking cessation booklet, but they did not receive the AWAR advice			Hong Kong
Cherrington *et al.* [47]	IM	Deep	7-day point prevalence abstinence	Tailored DVD and tobacco cessation information via brief counseling based on their responses to readiness to quit	Attention-control general DVD and the same information via brief counseling based on their responses to readiness to quit	6 mo	None reported	USA
Choi *et al.* [48]	IM	Both	7-day point prevalence abstinence	The ANBL intervention involved counseling led by Native counselor, tailored materials and curriculum	The CBP arm involved non-tailored counseling by non-Native facilitator, general curriculum and general materials	6 mo	Study medication provided by pharmaceutical company; no influence on final results	USA
Fang *et al.* [49]	IM	Deep	Point prevalence abstinence	One session focused on culturally specific predictors of smoking	One session focusing on general smoking information	1 week, 1 mo, 3 mo	None reported	USA
Froelicher *et al.* [50]	Adjunct	Deep	7-day point prevalence abstinence	The IAM intervention group program included all features of the control program plus a tailored, community co-developed IAM intervention	Control received a 1-h pre-class orientation session followed by a standard 5-week smoking cessation intervention. Participants received an edited version of PTF. The editing consisted of removing sections of PTF focused on social justice messages	6 mo, 12 mo	None reported	USA
Girgis *et al.* [75]	Adjunct	Surface	24-h point prevalence abstinence, reduction	Arabic/English telephone counseling based on the 5As approach, use of 'culturally appropriate' techniques to help people quit, Arabic/English quit kit, and family oriented pamphlet	Usual care given in the GPs office. The self-help smoking cessation kits and brochures in Arabic and English were made available for 'discretionary distribution' to smokers	6 mo, 12 mo	None reported	Australia
Kim *et al.* [22]	Adjunct	Both	Prolonged abstinence	Culturally specific counseling focusing on Korean cultural	Participants in both conditions received 8 weekly	12 mo	None reported	USA

(Continues)

TABLE 1 (Continued)

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
				values and historical references plus control condition	individualized counseling sessions in a face-to-face format			
Knight [23]	Adjunct	Both	Sustained abstinence	Church-based 10 week program with trained lay health workers and self-help materials	Minimally structured cessation program with self-help materials. Did not receive church-specific intervention	6 mo, 12 mo	None reported	USA
Lipkus *et al.* [51]	Adjunct	Both	30-day point prevalence abstinence	PI + TC: included materials tailored for the African-American community, including artwork, messaging, birthday cards	Control: PI alone: tailored, computerized prompting system that generated printed physician prompts that were attached to the patient's chart. Providers were asked to use the 4As for smoking cessation	16 mo post intervention	None reported	USA
Louwagie *et al.* [77]	Adjunct	Surface	Sustained abstinence	Participants allocated to the intervention arm received a brief MI session (15–20 min) from the LHCW, and were then referred to the TB nurse for usual care	Both groups received a short-standardized smoking cessation message from the TB nurse. All patients also received a smoking cessation booklet supplied by the National Council against Smoking of South Africa	1 mo, 3 mo, 6 mo	Unrelated pharmaceutical funding.	South Africa
Marley *et al.* [72]	Adjunct	Surface	7-day point prevalence abstinence	Usual care plus 11 counseling sessions with Aboriginal counselor and a support group	Usual care received routine care relating to smoking cessation at their local primary health care service	6 mo, 12 mo	None reported	Australia
Matthews *et al.* [52]	IM	Both	7-day point prevalence abstinence	Didactics and print materials were based on statistics and health information specifically about African American smokers	Didactics and print materials were based on statistics and information from general populations of smokers	EOT, 3 mo, 6 mo	None reported	USA
Matthews *et al.* [70]	IM	Both	7-day point prevalence abstinence, reduction	Culturally targeted CTQ program with tailoring elements for the LGBTQ+ community	Standard CTQ program.	1 mo, 3 mo, 6 mo, 12 mo	None reported	USA
Nollen *et al.* [53]	IM	Both	7-day point prevalence abstinence, reduction	The Harlem Health Connection's Kick-It video + PTF: Winning the Fight Against Tobacco with African American smokers	How to Quit is a 48-min videotape that is part of a larger kit produced by the American Medical Association + American Lung Association's	week 4, 6 mo	None reported	USA

TABLE 1 (Continued)

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
					Freedom From Smoking guide (1993)			
Orleans *et al.* [54]	IM	Deep	7-day point prevalence abstinence	PTF guide + tailored guide-based counseling	Standard guide + standard counseling	6 mo, 12 mo for a small subset	None reported	USA
Patten *et al.* [55]	Adjunct	Both	7-day point prevalence abstinence	The intervention group will be enrolled in a private, culturally relevant Facebook group for 3 months, moderated by an AN counselor plus standard services	Control was standard services including (1) Alaska state quitline, (2) regional tribal tobacco cessation programming, (3) smokefree.gov resources, including the free text messaging program	1 mo, 3 mo, 6 mo	None reported	USA
Pollak *et al.* [56]	Adjunct	Deep	Continuous abstinence	The intensive intervention arm received the booklet plus an option of up to 6 weeks of NRT, and three tailored counseling sessions during pregnancy (one face-to-face and two via phone) and three postpartum (one face-to-face and two via phone)	Men randomized to the written materials only arm received the booklet and the option of up to 6 weeks of free NRT (nicotine gum or patch)	End of pregnancy, 12 mo	None reported	USA
Shuter *et al.* [57]	Adjunct	Both	30-day point prevalence abstinence, Reduction	Access to PSF-M a smartphone accessible app tailored for PLWH plus the standard condition	Standard care (control) consisted of brief (<5 min), structured advice to quit, a self-help brochure, and an offer of a prescription for a 3-mos supply of nicotine patches	4 mo	None reported	USA
Smith *et al.* [58]	Adjunct	Both	7-day point prevalence abstinence	Control plus culturally tailored booklet, and culturally specific activities (tobacco pouch) and tailored relaxation CD	Standard counseling for four sessions	3 mo, 6 mo	None reported	USA
Stanton *et al.* [59]	Adjunct	Both	7-day point prevalence abstinence	Intervention participants received all control components in addition to (a) culturally sensitive print materials and	Participants the control attended two in-person sessions, and received one phone call on their quit date. They also	12 mo	None reported	USA

(Continues)

TABLE 1 (Continued)

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
				videos, (b) tailored behavioral counseling; two additional in-person sessions focused on tailored relapse prevention, (c) two 10-min booster phone calls, and (d) the option to bring a social support buddy to attend all sessions	received self-help materials and an offer of NRT			
Towfighi *et al*. [60]	Adjunct	Surface	Abstinence (proportion not smoking)	Usual care plus the offer of at least three APC clinic visits; at least three CHW home visits; telephone visits and other protocol-driven supports	Control group received usual care, which varied by study site, but incorporated some of the same supports across conditions	12 mo	None reported	USA
Tregobov *et al*. [61]	Adjunct	Surface	Reduction	Intervention group received four in person consultations in their preferred language plus educational materials	Control received educational materials	8 mo	None reported	Canada
Vogel *et al*. [71]	IM	Both	7-day point prevalence abstinence	POP was similar in structure to TSP-SGM, but culturally tailored to the SGM community; POP content was tailored for the target population (i.e. SGM young adults)	TSP-SGM non-tailored intervention. TSP, a randomized controlled trial of a smoking cessation intervention delivered through Facebook to young adult smokers age 18–25 years	3 mo, 6 mo	Some consulting, no financial interests declared	USA
Walker *et al*. [73]	Adjunct	Both	7-day point prevalence abstinence	Usual care plus tailored behavioral 'coaching' about the dangers of SHS exposure to children; material based on Maori and Aboriginal holistic models of health	Control group received 'usual care' comprising standard management by hospital and primary care providers, which ranged from brief quit advice to the provision of cessation treatment	4 mo, 12 mo	Some prior consultancy, no current financial interests to declare	Australia and NZ
Webb 2009 [62]	IM	Both	7-day point prevalence abstinence	The culturally specific condition received PTF mailer	Deculturally specified PTF mailer called Free Yourself	3 mo	None reported	USA
Webb Hooper 2017 [63]	IM	Both	7-day point prevalence abstinence	This intervention consisted of standard CBT, with session content framed for specific relevance to African Americans	The standard CBT intervention was based on an established protocol with demonstrated	EOT, 3 mo, 6 mo, 12 mo	None reported	USA

TABLE 1 (Continued)

Study ID	Comparison	Level of tailoring	Outcome(s) measured	Summary of tailored intervention	Summary of control condition	Follow-up	Conflict of interest	Country
					efficacy among African Americans			
Webb Hooper 2023 [69]	IM	Deep	28-day continuous abstinence	This intervention included the PTF video plus the QuitlineNC program	The attention-matched control included a standard 'How to Quit' video plus the QuitlineNC program	3 mo, 6 mo	Co-authors were employees of the quitline service provider; no other financial interests to declare	USA
Wu *et al*. [64]	IM	Surface	Abstinence, reduction	Four 60-min in-person sessions of AMI counseling in Chinese and a packet of self-help smoking cessation materials	Four 60-min in-person health education sessions and packets of general health self-help information, nutrition, exercise and the harmful effects of tobacco	3 mo, 6 mo	None reported	USA
Zhu *et al*. [65]	Adjunct	Both	Prolonged abstinence	Counseling + self-help materials; helpline staff, including bilingual and bicultural Chinese-, Korean- and Vietnamese-speaking paraprofessional counselors	Self-help materials only in preferred language	4 mo, 7 mo	None reported	USA

Abbreviations: 4As, Ask-Advise-Assist-Arrange Follow-Up model; ANBL, All Nations Breath of Life; CBP, current best practice; CBT, cognitive behavioral therapy; CD, compact disc; CHW, community health worker; CTQ, Courage to Quit; DVD, digital video disc; GP, general practitioner; HE, health education; IM, intensity matched; LCHW, lay community health worker; LGBTQ+, lesbian, gay, bisexual, transgender, queer; MI, motivation interviewing; NHS, National Health Service; NRT, nicotine replacement therapy; NZ, New Zealand; PI, provider intervention; PLWH, people living with HIV; PTF, Pathways to Freedom; PSF-M, Positively smoke free mobile; SGM, sexual gender minority; TC, tailored communication; TSP, Tobacco Status Project; UK, United Kingdom; USA, United States of America.

Indigenous communities (n = 3) [72–74]. One additional study in Australia was with Arabic-speaking smokers [75]. Two studies were conducted in Asia, one in Hong Kong with Cantonese-speaking smokers and another in Malaysia with a Muslim population [36, 76]. Two studies conducted in South Africa recruited people with tuberculosis or HIV who smoked [77, 78]. One study conducted in the United Kingdom recruited South Asian, predominantly Bangladeshi men, who smoked [79]. There were no included studies from other regions. None of the studies reported any conflict of interest and the majority stated government grants as their primary funding source.

We assessed the level of cultural tailoring in the intervention arm in each study. We judged 11 studies to have only surface level tailored elements in the intervention. This included intervention content being delivered by a culturally congruent provider (e.g. community health worker from the target population), language only translation of materials, counseling provided in a preferred language (e.g. Chinese, Arabic or Spanish), or other light touch tailoring, such as provision of a language choice of smoking cessation materials or counseling scripts [36, 43, 46, 60, 61, 64, 72, 75, 77, 79]. In the studies where lay health workers provided the smoking cessation content, it may have been delivered alongside information to address other health issues [60, 77]. The tailoring in these studies was designed to provide greater access to the standard smoking cessation content, with little else about the content changed [44]. Nine studies contained intervention elements that we judged as deep tailoring. The deep tailored elements specifically addressed cultural norms, practices or values. Examples included the comparison of recitation of specific passages in the Quran to a standard counseling method, counseling-based interventions that addressed community-specific cultural practices around smoking and print materials that provided information on historical targeting of the African American community by the tobacco industry [45, 47, 49, 50, 54, 56, 69, 76].

The remainder of the studies (n = 16) contained elements of both surface and deep levels of tailoring in the intervention arm. These tailored interventions had multiple components and provided tailoring on multiple levels. This included surface level tailoring, such as culturally congruent counselors or content delivered in a preferred language, and also deeper tailored elements such as print or video materials that address cultural community norms and values [22, 48, 51–53,59]. Some studies incorporated counseling, printed materials or video media that included deeply tailored messaging that was also delivered by a culturally congruent messenger [23, 53, 58, 62, 65, 70, 73, 80]. Others used social media platforms to deliver deeply tailored content and incorporated culturally congruent moderators for discussions [57, 71, 80].

Risk of bias

Assessments of risk of bias for all studies included in the review are summarized in Figures 2 and 3. We found 15 studies to be at high risk of bias overall. Of the remainder, we judged 15 to be at unclear risk of

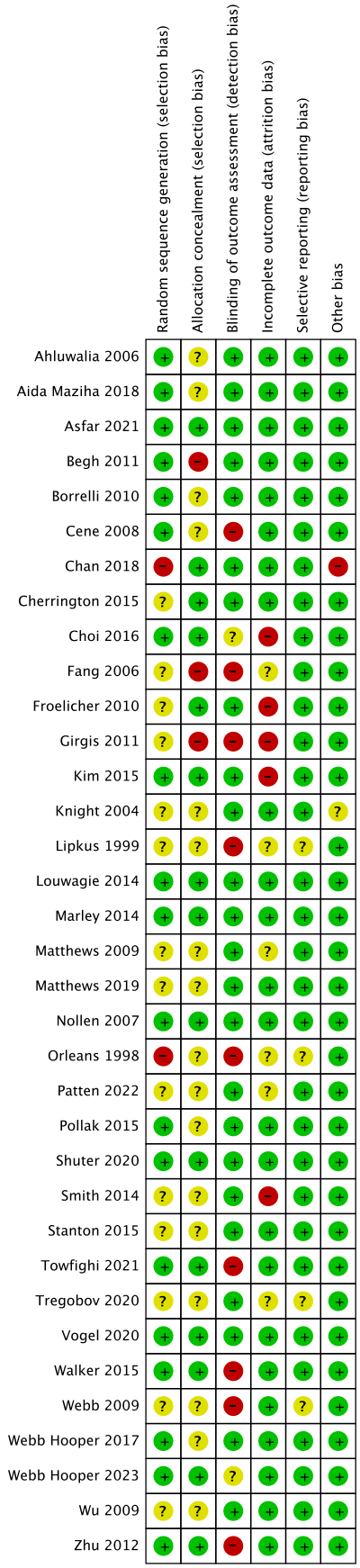

FIGURE 2 Risk of bias summary: review authors' judgements about each risk of bias item for each included study.

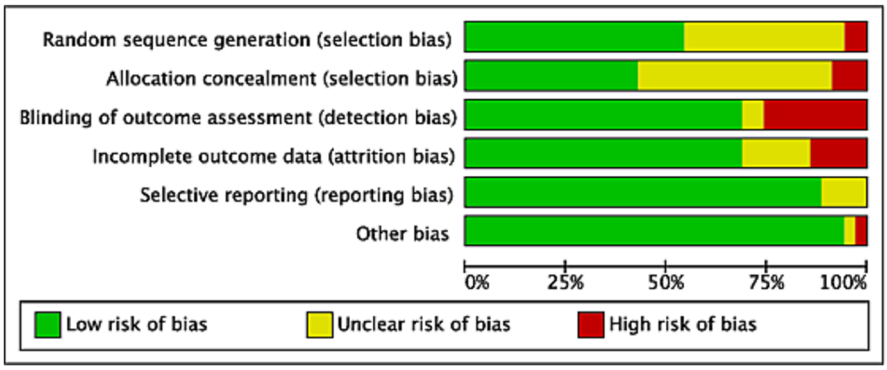

FIGURE 3 Risk of bias graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

bias in at least one domain. We determined six studies to be at low risk of bias across all domains. Allocation concealment (20 studies) and random sequence generation (16 studies) were not clearly described in a number of studies, and for this reason, we deemed them at either unclear or high risk of bias. Studies that did not biochemically verify smoking for the outcome measurement were deemed high risk of bias (nine studies).

Effects of the Interventions

Culturally tailored versus intensity matched non-tailored

Smoking abstinence

We included 15 studies in the intensity-matched comparison of culturally tailored versus non-tailored interventions, measuring abstinence as an outcome. Pooled results from 14 of these studies showed a positive effect of cultural tailoring interventions on quitting smoking (n = 5602, RR = 1.29, 95% CI = 1.10–1.51, I^2 = 47%) (Figure 4). Moderate statistical heterogeneity was detected. A subgroup analysis found substantial heterogeneity between subgroups (surface vs. deep tailoring vs. surface and deep tailoring; I^2 = 57.6%) with a potential larger effect in the surface tailored studies, however, there was still a moderate amount of heterogeneity within the surface tailored group (I^2 = 43%), and this finding should be treated with caution (Figure 4). Our findings were not sensitive to the removal of studies at high risk of bias (RR = 1.31, 95% CI = 1.07–1.60, I^2 = 59%) or with <6 months follow-up (RR = 1.33, 95% CI = 1.11–1.58, I^2 = 43%).

We were unable to meta-analyze data from one study relevant to this comparison and outcome as they did not report sufficiently detailed abstinence data by study arm. Webb [62] compared a 'de-culturally specified' mailer with an intensity matched culturally specific mailer designed for African-American smokers. They showed that although participants in the standard arm reported more quit attempts than the culturally specific arm (63% in standard vs. 41% in culturally specific, P = 0.03), the overall 7-day point prevalence abstinence rate was low (10% by intention-to-treat analysis) and there was no statistically significant difference between the groups (P > 0.05) [50].

Smoking reduction

We pooled two studies (728 participants) examining reduction in CPD, including those who quit, when comparing tailored and non-tailored interventions that were intensity matched. The point estimate was inconclusive and the CIs were imprecise (MD = 0.70, 95% CI = −0.80 to 2.20, I^2 = 0%) (Figure 5).

We analyzed Wu *et al*. [64] separately because they excluded quitters from the reduction analysis. Similarly, we found no clear evidence of an effect of the tailored intervention on reducing CPD in relation to the non-tailored intervention, and there was considerable imprecision (MD = 0.34, 95% CI = −7.40 to 8.08) (Figure 6). Sensitivity analyses removing studies as high risk of bias were not possible for this outcome and comparison as there were too few studies analyzed together.

We were unable to extract usable data from Aida Maziha *et al*. [76] They compared an intensity matched Al-Quran recitation program to a counseling program for reducing smoking and showed a greater reduction in the median number of cigarettes smoked per day in the Al-Quran arm than the 12 'M' counseling arm (median change = −9, IQR = 5.75 vs. median change = −7, IQR = 4, respectively) [63].

Adjunct culturally tailored versus non-tailored

Smoking abstinence

Pooled results from 18 studies showed that when a culturally tailored intervention component was added to a standard intervention it was more effective in helping people to quit smoking than the standard intervention alone, however, we detected substantial statistical heterogeneity (n = 6674, RR = 1.47, 95% CI = 1.10–1.95, I^2 = 74%) (Figure 7). There was no clear evidence of subgroup differences when grouping studies according to the type of tailoring (I^2 = 0%) (Figure 7). A sensitivity analysis removing studies at high risk of bias did not result in any change in the interpretation of the effect (RR = 1.77, 95% CI = 1.16–2.71, I^2 = 58%).

Smoking reduction

Pooled results from four studies (463 participants) provided evidence that cultural tailoring provided as an adjunct to standard care may have led to greater reductions in CPD, independent of quitting, than

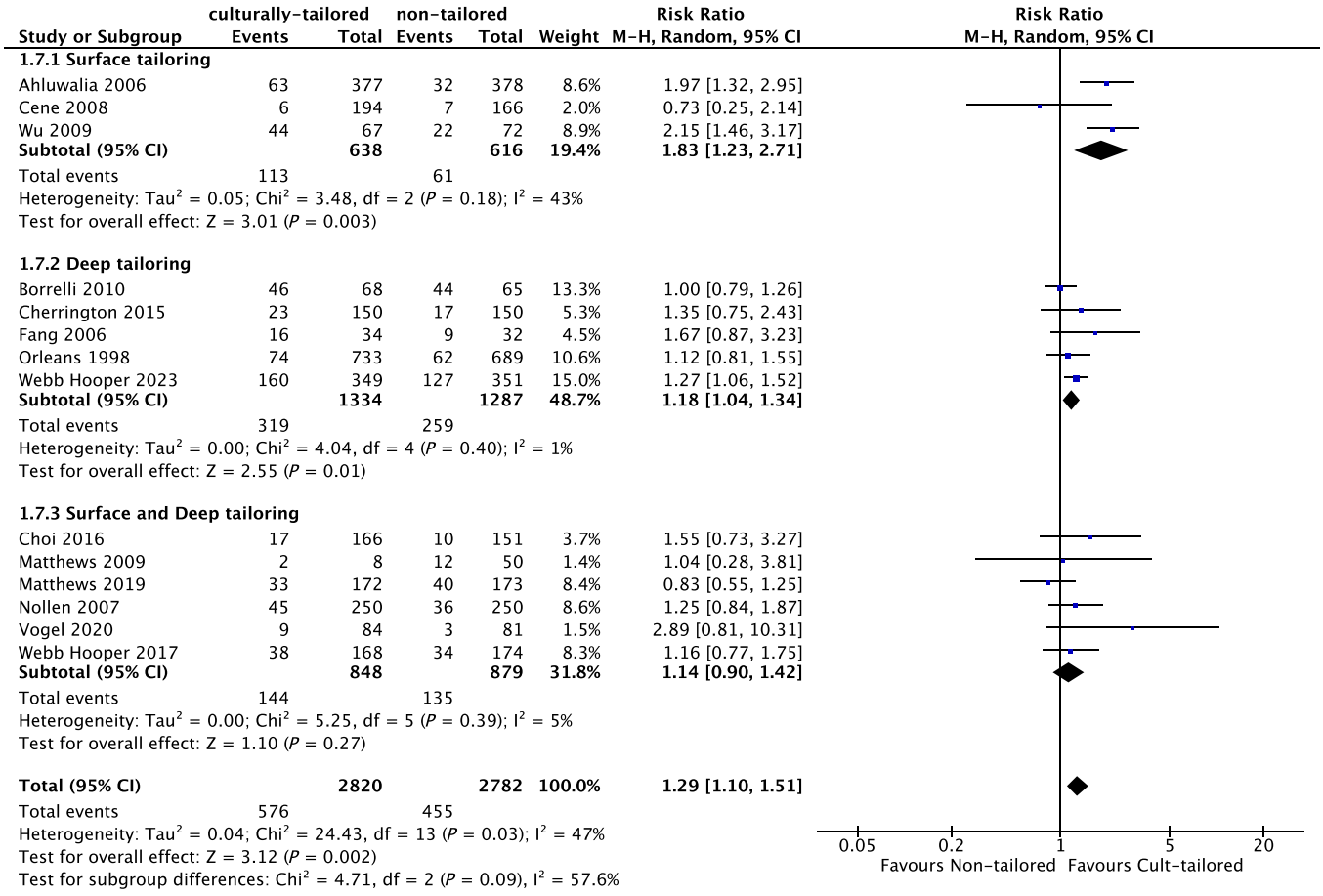

FIGURE 4 Forest plot of comparison: culturally tailored versus non-tailored, outcome: total abstinence—intensity matched studies.

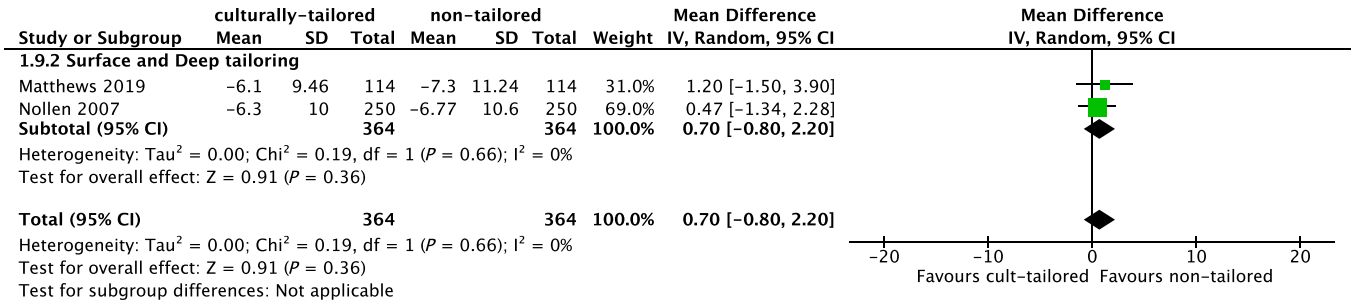

FIGURE 5 Forest plot of comparison: culturally tailored versus non-tailored, outcome: reduction in tobacco use—intensity matched studies (includes quitters).

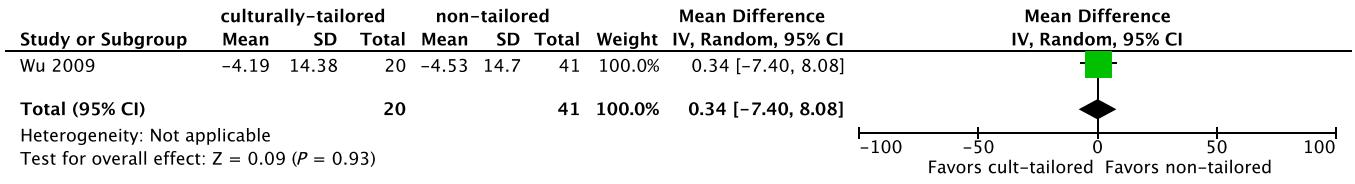

FIGURE 6 Forest plot of comparison: culturally tailored versus non-tailored, outcome: reduction in tobacco use—intensity-matched studies (quitters excluded).

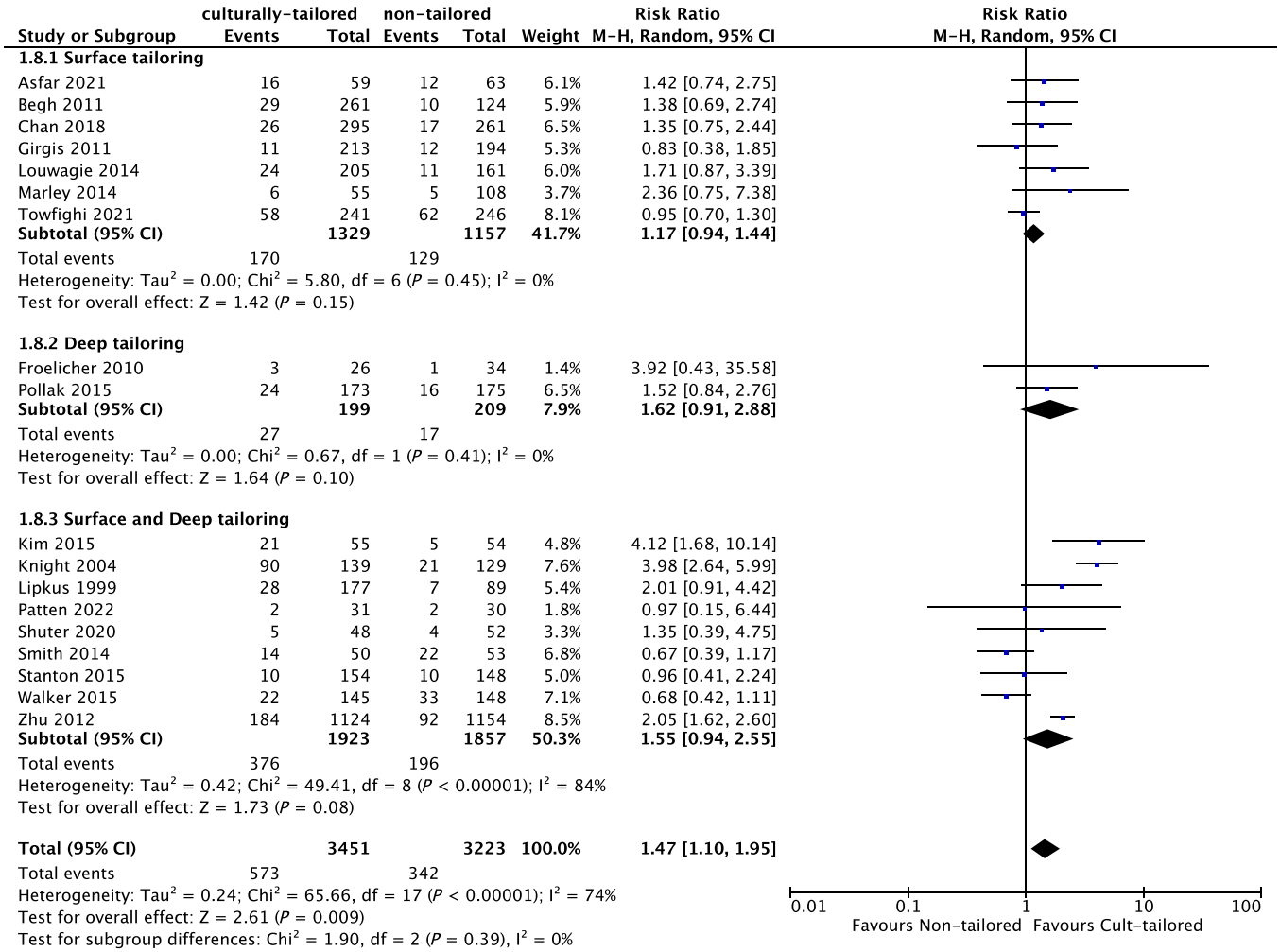

FIGURE 7 Forest plot of comparison: adjunct culturally tailored versus non-tailored, outcome: total abstinence—adjunct studies.

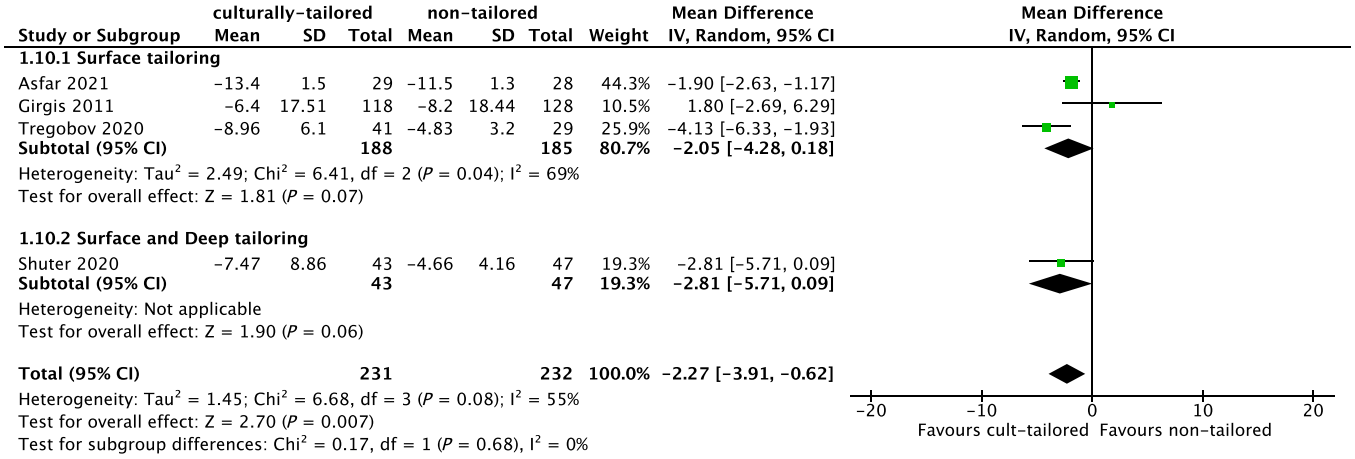

FIGURE 8 Forest plot of comparison: adjunct culturally tailored versus non-tailored, outcome: reduction in tobacco use—adjunct studies.

standard care alone (MD = −2.27, 95% CI = −3.91 to −0.62, I^2 = 55%) (Figure 8). There was no evidence of a subgroup difference (I^2 = 0) when grouping studies based on the type of tailoring. Removing one study deemed to be a high risk of bias did not meaningfully change the interpretation of the result (MD = −2.63, 95% CI = −4.06 to −1.21, I^2 = 47%).

TABLE 2 Summary of acceptability measures from included studies.

Study ID	Acceptability/satisfaction domains	Units reported	Control participants		Intervention participants		Other details about the acceptability
Begh *et al*. [79]	Overall satisfaction score	Median (range)	8	[5–9]	8	[6–9]	No differences between the groups were detected on all three measures. (P = 0.42, 0.24, and 0.49, respectively)
Matthews *et al*. [70]	Overall satisfaction	Mean (SD)	3.6	0.6	3.7	0.5	$t_{224} = -1.8$, $P = 0.311$
Webb [62]	Satisfaction with the study	Mean (SD)	23.59	4.26	23.87	4.31	$P = 0.66$
Asfar *et al*. [44]	Intervention quality was excellent	Percent agree	Not reported	Not reported	83%		All participants in the intervention group that completed the program evaluation reported that they would recommend it to a friend
	Was extremely satisfied with the intervention	Percent agree	Not reported	Not reported	85.4%		
Girgis *et al*. [75]	Acceptability of a telephone intervention	Percent agree	50.4%				Although 62% of participants thought the intervention would benefit Arabic smokers, nearly half (49%) would not agree to being contacted by a telephone support service to help them stop smoking
	Acceptability of the intervention among participating GPs	Percent agree	79.0%				
Webb Hooper *et al*. [63]	Quality of the intervention (overall mean reported)	Mean (SD)	20.18 (2.08) $P > 0.05$				
Summary of intervention specificity measures from included studies							
Webb Hooper *et al*. [63]	Perception that the intervention was intended for African Americans	Mean (SD)	9.89	3.96	12.76	2.38	**$t_{282} = -7.41$, $P < 0.001$**
Matthews *et al*. [52]	Specificity of the program to African American smokers	Difference between groups	**$F(1,14) = 19.3$, $P < 0.0005$**				
	Ability of the program to address their unique needs	Difference between groups	**$P = 0.07$**				
	Program is a 'really good fit'	Difference between groups	$P = -0.10$				
Matthews *et al*. [70]	Targeting of the intervention	Mean (SD)	5.3	3.5	8.1	2.2	**$t_{203} = -7.4$, $P < 0.0001$**

Note: Bold indicates significant differences between groups.
Abbreviation: GPs, general practitioners.

Acceptability of the intervention

Eleven studies included some process measures of helpfulness, acceptability or satisfaction with the intervention [44, 45, 52, 53, 62, 63, 70–72, 75, 79]. Types of measures varied greatly, as did reporting by study arm. Studies that asked participants about helpfulness or acceptability of the program did not report a difference between groups [45, 53, 71]. In the studies that specifically measured satisfaction and compared this by study arm (Table 2), there was no difference in the levels of satisfaction between the intervention and control groups, and generally there was a high level of satisfaction with the interventions [44, 62, 63, 70, 75]. Three studies incorporated measures of the intervention's specificity or targeting of the intervention for the intended cultural group. In these studies, we did see a difference between groups with participants in the tailored arms having a higher perception that the intervention was specifically intended for people like them (Table 2) [52, 63, 70].

DISCUSSION

For both comparisons, intensity-matched and cultural tailoring as an adjunct, tailoring was an effective strategy to help people quit smoking for at least 3 months. Compared with non-tailored interventions, we found moderate certainty evidence that intensity-matched tailored interventions were more effective in helping people quit smoking for 3 months or longer (downgraded one level because of unexplained statistical heterogeneity). We found low certainty evidence, limited by substantial heterogeneity, that studies which added a culturally tailored component to a standard cessation intervention were effective in helping people to quit smoking. The evidence for cultural tailoring of interventions to help people reduce smoking was low and moderate certainty because of imprecision. Summary of findings tables are in Supporting Information S4 and S5.

Most studies were conducted in North America and interventions were tailored on the basis of racial and ethnic cultural affiliations. Surface tailoring in the intensity-matched abstinence comparison seemed to have the largest effect; however, this should be investigated further as this subgroup included only three studies with moderate heterogeneity and may be underpowered. This effect could change with the inclusion of more studies.

There are additional limitations to be borne in mind when reading this review. Many of the analyses had high levels of statistical heterogeneity, possibly because of differences in the components of each of the studies. We were unable to disentangle the effects of each component as many studies contained several different components each with their own level of tailoring. Future studies could take a closer look at how each individual component and its tailoring may contribute to the effect of the intervention. We did not examine how different cultural tailoring strategies might work for different groups as we anticipated there would be insufficient data with which to do so, and hence, did not include this in our pre-specified scope for the review. We did not detect publication bias in our funnel plots (Supporting Information S6), however, there is the possibility that we may have missed studies that were not published or that have only been documented in gray literature. Follow-up times in the studies varied from 3 months to over 1 year. In a *post hoc* sensitivity analysis, we removed the studies with <6 months follow-up (n = 2 intensity-matched studies and n = 1 adjunct study), as these may not reflect long-term quit rates as accurately as studies with longer-term follow-ups. This did not result in a meaningful change in our effect estimates. Finally, our analyses, including subgroup analyses, may have been underpowered and the latter are based on indirect comparisons; future analyses, particularly those with direct comparisons of types of tailoring or RCTs randomizing to different levels of tailoring, may find different results.

Our review adds to existing literature in this area. Previous reviews concluded that interventions tailored on a cultural basis are preferred or are more accepted by the target populations, but have not been clear on their overall effects on clinical outcomes [5, 25, 81]. A review by Webb *et al.* [28] found some evidence that cultural tailoring can be more effective in helping people quit smoking, but this was not sustained at follow up. In our review, we found similar evidence that culturally tailored interventions resonated more with people and that people felt that the interventions were designed for people like them. This review adds further evidence that suggests cultural tailoring of smoking cessation interventions does show an effect on abstinence. It is likely that those who feel an intervention is for them will participate more fully in it and ultimately benefit from it.

Understanding factors that affect people's smoking behaviors is central to the development of appropriate cultural tailoring strategies for smoking cessation interventions. Careful consideration of the messaging and also the channels and the context in which the intervention is delivered is needed. Including both surface and deep tailored elements into an intervention requires substantial investment of time and resources. Surface tailoring strategies speak to the acceptability of an intervention, whereas deep tailoring strategies speak to its impact [8, 18]. More research examining the benefits of different types of tailoring: surface only, deep only or a combination of both surface and deep, is needed to understand what may be beneficial. Future studies could isolate intervention components and examine how tailoring modifies the effect of these components.

AUTHOR CONTRIBUTIONS

Andrea Leinberger-Jabari: Conceptualization (lead); data curation (lead); formal analysis (lead); investigation (lead); methodology (lead); project administration (lead); writing—original draft (lead); writing—review and editing (lead). **Melanie M. Golob:** Data curation (supporting); writing—review and editing (supporting). **Nicola Lindson:** Conceptualization (supporting); formal analysis (supporting); investigation (supporting); supervision (equal); writing—review and editing (supporting). **Jamie Hartmann-Boyce:** Conceptualization (supporting); formal analysis (supporting); investigation (supporting); supervision (equal); writing—review and editing (supporting).

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DECLARATION OF INTERESTS

None.

DATA AVAILABILITY STATEMENT

Search syntax for the four databases has been provided in the Supporting Information. Template data collection forms can be provided on request to the first author.

PROTOCOL REGISTRATION

The protocol for this review was prospectively registered on PROSPERO (CRD42022318579).

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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