Responses to reduced nicotine cigarette marketing features: a systematic review

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ABSTRACT

Objective To systematically review the literature regarding responses to commercial and public health marketing features for reduced nicotine cigarettes (RNCs) to anticipate potential industry and regulatory actions should an RNC product standard be issued.

Data sources We searched PubMed for English-language articles using several keywords for reduced nicotine products, cigarettes and marketing features published through 2020.

Study selection Of 4092 records, 26 studies were retained for review that met criteria focusing on responses to RNC marketing features.

Data extraction Search terms created by the research team were used for review and included independent extraction and coding by two reviewers. Coding was categorised using study design terminology, commercial and public health features in tobacco regulatory science, and their association with individual responses outlined by several message processing outcomes.

Data synthesis Most studies focused on current cigarette smokers and were cross-sectional. Reactions to RNCs and attitudes and beliefs were the most common outcomes measured. For commercial features, articles generally studied RNC advertisements, products and/or descriptors. For public health features, articles studied counter-messaging (eg, warning labels) or general descriptors about nicotine or a reduced nicotine product standard. Commercial features were generally associated with favourable responses. Public health features offset favourable responses across most outcomes, though their efficacy was mixed. Contrasts in results by smoking status are discussed.

Conclusions Commercial marketing of RNCs is appealing and may need stronger regulations or communication campaigns to accurately convey risks. Opportunities exist for future research within tobacco regulatory science.

INTRODUCTION

Cigarette smoking is one of the leading causes of preventable mortality and morbidity in the USA and globally.[1–3] To reduce the burden of cigarette use, there has been a focus on reducing nicotine,[4] the addictive chemical that promotes continued use.[2 5] There are a number of countries considering nicotine reduction strategies.[6] The 2009 Tobacco Control Act (TCA) gave the US Food and Drug Administration (FDA) the authority to reduce nicotine levels in cigarettes (eg, tobacco filler content)[7] and the agency has proposed enacting a reduced nicotine product standard.[8] Reducing nicotine to non-addictive levels in cigarettes has the potential to reduce mortality and morbidity.[9–12] Though this product standard holds great promise, reduced nicotine cigarettes (RNCs) still include carcinogenic constituents (eg, tar) and pose risks to users.[13] Nicotine reduction regulations must address how manufacturers market RNCs and how risk information is communicated through labelling and packaging.

RNCs were commercially available from 2002 to 2010. Referred to as potentially reduced exposure products (PREPs) prior to the TCA, RNCs were advertised with descriptors (eg, 'low nicotine') but had low uptake alongside conventional cigarettes.[14] An RNC product standard would mandate all cigarettes to comply with reduced nicotine requirements, but it is unclear how RNCs would be permitted to be marketed. There is limited research on marketing effects to date and it is important to understand if RNC labelling and packaging descriptors would be misleading.

Marketing is often the first introduction to a product that informs connotations around branding, appeal and risks. Tobacco marketing generally aims to increase sales and tobacco use.[2 15] Cigarette marketing features, including descriptors, colour, size and price, influence how individuals process information but also how favourable or risky they perceive a product to be.[16–19] Intertwined with these commercial features are public health features. Though this encompasses a variety of marketing techniques at public health's disposal (eg, social marketing, branding), it historically includes risk communication (eg, warning labels) and campaign messaging to offset the appeal of tobacco marketing.[20–22] Understanding how non-smokers and current cigarette smokers process marketing features would assist in gauging interest in uptake or switching to this class of products. Therefore, it is critical to review the existing literature to anticipate potential RNC marketing features and better understand the potential impact on behaviour.

Reviews of the RNC literature to date focus on basic science, risk assessment components and precede the TCA.[14 23–25] Their conclusions include: RNC use reduces exposure to nicotine; can be associated with cessation in controlled studies; and adult smokers and non-smokers are generally supportive of an RNC product standard and perceive RNCs as less risky than conventional cigarettes. Yet, the reviews did not systematically extract details pertaining to marketing. We conducted a focused review of RNC marketing feature research with a theoretical lens on how individuals respond to this

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information and summarise results by commercial and public health feature effects.

The current study is a systematic review that focuses on a qualitative assessment of the existing literature. This approach outlines narrative descriptions of both experimental and non-experimental research to characterise the literature. This strategy has several strengths including research question generation, broad descriptions of the literature, and theoretical development with qualitative categories and relationships among variables. Specifically, we aim to review the existing literature to determine how individuals respond to commercial and public health marketing features for RNC cigarettes to anticipate potential industry actions and public health responses should an RNC product standard be implemented. Several theories and frameworks postulate how individuals process information.[26–29] This review is guided by models designed to understand how tobacco advertising and other messages affect individual outcomes.[30–32] This commonly includes constructs following initial exposure to a message feature or stimuli (eg, attention, recall, reactions) that are associated with smoking attitudes and beliefs, intentions and ultimately behaviour. We hypothesise commercial features will be associated with favourable responses toward RNCs, including increased attention and recall, positive reactions and attitudes, intentions to use and increased smoking behaviour. We also hypothesise public health features will be associated with less favourable responses toward RNCs.

METHODS

Approach and search terminology

Our methodological approach was based on standard Preferred Reporting Items for Systematic Reviews and Meta-Analyses procedures[33] using terminology from relevant publications.[14 23–25] Broadly, we searched for articles focused on responses toward marketing features for RNCs. We focused on articles in English from PubMed using keywords and Medical Subject Heading terms for reduced nicotine, cigarettes and marketing as outlined in the online supplemental materials.[34 35] We included various terms used over time associated with RNC products broadly (eg, PREPs, denicotinized). We filtered results to include articles catalogued through 2020.

We operationalised marketing to include the four Ps of marketing (Promotion, Product, Price and Placement)[15 36] and allowed brief descriptors, including question preambles or stems, to be defined as a marketing exposure if it provided contextual information.[37–39] The rationale was to be inclusive of messaging, including brief descriptions, that could be perceived as informing connotations, including scenarios around an RNC product standard.

We largely excluded blinded study designs testing Spectrum research cigarettes, without any additional marketing exposure, as these products are partially designed with the intent of removing branding elements. We screened out articles focused on price as FDA does not have regulatory authority over excise taxes.[40] We excluded studies that did not include message processing outcomes (eg, nicotine yields, expert opinions, reviews, commentaries). Lastly, we excluded studies, or aspects of studies, that tested nicotine descriptors combined with other constituents (eg, tar) if we were not able to isolate the effects. We determined ineligibility in a hierarchical manner, outlined below.

Eligibility criteria

Eligibility criteria included: (1) RNCs, (2) marketing-related exposure or contextual information, and (3) published in English language.

Ineligibility criteria

Ineligibility criteria included: (1) no reference to RNCs or equivalent (eg, not referenced in any messaging, stimulus or outcome), (2) no marketing-related exposure or contextual information, (3) focused on price, (4) no message processing outcomes and (5) marketing feature not explicitly focused on nicotine.

Article coding

We searched PubMed through 2020, yielding 4092 results. Outlined in figure 1, two coders (ACJ and SR) independently screened titles/abstracts and removed 3971 articles. Any discrepancies were included in the 121 full-text articles and reviewed in depth for eligibility (93% agreement). The two coders extracted information from eligible articles across several categories: study characteristics (study design, design type, follow-up, sampling, data collection modality, country, sample age and smoking status, theoretical framework), marketing details (data collection format, exposure medium and features) and results for each outcome measure. There was suitable inter-rater reliability across each category (mean Cohen's kappa=0.90). Discrepancies were resolved in consultation with a third coder (MM) and we report the final, resolved codes.

Coding was based on study design terminology[41] and organised by common commercial and public health features in tobacco regulatory science.[42] To ground our findings in theory, we organised the results according to message processing outcome constructs: attention, recall, subjective ratings or reactions, attitudes and beliefs, intentions and behaviour. We adapted this strategy from an existing conceptual framework[22 32] to define and report each outcome. This includes attention to, recall of, and reactions to a feature that may lead to changes in smoking attitudes and beliefs, intentions to use and smoking behaviour. We not only include self-report measures, but objective measures where available (eg, eye-tracking, topography). We characterise the results first with a brief summary, and then include detailed results in relation to commercial and public health features. We group results by similar study design and common findings where possible.

RESULTS

As outlined in figure 1, 4092 articles were identified for evaluation using the search criteria. A total of 3971 articles were screened out based on their titles/abstracts. We reviewed 121 full-text publications for eligibility. Of those, 26 were eligible and 95 were ineligible. Ineligibility reasons included: 33 not RNCs or equivalent, 34 no marketing-related exposure, 11 focused on price, 7 no message processing outcomes (eg, reviews, commentaries) and 10 marketing features were not explicitly focused on nicotine.

Study characteristics

A total of 26 studies were included for review. The sample sizes ranged from 21 to 9736 (mean=1612; SD=2267; median=757). Studies were published between 2005 and 2019, with an uptick in recent years. As outlined in table 1, studies were primarily experimental (n=15, 58%). Of those, most used randomisation (n=12, 80%). Others were non-experimental studies (n=11, 42%). A majority of studies were cross-sectional (n=22, 85%), though four studies included at least one follow-up (15%). Follow-ups varied from 1 day to several weeks (eg, 1–6 weeks) in between data collection points.

Most larger studies were population focused and used probability-based sampling (n=14, 54%) including data from

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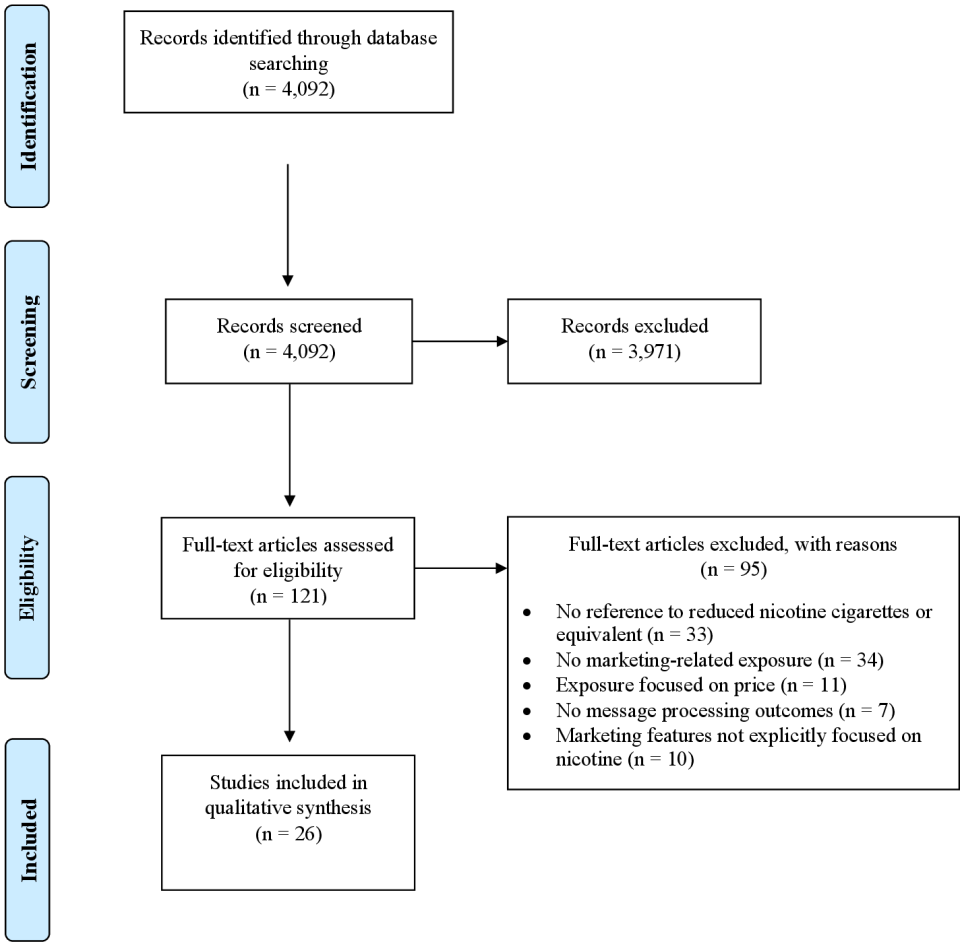

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses diagram.

Health Information National Trends Survey (HINTS) or International Tobacco Control Policy Four-Country Survey (ITC). Of those, a majority were non-experimental (n=12, 86%). Conversely, smaller convenience samples using local recruitment or crowdsourcing platforms all used experimental methods (n=12, 100%), nine of which were randomised experiments (75%). Studies varied in their mode of data collection, including online (n=8, 31%), in-person (n=7, 27%), phone (n=5, 19%) or mailing (n=3, 12%) methods. Yet, all experimental studies used online or in-person methods while non-experimental studies largely used phone and/or mailing methods that often reflected their sampling procedures. Studies were primarily conducted in the USA (n=23, 88%) and other high-income countries (Canada, New Zealand and France).

Almost all studies sampled adults aged 18 years and older (n=23, 88%). Samples included current cigarette smokers (n=25, 96%), former cigarette smokers (n=4, 15%) and/or non-smokers (n=9, 35%). Current cigarette smoking was defined either by lifetime use (≥100 cigarettes) and frequency, including now smoking some days or every day, or by smoking 5–15 cigarettes per day often with a specified duration (ranging from 6 months to 5 years). Non-smokers were defined by no cigarette use (<100 cigarettes) or no current usage (past 30 days). Former smokers were defined by lifetime smoking (≥100 cigarettes) but not smoking currently. There were no discernable differences for results by each definition. Fewer than half sampled more than one smoking status (n=11, 42%) and two studies confirmed smoking status using minimum carbon monoxide or cotinine criteria (8%).

Marketing features

Studies assessed commercial features (n=13, 50%), public health features (n=11, 42%) or both (n=2, 8%; table 2). Studies primarily collected outcomes through self-reported surveys, but some used qualitative techniques, eye-tracking or smoking topography. Commercial feature exposure included general descriptors alone or with branding mediums (eg, advertisement, packaging). Specific features included: branding, primarily Quest; pack colour to implicitly denote strength (eg, red vs blue); and claims or descriptors related to nicotine content using vague quantifiers (eg, 'low nicotine', 'very low nicotine') or numerals ranging from 0.05 mg to 0.6 mg. Public health feature exposure included general descriptors or counter-messaging (eg, warning labels). Specific features assessed descriptors focused on framing and education around an RNC product standard (eg, 'to make them less addictive') or warning labels on smoking risk and how RNCs are not intended for quitting smoking. Descriptor and warning label features were primarily text only in nature including themes of general harm or addiction, government requirements or individual effects (eg, reducing cravings, quitting/uptake). Feature descriptions and verbatim phrasing are outlined in the online supplemental materials.

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Table 1 Study characteristics (N=26)

Design elements	Count	Per cent
Study design		
Randomised experiment	12	46
Quasi-experimental	3	12
Non-experimental	11	42
Design type		
Cross-sectional	22	85
Longitudinal	4	15
Follow-up timing		
1 day	1	4
1 week	1	4
10 days	1	4
6 weeks	1	4
Data collection		
Sampling		
Convenience	12	46
Probability	14	54
Modality		
In-person	7	27
Mail	3	12
Online	8	31
Phone	4	15
Multimodal	4	15
Country		
USA	23	88
Canada	1	4
France	1	4
New Zealand	1	4
Sample description		
Ages		
Adults	23	88
Youth and adults	1	4
Not defined	2	8
Smoking status*		
Current cigarette smoker	25	96
Former cigarette smoker	4	15
Non-smoker	9	35
Dual or poly tobacco user	2	8

*Statuses add up over 100% given some studies sampled more than one smoking status.

Table 2 Marketing features by study exposure

	Commercial feature exposure only n=13 n (%)	Public health feature exposure only n=11 n (%)	Commercial and public health feature exposure n=2 n (%)
Data collection format			
Qualitative	1 (50)	0 (0)	1 (50)
Self-report survey	14 (56)	10 (40)	1 (4)
Eye-tracking	0 (0)	0 (0)	1 (100)
Smoking topography	2 (100)	0 (0)	0 (0)
Exposure medium			
General	6 (35)	10 (59)	1 (6)
Counter-messaging	0 (0)	0 (0)	1 (100)
Advertisement	4 (80)	0 (0)	1 (20)
Product	3 (100)	0 (0)	0 (0)
Multiple mediums	1 (50)	0 (0)	1 (50)
Exposure feature			
General branding	6 (86)	0 (0)	1 (14)
Descriptor	6 (33)	11 (61)	1 (6)
Pack colour	1 (50)	0 (0)	1 (50)
Warning label	0 (0)	0 (0)	1 (100)
Outcomes measured			
Attention	0 (0)	0 (0)	1 (100)
Recall	4 (80)	0 (0)	1 (20)
Reactions	4 (40)	5 (50)	1 (10)
Attitudes/beliefs	8 (57)	4 (29)	2 (14)
Intentions	3 (38)	5 (63)	0 (0)
Behaviour	5 (100)	0 (0)	0 (0)

Message processing outcomes

Studies measured message processing outcomes including: attention (n=1), recall (n=5), subjective ratings or reactions (n=10), attitudes and beliefs (n=14), intentions (n=8) and behaviour (n=5). Features associated with each outcome are outlined below. Commercial marketing features were generally associated with increased attention, mixed recall, negative product reactions, lower harm attitudes and beliefs, intentions to use RNCs or to quit smoking, and varied behavioural use. Public health features were generally not associated with attention or recall of warning information, greater support of an RNC product standard, and mixed harm perceptions and intentions. Cross-study patterns are broadly summarised in the online supplemental materials. A few studies incorporated conceptual models drawn from communication persuasion theories and general frameworks (eg, ITC Framework, WHO Frameworks) (n=6, 23%).

Attention

Attention was measured as an outcome in n=1 study. RNC commercial features (package colour) captured the attention of current cigarette smokers. Public health features (text-only warnings) did not capture the attention of current cigarette smokers.

Commercial feature

An experimental study tested the effects of features within an RNC Quest cigarette advertisement among current cigarette smokers while assessing attention using objective eye-tracking technology.[43] Results indicated that red packaging colour in the product advertisement was associated with increased attention to a corrective statement (eg, counter-message) captured by latency (time to first view) compared with an advertisement featuring blue packaging colour.

Public health feature

The same study[43] did not find a significant effect on latency or dwell time (total time spent attending to a feature) after exposure to a text-only warning label within the advertisement overall.

Recall

Recall was assessed as an outcome in n=5 studies. Studies used both objective and subjective methods to measure feature effects on recall with varying targets of interest. Commercial features, specifically branding, were not associated with high recall. Yet, branding recall was highest among current cigarette smokers. Current cigarette smokers did not recall warning content within an advertisement with red packaging, though there were effects of red packaging on advertisement content recall among young adult cigarette smokers. Exposure to a text-only warning label did not increase accurate recall of the warning information.

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Commercial features

Two US probability samples assessed if individuals had heard of an RNC product using aided recall. In 2005, findings indicate that Quest had low brand awareness (7%–12%), relative to other new tobacco products at the time (eg, Marlboro Ultra Smooth, Eclipse).[44 45] Awareness was higher among current cigarette smokers relative to former and non-smokers for tobacco products broadly. Results from the ITC Policy Evaluation Project Four-Country Survey showed similar findings.[46] Data on a US subsample (N=2028) of current cigarette smokers found that only n=210 (10%) could name a product using an unaided recall measure when asked about brands for products marketed as less harmful. Yet, Quest was by far the most common brand named among smokers (26%).[46]

An experimental study among adult current cigarette smokers by Lochbuehler *et al* tested the effects of manipulating cigarette pack colour content within an RNC Quest advertisement.[43] Results found that exposure to red packaging was not associated with greater recall of warning label content. Yet, Johnson *et al* tested the same advertisements within an online sample of young adults and found exposure to red packaging was associated with greater recall of the advertisement content.[47]

Public health features

The same Lochbuehler *et al* study found that exposure to a text-only warning label did not increase accurate recall of the warning information.[43] However, greater attention to the warning, specifically dwell time, was associated with accurate recall of the warning content.

Subjective ratings or reactions

A total of n=10 studies assessed subjective ratings (eg, satisfaction, positive expectations) or reactions to support an RNC product standard. RNC product ratings were negative among smokers and non-smokers. This was associated with product experience and expectancies compared with conventional cigarettes. There is also support for RNCs despite different descriptions, though current cigarette smokers and other subgroups are less supportive.

Commercial features

Studies focusing on RNC product ratings indicated lower positive expectancies and satisfaction compared with conventional cigarettes.[48 49] These findings were pronounced for non-smokers in some experimental work following a brief Quest advertisement exposure.[49] Other trials indicate cigarette smokers' negative reactions are partially driven by expectations due to product descriptors (eg, 'very low nicotine').[50 51] Qualitative responses complement these findings in that exposure to red packaging (eg, signalling greater strength) in an advertisement was associated with greater interest in the product compared with blue packaging alongside scepticism about the RNC's effectiveness and value among current smokers.[47]

Public health features

Population studies indicate consumers are generally supportive of an RNC product standard.[52–55] There was support despite varied presentations of contextual information, but more so when presented with the goal of making cigarettes less addictive, having the continued availability of non-cigarette nicotine products, and preventing youth usage.[54 55] Though there is support for RNCs with these descriptors, there are differences among subgroups such that those identifying as male gender, lower age, greater smoking frequency and no intent to quit had less support overall.[52 53] Another study assessed support of RNCs to make cigarettes less addictive in the context of a blinded trial using an RNC or participants' usual cigarette brand for 6 weeks.[56] Results showed no difference by condition; those who were supportive at baseline were the same individuals found to be supportive at 6 weeks, regardless of using RNCs or how much nicotine they perceived in their cigarettes used during the trial.[56] Yet, there was less support among those with lower adherence to RNCs and greater support by older individuals or those intending to quit smoking cigarettes in the next 6 months.

Attitudes and beliefs

Attitudes and beliefs were the most common outcome measured (n=14). Specifically, risk perceptions or risk appraisals toward RNCs were the most prevalent. All studies measured global assessments of harm, some included time frames (eg, in 30 years), and all included conditional statements comparing RNCs with conventional cigarettes. Commercial exposure (eg, advertisement) and 'low nicotine' descriptors were associated with lower perceived risks. Public health features were associated with higher risk perceptions after brief exposures to various types of messaging and descriptors.

Commercial features

Adult cigarette smokers commonly perceived RNCs as less harmful than conventional cigarettes after cigarette pack or advertisement exposure.[57 58] Low perceived vulnerability and need for cognition (enjoyment thinking about complex issues) after a Quest advertisement exposure,[59] individual aspects that can influence motivation to process a message were associated with greater RNC misperceptions. Additionally, experimental work testing branding-related descriptors (eg, 'Now you can enjoy smoking without all of the Nicotine: Introducing Quest 1, 2, and 3') showed those intending to quit cigarette smoking were less likely to endorse that RNCs could help them quit smoking.[58] Participants viewing the advertisement without branding-related descriptors were more accurate in believing Quest cigarettes are not: lower in tar, less likely to cause cancer, have fewer chemicals, healthier and make smoking safer. Identifying as female, younger age, lower education, and planning to quit smoking were associated with greater uncertainty or inaccurate beliefs.

Studies using HINTS data assessed perceptions of cigarettes advertised as 'low nicotine'. The 2015 cycle showed over a quarter of individuals viewed RNCs as less harmful and addictive than conventional cigarettes.[60] There was some variation where those who were black or a former smoker viewed RNCs as more harmful. Hispanics and other races viewed RNCs as more addictive, while those with greater education levels viewed RNCs as less addictive. The HINTS data also showed foreign-born residents were more likely to perceive cigarettes advertised as 'low nicotine' to be at lower risk of causing lung cancer than a conventional cigarette compared with US born.[61] There was variation among foreign-born individuals where non-Hispanic, black and Hispanic individuals endorsed RNCs as more harmful and addictive than non-Hispanic, white individuals. Lower English proficiency was associated with endorsing RNCs as more addictive as well.

Experimental studies found no significant results of red packaging colour (vs blue) on risk beliefs directly after a brief exposure to a Quest advertisement.[43 47 58] Yet, accurate recall of advertisement content overall was shown to directly relate with favourable product beliefs.[47] Other studies testing commercial

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facing text (eg, 'very low') and numerical (eg, milligrams) nicotine descriptors were associated with lower risk perceptions toward RNC when compared with text without qualifiers and average nicotine levels, respectively.[50 62]

Public health features

Studies focused on public health features for an RNC standard indicate priming can be associated with how individuals perceive RNC's harm. For instance, in the context of a new reduced nicotine regulation mentioning the government, individuals commonly had lower risk perceptions of RNCs globally compared with conventional cigarettes.[63] However, an experimental study among cigarette smokers found phrasing about cigarettes' inability to reduce one's cravings was associated with increased harm perceptions.[64] Qualitative work among an indigenous sample showed similar findings when characterising RNCs as the best option to reduce smoker risk.[48] Other experimental studies showed increased risk perceptions after brief exposure to educational RNC messaging. This included nicotine content per cent descriptors,[65] text-only warning labels[43] and other general nicotine-focused content.[66]

Intentions

Studies (n=8) assessed intentions to use RNCs or to quit smoking. There were mixed results for intentions to use RNCs after exposure to commercial features. RNC product standard descriptors indicate individuals intend to quit smoking, use RNCs exclusively or use multiple products including RNCs. Framing also influenced those who intend to quit all tobacco products.

Commercial features

An experimental study with a convenience sample of college students found greater interest in trying Quest compared with Marlboro Light cigarettes after a brief advertisement exposure,[49] although lower odds compared with other products (eg, Eclipse, Marlboro and Marlboro Ultralight). Another experimental study among young adults found red packaging colour within a Quest advertisement was not significantly associated with RNC intentions,[47] although favourable RNC beliefs were associated with RNC intentions. Furthermore, using equivalent RNCs with descriptors 'very low' nicotine compared with 'average' nicotine were associated with greater interest in quitting smoking among adult cigarette smokers.[50]

Public health features

Public health features had mixed effects on intentions. Two national probability samples found current cigarette smokers had less interest in quitting or switching to RNCs, particularly when primed with a descriptor about a government regulation.[63 64] Bryon *et al*[63] indicated this association was more prominent for those with misperceptions of RNCs as less carcinogenic than conventional cigarettes. In contrast, another national probability sample assessed intentions to use RNCs after exposure to a similar descriptor. Results showed current cigarette smokers are likely to fall into two classes of users: (1) use of RNCs with low intentions to use other tobacco products or (2) use of multiple tobacco products, including RNCs.[67] Characteristics associated with the first class included identifying as female, higher income and less time to first cigarette. The second, smaller group was also more willing to purchase regular nicotine cigarette illegally, as shown in experimental work as well.[68] Some cross-cutting characteristics associated with the multiple product class use were lower age, less time to first cigarette and current tobacco use. Yet, a third group of individuals excluded from analyses formed a large proportion of individuals who indicated they would quit tobacco altogether.[67] Characteristics included higher education and intentions to quit smoking in the next 30 days. Other work complements these findings in that general nicotine descriptors did not affect intentions to use RNCs[66] and framing RNCs as unable to reduce cravings was associated with a higher proportion indicating they would quit all tobacco products.[64]

Behaviour

Studies (n=5) assessed the impact of commercial features on behavioural outcomes. No studies included public health features at the time of review. Population-level work indicates Quest RNC rates were relatively low. Experimental studies assessing RNCs topography show smokers did not engage in compensatory smoking in the context of marketing descriptors. Yet, advertisement and packaging exposure suggest stronger effects compared with descriptors alone.

Commercial features

Population studies assessed brand recall and subsequently measured Quest brand use. An ITC sample included two adult cigarette smokers who reported using Quest in 2003.[46] Use was relatively low in 2005 among HINTS participants (24%) as well.[45] An experimental study tested in person used of equivalent RNC cigarettes with descriptors 'very low' nicotine compared with 'average' nicotine.[50] Results showed no significant differences by condition for smoking topography, including total puff count, total puff volume and interpuff interval. Another trial tested cigarette descriptors labelled 'usual', 'low' and 'very low' nicotine while participants were blinded to smoking their preferred brand.[51] A subset (n=25) completed topography measures and results indicated a lower mean puff volume for cigarettes labelled 'low' nicotine compared with the 'usual' condition. Both results show initial patterns that individuals did not engage in compensatory smoking following marketing descriptor exposure.

An experimental study[57] of adult smokers assessed self-reported behaviour (validated by spent filter collection) and total puff volume over a 10-day period following a Quest advertisement exposure. RNC misperceptions (eg, less likely to cause cancer, healthier) after seeing a Quest advertisement were associated with increased RNC use among those with positive subjective product evaluations (eg, strength and taste dimensions). Participants with average taste product ratings had lower puff volume if they reported greater misperceptions. This provides initial evidence of potential indirect effects, such that misperceptions after exposure to branding and favourable subjective ratings of RNCs can increase product use.

DISCUSSION

We reviewed the existing literature to determine how individuals respond to RNC marketing features to anticipate potential industry actions and public health responses should an RNC product standard be implemented. Most studies focused on current cigarette smokers and were cross-sectional. Reactions to RNCs and attitudes and beliefs were the most common outcomes measured, and attention, recall, and behaviour were the least common. No studies included all the outcomes and only two included both commercial and public health marketing features.[43 48] Prevalent commercial features included general advertisements, packaging or RNC descriptors. Prevalent public health features included counter-messaging using warning labels

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or general descriptors about RNCs, nicotine or a reduced nicotine product standard.

We hypothesised commercial features would be associated with favourable responses toward RNCs, including increased attention and recall, positive reactions and attitudes, intentions to use and increased behaviour. Our hypotheses were generally supported, though reactions to commercial features were not as positive as anticipated and behavioural outcomes varied between population level and lab-based studies. Results suggest there may be potential gradation or dose–response effects such that commercial descriptors alone are less potent than a full advertisement and the interaction of several features could enhance (eg, colour) or diminish (eg, warnings) their effects, especially among young people. There were also differences between current smokers and non-smokers. Our findings indicate smokers were more engaged with commercial marketing features but were more critical of RNC products than non-smokers. This shows careful attention to balancing marketing features is likely needed to effectively communicate RNC risks and benefits depending on the subgroup and the desired outcome (eg, cessation, harm reduction, no initiation).

We also hypothesised public health features would be associated with less favourable responses to RNCs. Our hypotheses had mixed results in that features did not consistently predict outcomes, either primarily discouraging RNC interest or having null effects. Notably, some features (eg, warning labels) were indirect in addressing nicotine risks and therefore less congruent with the marketing claims. There were also differences by smoking status. Current cigarette smokers paid attention to and recalled commercial features more than non-smokers, but both groups were less affected by public health features overall. When framing was incorporated, messaging was processed in a way that increased risk perceptions and intentions to quit all tobacco products. Yet, commercial exposure generally encouraged false beliefs and overshadowed public health features in the limited work studying both features. Modified risk claims from 22nd Century's RNC cigarette application and electronic cigarettes show relative risk statements (eg, '95% less nicotine') can be misunderstood due to potential cognitive biases and heuristics.[25 69] Therefore, correcting misperceptions should be a central focus if RNCs re-enter the market or when a standard is implemented. This could include testing nicotine-focused messaging, more potent messages (eg, pictorial warnings) and/or targeted educational campaigns. Furthermore, there was a dearth of information at both tails of the measures (eg, attention/recall and behaviour). To enhance the capacity for predicting corrected misperceptions and their impact, research should collect a range of constructs when aiming to strengthen public health features.

Results indicated that in light of an RNC product standard, current smokers would react by either discontinuing tobacco use, using RNCs only or using multiple tobacco products including RNCs. Importantly, current smokers not intending to quit were more critical of RNCs and indicated greater willingness to illicitly obtain regular nicotine cigarettes. Groups have outlined what an RNC product standard could entail[6 70 71] and recommend RNCs be one of multiple nicotine products available, while stressing a need to study RNC marketing features in relation to other products (eg, combustible, heated, non-combustible) to better predict how RNCs would fare in a diverse marketplace. Provided a standard could make RNCs and some combustible tobacco products equivalent with regard to their nicotine level and that consumers indicate less satisfaction with RNC products to date, companies are sure to rely on effective marketing features (eg, colourful visuals, descriptors) to compete for customers. Therefore, focusing on nicotine-related messaging and comparisons of one or more products with different marketing features (eg, descriptors, colour, flavours, size) is warranted. Given the proposed product standard would level the playing field with respect to nicotine content, using marketing to make an RNC brand more appealing than a competitor, or assuage the impact of an RNC product standard, makes RNC marketing features a timely and significant issue to critically examine prospectively.

There are limitations to the current review. First, the included studies were heterogeneous testing different research questions, using different measures, with different designs and sample sizes. As a result, we provided equal value, qualitatively, in how we described and broadly categorised each type of marketing feature from studies among a limited number of authors. Quantitative assessment of the literature with more narrow hypotheses among similar designs is an important area for future work. Furthermore, many features were broadly described based on what was available within each article. This limits the inferences to the features as outlined. We only focused on studies in PubMed and excluded studies focused on excise taxes. Price is a prominent marketing feature with a strong influence on behaviour, but we focused on aspects under FDA's regulatory authority. Other contextual factors and theoretical constructs (eg, self-efficacy, social norms) may be important to consider, including features not specific to nicotine (eg, tar). Future reviews could expand the criterion to compare and contrast content.

This systematic review contributes a better understanding for types of RNC marketing features associated with individual message processing outcomes. Overall, RNC commercial exposure was associated with favourable responses toward RNCs. Public health features appeared to offset favourable responses, though their efficacy is currently mixed. RNC commercial marketing may need descriptor restrictions, though previous studies of banned cigarette descriptors (eg, 'light', 'mild') suggest that individuals may not notice their removal.[72] Careful attention to an informative first impression is critical to enabling an RNC product standard that will progress public health. Finding the appropriate balance entails rigorous testing of the interaction between various types of commercial features while also educating consumers with compelling public health features that accurately convey RNC risks. With over 4000 results, less than 30 articles were eligible for review on RNC marketing features, illustrating the significant need for future research in

What this paper adds

⇒ Previous review show RNC use reduces exposure to nicotine, can be associated with cessation in controlled studies, and adult smokers and non-smokers are generally supportive of a RNC product standard and perceive RNCs as less risky than conventional cigarettes. Previous reviews did not systematically extract details pertaining to marketing.

⇒ This systematic review found that for public health features, articles studied counter-messaging (eg, warning labels) or general descriptors about nicotine or a reduced nicotine product standard. Commercial features were generally associated with favourable responses. Public health features offset favourable responses across most outcomes, though their efficacy was mixed.

⇒ With over 4,000 results, less than 30 articles were eligible for review on RNC marketing features, illustrating the significant need for future research in this area.

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this area.[73] This could include longitudinal studies using cross-cutting methodologies, focusing on systematically disadvantaged populations and diverse contexts, as well as studying causal mechanisms. Such findings should be considered alongside the potential compounding effects of implementing multiple policies (eg, pictorial warnings, menthol ban, plain packaging). Though additional work is needed to better understand the impact of marketing features, the benefits of an RNC product standard to reduce nicotine to non-addictive levels should outweigh delay of its implementation in order to reduce the burden of cigarette use on the population.

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SUPPLEMENTAL MATERIALS

1. Search Terms

Topic	General Terms	Search Field Terms
Reduced nicotine product	Reduced nicotine, reduced exposure	(reduced nicotine[tiab] OR RNC[tiab] nicotine reduction[tiab] OR reducing nicotine[tiab] OR low nicotine[tiab] OR very low nicotine[tiab] OR VLNC[tiab] OR lower nicotine[tiab] OR less nicotine[tiab] OR remov* nicotine[tiab] OR nicotine content[tiab] OR reduced exposure[tiab] OR reduced-exposure[tiab] OR reduced exposure products[tiab] OR reduced exposure tobacco products[tiab] OR PREP[tiab] OR PREPs[tiab] OR MRTP[tiab] OR modified risk[tiab] OR denicotin*[tiab] OR zero nicotine[tiab] OR nonnicotine[tiab] OR nicotine free[tiab] OR nicotine regulation[tiab] OR regulation of nicotine[tiab] OR Quest[tiab] OR nicotine[mesh] OR harm reduction[mesh] OR risk reduction behavior[mesh] OR smoking reduction[mesh])
Cigarettes	Cigarettes, combustible tobacco product, cigarette smoking	**AND** (cigar*[tiab] OR combustible*[tiab] OR smoking[mesh] OR tobacco products[mesh] OR cigarette smoking[mesh])

Topic	General Terms	Search Field Terms
Marketing Features	4Ps - Promotion, Product, Price, and Placement	**AND** (communication*[tiab] OR communicate*[tiab] OR market*[tiab] OR ad[tiab] OR ads[tiab] OR advertis*[tiab] OR promotion*[tiab] OR brand*[tiab] OR pack*[tiab] OR price[tiab] OR claim[tiab] OR descriptor[tiab] OR display[tiab] OR sale[tiab] OR discount[tiab] OR position[tiab] OR placement[tiab] OR sign[tiab] OR media[tiab] OR point of sale[tiab] OR internet[tiab] OR online[tiab] OR print[tiab] OR television[tiab] OR radio[tiab] OR warning[tiab] OR messag*[tiab] OR counter*[tiab] OR campaign[tiab] OR education[tiab] OR marketing[mesh] OR consumer*[mesh] OR product packaging[mesh] OR health communication[mesh] OR communication[mesh] OR health education[mesh])
Language	English only	**AND** (eng[Language])

Note. We aimed for parsimonious terms where possible, particularly when accounting for MESH terms, by using the highest hierarchical term. For instance, "cigarettes" is a subheading within "tobacco products," so we included the latter MESH term.

2. Feature Descriptions

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
1	Bolcic-Jankovic, Dragana; Biener, Lois	2015	934	Non-experimental	Cross-sectional	Nonsmokers and current smokers	n/a	n/a	n/a	General	Descriptor	Nicotine is the substance in cigarettes that makes people get addicted to smoking. The FDA has the authority to reduce the amount of nicotine in cigarettes to a very low level.
2	Byron, M. Justin; Hall, Marissa G.; King, Jessica L.; Ribisl, Kurt M.; Brewer, Noel T.	2019	1353	Randomized Experiment	Cross-sectional	Nonsmokers and current smokers	n/a	n/a	n/a	General	Descriptor	(1) concise language; (2) a percentage; (3) an interpretation; (4) a percentage and interpretation; (5) a percentage and a pictograph; or (6) a percentage, interpretation, and pictograph; or to a control description using (7) FDA's “minimally or nonaddictive” phrasing
3	Byron, M. Justin; Jeong, Michelle;	2018	650	Non-experimental	Cross-sectional	Current smokers	n/a	n/a	n/a	General	Descriptor	Imagine the government required tobacco companies to

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
	Abrams, David B.; Brewer, Noel T.											remove most of the nicotine from cigarettes.
4	Chung-Hall, Janet; Fong, Geoffrey T.; Driezen, Pete; Craig, Lorraine	2018	3215	Non-experimental	Cross-sectional	Current smokers (only and dual e-cigarette users)	n/a	n/a	n/a	General	Descriptor	If you could get nicotine in products other than tobacco, would you support or oppose a law that reduced the amount of nicotine in cigarettes and tobacco, to make them less addictive?
5	Connolly, Gregory N.; Behm, Ilan; Healton, Cheryl G.; Alpert, Hillel R.	2012	1021	Non-experimental	Cross-sectional	Nonsmokers and current smokers	n/a	n/a	n/a	General	Descriptor	Do you think that the FDA should reduce nicotine in cigarettes if it would cause fewer kids to become addicted or hooked on smoking?
6	Denlinger-Apte, Rachel L.; Joel, Danielle L.; Strasser, Andrew A.; Donny, Eric C.	2017	68	Randomized Experiment	Cross-sectional	Current smokers	General	Descriptor in context of product use	The next cigarette that you will be smoking contains a very low/average nicotine level, compared to most cigarettes available in the United States.	n/a	n/a	n/a
7	Denlinger-Apte, Rachel L.; Tidey, Jennifer W.;	2019	360	Randomized Experiment	Longitudinal	Current smokers	n/a	n/a	n/a	General	Descriptor in context	Would you support or oppose a law that

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
	Koopmeiners, Joseph S.; Hatsukami, Dorothy K.; Smith, Tracy T.; Pacek, Lauren R.; McClernon, F. Joseph; Donny, Eric C.										of product use	reduced the amount of nicotine in cigarettes, to make cigarettes less addictive?
8	Fix, Brian V.; O'Connor, Richard J.; Fong, Geoffrey T.; Borland, Ron; Cummings, K. M.; Hyland, Andrew	2011	678	Non-experimental	Cross-sectional	Current smokers	n/a	n/a	n/a	General	Descriptor	If nicotine was made easily available in non-cigarette form, would you support or oppose a law that reduced the amount of nicotine in cigarettes, to make cigarettes less addictive?
9	Fraser, Trish; Kira, Anette	2017	21	Quasi-Experimental	Longitudinal	Current smokers	Pack, Product	General	Branding	General	Descriptor	Lead researcher informed the participants of the potential benefits of VLNC cigarettes and a mandated VLNC cigarette-only policy, such as prevention of addiction to nicotine, reduction of tobacco dependence leading to increased quitting smoking and that a VLNC cigarette-only

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
												policy might be the best policy option for VLNC cigarettes as it reduces the risk of smokers smoking both low and HNC cigarettes.
10	Gallopel-Morvan, Karine; Moodie, Crawford; Hammond, David; Eker, Figen; Beguinot, Emmanuelle; Martinet, Yves	2011	836	Non-experimental	Cross-sectional	Nonsmokers and current smokers	General	Descriptor	0.8mg vs. 0.9mg	n/a	n/a	n/a
11	Hall, Marissa G.; Byron, Justin M.; Brewer, Noel T.; Noar, Seth M.; Ribisl, Kurt M.	2019	1712	Randomized Experiment	Cross-sectional	Current smokers	n/a	n/a	n/a	General	Descriptor	Imagine a new law requiring tobacco companies to remove 95% of the nicotine in cigarettes. Stores could legally sell only these new very low nicotine cigarettes, but not cigarettes that have regular amounts of nicotine.
12	Johnson, Andrea C.; Mays, Darren; Villanti, Andrea C.; Niaura, Raymond S.; Rehberg, Kathryn; Phan,	2019	426	Randomized Experiment	Cross-sectional	Current smokers	Ad	Pack color	Blue v. red package color for implicit risk	n/a	n/a	n/a

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
	Lilianna; Mercincavage, Melissa; Luta, George; Strasser, Andrew A.											
13	Lochbuehler, Kirsten; Tang, Kathy Z.; Souprountchouk, Valentina; Campetti, Dana; Cappella, Joseph N.; Kozlowski, Lynn T.; Strasser, Andrew A.	2016	203	Randomized Experiment	Cross-sectional	Current smokers	Ad	Pack color	Blue (inaccurate) v. red (accurate) packaging color for implicit risk	Counter-messaging	Warning	Text-only warnings (e.g., Not intended for quitting; Pregnant women Surgeon General)
14	Mercincavage, Melissa; Saddleson, Megan L.; Gup, Emily; Halstead, Angela; Mays, Darren; Strasser, Andrew A.	2017	77	Randomized Experiment	Longitudinal	Current smokers	Ad, Product	General	Branding	n/a	n/a	n/a
15	Mercincavage, Melissa; Smyth, Joshua M.; Strasser, Andrew A.; Branstetter, Steven A.	2016	36	Randomized Experiment	Longitudinal	Current smokers	General	Descriptor in context of product use	The cigarette you are smoking contains: (1) "…the same level of nicotine as your usual brand. (2) "…a low level of nicotine compared to your usual brand. (3) "…a very low level of nicotine compared to your usual brand."	n/a	n/a	n/a

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
16	Nguyen, Anh B.; Zhao, Xiaoquan; Hoffman, Leah; Morse, Aura Lee; Delahanty, Janine	2018	5474	Non-experimental	Cross-sectional	Non, Current, and Former smokers	General	Descriptor	Rated whether a cigarette advertised as "low nicotine": (1) be more or less harmful than a typical cigarette; (2) have lower or higher risk of causing lung cancer than a typical cigarette; (3) be more or less addictive than a typical cigarette	n/a	n/a	n/a
17	O'Brien, Erin Keely; Nguyen, Anh B.; Persoskie, Alexander; Hoffman, Allison C.	2017	3738	Non-experimental	Cross-sectional	Non, Current, and Former smokers	General	Descriptor	Rated whether a cigarette advertised as "low nicotine" would be more or less harmful/addictive than a typical cigarette	n/a	n/a	n/a
18	O'Connor, Richard J.; Ashare, Rebecca L.; Fix, Brian V.; Hawk, Larry W.; Cummings, K. Michael; Schmidt, William C.	2007	424	Quasi-Experimental	Cross-sectional	Current smokers, Susceptible and Non-susceptible nonsmokers	Ad	General	Branding	n/a	n/a	n/a
19	O'Connor, Richard J.; Hyland, Andrew; Giovino, Gary A.;	2005	2028	Non-experimental	Cross-sectional	Current smokers	Product	General	Tobacco companies are developing new types of cigarettes or	n/a	n/a	n/a

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
	Fong, Geoffrey T.; Cummings, K. Michael								cigarette-like products that are supposed to be less harmful than ordinary cigarettes. Have you heard of such products? If yes, unaided recall of product brands.			
20	Parascandola, Mark; Augustson, Erik; O'Connell, Mary E.; Marcus, Stephen	2009	5586	Non-experimental	Cross-sectional	Current and Former smokers	Product	General	Have you heard of the following products: Quest	n/a	n/a	n/a
21	Parascandola, Mark; Hurd, Ami L.; Augustson, Erik	2008	9736	Non-experimental	Cross-sectional	Non, Current, and Former smokers	Product	General	Have you heard of the following products: Quest	n/a	n/a	n/a
22	Patel, Minal; Cuccia, Alison F.; Czaplicki, Lauren; Donovan, Emily M.; Simard, Bethany; Pitzer, Lindsay; Hair, Elizabeth C.; Schillo, Barbara A.; Vallone, Donna M.	2019	917	Non-experimental	Cross-sectional	Current smokers	n/a	n/a	n/a	General	Descriptor	The federal government may require tobacco companies to significantly reduce the level of nicotine in cigarettes.
23	Popova, Lucy; Owusu, Daniel; Nyman, Amy L.; Weaver, Scott R.;	2019	1185	Randomized Experiment	Cross-sectional	Current smokers	n/a	n/a	n/a	General	Descriptor	What would you most likely do if [FRAMING]?" where

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
	Yang, Bo; Huang, Jidong; Ashley, David L.											the FRAMING was (1) “nicotine levels were reduced by 95% in all cigarettes for sale”; (2) “the government reduced nicotine levels by 95% in all cigarettes for sale”; (3) “all cigarettes for sale were changed so that they were no longer addictive”; (4) “all cigarettes for sale were changed so that they no longer relieved your cravings”; or (5) “all cigarettes for sale were changed so that you would be able to quit more easily?
24	Shadel, William G.; Lerman, Caryn; Cappella, Joseph; Strasser, Andrew A.; Pinto, Angela; Hornik, Robert	2006	200	Quasi-Experimental	Cross-sectional	Current smokers	Ad	General	Branding	n/a	n/a	n/a

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
25	Strasser, A. A.; Tang, K. Z.; Tuller, M. D.; Cappella, J. N.	2008	500	Randomized Experiment	Cross-sectional	Current smokers	Ad	Descriptor/ Pack color	Text v. no text ad, red v. blue pack color; All conditions showed pack branding and "low nicotine," "extra low nicotine," and "nicotine free"	n/a	n/a	n/a
26	Villanti, Andrea C.; West, Julia C.; Mays, Darren; Donny, Eric C.; Cappella, Joseph N.; Strasser, Andrew A.	2019	521	Randomized Experiment	Cross-sectional	Past 30−day tobacco users and non-past 30-day tobacco users	n/a	n/a	n/a	General	Descriptor	(1) nicotine is the addictive substance in tobacco products, (2) nicotine makes it easier for people to start smoking regularly, (3) nicotine makes it harder for people to quit smoking, (4) nicotine does not cause cancer, (5) chemicals in cigarette smoke, not nicotine, largely cause cancer, heart disease, and other health problems related to smoking, and (6) nicotine can be used safely long-term

ID	Authors	Year	Sample Size	Type	Data Collection Type	Smoking Status	Commercial Exposure Medium	Commercial Exposure Feature	Commercial Exposure Detail	Public Health Exposure Medium	Public Health Exposure Feature	Public Health Exposure Detail
												in quit smoking products like nicotine patches, gum, or lozenges.

3. Results Summary

	Message Processing Outcomes					
Message Features	**Attention**	**Recall**	**Subjective Ratings or Reactions**	**Attitudes & Beliefs**	**Intentions**	**Behavior**
Commercial						
Product/Ad/Pack		Parascandola, 2008 ↓ Parascandola, 2009 ↓ O'Connor, 2005 ↑	O'Connor, 2007 ↓ Fraser, 2017 ↓	Mercincavage, 2017 ↓ Shadel, 2006 ↓ Strasser, 2008 ↓	O'Connor, 2007 ↑	O'Connor, 2005 ↓ Parascandola, 2009 ↓ Mercincavage, 2017 ↑↓
Color	Lochbuehler, 2016 ↑	Johnson, 2019 ↑ Lochbuehler, 2016 NS	Johnson, 2019 ↑	Johnson, 2019 NS Lochbuehler, 2016 NS Strasser, 2008 NS	Johnson, 2019 NS	
Descriptor			Denlinger-Apte, 2017 ↓ Mercincavage, 2016 ↓	Denlinger-Apte, 2017 ↓ Gallopel-Morvan, 2010 ↓ O'Brien, 2017 ↓ Nguyen, 2018 ↓ Strasser, 2008 ↓	Denlinger-Apte, 2017 ↓	Denlinger-Apte, 2017 NS Mercincavage, 2016 ↓
Public health						
General			Bolcic-Ja, 2015 ↑ Connolly, 2012 ↑ Chung-Hall, 2018 ↑ Fix, 2011 ↑ Denlinger-Apte, 2019 ↑↓	Byron, 2018 ↓ Byron, 2019 ↑ Popova, 2019 ↑ Villanti, 2019 ↑ Fraser, 2017 ↑	Byron, 2018 ↓ Popova, 2019 ↑↓ Hall, 2019 ↑ Patel, 2019 ↑↓ Villanti, 2019 NS	
Warning Label	Lochbuehler, 2016 NS	Lochbuehler, 2016 NS		Lochbuehler, 2016 ↑		

NS = Not significant; ↑ = associated with an increased outcome; ↓ associated with a decreased outcome. Studies include different outcome targets, methodologies, and designs. Outcome directions are generally associated with greater attention and recall, positive subjective ratings and reactions, positive attitudes and beliefs, increased use intentions, and increased RNC behavior.