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The Effectiveness of Tailored Messaging Interventions to Promote Cancer Screening Adherence: A Systematic Review

Miriam Capasso ^a, Marcella Bianchi ^b, Anna Rosa Donizzetti ^c, and Daniela Caso ^c

^aDepartment of International Humanistic and Social Sciences, University of International Studies of Rome; ^bCharité Center for Prevention, Health and Human Sciences, Charité – Universitätsmedizin Berlin; ^cDepartment of Humanities, University of Naples Federico II

ABSTRACT

Promoting adherence to cancer screenings through effective communication campaigns is critical for the prevention and early detection of cancer, significantly enhancing patients' health outcomes. This systematic review aims to assess the effectiveness of tailored messaging interventions in promoting screenings for cervical, breast, and colorectal cancer. Randomized controlled trials conducted between January 2000 and August 2025, which personalized the intervention content based on at least one tailored psychological variable and measured screening intention or behavior as outcome variables, were included. Data were extracted from the PsycINFO, PubMed, and Scopus databases, resulting in the final identification of 42 studies that met the inclusion criteria. These studies were narratively synthesized and critically analyzed. Findings revealed a mixed but promising landscape: tailored interventions were consistently effective when compared to passive control groups (e.g. usual care), but showed more variable success against active, non-tailored message conditions. This superiority was more pronounced for female cancer screenings than for colorectal cancer screening. Successful interventions were consistently grounded in behavioral theories, and a key feature was the use of multiple communication formats, with the vast majority enhancing text with visual or audio components. This suggests that tailored messaging can positively influence cancer screening behaviors, but its value lies in strategic application. Therefore, a promising direction for future research is to explore the conditions under which different communication strategies are most effective. Future studies could develop and test stratified intervention models to investigate for which subgroups a resource-intensive tailored approach provides a clear advantage over simpler, more cost-effective strategies.

Background

Globally, cancer continues to be a major health challenge, responsible for nearly 10 million deaths in 2020—roughly one out of every six deaths (Ferlay et al., 2021). Nevertheless, many cancers can be cured if diagnosed early and treated effectively. Specifically, cancer screenings are key tools for secondary cancer prevention, enabling early detection of cancer in asymptomatic individuals, which can improve treatment outcomes and survival rates (National Cancer Institute, 2021). Recognizing their importance, the World Health Organization prioritizes promoting population-based screening programs, particularly for breast, cervical, and colorectal cancers, leading to their widespread implementation (World Health Organization, 2010).

While cancer screenings effectively reduce mortality (National Cancer Institute, 2021), adherence rates remain a significant challenge globally, with marked disparities across different populations. For example, in Europe, screening rates vary widely: Finland and Sweden report over 80% adherence to breast cancer screening, whereas others struggle to reach 50% participation for any screening (European Union, 2024). These disparities also exist within nations. For instance, in Italy, adherence to cancer screenings is significantly lower in

Southern regions compared to Central-Northern Italy, particularly for programs offered through public health services (AIRTUM, 2023). Similar challenges exist in the United States, particularly for female cancer screenings (Sabatino et al., 2021). Additionally, minority groups, such as Black Americans, often experience even lower adherence rates, reflecting broader inequities in healthcare access and utilization (Arevalo et al., 2024). This highlights the critical need to identify and implement effective strategies for promoting cancer screening uptake.

From a psychosocial perspective, tailored health communication has emerged as a promising approach to address this challenge (Albada et al., 2009). As outlined by Kreuter et al. (2013), health communication strategies can be placed on a continuum of individualization, moving from generic messages to fully tailored ones. Generic, one-size-fits-all materials provide a comprehensive set of information, assuming that individuals will sift through it to find what is relevant to them. This process may place a high burden on the recipient, with more sophisticated strategies aiming to reduce it. At a superficial level, *personalization* uses a personal identifier, like a name, to draw attention to an otherwise generic message. A more advanced strategy is *targeting*, which is based on “market segmentation” and aims to reach a specific subgroup

of the population, usually based on shared demographic characteristics. This approach, however, assumes homogeneity within the subgroup that may not exist, as demographic factors alone provide little information about the cognitive and behavioral patterns that influence health decisions. The most individualized approach is *tailoring*, formally defined as any combination of information and strategies intended for a specific person, based on characteristics that are unique to that person, related to the outcome of interest, and—most importantly—derived from an individual assessment. The two features that truly set tailoring apart are that it employs messages that are assessment-based and individual-focused. Thus, a tailored health communication program measures a participant's needs and interests to create messages that fit them precisely (Kreuter et al., 2013).

The theoretical superiority of tailoring over less individualized approaches lies in the specific psychological mechanisms it is hypothesized to activate. While strategies like targeting may also increase perceived relevance, tailoring is thought to be more effective because it triggers three key processes (Hawkins et al., 2008). First, it enhances selective attention. As information that is perceived as highly self-relevant is prioritized for cognitive processing, by containing details specific to the individual a tailored message increases its salience and is thus more likely to be consciously attended to, overcoming the informational clutter of generic communications. Second, it reduces cognitive load. Generic health communications typically present a high volume of information, requiring the recipient to exert significant cognitive effort to filter out what is irrelevant. Tailoring streamlines this process: by presenting only pertinent information based on individual assessment, it reduces this cognitive load, which in turn increases processing fluency and makes the core message easier to comprehend and act upon. Finally, it promotes deeper cognitive elaboration, a mechanism well-explained by the Elaboration Likelihood Model of Persuasion (Petty & Cacioppo, 1986). In fact, according to this theory, when a message resonates with an individual's personal situation, it engages the “central route” to persuasion. Such a process leads to a more deliberate and thoughtful evaluation of the arguments presented while also increasing the likelihood that the message will be remembered in the future, ultimately influencing health intentions and behaviors (Kreuter et al., 2013).

In the context of cancer screening, prior reviews on this topic have adopted different scopes, each with distinct focuses and advantages. Some reviews present an in-depth analysis of tailored interventions for a single cancer type (e.g., breast or colorectal cancer; Bai et al., 2020; Sohl & Moyer, 2007; Zhang et al., 2020), which allows for a highly focused synthesis. While this scope provides essential depth, a multi-cancer perspective offers a complementary opportunity to identify cross-cutting strategies relevant to broader public health campaigns. At the other end of the spectrum, some reviews adopt an overly broad approach, examining multiple screening types or even including any type of cancer, as seen in the systematic review by Albada et al. (2009). While comprehensive, this broad focus can make it difficult to compare specific strategies or draw conclusions relevant to the most widespread public health campaigns. Our review, therefore, adopts a pragmatic

middle-ground approach, focusing specifically on the three most prevalent cancer screenings (breast, cervical, and colorectal). This scope, which is directly aligned with the goals of the larger funded research project of which this review is part, allows for a focused comparison of intervention strategies across these types while maintaining broader applicability to public health practice.

Another common limitation in the existing review literature lies in the heterogeneity of interventions included. These reviews often combined two distinct types of studies: those that tailored only non-psychological factors (e.g., demographic variables such as age and gender) and those that specifically addressed psychosocial factors (or psychosocial variables plus demographics). While demographic tailoring alone can help target specific populations, it does not take advantage of the modifiable nature of psychosocial variables—like attitudes, beliefs, and perceived barriers—central to behavioral theories (Conner & Norman, 2015). Furthermore, other reviews combined different intervention approaches, tailored and non-tailored ones. For instance, Richardson-Parry et al. (2023) reviewed interventions designed to increase cancer screening uptake by including both tailored interventions and non-tailored interactive digital approaches. However, the inclusion of these distinct intervention strategies introduced heterogeneity, making it difficult to isolate the specific effects attributable to tailoring itself.

A final limitation is that previous reviews have often included interventions that relied exclusively on phone or in-personal communication rather than isolating the impact of tailored messaging approaches. This distinction is particularly important, as messaging-based interventions are among the most scalable and practical tools for promoting health behaviors in different populations (van Keulen et al., 2010). In particular, by focusing on the most influential determinants of health intentions and behaviors, tailoring message interventions can maximize their impact and cost-effectiveness (Kreuter et al., 2013).

In order to address the above-mentioned limitations, this systematic review aims to examine the effectiveness of tailored messaging interventions in promoting breast cancer screening, cervical cancer screening, and colorectal cancer screening. This specific focus is justified by the widespread implementation of these three screenings in population-based programs and their significant impact on public health outcomes, aligning with their prioritization by organizations such as the World Health Organization (2010). More in detail, it only focuses on interventions whose content was personalized based on psychosocial variables and that include as key outcomes both intention to get screened and attendance behavior. Indeed, while screening adherence is the ultimate goal, intention is a critical proximal predictor of this behavior, showing a medium-sized relationship with attendance in screening programs (e.g., Cooke & French, 2008). Analyzing the effects on intention can therefore offer valuable insights into the psychological mechanisms of behavior change and help unpack the processes underlying the well-known intention-behavior gap (Sheeran & Webb, 2016), an aspect less systematically explored in previous reviews.

The review is situated within the broader context of the MIRIADE project, a research initiative that aims to identify variables influencing adherence to these three cancer screenings in the Campania region (Italy), with the ultimate goal of developing effective health promotion activities. Building on two previous reviews (Lemmo et al., 2023; Vallone et al., 2022) conducted within this project, which focused on identifying factors promoting cancer screening behavior, this review specifically examines the effectiveness of psychosocial tailored messaging interventions, providing valuable insights for the design and implementation of future interventions.

Aims

Based on the rationale above, this review aims to evaluate the effectiveness of tailored messaging interventions in promoting adherence to breast, cervical, and colorectal cancer screenings. Specifically, it seeks to address the following research questions: *RQ1*: What variables are used to tailor the content of messaging interventions for cancer screening? *RQ2*: Which communication channels are used (e.g., online platforms, paper-based media, etc.)? *RQ3*: What is the effectiveness of tailored messaging interventions in promoting screening intention and behavior, according to the type of comparison group used?

These research questions were formulated using the PICO (population, intervention, comparison, outcome) framework (da Costa Santos et al., 2007). Specifically, the population examined in this review includes individuals at risk of developing colorectal, breast, and cervical cancer. The assessed intervention involved tailored messaging whose content was personalized based on at least one psychosocial variable. The comparison groups were varied, including both passive control groups (e.g., no intervention or usual care) and various active, non-tailored interventions (e.g., generic or targeted messages). Finally, the outcomes considered were the intention to participate in cancer screenings and actual adherence to screening.

Methods

This review was registered on PROSPERO (registration number: CRD42024527985) and reported in adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021).

Inclusion and exclusion criteria

Studies were included if they met the following inclusion criteria: (1) published in a peer-reviewed journal; (2) published from 2000 onwards (last search: August 5 2025); (3) written in English, Italian or Spanish; (4) described randomized controlled trials (RCTs) that included at least one comparison/control condition, such as usual care (defined as the standard procedures already in place with no active study intervention) or another active intervention (e.g., a non-tailored generic message); (5) included at least one experimental condition using tailored text-based messages (e.g., print materials like brochures/pamphlets, digital text on screens, SMS messages, emails); (6) the content of the intervention was personalized based on at least one psychosocial variable; (7) reported outcome data; and (8) considered as

outcome variables: intention to undergo breast (e.g., mammogram, mammography, breast magnetic resonance imaging), cervical (e.g., Pap test, Pap smear, HPV screening, HPV test, smear test, vaginal smear), and/or colorectal cancer screenings (e.g., fecal occult blood test, fecal immunochemical test, FIT-DNA test, stool test, sigmoidoscopy, colonoscopy), and/or screening behavior. Studies were excluded if they were not RCTs or if none of the conditions involved the use of text-based messages (e.g., interventions based only on telephone counseling or in-person meetings).

Search strategy

A systematic search was conducted in the PsycINFO (via EBSCOhost), PubMed (via NCBI PubMed), and Scopus databases, focusing on studies published from 2000 onwards, in English, Italian, or Spanish. The year 2000 was selected as the starting point to focus on interventions designed and delivered during the modern era of digital and internet-based health communication (Albada et al., 2009; Eysenbach, 2001). The search strategy included terms related to tailored messaging interventions (e.g., “tailored,” “personalized”) and communication formats (e.g., “brochures,” “letters”) in the context of cancer screenings (e.g., “mammography,” “Pap test,” “fecal occult blood test”). Filters were applied to exclude reviews, meta-analyses, and gray literature. The search targeted both titles and abstracts to identify randomized controlled trials that met the inclusion criteria. The full search string is available in the pre-registration. References from the selected papers and other relevant articles were also screened for potential additional studies to be included.

Study selection and data extraction

We used Zotero 6.0 to manage references, import search results from the three databases, and remove duplicate entries. Two authors (MC and MB) independently screened the titles and abstracts of the records identified through the search. In this phase, articles that did not meet the inclusion criteria were excluded. MC and MB then independently reviewed the full text of the remaining records, reaching an initial percent agreement of 97.1%. Additionally, the reference lists of included articles were scrutinized to identify further relevant studies. One author (MC) extracted data from the selected articles using a predefined data extraction form, and another (MB) reviewed the extracted data. Extracted information included study authors, year and country of publication, type of screening considered, research design, study arms, sample characteristics, tailored variable(s), communication channel used in the tailored condition(s), tailored message type in the text-including condition(s), outcome variable(s), and main findings. Any discrepancies at any stage of the review were resolved through discussion between the primary reviewers or with the other two authors (ARD and DC) for arbitration.

Risk of bias assessment

Two reviewers (MC and MB) independently assessed the risk of bias in each study using the Cochrane Risk of Bias

tool (Higgins et al., 2011). This tool includes seven domains: 1) random sequence generation (selection bias); 2) allocation concealment (selection bias); 3) blinding of participants and personnel (performance bias); 4) blinding of outcome assessment (detection bias); 5) incomplete outcome data (attrition bias); 6) selective reporting (reporting bias); and 7) other bias (Higgins et al., 2011). For each domain, studies were categorized as having a “low,” “high,” or “unclear” risk of bias. Any discrepancies between the two reviewers were resolved through discussion or, if necessary, by involving a third author (ARD or DC) for arbitration.

Results

Search results

As shown in the PRISMA flowchart in Figure 1, the initial search yielded 2181 records. After 431 duplicates were removed, 1750 unique records remained. The titles and abstracts of these records were screened, resulting in the exclusion of 1681 articles that did not meet the inclusion criteria. The full texts of the remaining 69 records were then assessed for eligibility, leading to the exclusion of 37 additional studies. A further examination of the reference lists identified six additional records. Additionally, four relevant studies were identified through expert recommendation, bringing the total to 42 studies included in the final review.

Study characteristics

This systematic review included 42 studies examining the effectiveness of tailored messaging interventions on cancer screening, with the majority ($N=35$) conducted in North America, five in Asia, and two in Oceania. Most studies focused on colorectal ($N=22$) or breast cancer screening ($N=21$), with only two examining cervical cancer screening.¹ Moreover, seven studies investigated intention to get screened as a primary outcome, while 39 examined screening behavior. Some investigated both screening intention and behavior as outcome variables, while others examined more than one type of screening. Detailed characteristics of the included studies are presented in Table 1.

Methodological quality

Overall, the assessment revealed varied risk levels, reflecting common challenges in psychosocial research. While random sequence generation was often judged as low risk (many studies used computer-based randomization), numerous studies had an unclear risk due to insufficient reporting. A consistent concern was allocation concealment, with nearly all studies having an unclear risk as the method was not described, potentially introducing selection bias. Similarly, blinding of participants and personnel frequently showed a high risk, often because it was not feasible in interventions like those incorporating tailored telephone counseling. Conversely, blinding of outcome assessment generally presented a low

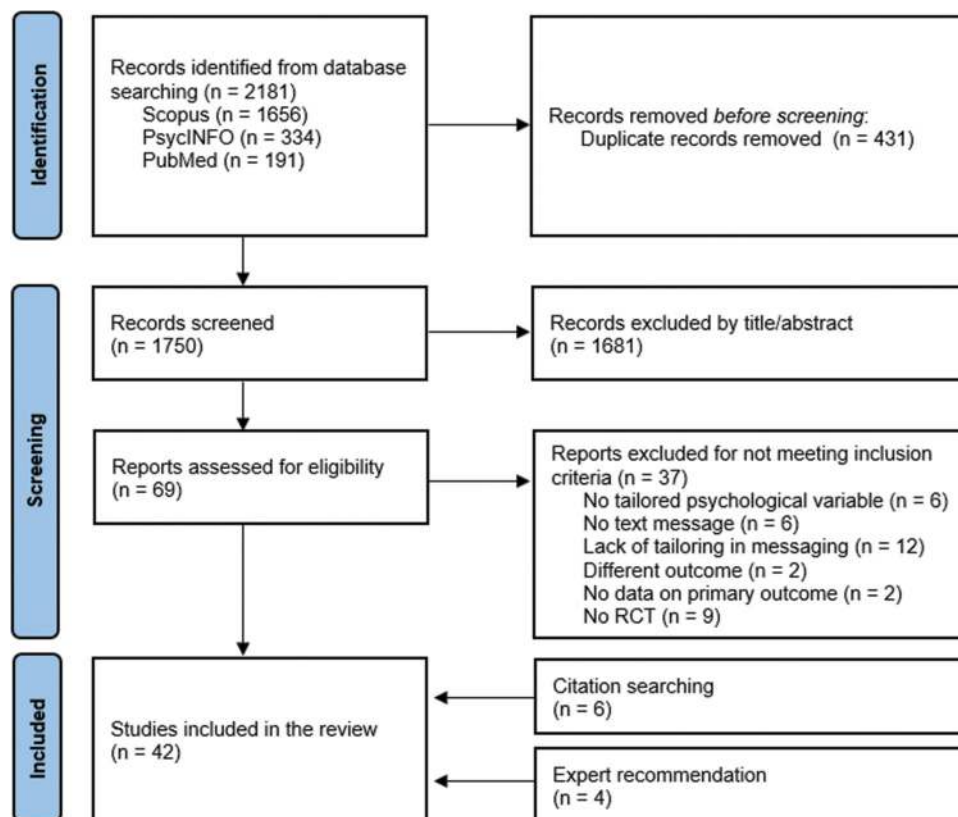


Figure 1. Flowchart of the literature search strategy and review process.

Table 1. Overview of the included studies.

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Bai et al. (2022), China	CRCS	Cluster RCT	(1) tailored communication intervention; (2) e-brochure standard information	N = 188 first-degree relatives of colorectal cancer patients. Mean age = 49.6 (SD = 9.1), 58.5% female	Perceived susceptibility, perceived severity, perceived barriers, perceived benefits, and self-efficacy	Mixed (online tailored assessment tool + voice call)	Text + images	Behavior: Colonoscopy uptake at three months post-intervention (verified by medical records)	The tailored intervention increased colonoscopy uptake compared to the standard intervention group
Bastani et al. (2015), USA	CRCS	RCT with sequential interventions	(1) ethnically targeted and individually tailored intervention; (2) no intervention	N = 1280 first-degree relatives of colorectal cancer patients, including individuals from diverse ethnic minority groups. Mean age = 51 (SD = 9), 44% male	Readiness to change, barriers to screening, and colorectal cancer risk	Mixed (printed booklet + telephone counseling for those not screened at six months after intervention)	The booklet included text and some graphic information to convey participants' risk category	Behavior: Self-reported receipt of any CRCS test (FOBT, sigmoidoscopy, or colonoscopy) at the 6-month and 12-month follow-ups	Both print and combined print/telephone interventions increased screening rates compared to the control condition
Champion et al. (2002), USA	BCS	RCT	(1) usual care; (2) tailored telephone counseling; (3) tailored mailed materials promoting a combination of tailored mail and telephone counseling	N = 1367 female participants. Mean age = 65.7 (SD = 10.4)	Perceived breast cancer susceptibility, mammography benefits and barriers, perceived self-efficacy, family history, age, and stage of adoption	Mixed (mail and/or telephone counseling, based on assigned condition)	The mail included text and graphics	Behavior: Self-reported data of last mammogram at two months post-intervention	Tailored telephone, mail, and combined mail/telephone interventions were more effective than usual care in increasing mammography adherence
Champion et al. (2018), USA	CRCS	RCT	1) usual care; 2) tailored web intervention; 3) tailored phone intervention; 4) tailored web + phone intervention	N = 1196 female participants. Mean age = 58.9 (SD = 6.2)	Age, race, family history of colon cancer, knowledge and beliefs about colon cancer and colorectal cancer screening	Mixed (web program including graphs, text, and videos and/or telephone counseling session, based on assigned condition)	The web program included graphs, text, videos, and animation to reinforce verbal messaging	Behavior: Receipt of stool test and/or colonoscopy (self-report data subsequently verified by checking medical records) Intention: Intention to screen at six months follow-up	Tailored telephone interventions, alone or with web components, increased stool test screening. Telephone intervention also increased colonoscopy in those with a high fear of cancer. All interventions increased intention to get a stool test
Champion et al. (2020), USA	BCS and CRCS	RCT	1) usual care; 2) tailored web intervention; 3) tailored phone intervention; 4) tailored web + phone intervention	N = 692 female participants. Mean age = 58.7 (SD = 6)	Knowledge, perceived and actual risk of breast and colorectal cancers, benefits, barriers, and self-efficacy for both BCS and CRCS	Mixed (web program and/or telephone counseling session, based on assigned condition)	The web program included graphs, text, videos, and animation to reinforce verbal messaging	Behavior: Receipt of CRCS (stool test or colonoscopy) and/or mammography at six months follow-up (self-report data subsequently verified by checking medical records)	All interventions increased either mammography or stool test uptake compared to the control group; however, conditions that included a telephone component were the most effective

(Continued)

Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-condition(s)	Outcome variable(s)	Main findings
Clark et al. (2002), USA	BCS	RCT	(1) usual care; (2) standard materials; (3) stage matched/tailored materials	N = 1026 female participants, of whom 68.8% aged 50 to 64 years. Only those without an initial mammogram scheduled (N = 896) were included in the final analysis	Current stage of adoption, pros and cons of screening, and processes of change	Printed (education materials + tailored letter)	Text-based	Behavior: Receipt of a second mammogram within 14 months after obtaining an initial postbaseline mammogram (checked by medical records)	The tailored intervention was more effective than usual care in promoting repeat mammography screening
Flight et al. (2012), Australia	CRCS	2x2 RCT	Message type (tailored vs. non-tailored) X message modality (paper vs. web)	N = 104, Mean age = 60.8 (SD = 6.9), equally distributed by gender	Decision stage for screening, salience and coherence of screening, perceived susceptibility, cancer worries and concerns, self-efficacy and response efficacy, and fecal aversion	Mixed (computer program or booklet, based on assigned condition)	Text-based	Behavior: Return of fecal occult blood test within 12 weeks post-intervention, Intention: Intention to screen for CRC	There were no differences between groups in FOBT return or intention
Hirai et al. (2016), Japan	CRCS	RCT	(1) tailored matched-message condition; (2) non-tailored unmatched message condition; (3) control group 1: typical message with a professional design; (4) control group 2: typical message without a professional design	N = 2140, of whom 70.7% were aged 60 to 66 years, 57.9% female	Intention to have FOBT, cancer worry	Printed reminders	Text-based	Behavior: Adherence to FOBT at five months post-intervention (checked by medical records)	Only the tailored, matched-message intervention increased FOBT attendance compared to the control group
Ishikawa et al. (2012), Japan	BCS	RCT	(1) tailored print reminder; (2) non-tailored print reminder	N = 1859 female participants aged 51–59 years (except those aged 55 years)	Intention to undergo mammography, cancer worry	Printed reminders	Text-based	Behavior: Adherence to mammography at five months post-intervention (checked by medical records)	The tailored intervention significantly increased breast cancer screening attendance compared to the non-tailored group
Jensen et al. (2012), USA	BCS	2x2x3 RCT	2 (tailored vs. stock message) x2 (charts/graphs vs. illustrated visuals) x3 (nested replications of the visuals) experiment	N = 119 female participants. Mean age = 52.3 (SD = 8.3)	Age, race, family history of breast cancer, access to insurance, breast cancer risk, and Health Belief Model constructs (i.e., perceived benefits, barriers, and self-efficacy)	Printed pamphlets	Text + visual information (charts/graphs or illustrated visuals, based on assigned condition)	Intention: Intention to have a mammogram	Tailored messages, especially with illustrations, increased screening intentions compared to generic messages

(Continued)

Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Jensen et al. (2014), USA	CRCS	RCT	(1) stock message; (2) narrative message; (3) tailored message; (4) tailored narrative message	N = 209. Mean age = 55.6 (SD = 4.2), 71.8% female	Age, gender, self-efficacy, response efficacy, curability, cancer worry, perceived barriers, perceived benefits, and stage of change	Mixed (web message + an identical take-home pamphlets)	Text + images	Behavior: Colonoscopy claims, FOBT claims, and any CRCs claims at two years post-intervention (checked by medical records) Behavior: Self-reported receipt of any CRCs at 12 months follow-up (checked by medical records)	The narrative intervention increased colonoscopy rates compared to other conditions. Tailored messages were only effective for those with high information overload
Jerant et al. (2014), USA	CRCS	RCT	(1) tailored, interactive multimedia computer program; (2) non-tailored program	N = 1164. Mean age = 57.1 (SD = 6.2), 65.4% female	Knowledge, self-efficacy, barriers, readiness, test preference, and prior screening	Digital (computer programs)	Text-based (with the option of listening to an audio narration of on-screen text)	Behavior: Self-reported utilization of BCS and genetic counseling at eight months post-intervention	The tailored intervention did not increase colorectal cancer screening
Katapodi et al. (2020), USA	BCS	Cluster RCT	(1) targeted intervention; (2) tailored intervention	N = 801 young breast cancer survivors (Mean age = 51.1; SD = 5.7) and N = 431 relatives (Mean age = 43.3; SD = 11.9), all female	Past behavior, perceived barriers, objective risk, perceived risk, family support	Printed (letter + booklet)	Text-based	Behavior: Self-reported utilization of BCS and genetic counseling at eight months post-intervention	There were no differences between groups in genetic testing or breast cancer screening uptake
Kinney et al. (2014), USA	CRCS	Cluster RCT	(1) tailored telehealth intervention; (2) standard educational brochure	N = 481 first-degree relatives of colorectal cancer patients. Mean age = 50.3 (SD = 9.0), 57.4% female	Perceived CRC risk and severity, beliefs about colonoscopy, screening history, knowledge, health care access, social support, and barriers to screening	Mixed (mailed tailored materials + telephone counseling)	Text + images	Behavior: Medically verified colonoscopy at nine months post-intervention	The tailored intervention significantly increased colonoscopy uptake compared to the standard brochure group
Kramish Campbell et al. (2004), USA	CRCS	2x2 cluster RCT	Tailored print newsletters and targeted videotapes (TPV) X lay health advisor (LHA) intervention	N = 587. Mean age = 52 (SD = n/a), 74% female	CRC risk factors, stage of change, beliefs, knowledge, barriers and motivators, social support, spiritual factors (e.g., church-specific pastor messages), age, and gender	Printed newsletters	Text + videotapes	Behavior: Self-reported CRC screening adherence (FOBT, sigmoidoscopy, colonoscopy, double contrast barium enema) at 12 months follow-up	The TPV-only intervention marginally significantly increased FOBT rates at 1-year follow-up compared to the control group
Kreuter et al. (2005), USA	BCS	RCT	(1) behavioral construct tailoring (BCT); (2) culturally relevant tailoring (CRT); (3) BCT + CRT; (4) control group	N = 1227 female participants. Mean age = 35.6 (SD = 11.6)	Knowledge, perceived risk and family history of breast cancer, perceived barriers to mammography, past behavior, stage of readiness, religiosity, collectivism, racial pride, and time orientation	Printed magazines	Text + images	Behavior: Self-reported use of mammography at 18 months follow-up	The combined BCT + CRT intervention significantly increased mammography adherence compared to the control group

(Continued)

Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Lee et al. (2017), USA	BCS	RCT	(1) tailored mobile app; (2) usual care (printed brochure)	N = 120 Korean American immigrant women. Mean age = 51.6 (SD = 9.55).	Knowledge of breast cancer, structural and cultural barriers to screening (e.g., fatalism, embarrassment), level of intention, perceived risk	Digital (mobile phone app)	Text + images + video	Behavior: Mammogram receipt at 6-month follow-up (self-report). Intention: Intention to have a mammography post-intervention	The tailored mobile app intervention significantly increased mammogram receipt and intention to have mammography compared to the control group
Leone et al. (2016), USA	CRCS	Cluster RCT	(1) tailored intervention; (2) comparison intervention promoting fruit and vegetables consumption	N = 712. Mean age = 62.8 (SD = n/a), 68.6% female	Risk factors, Health Belief Model constructs (i.e., perceived benefits, barriers, vulnerability and self-efficacy), social support constructs, and relationship with provider	Mixed (4 tailored printed newsletters + non-tailored counseling for those not up to date for CRCS at baseline)	Text-based	Behavior: Receipt of colorectal cancer screening at nine to 20 months follow-up (checked by medical records)	There were no differences between intervention and control conditions in colorectal cancer screening adherence
Levitz et al. (2023), USA	CRCS	RCT	(1) usual care; (2) tailored bidirectional texting intervention	N = 5241. Mean age = 60.1 (SD = 6.2), 54.4% female	Perceived barriers, prior screening history, sex, and language preference	Digital (bidirectional SMS with link to a mobile web page)	Text + images (fotonovela comics)	Behavior: Completion of colorectal cancer screening (FIT return or other) at two months post-intervention (verified by electronic medical records)	The tailored bidirectional texting intervention significantly increased screening completion compared to the usual care group
Lin and Effken (2010), Taiwan	BCS	RCT	(1) tailored intervention; (2) standard intervention	N = 144 female participants, of whom 68% aged 35–50	Perceptions of mammography	Digital (computer program including text messages and audiovisual content)	Text + audiovisual content	Intention: Intention to have a mammography	Participants who received tailored information reported higher intentions to get screened compared to those in the standard intervention group
Lin and Wang (2009), Taiwan	BCS	RCT	(1) complete tailored intervention (tailored message + additional behavior change techniques) (2) tailored message intervention; (3) standard intervention	N = 185 female participants, of whom 72.9% aged 35–45	Stage of adoption, decisional balance, and processes of change	Digital (computer program including text messages and audiovisual content)	Text + audiovisual content	Intention: Intention to have a mammography	Only the completed tailored intervention increased mammography intentions compared to the standard intervention
Lipkus et al. (2000), USA	BCS	RCT	(1) usual care; (2) tailored print communications; (3) tailored telephone counseling	N = 1099 female participants. Mean age = 59 (SD = 7.5)	Barriers, facilitators, and stage of change	Mixed (telephone counseling or tailored print communications, based on assigned condition)	Text + images	Behavior: Being on schedule with mammography (self-reported) at 1, 2-, 3-, 4- and 5-years post-intervention	Only telephone counseling was more effective than usual care in promoting mammography scheduling

(Continued)

Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Manne et al. (2009), USA	CRCS	RCT	(1) generic print pamphlet; (2) tailored print pamphlet; (3) tailored print pamphlet + tailored counseling call	N = 412. Mean age = 47.9 (SD = 9), 60.2% female	Marital status, gender, ethnicity, colorectal cancer and colonoscopy knowledge, colorectal cancer risk, low-rated benefits, highly rated barriers, level of family, support for CRCS, stage of adoption, closeness with the affected siblings, and commitment to screening	Mixed (tailored print or print + telephone counseling intervention, based on assigned condition)	Text + images	Behavior: Receipt of colorectal cancer screening (flexible sigmoidoscopy, or colonoscopy, or FOBT) six months after intervention (self-reported and then confirmed by the participant's physician)	Both the tailored print pamphlet alone and with counseling adherence compared to the generic pamphlet
Manne et al. (2013), USA	CRCS	RCT	(1) generic print pamphlet; (2) generic print + couple-tailored print pamphlets	N = 168 couples. Husbands mean age = 60.1 (SD = 7.6), wives mean age = 58.6 (SD = 7.3)	Level of support for the other spouse's screening, barriers, relational perspective on screening, level of couple discussion about screening	Printed pamphlets	Text + images	Behavior: Receipt of any cancer screening test (self-reported and then confirmed by the participant's physician) Intention: Intention to screen at six months follow-up	There were no differences in colorectal cancer screening adherence between groups, but the couple-tailored condition increased intentions from T1 to T2
Marcus et al. (2005), USA	CRCS	RCT	(1) single untailored mailout of print material (standard intervention); (2) single tailored mailout of print material; (3) four (multiple) tailored mailouts of print materials spanning 12 months; (4) four (multiple) retailed mailouts, also spanning 12 months	N = 4014, of whom 53.5% were aged 50–59 and 83.2% were female	Stage of change, knowledge of age eligibility and interval screening guidelines for CRCS, risk factors for colorectal cancer, barriers to CRCS	Print materials	Text + images and diagrams	Behavior: Self-reported receipt of any colorectal cancer screening test (flexible sigmoidoscopy, or colonoscopy, or FOBT) at six and/or 14 months follow-up	The tailored interventions increased colorectal cancer screening adherence compared to the standard intervention at 14 months, particularly for women and those aged 50–59
McCauley and Wold (2002), USA	BCS	RCT	(1) simple reminder message; (2) reminder message + communication emphasizing personal risk; (3) reminder + tailored message focused on participant's chief barrier	N = 4829 female participants. Mean age = n/a	Barriers to screening	Printed letters	Text-based	Behavior: Receipt of mammography at six months post-intervention (checked by Medicare claims data)	Mammography rates did not differ between experimental conditions

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Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Myers et al. (2007), USA	CRCS	RCT	(1) control condition; (2) standard intervention; (3) tailored intervention; (4) tailored plus phone intervention	N = 1546, of whom 61.9% were aged 50–59, 67% female	Perceived salience and coherence, susceptibility, worries and concerns, self-efficacy, response efficacy, and social support	Mixed (mailed materials or mailed materials + reminder telephone call, based on assigned condition)	Text + images	Behavior: Receipt of any screening test at 24 months follow-up (assessed using data from different sources, including medical databases and self-report data)	All intervention groups increased screening adherence compared to the control group, with no significant differences among their effects
Rakowski et al. (2003), USA	BCS	RCT with a stepped intervention	(1) simple reminder letter; (2) 2-month, tailored, stepped intervention delivered two months after the completed mammogram; (3) 10-month, tailored, stepped intervention delivered two months before the repeat mammogram was due; (4) self-choice of one of the above three strategies	N = 1614 female participants, of whom 73.3% aged 50–64	Barriers to screening, knowledge of the recommended screening interval, intention for the next screening	Mixed (mailed materials + counseling call for level three stepped intervention)	Text-based	Behavior: Receipt of a second mammogram within 15 months (based on clinic records)	There were no differences between groups in repeat screening rates
Rawl et al. (2008), USA	CRCS	RCT	(1) tailored print intervention; (2) non-tailored print intervention	N = 208 first-degree relatives of colorectal cancer patients. Mean age = 53.5 (SD = n/a), 68.6% female	Perceived susceptibility, perceived benefits, perceived barriers, self-efficacy related to each colorectal screening test, age, family history, and presence of other comorbidity	Printed brochure	Text, graphs, and images	Behavior: Self-reported receipt of FOBT or sigmoidoscopy or colonoscopy at three months post-intervention	There were no differences between groups in screening adherence
Rawl et al. (2011), USA	CRCS	RCT	(1) computer-tailored intervention; (2) non-tailored brochure	N = 817. Mean age = 57.3 years (SD = 6.2), equally distributed by gender	Perceived risk, benefits and barriers to CRCS, age, gender, and family history	Digital (computer program)	The program was fully narrated to accommodate patients with low literacy and provided a tailored, single-page color printout summarizing the program content	Behavior: Completion of stool blood test, colonoscopy, and any test at six months post-intervention (extracted from medical records)	The computer-based intervention increased screening completion (stool blood test or any test) compared to the brochure intervention

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Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-condition(s)	Outcome variable(s)	Main findings
Resnicow et al. (2014), USA	CRCS	RCT	(1) two minimally tailored newsletters (based on electronic health record information only); (2) two enhanced tailored print newsletters (based on Self-Determination Theory and personality attributes)	N = 881. Mean age = 57.3 (SD = n/a), 66.2% female	Marital status, family history of colorectal cancer, barriers to CRCs, reasons to get screened, communication preference, time orientation, decisional style, medical mistrust, spirituality, ethnic identity, desire for information about colorectal cancer, and procrastination	Printed newsletters	Text-based	Behavior: Receipt of CRCS at 1-year follow-up (based on electronic health records supplemented by self-reported CRCS for participants who left the health system during the trial)	Tailored interventions did not increase colorectal cancer screening, except for participants with a preference for communication leveraging autonomous motivation in the enhanced tailored group
Rimer et al. (2001), USA	BCS	RCT	(1) usual care; (2) tailored print booklets alone; (3) tailored print booklets + telephone counseling	N = 1127 female participants, equally distributed in two age ranges (41–46 and 51–56)	Stage of readiness, intentions, age, risk factors, perceived risk, benefits and limitations of mammography, misperceptions, recommendations, and barriers	Mixed (printed booklet or printed booklet + telephone counseling, based on assigned condition)	Text + visual information (e.g., charts on risk estimate)	Behavior: Self-reported receipt of mammography at 12 months post-intervention	The combined tailored print and telephone counseling intervention increased mammography uptake at 12 months compared to usual care
Rimer et al. (2002), USA	BCS	RCT	See Rimer et al. (2001)	See Rimer et al. (2001)	See Rimer et al. (2001)	Mixed (printed booklet or printed booklet + telephone counseling + newsletter)	See Rimer et al. (2001)	Behavior: Self-reported receipt of mammography at 12- and 24-month post-intervention	Combining data at both 12- and 24-month follow-ups, conditions did not differ significantly in relation to receipt of mammography
Saywell et al. (2004), USA	BCS	RCT	(1) usual care; (2) tailored telephone; (3) tailored letter; (4) tailored phone and letter	N = 1044 female participants. Mean age = 65.6 (SD = n/a)	Perceived breast cancer susceptibility, mammography benefits and barriers, self-efficacy for obtaining a mammogram, family history, age, stage of mammography adoption	Mixed (printed letters and/or telephone counseling, based on assigned condition)	Text and graphics	Behavior: Self-reported receipt of mammography at eight weeks post-intervention	All three tailored interventions (telephone, mail, and combined) improved screening adherence compared to the control group

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Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-condition(s)	Outcome variable(s)	Main findings
Valanis et al. (2002), USA	BCS and CCS	RCT with sequential interventions	(1) tailored in-reach intervention delivered at the site of a primary care visit; (2) outreach tailored intervention (letter + phone call); (3) combined in-reach + outreach intervention; (4) usual care	N = 510 female participants. Mean age = 59 (SD = n/a)	Barriers to obtaining Pap smear and mammography	Mixed (printed letters + telephone counseling and/or in-person encounters)	Text-based	Behavior: Receipt of mammogram, Pap smear, or both tests at 14 months post-intervention (data retrieved from health plan electronic records)	The outreach intervention increased mammography, Pap test, and combined screening rates compared to usual care
Valanis et al. (2003), USA	BCS and CCS	See Valanis et al. (2002)	See Valanis et al. (2002)	See Valanis et al. (2002)	See Valanis et al. (2002)	See Valanis et al. (2002)	See Valanis et al. (2002)	Behavior: Receipt of mammogram, Pap smear, or both tests at 24 months post-intervention (data retrieved from health plan electronic records)	The outreach intervention continued to show increased screening rates at 24 months, but only for women aged 50–64
Vernon et al. (2011), USA	CRCS	RCT	(1) tailored interactive computer program; (2) generic web site; (3) control group	N = 1224, of whom 80.2% aged 50–59 years, 59.2% female	Stage of change, gender	Mixed (interactive computer program + printed letter)	Text (narrative feedback on screen + printed letter) + video vignettes	Behavior: Completion of any CRC screening (FOBT, sigmoidoscopy, or colonoscopy) at 6, 12, and 24 months (verified by medical records)	There was no significant difference in screening rates between the tailored, website, and survey-only groups
Weinberg et al. (2013), USA	CRCS	2x2 RCT with a control group	Channel (web/print) X monitoring (low/high) + control group	N = 865, of whom 60.1% were aged 50–54, all female	Attentional styles (high monitoring vs. low monitoring)	Mixed (web or printed intervention, based on assigned condition)	Text, or text + visual content (in the web condition)	Behavior: Receipt of CRCS at 4- and 12-months post-intervention (data retrieved from medical records)	Neither communication channel nor attentional style affected screening adherence
Williams-Piehot et al. (2003), USA	BCS	2x2 RCT	Need for cognition (high/low) X message type (tailored to high/low need for cognition)	N = 602 female participants. Mean age = 58 (SD = 12)	Need for cognition	Mixed (personal communication + mailed pamphlet + refrigerator magnets)	Text + images or tables (based on condition)	Behavior: Self-reported mammography utilization at 6- and 12-month post-intervention	Tailored messages increased mammography uptake for individuals with a high need for cognition, but this effect disappeared at 12 months

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Table 1. (Continued).

Authors, year, country	Screening	Research design	Study arms	Sample characteristics	Tailored variable(s)	Communication channel in the tailored condition(s)	Tailored message type in the text-including condition(s)	Outcome variable(s)	Main findings
Williams-Piehot et al. (2004), USA	BCS	2x2 RCT	Locus of control (internal/external) X message type (internally oriented/externally oriented)	N = 499 female participants. Mean age = 57 (SD = 11.3)	Locus of control	Mixed (personal communication + mailed brochure + refrigerator magnets)	Text-based	Behavior: Self-reported mammography utilization at 6- and 12-month post-intervention	Matching messages to internal locus of control increased mammography use at 12 months, but only among women aged 50+
Williams-Piehot et al. (2005), USA	BCS	2x2 RCT	Participant coping style (monitor/blunter) X message type (monitor/blunter)	N = 500 female participants. Mean age = 57 (SD = n/a)	Monitor-Blunter coping styles	Mixed (personal communication + mailed brochure + refrigerator magnets)	Text-based	Behavior: Self-reported mammography utilization at 6- and 12-month post-intervention	Matching messages to information processing styles increased mammography use at six months post-intervention
Wilson et al. (2015), Australia	CRCS	RCT	(1) tailored personalized decision support; (2) non-tailored personalized decision support; (3) control group	N = 3408, of whom 56.4% were aged 50-59, equally distributed by gender	Decision stage, salience and coherence of screening, perceived susceptibility, cancer worries and concerns, self-efficacy and response efficacy, social support, and fecal aversion	Digital (computer program)	Text-based	Behavior: Return of fecal occult blood test within 12 weeks post-intervention	There were no differences between groups in FOBT return

Note. AOR: Adjusted Odds Ratio. BC: Breast Cancer. BCS: Breast Cancer Screening. CRC: Colorectal Cancer. CRCS: Colorectal Cancer Screening. CCS: Cervical Cancer Screening. FOBT: Fecal Occult Blood Test. OR: Odds Ratio. RCT: Randomized Controlled Trial. SD: Standard Deviation.

risk, especially when objective primary outcomes were used. However, incomplete outcome data (attrition bias) was a significant concern, as many studies reported high attrition rates and lacked comprehensive analyses, making it difficult to assess potential bias from participant loss. Finally, regarding selective reporting, the risk was often unclear or high across the studies, primarily due to the absence of published protocols or discrepancies found between protocols and reported outcomes. A detailed summary of the risk of bias assessment is provided in the Appendix.

Findings by research question

RQ1: variables used for tailoring the content of the messages

The examination of the variables that were tailored across studies revealed that a broad range of theoretical constructs was used to tailor the content of the messages.

Female cancer screenings. Studies on breast and cervical cancer screenings frequently tailored modifiable psychosocial constructs from the Health Belief Model (Becker et al., 1974): perceived barriers (Champion et al., 2002, 2020; Jensen et al., 2012; Katapodi et al., 2020; Kreuter et al., 2005; Lee et al., 2017; Lipkus et al., 2000; McCaul & Wold, 2002; Rakowski et al., 2003; Rimer et al., 2001, 2002; Saywell et al., 2004; Valanis et al., 2002, 2003), perceived benefits (Champion et al., 2002, 2020; Jensen et al., 2012; Rimer et al., 2001, 2002; Saywell et al., 2004), perceived risk (Champion et al., 2002, 2020; Katapodi et al., 2020; Kreuter et al., 2005; Lee et al., 2017; Rimer et al., 2001, 2002; Saywell et al., 2004), and self-efficacy (Champion et al., 2002, 2020; Jensen et al., 2012; Saywell et al., 2004). For instance, Champion et al. (2002) tailored messages to address perceived barriers and susceptibility and to increase perceived benefits and self-efficacy. For example, if a woman reported fear of a negative result as a major barrier, the message emphasized that most women feel reassured after the test, as results are often negative or indicate early, treatable forms of cancer. If a woman underestimated mammography effectiveness, the message provided corrective information. Similarly, messages addressed perceived susceptibility by clarifying that anyone can develop breast cancer. Other psychosocial constructs targeted by the interventions included attitudes, intentions, and more general perceptions about the screening (Clark et al., 2002; Ishikawa et al., 2012; Lee et al., 2017; Lin & Effken, 2010; Rakowski et al., 2003; Rimer et al., 2001). Another variable frequently tailored within these trials was the stage of adoption (Champion et al., 2002; Clark et al., 2002; Kreuter et al., 2005; Lin & Wang, 2009; Lipkus et al., 2000; Rimer et al., 2001, 2002; Saywell et al., 2004), following the Transtheoretical Model of Health Behavior Change (Prochaska & Velicer, 1997). A common strategy used in these studies involved evaluating the woman's current stage (e.g., pre-contemplation, contemplation, action, maintenance, or relapse risk) and providing stage-matched messages: for example, encouraging intention in pre-contemplators or prompting plan development in contemplators.

Some studies also focused on tailoring messages to stable individual differences such as locus of control (Williams-

Piehot et al., 2004), need for cognition (Williams-Piehot et al., 2003), and information processing style (Williams-Piehot et al., 2005). Here, the goal was not to modify psychosocial determinants but rather to leverage these individual characteristics to make the message more salient. For example, messages for individuals with an internal locus of control emphasized personal responsibility for health and screening, whereas messages for those with an external locus of control encouraged reliance on healthcare providers for guidance (Williams-Piehot et al., 2004). Kreuter et al. (2005) also tailored messages to cultural constructs such as religiosity, collectivism, racial pride, and time orientation. Affective variables, such as cancer worry, were also addressed in one study (Ishikawa et al., 2012). Finally, in addition to psychological variables, many studies also tailored messages based on individual factors such as demographics (e.g., age, race, and family history; Champion et al., 2002; Jensen et al., 2012; Kreuter et al., 2005; Rimer et al., 2001, 2002; Saywell et al., 2004), objective risk factors (Champion et al., 2020; Jensen et al., 2012; Katapodi et al., 2020; Rimer et al., 2001, 2002), past behavior (Katapodi et al., 2020; Kreuter et al., 2005) and knowledge (Champion et al., 2020; Kreuter et al., 2005; Lee et al., 2017; Rakowski et al., 2003).

Colorectal cancer screening. As with interventions aimed at increasing female cancer screening, most colorectal screening promotion interventions tailored modifiable psychosocial constructs from the Health Belief Model, with perceived barriers being the most frequently used variable (Bai et al., 2022; Bastani et al., 2015; Champion et al., 2020; Jensen et al., 2014; Jerant et al., 2014; Kinney et al., 2014; Kramish Campbell et al., 2004; Leone et al., 2016; Levitz et al., 2023; Manne et al., 2009, 2013; Marcus et al., 2005; Rowl et al., 2008, 2021; Resnicow et al., 2014), followed by efficacy beliefs (Bai et al., 2022; Champion et al., 2020; Flight et al., 2012; Jensen et al., 2014; Jerant et al., 2014; Kinney et al., 2014; Leone et al., 2016; Myers et al., 2007; Rowl et al., 2008; Wilson et al., 2015), perceived risk (Bai et al., 2022; Champion et al., 2020; Flight et al., 2012; Kinney et al., 2014; Leone et al., 2016; Myers et al., 2007; Rowl et al., 2008, 2021; Wilson et al., 2015), and perceived benefits (Bai et al., 2022; Champion et al., 2020; Jensen et al., 2014; Kinney et al., 2014; Leone et al., 2016; Manne et al., 2009; Rowl et al., 2008, 2021). Messages were also frequently tailored to the participant's stage of adoption (Bastani et al., 2015; Flight et al., 2012; Jensen et al., 2014; Jerant et al., 2014; Kramish Campbell et al., 2004; Manne et al., 2009; Marcus et al., 2005; Vernon et al., 2011; Wilson et al., 2015), drawing on the Transtheoretical Model of Health Behavior Change. Beyond these core constructs, several studies incorporated social support into their tailoring efforts (Kinney et al., 2014; Kramish Campbell et al., 2004; Leone et al., 2016; Manne et al., 2009, 2013; Myers et al., 2007; Wilson et al., 2015), but only two clearly described how this was tapped into the tailored messages: Leone et al. (2016) used stories modeling how others have sought social support for screening, tailored to the type of person that the participant said they preferred to get support from (e.g., spouse or a friend), whereas Manne et al. (2013) tailored messages to the level of support one spouse expressed for the other spouse's screening by including a gender-matched picture of a patient discussing the screening experience with their spouse.

Furthermore, some studies tailored messages to affective variables, such as cancer worry (Flight et al., 2012; Hirai et al., 2016; Jensen et al., 2014; Myers et al., 2007; Wilson et al., 2015) and fecal aversion (Flight et al., 2012; Wilson et al., 2015). For instance, Hirai et al. (2016) identified three profiles of non-adherent individuals based on their levels of intention and cancer worry, providing tailored messages to each profile: clear information for highly intentioned individuals, gain-framed messages emphasizing screening benefits for those with low intention and high worry, and loss-framed messages highlighting the risks of not screening for those with low intention and low worry. In another study, Flight et al. (2012) measured fecal aversion and provided messages to reinforce accurate beliefs or dispel misconceptions about the screening process, such as explaining why bowel cancer screening is hygienic if participants believed otherwise.

Other studies tailored messages to individual differences without necessarily adopting a “determinant-modifying” approach but instead focusing on activating that specific characteristic—such as attentional style (Weinberg et al., 2013) and time orientation (Resnicow et al., 2014). For example, Weinberg et al. (2013) classified participants as having a high or low monitoring attentional style: those with a high monitoring style received lengthier, detailed messages highlighting the benefits of getting screened, whereas those with a low monitoring style received briefer and less detailed messages focused on the costs of not following screening recommendations. Finally, many studies incorporated additional non-psychological variables into their tailoring strategies, including demographics like objective risk factors (Kramish Campbell et al., 2004), age (Champion et al., 2018; Jensen et al., 2014; Kramish Campbell et al., 2004; Rawl et al., 2008, 2021), gender (Jensen et al., 2014; Kramish Campbell et al., 2004; Levitz et al., 2023; Manne et al., 2009; Rawl et al., 2021; Vernon et al., 2011), marital status (Manne et al., 2009; Resnicow et al., 2014), and race/ethnicity (Champion et al., 2018; Manne et al., 2009), as well as knowledge (Champion et al., 2018, 2020; Jerant et al., 2014; Kinney et al., 2014; Kramish Campbell et al., 2004; Manne et al., 2009; Marcus et al., 2005), past screening behavior and preferences for specific screening test types (Jerant et al., 2014; Kinney et al., 2014; Levitz et al., 2023).

RQ2: communication channels

The analyzed studies employed a variety of communication channels to deliver tailored messages, which can be broadly categorized as print, digital, or mixed media, with several studies additionally incorporating telephone counseling.

Female cancer screenings. In studies focused on breast and cervical cancer screening, the most common approach combined mixed media, integrating printed materials with telephone counseling (Champion et al., 2002, 2020; Lipkus et al., 2000; Rakowski et al., 2003; Rimer et al., 2001, 2002; Saywell et al., 2004; Valanis et al., 2002, 2003; Williams-Piehot et al., 2003, 2004, 2005). Print-only interventions followed closely (Clark et al., 2002; Ishikawa et al., 2012; Jensen et al., 2012; Katapodi et al., 2020; Kreuter et al., 2005; McCaul & Wold, 2002), using letters (Katapodi et al., 2020; McCaul & Wold, 2002), pamphlets (Jensen et al., 2012), booklets

(Katapodi et al., 2020), reminders (Ishikawa et al., 2012), and magazines (Kreuter et al., 2005) as the preferred formats for delivering text-based messages, while a few studies focused on digital-only interventions (Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009), delivered through ad-hoc computer programs. It is noteworthy that even within many mixed-channel interventions (e.g., those combining print materials with telephone counseling), the tailored written message content itself was often purely text-based (Clark et al., 2002; Ishikawa et al., 2012; Katapodi et al., 2020; McCaul & Wold, 2002; Rakowski et al., 2003; Valanis et al., 2002, 2003; Williams-Piehot et al., 2004, 2005). Some also included images or graphics to support the text message (Champion et al., 2002; Jensen et al., 2012; Kreuter et al., 2005; Lipkus et al., 2000; Rimer et al., 2001, 2002; Saywell et al., 2004; Williams-Piehot et al., 2003), while a smaller subset incorporated audiovisual content (Champion et al., 2020; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009).

Colorectal cancer screening. For colorectal cancer screening interventions, print-only materials were the most frequently used (Hirai et al., 2016; Manne et al., 2013; Marcus et al., 2005; Rawl et al., 2008; Resnicow et al., 2014), delivered through reminders (Hirai et al., 2016), pamphlets (Manne et al., 2013), newsletters (Kramish Campbell et al., 2004; Resnicow et al., 2014), brochures (Rawl et al., 2008), or mixed-print materials (e.g., booklet plus newsletter) (Marcus et al., 2005). Mixed approaches that combined printed materials with telephone counseling were also common (Bastani et al., 2015; Kinney et al., 2014; Leone et al., 2016; Manne et al., 2009; Myers et al., 2007). In some studies, researchers paired digital channels, such as computer programs, with telephone calls (Bai et al., 2022; Champion et al., 2018, 2020), while others opted for a blend of digital and printed formats (Flight et al., 2012; Jensen et al., 2014; Vernon et al., 2011; Weinberg et al., 2013). A few studies took a digital-only route (Jerant et al., 2014; Levitz et al., 2023; Rawl et al., 2021; Wilson et al., 2015).

In terms of message content, most studies used text-based messages accompanied by images or graphics to enhance engagement (Bai et al., 2022; Bastani et al., 2015; Jensen et al., 2014; Kinney et al., 2014; Levitz et al., 2023; Manne et al., 2009, 2013; Myers et al., 2007; Rawl et al., 2008; Weinberg et al., 2013). Some focused exclusively on text-only messages (Flight et al., 2012; Hirai et al., 2016; Jerant et al., 2014; Leone et al., 2016; Marcus et al., 2005; Resnicow et al., 2014; Wilson et al., 2015), and a small number integrated audiovisual content (Champion et al., 2018, 2020; Kramish Campbell et al., 2004; Rawl et al., 2021; Vernon et al., 2011).

RQ3: tailored messages effectiveness

Female cancer screenings. Regarding breast and cervical cancer screening, 21 studies were included in the review. Sixteen of the 21 studies reported a statistically significant positive impact of tailored messaging conditions compared to at least one alternative condition on at least one of the main outcomes (Champion et al., 2002, 2020; Clark et al., 2002; Ishikawa et al., 2012; Jensen et al., 2012; Kreuter et al., 2005; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009; Rimer et al., 2001;

Saywell et al., 2004; Valanis et al., 2002, 2003; Williams-Piehot et al., 2003, 2004, 2005). Specifically, 13 studies found that the tailored condition(s) significantly increased adherence to mammography screening (Champion et al., 2002, 2020; Clark et al., 2002; Ishikawa et al., 2012; Kreuter et al., 2005; Lee et al., 2017; Rimer et al., 2001; Saywell et al., 2004; Valanis et al., 2002, 2003; Williams-Piehot et al., 2003, 2004, 2005), and two studies also found a significant impact on adherence to cervical cancer screening (Valanis et al., 2002, 2003). Furthermore, four studies demonstrated a significant effect on intention to undergo mammography (Jensen et al., 2012; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009). However, five studies found no statistically significant impact of the tailored interventions compared to the comparison conditions (Katapodi et al., 2020; Lipkus et al., 2000; McCaul & Wold, 2002; Rakowski et al., 2003; Rimer et al., 2002).

To better understand this variability, the findings are presented below according to the type of comparison group used in each study.

Tailored interventions vs. passive controls (usual care/no intervention). When compared to a passive control group, tailored interventions were almost universally effective. Eight different studies found that their tailored interventions were significantly more effective at increasing mammography or cervical cancer screening adherence than a usual care or no-intervention control group (Champion et al., 2002, 2020; Clark et al., 2002; Kreuter et al., 2005; Rimer et al., 2001; Saywell et al., 2004; Valanis et al., 2002, 2003). Only two studies failed to find a significant advantage for tailoring over usual care in the long term (Lipkus et al., 2000; Rimer et al., 2002).

Tailored interventions vs. non-tailored alternative interventions (e.g., non-tailored generic information, alternative message interventions). When tailored interventions were tested against an active control group, the results were mixed. Twelve studies made this comparison, with eight demonstrating the superiority of the tailored approach. In five of these latter studies, the tailored intervention was more effective than a non-tailored, generic message (e.g., a standard brochure or reminder) in increasing screening intention or behavior (Ishikawa et al., 2012; Jensen et al., 2012; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009). In the other three successful trials, by Williams-Piehot et al. (2003, 2004, 2005), tailored messages matched to an individual's stable psychological traits proved more effective than mismatched messages.

A closer look at these eight successful interventions reveals a crucial common characteristic: the majority drew from established health behavior theories, tailoring the messages based on modifiable constructs such as perceived barriers and cancer worry (Ishikawa et al., 2012; Jensen et al., 2012; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009). Others tapped well-established psychosocial constructs related to personality and persuasion, tailoring the *style* of the message to be congruent with stable individual characteristics like coping style or locus of control (Williams-Piehot et al., 2003, 2004, 2005). Regarding communication channels, three of the eight interventions utilized a mixed approach involving telephone calls (Williams-Piehot et al., 2003, 2004, 2005), three used digital-

only channels (Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009), and two relied on print-only materials (Ishikawa et al., 2012; Jensen et al., 2012). In terms of message format, the majority enhanced their text with visual or audio-visual content (Jensen et al., 2012; Lee et al., 2017; Lin & Effken, 2010; Lin & Wang, 2009; Williams-Piehot et al., 2003), with purely text-based approaches being less common among this successful group (Ishikawa et al., 2012; Williams-Piehot et al., 2004, 2005). In the remaining four studies, the tailored intervention was not found to be more effective than the non-tailored generic message (Clark et al., 2002; Katapodi et al., 2020; McCaul & Wold, 2002; Rakowski et al., 2003).

Within-study comparisons of different tailoring strategies.

Finally, a significant number of multi-arm trials (11 studies) compared different tailoring strategies against each other. Six of these studies explored the impact of a tailored message delivered by different communication channels, with most reporting no significant differences in effectiveness between tailored mail, tailored telephone, or a combination of both (Champion et al., 2002; Lipkus et al., 2000; Rimer et al., 2001, 2002; Saywell et al., 2004). One study found that the intervention arm including a telephone component was more effective compared to a text-only message, though this was potentially confounded by other factors like the proactive offer of a screening kit (Champion et al., 2020). The other five studies compared different types of tailored messages and found no significant differences between different tailoring strategies. For instance, Lin and Wang (2009) compared a "complete" tailored intervention (which included additional behavior change techniques) with a "simpler" one (containing only the tailored message). While the "complete" intervention was more effective than a standard, non-tailored message, there was no significant difference between the two tailored conditions. Similarly, other studies found no significant differences when comparing cultural versus behavioral tailoring (Kreuter et al., 2005) or among various stepped-care interventions (Rakowski et al., 2003; Valanis et al., 2002, 2003).

Colorectal cancer screening. Regarding colorectal cancer screening, 22 studies were included in the review. Concerning the impact of tailored messaging on colorectal cancer screening intentions and behaviors, 13 studies demonstrated that the tailored condition was more effective than at least one alternative condition in improving at least one of the outcomes (Bai et al., 2022; Bastani et al., 2015; Champion et al., 2018, 2020; Hirai et al., 2016; Kinney et al., 2014; Kramish Campbell et al., 2004; Levitz et al., 2023; Manne et al., 2009, 2013; Marcus et al., 2005; Myers et al., 2007; Rawl et al., 2021). Specifically, tailored interventions significantly increased adherence to any colorectal cancer screening in six studies (Bastani et al., 2015; Levitz et al., 2023; Manne et al., 2009; Marcus et al., 2005; Myers et al., 2007; Rawl et al., 2021), adherence to the stool test in five studies (Champion et al., 2018, 2020; Hirai et al., 2016; Kramish Campbell et al., 2004; Rawl et al., 2021), and adherence to colonoscopy in two studies (Bai et al., 2022; Kinney et al., 2014). Two studies showed an increased intention to undergo colorectal screening (Champion et al., 2018; Manne et al., 2013). Two studies

demonstrated partial efficacy, with positive effects observed only in specific subgroups of the sample (Jensen et al., 2014; Resnicow et al., 2014). Finally, in seven studies the tailored condition(s) did not significantly affect the main outcomes (Flight et al., 2012; Jerant et al., 2014; Leone et al., 2016; Rawl et al., 2008; Vernon et al., 2011; Weinberg et al., 2013; Wilson et al., 2015).

To better understand this variability in findings, the results are presented below according to the type of comparison group used in each study.

Tailored interventions vs. passive controls (usual care/no intervention). Eight studies compared a tailored intervention to a passive control group, such as usual care or no intervention. The results in this category were generally positive. Five of these studies found that their tailored interventions significantly increased screening behavior compared to a no-intervention or usual care control (Bastani et al., 2015; Champion et al., 2018, 2020; Levitz et al., 2023; Myers et al., 2007). However, the three other studies did not find a significant advantage for tailoring on behavioral outcomes when compared to a survey-only control group (Vernon et al., 2011; Weinberg et al., 2013; Wilson et al., 2015).

Tailored interventions vs. non-tailored alternative interventions (e.g., non-tailored generic information, alternative message interventions). Thirteen studies tested a tailored intervention against an active control group. A large subset of these (10 studies) compared tailoring to a generic, non-tailored message (e.g., a standard brochure). In six of these trials, the tailored approach proved superior, significantly increasing either screening behavior (Bai et al., 2022; Kinney et al., 2014; Manne et al., 2009; Marcus et al., 2005; Rawl et al., 2021) or intention (Manne et al., 2013).

An examination of these successful interventions reveals they were theory-based, with three of the six utilizing a combination of digital or printed materials plus telephone calls (Bai et al., 2022; Kinney et al., 2014; Manne et al., 2009), two relying solely on printed materials (Manne et al., 2013; Marcus et al., 2005), and one employing a digital-only approach (Rawl et al., 2021). Furthermore, all of them enhanced their textual messages with formats such as images, diagrams, or audio narration. In contrast, four other studies found no significant difference between the tailored and the generic message conditions (Flight et al., 2012; Hirai et al., 2016; Jerant et al., 2014; Rawl et al., 2008). Finally, when compared to other types of active interventions, the results were less favorable for

tailoring. Jensen et al. (2014) found that a narrative message was more effective. Furthermore, no advantage for tailoring was found over other active controls, such as a targeted message (Kramish Campbell et al., 2004) or an attention-control condition (Leone et al., 2016).

Within-study comparisons of different tailoring strategies. Eight multi-arm trials provided insights by comparing different tailoring strategies with one another. Six studies explored the impact of the communication channel. Four of them found no difference between print and web delivery (Flight et al., 2012; Weinberg et al., 2013) or between a text-only and a text-plus-counseling condition (Manne et al., 2009; Myers et al., 2007). In contrast, the other two trials found that interventions including a telephone counseling component were the most effective at increasing screening behavior, although this effect was potentially confounded by the proactive offer of a mailed screening kit in the telephone arms of the studies (Champion et al., 2018, 2020). The remaining two studies compared different types of tailored messages; for instance, Marcus et al. (2005) found that interventions involving single, multiple, or re-tailored messages were all more effective than a standard non-tailored message but found no significant differences among the different tailoring strategies themselves. In contrast, Resnicow et al. (2014) observed higher screening rates in the enhanced tailored groups compared to minimally tailored groups, but only among those with autonomous communication preference.

To provide a final, at-a-glance summary of the key characteristics of the most successful interventions identified in our review, the findings are synthesized in Table 2.

Discussion

This systematic review of 42 studies explored the effectiveness of tailored messaging interventions in promoting adherence to breast, cervical, and colorectal cancer screenings. The findings suggest that tailored interventions are a promising strategy, but their effectiveness varies significantly depending on the comparison group used in the included studies, a variability that aligns with previous reviews on this topic (Albada et al., 2009; Richardson-Parry et al., 2023). When compared to passive control groups (e.g., usual care), tailored interventions demonstrated a strong and consistent positive effect, particularly for female cancer screenings. However, the superiority of tailoring was less pronounced when tested against active control groups (e.g., generic, non-tailored health messages). Across both screening types, 14 out of 25 studies that made this comparison demonstrated a significant advantage when

Table 2. Summary of key characteristics in successful interventions comparing tailoring to alternative, non-tailored interventions.

Screening type	Successful studies (N)	Communication channel (N)	Message format (N)	Most common tailored psychosocial variables
Female Cancers	8	Mixed (e.g., text + phone): 3 Digital-only: 3 Print-only: 2	Text + visuals/audio: 5 Text-only: 3	Perceived barriers, stage of adoption, locus of control/coping style
Colorectal Cancer	6	Mixed (e.g., text + phone): 3 Digital-only: 1 Print-only: 2	Text + visuals/audio: 6 Text-only: 0	Perceived barriers, perceived benefits, stage of adoption, self-efficacy

using the tailored approach. Notably, this superiority was more evident for female cancer screenings (where eight out of 12 studies were effective in this comparison) than for colorectal cancer screening (where six out of 13 relevant studies were effective). The difference may stem from the nature of these screenings, as while breast and cervical cancer screenings are part of routine preventive care throughout a woman's life, colorectal screening is introduced later and less frequently. Patients also tend to view colorectal cancer as less threatening, partly due to less prominent public awareness campaigns (Meissner et al., 2012). Thus, it is plausible that tailored messages may be more effective when reinforcing existing health behaviors rather than promoting new ones for underestimated risks.

A closer analysis of those studies where tailored messaging proved to be more effective than alternative messaging approaches highlights several key elements. First, most effective interventions were grounded in behavioral theories, such as the Health Belief Model (Becker et al., 1974) or the Transtheoretical Model of Change (Prochaska & Velicer, 1997), or incorporated constructs common to multiple behavior change theories, such as attitudes and beliefs. This highlights the importance of designing theory-based interventions, which offer several advantages. To begin with, theory provides a map of multiple psychosocial determinants to target. Indeed, a common feature of the successful interventions in this review was their multifactorial approach, often addressing several variables simultaneously within the same theoretical framework (e.g., the Health Belief Model). This aligns with past reviews (Noar et al., 2007) showing that, in the context of health behavior change, the most effective tailored messages tend to focus on more than one variable simultaneously. Second, a theory-based approach allows for the identification of the mechanisms of change, and indeed, several studies in our review demonstrated this process in action. Some successful interventions showed a complete causal pathway, influencing not only behavioral outcomes but also their theoretical antecedents. In some cases, formal mediation analyses further confirmed this was the mechanism of action. For instance, Manne et al. (2009) found that the effect of their intervention on screening was partially mediated by changes in decision balance, while Rawl et al. (2021) showed that changes in perceived benefits, barriers, and knowledge significantly mediated their intervention's success. Other effective interventions similarly reported positive changes in both screening uptake and targeted predictors like knowledge and readiness (Lee et al., 2017; Rimer et al., 2001). Conversely, a different set of studies provides a compelling illustration of the well-known intention-behavior gap. In these trials, the tailored interventions were successful at changing key psychosocial predictors—such as increasing self-efficacy and perceived susceptibility (Flight et al., 2012; Jerant et al., 2014; Katapodi et al., 2020)—but these positive psychological shifts did not translate into an increase in screening behavior. This pattern offers two critical insights. First, it confirms that theory-based tailoring can work as intended by engaging and modifying the specific determinants of behavior. Second, it highlights that changing beliefs and attitudes is often a necessary but not always sufficient condition for behavior change. This points to the need for interventions

that not only address psychosocial determinants but may also need to include components that help translate positive intentions into concrete action, for example, by addressing practical barriers (Prestwich et al., 2024).

However, not all effective interventions tailored messages to modifiable psychosocial determinants. Some focused on stable individual differences, such as locus of control, need for cognition, or attentional style, and achieved positive outcomes. Unlike determinant-modifying tailoring, this approach does not aim to *change* psychosocial constructs but instead *activates* specific psychological traits. This strategy conceptually aligns with what the broader persuasion literature defines as motivational message matching—that is, tailoring messages to stable characteristics such as values, needs, or personality traits. This broader family of interventions has proven to be particularly potent, with a recent large-scale meta-analysis confirming its superiority over non-motivational approaches (Joyal-Desmarais et al., 2022). This method may be particularly effective, as it avoids the risk of reactance, which individuals might experience when they perceive their personal perspectives are being challenged (Reynolds-Tylus, 2019). By leveraging these stable characteristics, interventions encourage behavior change within a familiar psychological framework for the patient. Crucially, our review found that this activating approach was only successful in the context of female cancer screenings. The trials by Williams-Piehotta et al. (2003, 2004, 2005), which tailored messages to traits like coping style and locus of control, all demonstrated positive effects on mammography uptake. In stark contrast, the studies on colorectal cancer that used a similar approach—tailoring on factors like attentional style or communication preference—failed to find a significant main effect on screening behavior (Resnicow et al., 2014; Weinberg et al., 2013). This pattern may suggest a relevant difference in the nature of the behaviors required. Such an “activating approach” may be particularly effective for motivating a relatively discrete action like scheduling a mammogram. In contrast, colorectal cancer screening often involves a complex, multi-step behavioral sequence that the patient must perform autonomously (e.g., retrieving a kit, collecting a sample, and returning it). For such a process, merely activating a stable characteristic seems to be insufficient. It might be that a determinant-modifying approach, which directly targets and improves factors like self-efficacy and perceived barriers for each step of the process, is necessary to facilitate the completion of the entire behavioral chain. Future research could benefit from both comparing or integrating the determinant-modifying and activating approaches within a single study, as well as conducting within-approach comparisons across different screening types to test, for instance, whether one approach is more suitable for a specific type of screening than another.

In terms of communication channels, our within-study analysis suggests that the additive value of combining text-based messages with more intensive components like telephone counseling is questionable. This was particularly evident for colorectal cancer screening, where multi-arm trials consistently found that a mixed-modality approach provided no significant benefit over text-only (print or digital) interventions (e.g., Manne et al., 2009; Myers et al., 2007). For female

cancer screenings, the evidence was more mixed, with some studies showing a benefit for the additional telephone component (e.g., Champion et al., 2020) and others finding no difference (e.g., Champion et al., 2002; Saywell et al., 2004). Crucially, even when a mixed approach appeared superior, this was often attributable to confounding factors, such as the inclusion of a practical facilitator like a mailed screening kit, rather than the counseling itself (Champion et al., 2018, 2020). This pattern has crucial implications for cost-effectiveness. Given that text message interventions are significantly less resource-intensive, they likely represent a more scalable and efficient strategy for large-scale public health campaigns, especially when the evidence for the additive benefit of more costly components is so inconsistent (Saywell et al., 2004).

While the choice of channel shows mixed results, our analysis of message format revealed a clearer pattern: the vast majority of successful interventions, particularly for colorectal cancer screening, did not rely on text alone but enhanced their messages with visual or audio components. This aligns with extensive research on multimedia communication, which shows that combining text with graphics or audio can increase attention, improve comprehension, and enhance recall of health information (Meppelink et al., 2015). More research is needed to clarify when a mixed-channel approach is preferable and to identify the optimal combination of message formats to maximize engagement and effectiveness.

Connecting back to the issue of health equity raised in the Introduction, it is crucial to consider not just *if* tailoring works, but also *for whom*. Our review identified several studies where the effects of tailoring were moderated by individual characteristics, a finding with significant implications. These moderators spanned a range of factors. Some were demographic, with interventions being more effective for specific age groups (Valanis et al., 2003; Williams-Piehot et al., 2004). More frequently, effects were moderated by psychosocial and cognitive variables. For instance, interventions showed greater success among individuals with a higher fear of cancer (Champion et al., 2018), those experiencing high information overload (Jensen et al., 2014), or those with a preference for autonomous communication (Resnicow et al., 2014). These moderation effects reveal a crucial opportunity for a more sophisticated and equitable approach to health communication. They suggest that the ultimate goal is not simply to decide whether to tailor, but rather to understand when tailoring provides a meaningful advantage over simpler strategies. For some population subgroups, a generic reminder might be sufficient and more cost-effective, while for others, a deeply tailored intervention is necessary to overcome specific barriers. Future work could therefore focus on developing stratified intervention models. Such models would use these individual characteristics not only to shape the content of a message, but to determine the most appropriate strategy (e.g., generic, targeted, or tailored) for different segments of the population, thereby maximizing both effectiveness and efficiency.

A final analysis of the studies in which tailoring was ineffective offers further insights, revealing a consensus among authors on several practical and methodological pitfalls. Researchers frequently attributed failure to a combination of

insufficient intervention dosage and low participant engagement. They noted that a single, brief exposure is often inadequate to change complex, long-term health behaviors (Jerant et al., 2014; Rowl et al., 2008), a problem compounded when participant adherence to the intervention itself is low. For example, one web-based trial reported that only 24.4% of participants actually logged on to view the materials (Weinberg et al., 2013). Moreover, high rates of participant attrition across some trials (e.g., Jensen et al., 2014) weakened statistical power, making it more difficult to detect potential intervention effects. Another recurring explanation was the strong usual care control group, which created a ceiling effect that made it difficult for the tailored intervention to show a significant additional benefit (Lipkus et al., 2000; Rimer et al., 2002). Finally, authors observed that interventions failed when applied to populations that were either already highly motivated—for whom a simple reminder was sufficient (Rakowski et al., 2003)—or highly resistant, for whom low-intensity mailings were too weak to be effective (McCaul & Wold, 2002).

The mixed findings of this review raise the crucial question of whether tailoring is a worthwhile investment. Our analysis suggests that the answer depends on a confluence of factors. Tailoring appears to be most successful when it is grounded in robust behavioral theory, targets modifiable psychosocial constructs, and is delivered with sufficient dosage to a receptive audience. Conversely, its effectiveness is limited when applied to already motivated or highly resistant populations, when the intervention itself is too weak, or when it fails to account for key moderators that determine *for whom* the strategy is a good fit. Thus, the high cost and labor involved in individual assessment and message matching are only justified when the intervention is carefully designed and targeted to a population that can truly benefit from it. In many cases, as our findings suggest, a simpler, less resource-intensive generic message can be equally effective and thus a more pragmatic public health strategy (Saywell et al., 2004). Hence, tailoring emerges not as a universally superior strategy, but rather as a powerful tool to be used selectively and strategically, where a more generic approach is known to fail.

Practical implications

This review highlights several practical implications for promoting cancer screening adherence. First, the most effective tailored messages were grounded in behavioral change theories. This suggests that designing theory-based interventions could be a particularly promising strategy. However, it is important to acknowledge that tailoring may not always be the most effective approach for every individual or context. A deeper understanding of the conditions and populations where tailoring can make a significant impact is crucial. This requires exploring the mechanisms of action, identifying mediators of effectiveness, and considering individual differences to fine-tune intervention strategies. A potentially fruitful direction could involve combining tailored and targeted interventions into a hybrid approach, leveraging the strengths of both strategies. Similarly, integrating determinant-modifying approaches (which aim to change key psychosocial determinants like beliefs, attitudes, or self-efficacy)

with activating approaches (which leverage stable psychological traits to encourage behavior) may offer additional benefits. This dual strategy could provide a way to promote behavior change while avoiding resistance that may arise when individuals feel their beliefs, perceptions, or decisions are being directly challenged.

Furthermore, future interventions should address key implementation challenges identified in studies with null outcomes. A primary focus should be on cost-effectiveness; since simple, low-cost strategies (e.g., a standard reminder) often performed as well as resource-intensive tailored programs, future work should justify the added value of more complex interventions (Jerant et al., 2014; Rakowski et al., 2003). Similarly, future designs must ensure an adequate intervention dosage and actively promote participant engagement. The frequent failure of single, low-intensity exposures suggests that multi-contact strategies may be necessary for complex behaviors (Rawl et al., 2008). Overcoming the low engagement seen in past trials—for instance, by combining passive delivery with active follow-ups—will be critical for success (Weinberg et al., 2013).

Finally, to facilitate behavior change beyond merely increasing intentions, interventions could consider addressing variables that directly influence action, such as action and coping planning, instead of only focusing on predictors of intention (e.g., perceived benefits, perceived risk). Incorporating these elements—by helping individuals plan when, where, and how to engage in screening and addressing potential obstacles—may be key to bridging the intention-behavior gap (Le Bonniec et al., 2022), which remains a central challenge in psychosocial research and a critical focus for future efforts in cancer prevention strategies (Bianchi, Capasso, et al., 2024; Bianchi, Donizzetti, et al., 2024). Addressing these complex challenges and advancing the field, however, will require a concerted effort to strengthen the methodological rigor of future research, paramount to building a more robust evidence base.

Study limitations

This review has some limitations. First, the search strategy included a limited number of databases, which may have affected the comprehensiveness of the search. A related potential limitation is also the restriction of our search to studies published in English, Italian, and Spanish, which may have led to the exclusion of relevant studies published in other languages. Second, most studies were conducted in North America, potentially limiting the generalizability of findings. Third, there was significant variability in intervention design and implementation across studies, tapping diverse tailoring variables, communication channels, intervention components (e.g., text-based vs. mixed with counseling), and outcome measurements (e.g., intention vs. various screening behaviors, assessed at different follow-up times). This substantial heterogeneity significantly limited the feasibility of conducting a meta-analysis, making it difficult to quantitatively synthesize results and draw definitive conclusions about the average effectiveness of specific tailoring techniques or compare them systematically. Indeed, some studies have employed minimal personalization, while others utilized more sophisticated

techniques to elaborate messages. Fourth, by focusing primarily on text-based messaging interventions, the generalizability of our findings to tailored interventions relying *exclusively* on non-textual formats, such as video, image, audio, telephone counseling, or in-person interactions, may be limited. Additionally, the exclusion of gray literature means that our review may be subject to publication bias, as studies with statistically significant results are more likely to be published.

Conclusion

In conclusion, this systematic review demonstrates that tailored messaging is a valuable, but not universally superior, tool for promoting cancer screening. Its effectiveness is greatest when interventions are grounded in behavioral theory and enhance textual messages with visual or audio components. However, our findings highlight that the effectiveness of tailoring is often moderated by individual characteristics. This suggests that the key challenge is not simply whether to tailor but understanding for whom and under which conditions it provides a meaningful advantage over simpler approaches.

Therefore, a promising path for future research and practice may lie in developing stratified intervention models. These models would strategically deploy resource-intensive tailoring only for those subgroups who need it most, while using more cost-effective generic messages for others, thereby maximizing both public health impact and efficiency. Ultimately, the greatest promise of tailoring lies not in replacing other communication strategies, but in offering a powerful solution for specific behavioral challenges where simpler approaches are known to fall short.

Note

1. Since only two studies focused on cervical cancer screening, the results from studies on breast and cervical cancer screenings will be described together in the following sections.

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ORCID

Miriam Capasso  <http://orcid.org/0000-0002-9094-5635>
 Marcella Bianchi  <http://orcid.org/0000-0002-9417-7119>
 Anna Rosa Donizzetti  <http://orcid.org/0000-0003-2605-8705>
 Daniela Caso  <http://orcid.org/0000-0002-6579-963X>

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