

**Clearing the Air: Combating Vaping Misinformation Through Tailored Communication
Strategies**

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Abstract

This study investigates the effectiveness of tailored communication strategies in debunking the myth that e-cigarettes do not contain nicotine. The research aims to determine whether messages tailored to individuals' levels of agreeableness can reduce belief in vaping misinformation among smokers and non-smokers. Participants completed an online questionnaire assessing their smoking behaviour and agreeableness before being exposed to either a tailored or counter-tailored message about e-cigarettes. Following the intervention, participants re-evaluated their beliefs regarding the nicotine content in e-cigarettes. Results indicated that while the type of message significantly influenced beliefs, smoking status did not have a significant effect. Counter-tailored messages were generally more effective than tailored ones, regardless of smoking status. The findings suggest that messages tailored to agreeableness did not produce the expected differential effects based on smoking status. Further research is recommended to explore the long-term effects of tailored messages and the interaction of multiple personality traits in health communication.

Introduction

In recent years, e-cigarettes have gathered more and more popularity, as it has been marketed as a much safer alternative to regular tobacco cigarettes. Their perceived lesser health risk and the unimaginable number of different flavours have made this a very sought-after product. One of the myths that have been circling is that e-cigarettes do not contain nicotine. The Centre for Disease Control and Prevention, which is the national public health agency of the United States, states on their site that approximately two-thirds of young people aged 15 – 24 who use JUULs, a specific brand of e-cigarettes, do not know that JUULs always contain nicotine (Quick Facts on the Risks of E-cigarettes for Young People, 2024). This is supported by a study by Wagoner et al. (2020), which specifies this number to 63%. This widespread confusion endangers consumers' realization of the potential health risks associated with the use of e-cigarettes, as many e-cigarettes and vapes do, in fact, contain nicotine, a highly addictive ingredient that can cause significant health problems (Mishra et al., 2015). This misconception not only conceals the true exposure to nicotine while using e-cigarettes, but it also threatens public health and academic efforts that have been made in the field of nicotine addiction awareness and associated health risks. Therefore, discovering approaches to successfully intervene and adjust wrong beliefs is crucial, as belief in misinformation can lead to users' decisions that can turn out to be dangerous.

In a cross-sectional study by Pinho-Gomes et al. (2023), participants' survey answers show that perceiving e-cigarettes as harmful was associated with a 40% lower likelihood of using e-cigarettes. However, frequently, users do not fully understand the risks of the product. Twelve percent of the participants of the National Youth Tobacco Survey in the US from 2022 answered they 'did not know' when they were asked if any of the e-cigarettes that they used in the past 30 days contained nicotine (Historical NYTS Data and Documentation | CDC, n.d.). People often misunderstand that e-cigarettes contain nicotine, leading to continued use despite health risks. Accurate information needs to be widely shared. Correcting this misconception is crucial due to nicotine's negative health impacts, including cardiovascular, respiratory, and gastrointestinal issues, decreased immune response, reproductive health problems, and potential DNA mutations causing cancer (Mishra et al. 2015). Nicotine poses serious health risks and is highly addictive. For young adults, who often use e-cigarettes, vaping can lead to regular tobacco use and increased nicotine dependency (Chatterjee et al., 2016; Schneider & Uter, 2015).

Therefore, correcting misinformation about e-cigarettes is vital for both smokers and

non-smokers. For smokers, e-cigarettes are often seen as a practical cessation tool to help them quit smoking tobacco (Ghosh & Drummond, 2016). Misinformation about e-cigarettes' safety and ingredients can lead to new nicotine dependencies rather than cessation. Non-smokers, especially young adults, may start using e-cigarettes believing they are nicotine-free, unaware of the health risks. This confusion undermines anti-smoking campaigns and complicates policymaking, which depends on accurate information. Debunking e-cigarette myths is essential for informed choices and effective health policies.

Theory

In the field of health communication, the fight against misinformation remains a challenge, especially for controversial topics such as vaping and e-cigarettes. For example, Sidani et al. (2022) discuss the prevalence of potential misinformation related to Electronic Nicotine Delivery Systems (ENDS) on Twitter, where approximately 40% of tweets about nicotine or addiction concerning ENDS were identified as containing potential misinformation.

Existing false beliefs in health communication can be debunked by labelling misinformation as false and providing accurate information (Kessler & Bachmann, 2022). A meta-analysis by Chan et al. (2017) showed that debunking is more effective when misinformation is corrected with accurate information, rather than just labelled false. Interventions combining both elements can change beliefs successfully (Svenson et al., 2021; Jin et al., 2022). Svenson et al. (2021) found that smokers exposed to accurate information about e-cigarettes had more accurate beliefs and were more likely to plan to quit smoking than those exposed to misinformation or no information. Jin et al. (2022) demonstrated that an 'information shock,' such as the FDA's health warning on e-cigarettes, lowered risk perceptions and increased vaping and smoking cessation. These studies illustrate that debunking misinformation with accurate information is effective. However, to further improve the approach, considering tailored interventions might be beneficial.

In this context, tailored messaging is defined as the practice of 'fitting' the message to the targeted individual, based on their personal beliefs, behaviours, or demographic factors (Schmid et al., 2008). This customization increases the message's relevance, engagement, and persuasion for the receiver when it is tailored to their personal preferences. Tailoring is different from targeting in such a way that tailored messages are focussed on the individual characteristics of the person that is trying to be reached, whereas targeting tries to group

people and targets them based on shared characteristics (Kreuter and Skinner, 2000). These tailored interventions are shown to have a positive impact on the effectiveness of the intervention (Hawkins et al., 2008; Kreuter and Wray, 2003; Schmid et al., 2008). Schmid et al. (2008) conducted a series of experiments, in which the effectiveness of tailored messages based on four types of information processing styles is measured. First, participants completed a brief survey in which their preferred information processing style was determined after which they were randomly assigned to receive either a message tailored to their preferred processing style or a message that was not tailored to their preferred style. Follow-up interviews showed that tailored compatible messages were generally more persuasive than incompatible messages in affecting behavioural change.

Hirsh et al. (2012) explores how tailoring persuasive messages to individuals' personality traits can enhance their effectiveness. The researchers focused on the Big Five Inventory personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) and crafted messages to align with these traits. The study found that personalized messages were more effective in changing attitudes and behaviours compared to non-tailored messages, demonstrating the importance of considering individual differences in persuasive communication.

These studies imply that by adapting the tailored intervention to fit the individual's beliefs, values, and personality traits, the message becomes more than just a stated fact; it becomes a persuasive communication strategy congruent with their personal experiences and view of the world. The theory that personalised messaging can contribute to fighting vaping disinformation is based on persuasion and communication models, which state that message processing is influenced by individual attributes as well as the message's contextual framing.

One of these communication theories is the Elaboration Likelihood Model (ELM). This model sheds light on this variation in message processing, positing that an individual's motivation and ability to comprehend a message—both of which are influenced by personality traits—determine the processing route (central vs. peripheral) and, ultimately, the message's persuasive effectiveness. The central route involves deep, thoughtful processing of message content, leading to more durable attitude change. This route is most effective when the audience is motivated and able to process the message. Tailored messaging engages the central route by making the content highly relevant to the individual's beliefs, values, and needs. Therefore, in addressing the myth that vapes do not contain nicotine, a message tailored to a recipient's health concerns (e.g., the risk of nicotine addiction) encourages the central processing route, which will lead to more thoughtful engagement and acceptance of

the message.

Consider a campaign aimed at encouraging smokers to quit smoking by highlighting the benefits of quitting for personal relationships. A generic anti-smoking message might stress the general health risks of smoking and the benefits of quitting, which is relevant to all smokers but not tailored. In contrast, a tailored message could be designed for a smoker who is a parent and deeply cares about their children's well-being. This message might focus on how quitting smoking can improve their children's health by reducing their exposure to second-hand smoke and setting a positive example for them. It could include testimonials from other parents who successfully quit and noticed significant improvements in their family's health and happiness. By specifically addressing the smoker's role as a parent and their concern for their children's health, the message becomes highly relevant and personally meaningful. This tailored approach engages the central processing route, as the content directly resonates with the smoker's personal values and responsibilities. As a result, the smoker is more likely to deeply process the message, leading to a more thoughtful consideration of quitting and a greater likelihood of a lasting attitude change toward smoking.

This example shows how tailoring a message to an individual's specific context and values can make the information more engaging and effective, promoting a deeper and more sustained change in behaviour. This approach ensures that the corrective information is not only processed more deeply but is also more likely to result in a lasting change in attitudes toward vaping as the central processing route leads to a more long-lasting attitude change.

In this study, the participants were exposed to a stimulus, a is message that was tailored to fit the characteristics of smokers, in order to increase the effectiveness of the intervention that is debunking the myth. The messages will be tailored based on the factor of agreeableness since this is a characteristic that has been shown to be different between smokers and non-smokers. Agreeableness is one of the five dimensions of the widely known Big Five five-factor model of personality. It is defined as a “prosocial and communal orientation towards others with antagonism and includes traits such as altruism, tender-mindedness, trust, and modesty” (John & Srivastava, 1999, p.121). This means that the individual is very much inclined to act in such a way that it is beneficial to others, without expecting any personal gain. This includes helping others and selfless actions such as donating to charity (John & Srivastava, 1999). Individuals high in agreeableness are more likely to value social cohesion and kindness (Rothmann & Coetzer, 2003).

Studies have shown that smokers on average score lower on the scale of agreeableness compared to non-smokers (Aboelsaad et al., 2022; Mai et al., 2022; Malouff et al., 2006;

Terraccino & Costa, 2004). Terraccino & Costa (2004) conducted a cross-sectional survey of 1638 American participants which shows that current-smokers scored lower on agreeableness than never-smokers. Malouff et al. (2006) conducted a meta-analysis based on nine different studies that included a total of 4,730 participants which again pointed out that smoking was associated with lower levels of agreeableness. This contrast in personality traits suggests that smokers hold other values than non-smokers and would thus respond differently to different messages since other types of persuasive strategies would appeal to them, especially when these are tailored in some way. This shows us that we can tailor towards smokers by adjusting the message in such a way that it appeals more to individuals with lower levels of agreeableness.

For individuals lower in agreeableness, which research suggests includes a higher proportion of smokers compared to non-smokers, a specific approach is required. These individuals might respond better to messages that focus on direct, personal benefits or consequences and explicit straightforward facts rather than emotional or communal appeals (Bartneck et al., 2007; Hughes, 2020; Jensen, 2016). Particularly, Jensen's (2016) study that included over 300 students concluded that individuals with higher levels of agreeableness favour an indirect, implicit, and nonverbal communication style. This suggests that individuals low in agreeableness prefer a direct, explicit communication style. Jensen also states that lower levels of agreeableness are less relationship-oriented and more self-centred and self-beneficial, which is supported by Bartneck et al. (2007). Therefore, tailoring messages to account for lower levels of agreeableness in smokers could involve highlighting the individualistic properties of the message, presenting clear and explicit arguments against vaping in a direct and concise way, and avoiding appeals to social harmony or selflessness that may be more persuasive to those higher in agreeableness. Highlighting the personal relevance of the message in an explicit and blunt manner might be the most effective way to tailor to individuals that are low in agreeableness.

Regarding the visual properties of the message, Jue and Ha (2022) investigate the relationship between personality traits and colour preferences among 854 Korean adults, utilizing the Ten Item Personality Inventory and colour rankings. The findings suggest that each of the Big Five personality traits correlates with specific colour preferences, indicating that personality can significantly predict colour preference. Notably, agreeableness was found to negatively correlate with a preference for the colours red, grey, and black, which means that individuals low in agreeableness do prefer these colours. These insights are valuable for designing targeted interventions for smokers, who tend to score lower in agreeableness.

The combination of tailored interventions and debunking strategies, specifically with the added value of an understanding of personality traits like agreeableness, offers a new way to combat misinformation regarding e-cigarettes. Based on behaviour theories like the Elaboration Likelihood Model (ELM), this method shows promise for influencing health behaviours. The literature is promising regarding tailoring based on personal characteristics of the BFI, yet there is a noticeable gap in the research: we don't have much evidence on how the differences in agreeableness between smokers and non-smokers might affect the success of these interventions against misinformation about e-cigarettes. Our study looks to fill this gap by examining if tailoring messages to those with lower levels of agreeableness could make our health communication strategies more effective.

Our Study

Previous research has investigated the general efficiency of tailoring messages and debunking myths in health communication, however, the specific effect of adding personal characteristics like agreeableness to the equation to influence the processing of the intervention remains unclear. Individual levels of agreeableness may have a significant effect on how smokers and non-smokers process and are persuaded by health-related messages. Nevertheless, there is still a research gap regarding tailored interventions based on agreeableness to reduce belief in misinformation. Addressing this gap could positively influence the efficiency and effectiveness of public health campaigns by correcting the misinformation while also speaking to the individual on a personal level due to which the belief is permanently changed.

This results in the following research question:

"Does a message tailored to agreeableness reduce belief in misinformation about e-cigarettes among smokers and non-smokers?"

This question seeks to detect whether the personalisation based on the agreeableness of the participants improves the effectiveness of the intervention that aims at debunking myths related to e-cigarettes, especially the myth that e-cigarettes do not contain nicotine.

Hypotheses:

- H1: The effect of tailoring on belief in the vaping myth depends on smoking status. This hypothesis suggests that there is a significant difference in belief in the myth between the smoker and the non-smoker group.
- H2: The belief in the myth is lower for smokers who were exposed to the tailored intervention, and this is not the case for non-smokers. This hypothesis suggests that

the tailoring of an intervention which aligns with the individual's level of agreeableness is more persuasive for that individual to reconsider and change their belief in misinformation about e-cigarettes.

These hypotheses are based on the theory that implies that tailored interventions are more effective when aligned with specific personality traits. For smokers, who typically have lower agreeableness and higher self-centeredness, messages tailored to these traits can be more persuasive, leading to a change in belief about e-cigarettes. In contrast, non-smokers, who might not have these specific traits or the same level of personal relevance to the message, may respond better to counter-tailored messages. This suggests a difference in the impact of tailoring based on smoking status, with smokers responding better to the tailored message and non-smokers to the counter-tailored message.

Method

Materials

The first independent variable was smoking behaviour, which was measured in the questionnaire. The participants were asked about whether they smoke or vape regularly (1), smoke or vape sometimes (2), used to smoke or vape, but have not done so for at least 6 months (3), or have never smoked or vaped (4). Groups 1 and 2 were grouped together as 'smokers' and 3 and 4 as 'non-smokers'. The second independent variable was the message type. There were two different messages, a message tailored towards low levels of agreeableness (Appendix A) and a message tailored towards high levels of agreeableness (Appendix B). Both messages were based on a text from the website of the World Health Organization (Tobacco: E-cigarettes, 2024). Since we mainly want to tailor to smokers, who have low levels of agreeableness, we will call the message tailored to low agreeableness the tailored message and the message tailored to high levels of agreeableness the counter-tailored message. The tailored message emphasised the health risks to the individual (individualistic) while the counter-tailored message framed vaping as a threat to the lives of family members (collectivistic). The overall content of the message was largely applied from a study by Park and Lee (2012) which stated that a campaign against smoking could use either an individualistic appeal by including "When you smoke, you suffer... You inhale poisons... affect your heart, lungs... Take care of yourself" (p. 76) or it could utilise a collectivistic appeal by saying "When you smoke, they suffer... Your friends and family

breathe your smoke, inhaling poisons...affect their hearts, lungs...Take care of them” (p. 76).

The changes that have been made to the message to tailor it to individuals either low or high in agreeableness are displayed in Appendix C. Apart from these changes, the message was meant to remain largely unchanged to avoid introducing new variables that could affect the belief in the myth.

Subjects

The subjects that have taken part in this study were gathered through a non-random sampling method. They were gathered through convenience sampling and subsequently snowballing by every involved researcher. Our study did not impose age restrictions on participants, except for the minimum age requirement of 16 years. This age limit ensured that individuals aged 16 and older could participate in the questionnaire without the need of parental consent. Furthermore, we also did not restrict the participants by gender or educational level. A requirement for the sample was that it contained both smokers and non-smokers.

A total of 240 people participated in this study. This consisted of 73 smokers (age: $M = 25.04$, $SD = 6.01$; range 19-63; 24.7% female; 39.5% male; 31.6% high school degree; 45.0% MBO degree; 29.5% BA degree/HBO; 28.3% Master’s degree/WO; 25.0% PhD degree or higher) and 167 non-smokers (age: $M = 33.34$, $SD = 13.57$; range 16-73; 75.3% female; 60.5% male; 100% elementary school degree; 68.4% high school degree; 55.0% MBO degree; 70.5% BA degree/HBO; 71.7% Master’s degree/WO; 75.0% PhD degree or higher).

Age ($t(237.93) = -0.36$, $p = .704$), gender ($\chi^2(1) = 1.25$, $p = .264$), educational level ($\chi^2(5) = 2.27$, $p = .811$), and smoker status ($\chi^2(1) = 0.20$, $p = .888$) were equally distributed over the two conditions of message type. The exact distributions of gender, educational level, and smoker status for the type of message the participants saw are shown in tables 3, 4 and 5.

An independent samples t-test on the mean age of the participants with ‘message type’ as a between-subjects factor, did not show a difference between the participants exposed to either non-tailored or tailored message type. This difference, -0.6, 95% CI [-3.8, 2.55], was non-significant ($t(237.93) = -0.36$, $p = .704$).

Table 3*Gender Distribution for Message Type*

		Non-tailored message	Tailored message	Total
Male	Count	42a	34a	76
	%	35.9%	29.1%	32.5%
Female	Count	75a	83a	158
	%	64.1%	70.9%	67.5%

Table 4*Educational Level Distribution for Message Type*

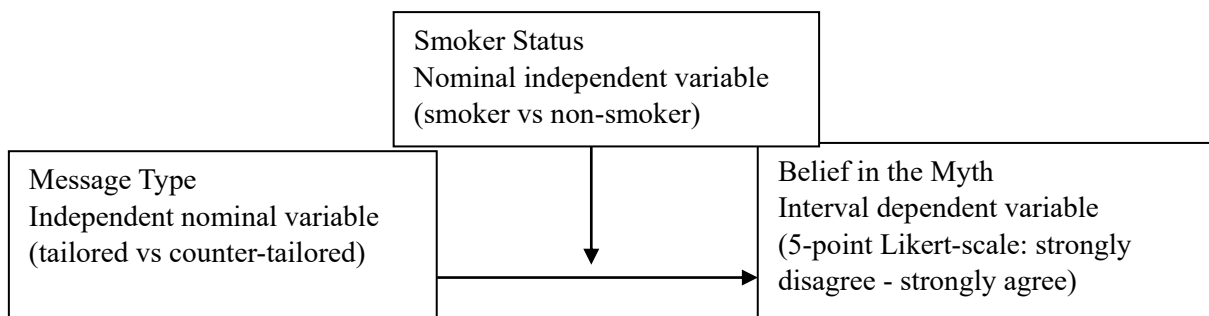
		Non-tailored message	Tailored message	Total
Elementary school	Count	1a	0a	1
	%	0.8%	0.0%	0.4%
High school	Count	11a	8a	19
	%	9.2%	6.7%	7.9%
MBO	Count	10a	10a	20
	%	8.3%	8.3%	8.3%
Bachelor's degree / HBO	Count	67a	65a	132
	%	55.8%	54.2%	55.0%
Master's degree / WO	Count	28a	32a	60
	%	23.3%	26.7%	25.0%
PhD or higher	Count	3a	5a	8
	%	2.5%	4.2%	3.3%

Table 5*Smoker Status Distribution for Message Type*

		Non-tailored message	Tailored message	Total
Smoker	Count	36a	37a	73
	%	30.0%	30.8%	30.4%
Non-smoker	Count	84a	83a	167
	%	70.0%	69.2%	69.6%

Design

The design of this study was a 2 x 2 quasi-experimental between-subjects experiment. We have used two independent variables that both had two levels. The independent variable smoking behaviour consisted of smoker and non-smoker, and the independent variable message type consisted of tailored and counter-tailored. Participants were randomly distributed to be exposed to either the tailored or counter-tailored intervention. Among the smokers, one group will receive a counter-tailored intervention, while the other group will receive an intervention specifically tailored for individuals with lower levels of agreeableness. Similarly, among the non-smokers, one group will be exposed to the counter-tailored intervention, and the other group will receive the tailored intervention.

Analytical Model

The direct arrow between message type and belief in the myth indicates the hypothesised direct effect of message type on belief in misinformation. The arrow from smoker status to the relationship between message type and belief in the myth represents its role as a moderating variable, suggesting that the effect of message type might differ based on smoking status.

Instruments

The dependent variable that was measured is belief in the myth that e-cigarettes do not contain nicotine. Research has shown that some people believe this claim is true (Quick Facts on the Risks of E-cigarettes for Young People, 2024; Wagoner et al., 2020; Historical NYTS Data and Documentation | CDC, n.d.). E-cigarettes are smoking devices that either belong to the group of ENDS's (Electronic Nicotine Delivery System) or ENNDS's (Electronic Non-Nicotine Delivery System) (Tobacco: E-cigarettes, 2024). If they are ENDS's, the devices certainly contain nicotine and even ENNDS's have been found to often contain some nicotine (Grana, 2013). Therefore, the myth that e-cigarettes do not contain nicotine is false. In this research, the belief in this myth was measured by a question. The participants were asked to indicate for how much they agreed with the statement 'E-cigarettes do not contain nicotine' on a 5-point Likert scale (strongly disagree - strongly agree). The measuring of the belief in the myth was done once before the participant was exposed to the tailored or counter-tailored message, and once after. The type of message that the participant was shown, was expected to correct participants' misbeliefs in the myth.

Additional measures

An additional measure that was investigated is agreeableness. This was done to verify the difference in agreeableness between smokers and non-smokers. Agreeableness was measured in the present study with nine statements anchored by five-point Likert scales ('completely disagree' – 'completely agree'). These statements were all based on John and Srivastava's (1999) Big Five Inventory. We have grouped these nine items together under one variable called agreeableness. The reliability of the scale comprising nine items was measured by Cronbach's α , which was acceptable: $\alpha = .71$.

Procedure

A link to the online Qualtrics questionnaire was spread among our contacts which included a direct link to the questionnaire. When participants clicked the link, they were presented a

welcome page that provided them with information about the study such as the duration of the questionnaire, which was approximately seven minutes. They were also informed with the fact that their participation is voluntary, and they can withdraw consent any time during the study. They were informed about what happens to the data we collect and who to contact if they have any questions. They were told that if they clicked the 'I agree' button, they gave their consent and wanted to participate in the study. If they did not want to participate, they clicked 'no' and were forwarded to a closing screen and were thanked for their time. If participants did want to participate, they clicked 'Yes, I agree to participate in this study' and were forwarded to the first questions about their personal smoking behaviour. They had to answer whether they smoke or vape regularly (1), smoke or vape sometimes (2), used to smoke or vape, but have not done so for at least 6 months (3), or have never smoked or vaped (4). Groups 1 and 2 were then grouped together as 'smokers' and 3 and 4 as 'non-smokers'. All participants were then exposed to the same neutral basic information about e-cigarettes to ensure everyone had the same baseline of prior knowledge. This was also to get them in the right headspace to be able to understand the intervention about e-cigarettes. Every participant was then asked to indicate for each of the ten statements about e-cigarettes how much they agree with the statement on a 5-point Likert scale (strongly disagree to strongly agree). Nine of these statements are filler items. Our experiment is only focussed on the fourth statement 'E-cigarettes do not contain nicotine.' After this, the smoker group and the non-smoker group were randomly divided between and exposed to the tailored message or the counter-tailored message. They were asked to read the information about e-cigarettes. When they were done reading the information, they had to click 'next' to access the next screen on which participants' agreeableness was measured by nine statements that each participant had to indicate on a 5-point Likert scale if they "see themselves as someone who...". Next, they were asked again to indicate for each of the same ten statements about e-cigarettes how much they agree with the statement. Again, this experiment only focuses on the answer to the fourth statement 'E-cigarettes do not contain nicotine.' After this, standard demographic questions were asked about age, gender and educational level. After all questions have been answered, participants clicked 'next' to get to the final screen where they were debriefed and explained what the study was about. They were told about the purpose of this study and that all texts were fictional and made by the researchers. Participants were thanked for their participation and informed whom they could contact in case of questions or comments.

Statistical treatment

We have conducted different statistical analyses to investigate whether a message tailored to agreeableness affects belief in misinformation about e-cigarettes among smokers and non-smokers. Firstly, to explore whether the smokers in our experiment truly did have lower agreeableness scores than the non-smokers, we conducted an independent samples t-test. This statistical test compared the average scores of agreeableness between groups of smokers and non-smokers.

Secondly, we ran an ANCOVA to evaluate how message type influences beliefs in e-cigarette myths across varying smoker statuses. This approach has adjusted for initial beliefs about e-cigarette myths by using them as a covariate, ensuring baseline levels of misinformation are accounted for. The analysis has examined the main effects of message type (tailored vs. counter-tailored) and smoking status (smoker vs. non-smoker) on individuals' beliefs in the myth after exposure. The second goal was to determine if an interaction exists between the type of message and the smoker status.

Lastly, to see if our results hold up under different circumstances, two more ANCOVAs were conducted as robustness checks. First, all outliers regarding the duration of completion of the questionnaire were excluded. Any participant that took under four minutes to complete the questionnaire must have been speeding and should therefore not be taken into account for this robustness check. Additionally, since the independent t-test showed that smoking is not correlated with agreeableness as expected, the ANCOVA was conducted again with all 240 participants, but this time discounting the participants' smoking status and instead using agreeableness (agreeable vs. non-agreeable) as an independent variable. The sample was split into two equal groups, based on the median, which resulted in one group of participants who scored high in agreeableness (agreeable) and one group who scored low in agreeableness (non-agreeable). This allowed us to investigate whether the tailoring of the messages would work when taking agreeableness as the independent variable instead of smoking status. This would imply the effectiveness of the message tailored to agreeableness, since we assumed smokers score lower on the agreeableness scale.

Results

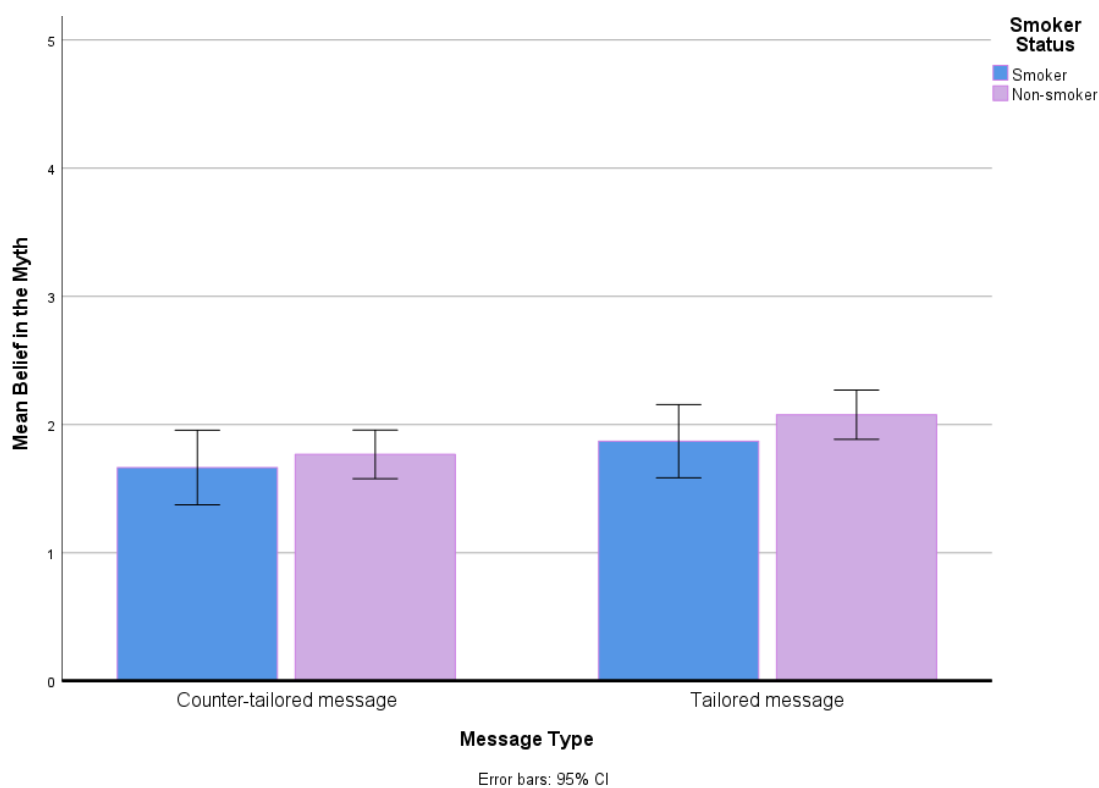
Firstly, to determine if smokers in our experiment actually had lower agreeableness scores than non-smokers, we conducted a manipulation check. This statistical test compared the

average agreeableness scores between the smoker and non-smoker groups. The independent samples t-test on agreeableness, with ‘smoker status’ as a between-subjects factor, did not show a significant difference between smokers and non-smokers. This difference, -0.1 , 95% CI $[-.23, .04]$, was not significant ($t(178.82) = -1.38, p = .169$).

Secondly, we ran an ANCOVA to evaluate how message type influences beliefs in e-cigarette myths across varying smoker statuses with prior belief as a covariate. A two-way analysis of covariance (ANCOVA) with message type and smoking status as factors showed a significant main effect of message type on belief ($F(1,235) = 4.315, p = .039, \eta^2 = .02$). As Figure 3 shows, the participants that were exposed to the counter-tailored message are shown to have a lower belief in the myth ($M = 1.68, SD = 1.029$) compared to those who saw the tailored message ($M = 2.20, SD = 1.172$). Smoking status, on the other hand, was not found to have a significant effect on belief ($F(1,235) = 1.523, p = .218$). The interaction between message type and smoking status was also not statistically significant ($F(1,236) = .177, p = .675$).

Figure 1

The Influence of Message Type on Belief in the Myth



Note. This figure shows the influence of the type of message that the participants were exposed to on the belief in the myth.

Thirdly, the scale of the covariate agreeableness was measured by grouping the nine items from the questionnaire together under one variable called agreeableness.

Additionally, it was estimated that completing the questionnaire and carefully reading the texts would take about five minutes. All researchers completed it once while carefully reading all questions and information. We concluded that any participant who took under four minutes could not have been giving an elaborate, truthful, genuine response and must have been speeding. Therefore, we repeated the ANCOVA, with the exclusion of 67 participants who took less than four minutes to complete the survey, resulting in a data base of 173 participants. The main effects of smoker status and message type on belief in the misinformation, as well as the interaction effect between smoker status and message type on belief in the misinformation, remained insignificant. However, the initial measure of 'belief in the misinformation' was shown to be a strong predictor of belief in the misinformation after exposure to the stimulus. The main effect of smoker status on belief in misinformation became insignificant ($F(1,168) < 1, p = .5$), so did the effect of message type on belief in misinformation ($F(1,168) = 1.4, p = .238$). The interaction effect also remained non-significant ($F(1,168) < 1, p = .342$).

Lastly, since the independent t-test showed that smoking is not correlated with agreeableness as expected, the ANCOVA was conducted again with all 240 participants, but this time discounting the participants' smoking status and instead using agreeableness (agreeable vs. non-agreeable) as an independent variable. The sample was split into two equal groups, based on the median, which resulted in one group of participants who scored high in agreeableness (agreeable) and one group who scored low in agreeableness (non-agreeable). The ANCOVA revealed a significant main effect of message type, ($F(1, 235) = 5.62, p = .019, \eta^2 = .023$). This indicates that belief in misinformation scores differed significantly between those who received the tailored message (agreeable: $M = 1.98, SD = 1.213$; non-agreeable: $M = 2.13, SD = 1.145$) and those who received the counter-tailored message (agreeable: $M = 1.50, SD = .960$; non-agreeable: $M = 1.85, SD = 1.069$). There was no significant main effect of agreeableness ($F(1, 235) = 1.94, p = .17$), nor was there a significant interaction effect between message type and agreeableness ($F(1, 235) < 1, p = .69$).

Discussion

In this study, we aimed to explore whether tailoring messages to individuals' levels of agreeableness could reduce belief in misinformation about e-cigarettes among smokers and non-smokers. Our research question was: "Does a message tailored to agreeableness reduce belief in misinformation about e-cigarettes among smokers and non-smokers?" The findings suggest that while the type of message significantly influenced beliefs, smoking status did not have a significant effect. Specifically, participants exposed to counter-tailored messages (designed for those with higher agreeableness) were less likely to believe in the e-cigarette myths compared to those exposed to tailored messages (designed for those with lower agreeableness). However, no significant interaction between message type and smoking status was observed. This indicates that perhaps the counter-tailored message itself was more effective than the tailored message, regardless of whether the individual is a smoker or non-smoker.

Hypothesis 1 suggested that there would be a significant difference in belief in the myth between smokers and non-smokers. Our results did not support this hypothesis. Smoker status did not have an effect on belief in the myth.

Hypothesis 2 proposed that tailored interventions would be more persuasive for smokers, leading them to reconsider and change their beliefs about e-cigarettes. However, our findings did not fully support this hypothesis either. While the type of message (counter-tailored vs. tailored) significantly influenced belief in the misinformation, this effect was observed irrespective of smoking status. The interaction effect between smoking status and message type on belief in the misinformation was found to be insignificant, indicating that the effectiveness of tailored messages in reducing belief in the vaping myth did not differ based on whether the participant was a smoker or non-smoker. Thus, both smokers and non-smokers were similarly influenced by the counter-tailored messages, contradicting the expectation that smokers would be uniquely responsive to the tailored intervention.

Possible explanation for the results

Our results indicate that tailoring messages based on smoking status does not work. However, as seen in the robustness check where a median split based on agreeableness was used, tailoring to agreeableness can effectively reduce belief in misinformation about e-cigarettes, aligning with the Elaboration Likelihood Model (ELM) which posits that personalised messages are more persuasive.

Our results suggest that tailoring messages based on smoking status alone is not

effective. This may be due to the lack of significant differences in agreeableness between smokers and non-smokers, the broadness and heterogeneity of the smoking status category, the universal appeal of counter-tailored messages or the potential misalignment in the tailored messages.

Primarily, the lack of difference in agreeableness between smokers and non-smokers should be discussed. The manipulation check regarding the degree of agreeableness between smokers and non-smokers showed no significant difference between the two groups. This result differs from previous research, which has shown that smokers on average score lower on the scale of agreeableness compared to non-smokers (Aboelsaad et al., 2022; Mai et al., 2022; Malouff et al., 2006; Terraccino & Costa, 2004). Several explanations could account for this discrepancy. Firstly, it is possible that the participants in this study were not representative of the general population. We, the researchers, are university students and have gathered participants through convenience sampling, which could explain that 82.5% of our participants have a high educational background. Highly educated individuals are proven to smoke less than individuals with lower education, which is reflected in our data (Solberg et al., 2007; Grossman, 2006). Only 25-30% of participants with a high educational background belonged to the 'smokers' group. This could explain how the sample was not equally distributed across all factors. Ideally, 50% of the participants with a high educational background would have been smokers and 50% would have been non-smokers.

Secondly, the cultural context in which the study was conducted may differ from those of previous studies. Cultural norms and values can influence personality traits and smoking behaviours differently, potentially affecting the relationship between smoking status and agreeableness. This study was conducted in the Netherlands, whereas Aboelsaad et al. (2022) conducted theirs with Egyptian students and Mai et al. (2022) conducted their study in Guangdong Province, China. Hofstede's cultural dimensions show that the levels of individualism differ greatly across these three different cultures. The Netherlands scores exceptionally high on individualism, 100%, whereas Egypt and China both score low (17% and 43%) (Country Comparison Tool, n.d.). This means that overall, participants in China and Egypt are expected to score higher on agreeableness, which results in smokers in these countries being more agreeable than Dutch smokers. Dutch individuals, both smoker and non-smoker tend to score remarkably high on individualism. Therefore, Dutch smoker and non-smokers would not differ as much in agreeableness as in Egypt or China. If this is the case, this could explain why this study did not find a significant difference in agreeableness, where other studies did.

Thirdly, participants may have responded in a socially desirable manner, particularly in self-report measures of agreeableness. Smokers might underreport traits perceived as negative to conform to social expectations, thereby skewing the results. Lastly, there could be a selection bias where smokers who chose to participate in this study were not representative of the broader smoker population, particularly regarding their personality traits. As filling in the questionnaire takes time and effort out of one's life to help another person, this might be an action that is more likely to be performed by people higher in agreeableness. Therefore, it could be the case that the smokers in our sample score higher on agreeableness than the average smoker would, which could result in a non-significant difference in agreeableness between smokers and non-smokers.

Another possible explanation of why tailoring messages based on smoking status did not show a significant effect in our study could be the heterogeneity of our smoking status groups. Smoking status is a broad category that includes individuals with diverse characteristics and motivations. This diversity makes it challenging to create messages that are relevant and persuasive for all smokers or all non-smokers. We asked participants whether they smoke or vape regularly (1), smoke or vape sometimes (2), used to smoke or vape, but have not done so for at least 6 months (3), or have never smoked or vaped (4). Perhaps the distribution of the smoking status groups with (1) and (2) in the smoker group and (3) and (4) in the non-smoker group was overly simplified.

Additionally, the finding that counter-tailored messages were more effective suggests that in general, people respond better to indirect and communal messages that resonate more with values of social harmony and concern for others. This implies that certain types of messages might have a broader appeal and effectiveness, regardless of smoking status. These counter-tailored messages likely contained universally persuasive elements, such as clear, accurate information and appeals to widely held values (Chan et al., 2017).

Lastly, it is possible that the tailored messages for smokers did not align specifically enough with the values of individuals with lower agreeableness. Tailored messages need to be precisely crafted to resonate with the target audience's personality traits and preferences, which may not have been fully achieved in our study (Jensen, 2016).

Limitations

Several limitations should be acknowledged. Firstly, the sample size, while sufficient for the statistical analyses conducted, may limit the generalisability of the findings. Unfortunately, a power analysis to determine the sample size needed for the study to detect a difference of a

specified size with a specified level of confidence was not possible since this is a student project and there was not enough time or resources for this test. Additionally, the study did not control for other personality traits that might interact with agreeableness and influence the effectiveness of tailored messages. The messages were only tailored for agreeableness, not considering other potentially relevant personality traits like conscientiousness or neuroticism. Furthermore, the stimuli differed in more areas than just individualism/collectivism. For example, in the counter-tailored message, more chemicals were more specifically named than in the tailored message, such as nicotine, benzene, toluene and isoprene. In the tailored message, on the other hand, more diseases were more specifically named, such as asthma and oral diseases. Therefore, the stimuli were not identical except for their level of agreeableness, and this can account for unexpected results.

Thirdly, regarding the first robustness check, we split the data file according to the median split of agreeableness instead of smoker status. In this ANCOVA, this approach can be problematic because individuals near the median are not particularly high or low in agreeableness, yet they are given the same weight in the analysis as those who are at the extremes of the agreeableness scale.'

In the chi-square analyses conducted in the subjects part of the method section, we had to exclude participants who identified as non-binary or preferred not to say, as their counts were under 5. This exclusion was necessary to ensure the statistical validity of the chi-square test, which requires a minimum expected cell count to produce reliable results. However, this exclusion could have impacted our findings in several ways. Firstly, it may have reduced the diversity of our sample, potentially limiting the generalizability of the results to broader populations. Consequently, future research should aim to include a larger and more diverse sample to capture the full range of gender identities, ensuring that the findings are more inclusive and representative.

Suggestions for Further Research

Based on the findings and limitations of this study, several suggestions for future research can be made to build on our understanding of how tailoring messages based on personality traits such as agreeableness can influence belief in misinformation about e-cigarettes.

Firstly, future research could further examine the role of agreeableness in tailored messages. As our robustness check indicated, when a median split was used to split the sample based on their agreeableness score instead of their smoking status, there was a significant effect on belief in the myth. Belief in misinformation scores differed significantly

between those who received the tailored message and those who received the counter-tailored message. This effect needs to be investigated more thoroughly because it suggests that agreeableness may be a successful characteristic to tailor health communication to. Understanding this relationship could lead to more precise and impactful interventions that better address individual differences in personality traits, thereby enhancing the overall effectiveness of public health campaigns against misinformation.

More research should also be conducted on the relation between smoking status and agreeableness to investigate the incongruence between previous research and our study. Previous studies suggest that smokers score lower on agreeableness than non-smokers, whereas in our study, this was not the case. This could possibly be done by examining a bigger sample that contains individuals in different age groups and with different educational backgrounds.

Additionally, future research should explore the impact of tailoring messages on other personality dimensions beyond agreeableness. Future research should explore the interaction of multiple personality traits, such as conscientiousness, neuroticism, and openness, in addition to agreeableness. This would provide a more nuanced understanding of how various aspects of personality influence the effectiveness of tailored health messages.

Studies could also examine the long-term effects of such tailored interventions to see if the reduced belief in misinformation persists over time. Future research should consider longitudinal designs to examine how the impact of tailored health messages on belief in misinformation changes over time. This would provide valuable information on the persistence of belief change and the long-term effectiveness of tailored interventions.

Furthermore, expanding the demographic diversity of the sample would help in understanding the broader applicability of these findings. Conducting a power analysis to determine the appropriate sample size needed to detect a significant effect with a specified level of confidence is essential. A larger sample size would increase the statistical power of the study, allowing for more robust conclusions and the detection of smaller effects. Future studies should aim to recruit a more diverse sample, including a broader range of educational backgrounds, cultures, and gender identities. This would enhance the generalizability of the findings and ensure that the results are more representative of the general population. This involves the inclusion of a larger number of non-binary and gender non-conforming participants would also provide a more comprehensive understanding of how these groups respond to tailored health messages.

Investigating the mechanisms through which tailored messages exert their influence,

such as cognitive or emotional engagement, could provide deeper insights into why certain messages work better for different individuals. Investigating the underlying mechanisms through which tailored messages influence belief change would be beneficial. This could involve examining cognitive and emotional processes, such as message elaboration, perceived relevance, and emotional engagement, to understand better why certain messages are more persuasive for individuals with different personality traits.

Lastly, conducting cross-cultural studies would provide insights into how cultural norms and values influence the relationship between personality traits and the effectiveness of tailored health messages. Comparing results across different cultural contexts would help identify whether the findings are culturally specific or more universally applicable.

By addressing these areas, future research can build on the current study's findings and contribute to a more comprehensive understanding of how tailored health messages can effectively reduce misinformation and influence health behaviours across diverse populations.

This study contributes to the theory of tailored health communication by demonstrating that agreeableness is not a significant factor in designing effective debunking messages. Future campaigns could benefit from incorporating this insight to improve the effectiveness of health communication strategies, ultimately contributing to better public understanding and healthier behaviours.

References

- Aboelsaad, M., Soliman, O. S., Medhat, A., Khalil, O. S., AlWahsh, M., Wageh, Y., ElSaied, A., ElShrkawy, H., Abdulhafiz, H., & Sayed, M. (2022). Effects of Smoking on Aggression, Big Five Personality Factors, and Polymorphisms in HTR2A, DRD4, and MAOA among Egypt University Students. *The Journal of Smoking Cessation*, 2022. <https://doi.org/10.1155/2022/1879270>
- Bartneck, C., Van Der Hoek, M., Mubin, O., & Mahmud, A. A. (2007). “Daisy, Daisy, give me your answer do!” *Proceedings of the ACM/IEEE International Conference on Human-Robot Interaction*, 217–222. <https://doi.org/10.1145/1228716.1228746>
- Bechtoldt, M. N., Choi, H.-S., & Nijstad, B. A. (2012). Individuals in mind, mates by heart: Individualistic self-construal and collective value orientation as predictors of group creativity. *Journal of Experimental Social Psychology*, 48(4), 838–844.
- Chan, M. S., Jones, C. R., Jamieson, K. H., & Albarracín, D. (2017). Debunking: A Meta-Analysis of the Psychological Efficacy of Messages Countering Misinformation. *Psychological Science*, 28(11), 1531–1546. <https://doi.org/10.1016/j.jesp.2012.02.014>
<https://doi.org/10.1177/09567976177114579>
- Chatterjee, K., Alzghoul, B., Innabi, A., & Meena, N. (2016). Is vaping a gateway to smoking: a review of the longitudinal studies. *International Journal of Adolescent Medicine and Health*, 30(3). <https://doi.org/10.1515/ijamh-2016-0033>
- Country comparison tool*. (n.d.). <https://www.hofstede-insights.com/country-comparison-tool?countries=china%2Cegypt%2Cnetherlands%2C>
- Digman, J. (1990). Personality Structure: Emergence of the 5-Factor Model. *Annual Review of Psychology*, 41(1), 417–440. <https://doi.org/10.1146/annurev.psych.41.1.417>
- Ebersole, J., Samburova, V., Son, Y., Cappelli, D., Demopoulos, C., Capurro, A., Pinto, A., Chrzan, B., Kingsley, K., Howard, K., Clark, N., & Khlystov, A. (2020). Harmful chemicals emitted from electronic cigarettes and potential deleterious effects in the oral cavity. *Tobacco Induced Diseases*, 18(May). <https://doi.org/10.18332/tid/116988>
- Ghosh, S., & Drummond, B. (2016). Electronic cigarettes as smoking cessation tool: are we there? *Carolina Digital Repository (University of North Carolina at Chapel Hill)*. <https://doi.org/10.17615/rn0q-je91>
- Grana, R. (2013). Electronic cigarettes: a new nicotine gateway? *Journal of Adolescent Health*, 52(2), 135–136. <https://doi.org/10.1016/j.jadohealth.2012.11.007>

- Graziano, W. G., Habashi, M. M., Sheese, B. E., & Tobin, R. M. (2007). Agreeableness, empathy, and helping: A person \times situation perspective. *Journal of Personality and Social Psychology*, *93*(4), 583–599. <https://doi.org/10.1037/0022-3514.93.4.583>
- Grossman, M. (2006). Education and nonmarket outcomes. *Handbook of the Economics of Education*, *1*, 577-633.
- Hawkins, R. P., Kreuter, M. W., Resnicow, K., Fishbein, M., & Dijkstra, A. (2008). Understanding Tailoring in Communicating About Health. *Health Education Research*, *23*(3), 454–466. <https://doi.org/10.1093/her/cyn004>
- Hirsh, J. B., Kang, S. K., & Bodenhausen, G. V. (2012). Personalized persuasion. *Psychological Science*, *23*(6), 578–581. <https://doi.org/10.1177/0956797611436349>
- Historical NYTS Data and Documentation | CDC. (n.d.). https://www.cdc.gov/tobacco/data_statistics/surveys/nyts/data/index.html
- Hughes, K. (2020, December 30). *How to tailor user interfaces with the Big-5 personality traits - Kamran Hughes*. Kamran Hughes. <https://www.kamranhughes.com/how-to-tailor-designs-using-the-big-5-personality-traits/>
- Jensen, M. (2016). Personality traits and nonverbal communication patterns. *International Journal of Social Science Studies*, *4*(5). <https://doi.org/10.11114/ijsss.v4i5.1451>
- Jin, L., Kenkel, D., Lovenheim, M., Mathios, A., & Wang, H. (2022). *Misinformation, Consumer Risk Perceptions, and Markets: The Impact of an Information Shock on Vaping and Smoking Cessation*. <https://doi.org/10.3386/w30255>
- John, O. P., & Srivastava, S. (1999). The Big-Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives. In O. P. John, R. W. Robins, & L. A. Pervin, *Handbook of personality: Theory and research*, 2nd ed. (2nd ed., pp. 102–138). Guilford. <http://psycnet.apa.org/record/1999-04371-000>
- Jue, J., & Ha, J. H. (2022). Exploring the relationships between personality and color preferences. *Frontiers in Psychology*, *13*. <https://doi.org/10.3389/fpsyg.2022.1065372>
- Kessler, S. H., & Bachmann, E. (2022). Debunking health myths on the internet: the persuasive effect of (visual) online communication. *Journal of Public Health*, *30*(8), 1823–1835. <https://doi.org/10.1007/s10389-022-01694-3>
- Kreuter, M. W., & Skinner, C. S. (2000). Tailoring: What’s in a Name? *Health Education Research*, *15*(1), 1–4. <https://doi.org/10.1093/her/15.1.1>
- Kreuter, M. W., & Wray, R. J. (2003). Tailored and Targeted Health Communication: Strategies for Enhancing Information Relevance. *American Journal of Health Behavior*, *27*(1), 227–232. <https://doi.org/10.5993/ajhb.27.1.s3.6>

- Mai, J., Lin, L., Ling, Z., Guan, Q., Wang, Z., & Zhou, W. (2022). Will personality traits affect the use of e-cigar among college students? A cross-sectional study in Guangdong Province, China. *Frontiers in Public Health*, *10*.
<https://doi.org/10.3389/fpubh.2022.1032606>
- Malouff, J. M., Thorsteinsson, E. B., & Schutte, N. S. (2006). The Five-Factor Model of Personality and Smoking: A Meta-Analysis. *Journal of Drug Education*, *36*(1), 47–58.
<https://doi.org/10.2190/9ep8-17p8-ekg7-66ad>
- Mishra, A., Chaturvedi, P., Datta, S., Sinukumar, S., Joshi, P., & Garg, A. R. (2015). Harmful Effects of Nicotine. *Indian Journal of Medical and Paediatric Oncology*, *36*(01), 24–31. <https://doi.org/10.4103/0971-5851.151771>
- Park, N., & Lee, H. (2012). Social implications of smartphone use: Korean college students' smartphone use and Psychological Well-Being. *Cyberpsychology, Behavior and Social Networking*, *15*(9), 76. <https://doi.org/10.1089/cyber.2011.0580>
- Pinho-Gomes, A., Santos, J. A., Jones, A., Thout, S. R., & Pettigrew, S. (2023). Attitudes and behaviours regarding e-cigarettes in people aged 15–30 years in the UK: a cross-sectional study. *The Lancet*, *402*, S76. [https://doi.org/10.1016/s0140-6736\(23\)02110-4](https://doi.org/10.1016/s0140-6736(23)02110-4)
- Quick facts on the risks of e-cigarettes for young people*. (2024, January 16). Centers for Disease Control and Prevention. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/Quick-Facts-on-the-Risks-of-E-cigarettes-for-Kids-Teens-and-Young-Adults.html
- Rothmann, S., & Coetzer, E. P. (2003). The big five personality dimensions and job performance. *Sa Journal of Industrial Psychology*, *29*(1).
<https://doi.org/10.4102/sajip.v29i1.88>
- Schmid, K. L., Rivers, S. E., Latimer, A. E., & Salovey, P. (2008). Targeting or Tailoring? *PubMed*. <https://pubmed.ncbi.nlm.nih.gov/18389854>
- Schneider, S., & Uter, W. (2015). Vaping as a Catalyst for smoking? An initial model on the initiation of electronic cigarette use and the transition to tobacco smoking among adolescents. *Nicotine & Tobacco Research*, *18*(5), 647–653.
<https://doi.org/10.1093/ntr/ntv193>
- Sidani, J. E., Hoffman, B. L., Colditz, J. B., Melcher, E. M., Taneja, S. B., Shensa, A., Primack, B. A., Davis, E. M., & Chu, K. (2022). E-Cigarette-Related nicotine misinformation on social media. *Substance Use & Misuse*, *57*(4), 588–594.
<https://doi.org/10.1080/10826084.2022.2026963>

- Solberg, L. I., Asche, S. E., Boyle, R., McCarty, M. C., & Thoele, M. J. (2007). Smoking and cessation behaviors among young adults of various educational backgrounds. *American Journal of Public Health, 97*(8), 1421–1426.
<https://doi.org/10.2105/ajph.2006.098491>
- Svenson, M., Green, J., & Maynard, O. M. (2021). Tackling Smoker Misperceptions About E-cigarettes Using Expert Videos. *Nicotine & Tobacco Research, 23*(11), 1848–1854.
<https://doi.org/10.1093/ntr/ntab104>
- Tariq, F. T., & Naqvi, I. (2020). Relationship between personality traits and prosocial behavior among adolescents. *Foundation University Journal of Psychology, 4*(2), 54–63. <https://fui.edu.pk/fjs/index.php/fujp/article/view/79>
- Terracciano, A., & Costa, P. T. (2004). Smoking and the Five-Factor Model of personality. *Addiction, 99*(4), 472–481. <https://doi.org/10.1111/j.1360-0443.2004.00687.x>
- Tobacco: E-cigarettes*. (2024, January 16). <https://www.who.int/news-room/questions-and-answers/item/tobacco-e-cigarettes>
- Twenge, J. M., Campbell, W. K., & Gentile, B. (2012). Changes in Pronoun Use in American Books and the Rise of Individualism, 1960-2008. *Journal of Cross-Cultural Psychology, 44*(3), 406–415. <https://doi.org/10.1177/0022022112455100>
- Visser, W., Geraets, L., Klerx, W., Hernandez, L., National Institute for Public Health and the Environment, Stephens, E., University of St Andrews, Croes, E., Trimbos Institute, Schwillens, P., Cremers, H., Bos, P., Talhout, R., & ministry of Health, Welfare and Sport. (2015). The health risks of using e-cigarettes. In *RIVM Letter Report 2015-0144*. National Institute for Public Health and the Environment.
<https://www.rivm.nl/bibliotheek/rapporten/2015-0144.pdf>
- Wagoner, K. G., King, J. S., Suerken, C. K., Reboussin, B. A., Ross, J. C., & Sutfin, E. L. (2020). Changes in knowledge, perceptions and use of JUUL among a cohort of young adults. *Tobacco Control, 30*(6), 638–643. <https://doi.org/10.1136/tobaccocontrol-2020-055651>
- Wackowski, O. A., O'Connor, R. J., Strasser, A. A., Hammond, D., Villanti, A. C., & Delnevo, C. D. (2016). Smokers' and e-cigarette users' perceptions of modified risk warnings for e-cigarettes. *Preventive Medicine Reports, 4*, 309–312.
<https://doi.org/10.1016/j.pmedr.2016.07.005>

Appendices

Appendix A

Tailored Message

Are e-cigarettes dangerous?

WHEN YOU VAPE, YOU SUFFER. You inhale poisons such as formaldehyde, acetaldehyde, acrolein, and other toxic chemicals that can cause cancer, asthma, and other lung and oral diseases. If you don't vape, don't start. If you do vape, quit. Take care of yourself. Because if you don't, who will?

Appendix B

Counter-Tailored Message

Are e-cigarettes dangerous?

WHEN YOU VAPE, THEY SUFFER. Your friends and family don't vape, and they don't want to, but when you vape, they suffer. They breathe secondhand aerosols, inhaling poisons such as nicotine, formaldehyde, benzene, toluene, and isoprene, which can cause cancer, lung diseases, and other diseases.

If you don't vape, don't start. If you do vape, quit. Take care of them. Because if you don't, who will?

Appendix C

Table 4

Differences between messages

Tailored message	Counter-tailored message
Overall message is individualistic; you are harming yourself when you vape	Overall message is collectivistic; you are harming others when you vape
Direct and straightforward, with a more individual and personal approach (Bechtoldt et al., 2012; Digman, 1990)	Pro-social and collectivistic values, with a focus on interdependent behaviour (Bechtoldt et al., 2012; Graziano et al., 2007; Tariq & Naqri, 2020)
Second-person personal pronoun ‘you’ directly addresses the reader (Twenge et al., 2012)	Third-person personal pronouns ‘they’ and ‘them’ emphasises risks associated with second-hand aerosols from vaping to the people around the smoker
“You inhale toxins”	“Your friends and family breathe in second-hand toxins” “Your friends and family don’t vape, and they don’t want to, but when you vape, they suffer”
Focus on first-hand risks which include the inhalation of various chemicals such as formaldehyde, acetaldehyde and acrolein (Ebersole et al., 2020; Visser et al., 2015)	Focus on second-hand risks which include the inhalation of various chemicals such as benzene, toluene and isoprene (Greenhalgh et al. 2024).
‘Toxic chemicals’ based on Wackowski et al. (2016)	‘Nicotine’ based on the WHO website (Tobacco: E-cigarettes, 2024)
The colours grey, black and red (Jue & Ha, 2022)	Colours: white and blue, same as WHO website (Tobacco: E-cigarettes, 2024) and more neutral