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Examining the Mechanisms Underlying the Persuasive Effects of User-Initiated Customisation on Attitudes Toward Health Behaviours

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Abstract

Insights from tailoring research have been useful in enhancing online health communication efforts. User-initiated customisation (UIC) is a novel tailoring approach that involves the self-tailoring of information. This study examined the strength and the mechanisms underlying UIC effects to further understand the suitability of UIC as a method of persuasion for online health communication efforts. Using a web-based experiment (N = 178), the effects of UIC on attitudes via sense of control, attention, and elaboration were assessed, including the moderating role of behaviour type (i.e., detection vs. prevention). The results demonstrate that UIC (vs. generic webpages) was significantly more effective at increasing sense of control, which consequently enhanced attention and elaboration of information, resulting in stronger positive attitudes toward health behaviours. These effects were stable across different behavioural contexts. The findings suggest that the online communication efforts of governments can be enhanced through the embedment of a UIC webpage feature.

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Keywords
Elaboration likelihood model, persuasion, information processing and cognition, mediation, moderation, tailoring.

A one-size-fits-all approach whereby the same information is provided to each user is often employed in web-based systems, such as webpages (Cortese & Lustria, 2012; Lustria et al., 2016; Reategui et al., 2008). Yet, literature has shown that web-based systems are more persuasive when they employ a tailored strategy to provide information (Cortese & Lustria, 2012; Krebs et al., 2010; Lustria et al., 2013, 2016; Rimer & Kreuter, 2006). Meta-analyses indicate that, compared to non-tailored health interventions (e.g., general online resources about smoking cessation), web-based tailored interventions are associated with higher behavioural adoption rates from audience members, despite the small to medium effect sizes (Krebs et al., 2010; Lustria et al., 2013). In a tailored strategy, online information is modified to resonate with users at an individual-level (Rimer & Kreuter, 2006), such as providing users with personalised feedback on alcohol consumption following a computerised self-assessment (Kypri & McAnally, 2005).

Communication scholars have largely studied the effects of two types of tailoring strategies. The most common strategy involves tailoring the *content* of information so that it resonates with peoples' topical needs and preferences (i.e., content tailoring; Cortese & Lustria, 2012; Lustria et al., 2016). In comparison, a more novel tailoring strategy adapts the delivery *mode* of information (e.g., text-only, or illustrative format) to peoples' preferred learning and processing styles (i.e., mode tailoring; Smit et al., 2015; Nguyen et al., 2017). In addition, tailoring has been largely conceptualised as a system-initiated process, also known as *system-initiated personalisation* (SIP). In SIP, the tailoring process typically relies on an online system, such as algorithms on a computer, that personalises information to users (e.g., messages for reducing sexually transmitted disease (STD) risk) based on an assessment of previously collected demographic or theory-based characteristics (e.g., gender, relationship status, perceived STD risk, sexual behaviour; Lustria et al., 2016). However, scholars have begun to broaden their conceptualisation of tailoring by distinguishing between SIP and *user-initiated customisation* (UIC; e.g., Nguyen, Bol, & King, 2020; Sundar & Marathe, 2010). Unlike in SIP, the tailoring process for UIC relies on users who leverage system functionalities, such as radio buttons, selection tags and checkboxes, to *self*-tailor online content to their topical needs, preferences, and learning styles (Sundar & Marathe, 2010).

Research related to SIP has shown that such webpages (compared to generic ones) lead to greater attention and deeper elaboration of information via the underlying mechanism of perceived personal relevance (Cortese & Lustria, 2012; Lustria et al., 2016). Based on the elaboration likelihood model (ELM), greater attention and deeper elaboration of information can activate central route processing of information (DiClemente et al., 2009; Petty et al., 1983; Petty & Cacioppo, 1986). Central route processing has been shown to form strong positive attitudes toward health behaviours, and such attitudes are often more predictive of behaviour change thus enhancing the persuasive effects of health messages (DiClemente et al., 2009; Petty et al., 1983). This activation of central route processing has yet to be thoroughly examined for the UIC of online health information. Specifically, while UIC has shown promising effects on information processing outcomes, such as better information recall (Nguyen, Bol, & Lustria, 2020) and increased attention in lower health literates (Nguyen, Bol, & King, 2020), it is still

unclear the degree to which UIC can facilitate information processing through the central route to persuasion (i.e., via attention and elaboration) and whether this activation is driven by a specific underlying mechanism.

One mechanism that distinguishes UIC from SIP is the sense of control the process derives. Specifically, the physical act of self-tailoring online content is posited to increase perceptions of control in users (Kang & Sundar, 2016; Konijn, 2008). For the UIC of online health information, perceptions of control have been found to elicit favourable intrinsic (e.g., autonomous motivation; Bol et al., 2019) and cognitive outcomes (e.g., reduced cognitive load; Nguyen, Bol, & Lustria, 2020). As such, perceptions of control may play an important role in activating the central route to persuasion in UIC. However, outside of a UIC context, perceptions of control have also shown particularly favourable outcomes for the promotion of health detection behaviours (e.g., cervical and colorectal cancer screening; Abamecha et al., 2019; Devellis et al., 1990). Compared to health prevention behaviours, health detection behaviours are often viewed as a threat as their adoption can uncover the presence of a (severe) illness and the behaviours themselves do not offer a plan to action to cope with the perceived threat (Millar & Millar, 1993, 1996). As a result, the effective online promotion of health detection behaviours may present its inherent challenges, as users are likely to engage in behavioural avoidance (Millar & Millar, 1993, 1996). However, affording control during information seeking through UIC could help counteract these challenges as the opportunity to customise online information about health detection behaviours could serve as the necessary plan to action to reduce the perceived threat. Thus, while successful activation of central route processing can shed light on the appropriateness of UIC as a method of persuasion for online health communication efforts in general, understanding its effects in different health behavioural contexts can (1) help researchers form stronger conclusions on its effectiveness, and (2) optimise its use in health practice. Thus, taken together, the aim of the current study is twofold. First, it aims to advance our theoretical understanding of UIC by exploring whether self-tailoring online health information can activate the central route to persuasion, subsequently strengthening attitudinal outcomes, and whether this activation is driven by sense of control. Second, it aims to seek novel insight into the different persuasive effects of UIC of online information across prevention and detection health behaviour contexts. In the current study, users engaged in both user-initiated content and mode customisation (i.e., self-tailoring the content and delivery mode of information).

User-Initiated Customisation and Sense of Control

The agency model of customisation suggests that "the interactivity, modality, and navigability" (p. 562 in Kang & Sundar, 2016) of UIC can increase a sense of agency in users because the process allows them to serve as active sources instead of passive receivers of information (Kang & Sundar, 2016; Konijn, 2008). This unique psychological state of self-as-source is believed to positively enhance users' *sense of control* over online interfaces, which has been shown to facilitate persuasive outcomes (Konijn, 2008; Marathe & Sundar, 2011; Sundar & Marathe, 2010). For instance, after users were given the opportunity to choose between textual, visual, and/or audio-visual formats, Nguyen, Bol, and Lustria (2020) found that UIC increased perceived active control, which resulted in improved information recall and positive website attitudes. Moreover, Kim et al. (2017) argued that their study's indirect effect of user-initiated

content customisation on users' positive attitudes toward health messages may have resulted as a by-product from participants greater sense of control over the webpage. Thus, sense of control is hypothesised to be the key underlying mechanism that elicits the information processing routes between UIC and attitudes.

H1a: UIC (vs. generic webpages) will enhance sense of control.

In the following sections, we will elaborate how sense of control derived from the process of UIC could activate central route processing and explain the possible conditions under which the resulting attitudes may fluctuate.

Sense of Control, Attention, and Elaboration

According to the ELM, eliciting strong attitudinal outcomes that are resistant to counter persuasion and predictive of behaviour change is contingent upon two conditions: users' motivation to process issue-relevant information and users' ability to process issue-relevant information (Petty & Cacioppo, 1986). If both conditions are met, central route processing will occur whereby users pay greater *attention* to the central arguments of the message and engage in deeper *elaboration* of issue-relevant information. In the event that none or only one condition is met, users' attitudinal change occurs through peripheral route processing. This results in a relatively weak and short-term attitude change that is receptive to counter persuasion and non-predictive of behaviour change (DiClemente et al., 2009; Petty et al., 1983; Petty & Cacioppo, 1986). User control theory posits that providing people with heightened perceptions of control in online environments, such as webpages, can increase this motivation and ability to process new information (Eveland & Dunwoody, 2001). Indeed, Bol et al. (2019) have shown that perceived active control over mobile health apps can significantly increase users' autonomous motivation to use mobile health apps. Similarly, UIC research suggests that controlling the delivery mode of online health information can prompt both a motivational response (i.e., increased website engagement) and increase user's ability to process online information (i.e., reduced cognitive load; Nguyen, Bol, & King, 2020). Thus, through this perception of being in control, UIC could activate central route processing which, as posited by the ELM, would manifest itself as enhanced attention and deeper elaboration, and result in strong positive attitudes toward the displayed health behaviours (DiClemente et al., 2009; Petty et al., 1983; Petty & Cacioppo, 1986). As such, the current study hypothesises that:

H1b: UIC (vs. generic webpages) will enhance sense of control, which will consequently lead to higher attention levels and deeper elaboration of information and in turn result in greater positive attitudes toward health behaviours.

The Moderating Role of Health Behaviour Type

Inspired by the taxonomy of health-relevant situations (Cameron & Leventhal, 2003; Rothman et al., 2006) and the dual-process model of interactivity effects (Liu & Shrum, 2009), we will now explain how the persuasive effects of UIC may differ for different types of health behaviours. According to the taxonomy of health-relevant situations, the functional role of a health behaviour can be classified into two categories: (1) *preventing* the onset of a disease (i.e., health prevention behaviours) and (2) *detecting* the presence of a disease (i.e., health detection behaviours; Cameron & Leventhal, 2003; Rothman et al., 2006). These two

categories can be used to help predict the adoption of health behaviours by evaluating the extent to which the outcome associated with a given health behaviour poses a perceived health threat. For example, because the outcome associated with a health prevention behaviour can help maintain or improve a person's (current) health status by following the recommended plan to action, adopting the behaviour is most likely considered a beneficial course of action. However, because health detection behaviours can uncover the presence of a disease and are unaccompanied by a plan to action, they are often perceived as a threat to one's current health status (e.g., detecting you have cancer; Cameron & Leventhal, 2003; Millar & Millar, 1993, 1996). Such threat perceptions and the lack of a plan to action are posited to induce anxiety and fear among individuals, leading to behavioural avoidance (Leventhal et al., 1983; Leventhal & Cameron, 1987; Millar & Millar, 1996).

According to the dual-process model of interactivity effects, how users feel about the informational content on a webpage can either serve as a central argument or positive peripheral cue that influences users' use of webpage functionalities, sense of control, information processing, and subsequent persuasive outcomes. For example, when users' feel more involved with the information on a website, they are more motivated to use the functionalities of a webpage to search for information that matches their needs and preferences. As a result, the user is likely to experience higher levels of control over their online experience, which is posited to facilitate central route processing and consequently lead to strong positive attitudes (Liu & Shrum, 2002, 2009). For example, in the context of this study, for health detection behaviours, searching for information could be viewed as a coping strategy or a plan to action to control for the aforementioned negative emotions induced by the behaviour (Leventhal et al., 1983; Leventhal & Cameron, 1987; Millar & Millar, 1996). As a result, users in the health detection behaviour context may be especially content with the opportunity to customise online environments—as opposed to more generic, static online environments—and therefore experience a higher sense of control compared to users that search for information about health prevention behaviours. This heightened sense of control in UIC health detection is posited to facilitate central route processing and result in stronger positive attitudes toward the displayed detection behaviours (Liu & Shrum, 2009). In comparison, because prevention behaviours are by themselves a plan to action (Millar & Millar, 1993, 1996), such as social distancing to prevent a COVID-19 infection, users may be less content with the opportunity to customise online environments and, in turn, experience lower levels of sense of control. In this scenario, UIC is posited to act as a positive peripheral cue resulting in weaker positive attitudes toward the displayed prevention behaviours (Liu & Shrum, 2009). Thus, the current study posits that users that are given the opportunity to customise a webpage to read about detection (vs. prevention) behaviours will experience higher sense of control, consequently activating central route processing (i.e., enhanced attention and elaboration of information) resulting in stronger positive attitudes toward the displayed detection behaviours (Liu & Shrum, 2002).

> *H2:* The effect described in H1 will be stronger for participants in the UIC health detection versus prevention condition.

Materials and Methods

Design and Power Analysis

A 3 (webpage: UIC vs. generic text-only vs. generic text with illustrations) × 2 (type of health behaviour: prevention vs. detection) between-subjects online experiment was conducted to test the hypotheses. Comparisons will be made between the UIC webpage on the one hand and the generic webpages on the other hand. Including two types of generic webpages (i.e., text-only and text with illustrations) in the control condition was done to account for potential variation in participants' delivery mode preferences and reduce the likelihood that any observed effects were driven solely by alignment with those preferences (Nguyen et al., 2018). Ethical approval for this study was provided by the ethics committee of the Amsterdam School of Communication Research (reference number: 2020-PC-12817). An a priori power analysis using G*Power was performed to determine the minimum sample size to test the interaction effect between health behaviour and UIC on sense of control. We calculated the power based on the two-way ANOVA, with medium effect sizes (f = .25), an alpha set at .05 (two-tailed), and an expected power of 80%. The analysis suggested that a sample size of 158 was needed to detect the interaction effect between health behaviour and UIC on sense of control.

Stimuli Materials

We conceptualise UIC as the interactive process of self-tailoring *both* the delivery mode and content of online information using a customisation functionality to fit one's topical needs (i.e., by content tailoring) and learning preferences (i.e., by mode tailoring). The online health information chosen for this study was about the COVID-19-related behaviours that, at the time of data collection, played an integral role in controlling the spread of the COVID-19 virus. We chose COVID-19-related behaviours for two reasons. First, the study was conducted mid-pandemic and thus we assumed that all participants were highly involved with these health behaviours. Second, COVID-19-related behaviours constitute both prevention and detection behaviours. The prevention behaviours in question included social distancing, hand washing, and mask wearing. The detection behaviours in question included viral testing when experiencing COVID-19-related symptoms or after contact with a COVID-19 positive individual.

For the study, six different versions of a webpage using Wix.com were created (Wix.com, n.d.). The content entailed information about the aforementioned COVID-19-related prevention or detection behaviours, gathered from a variety of reputable government and public health sources (e.g., The World Health Organization, RIVM, Centers for Disease Control and Prevention, Le Gouvernement du Grand-Duché de Luxembourg). Information about the COVID-19-related behaviours were conveyed in the form of leaflets on a webpage that displayed the content in either a text-only or text with illustrations format, keeping the same text in both formats. The illustrations were developed using Canva, a free graphic design platform (Canva, n.d.).

The COVID-19 prevention behaviour versions of the webpage included 11 informational leaflets about hand washing (e.g., "How do I wash my hands correctly?"), social distancing (e.g., "Social distancing in public: When?"), mask wearing (e.g., "How should I wear my mask?"), or general questions related to preventing COVID-19 (e.g., "Why partake in preventive measures?"). In comparison, the COVID-19 detection versions of the webpage

included 11 informational leaflets about the viral testing procedure (e.g., "What will my testing experience look like?"), performance (e.g., "How is the test performed?"), evaluation (e.g., "How will my test be evaluated?"), outcome (e.g., "What should I do if I test positive?") or general questions related to viral testing for COVID-19 (e.g., "Why should I partake in detection measures?"). All versions of the webpage included a homepage that served as an introduction. The webpages were in English and accessible on a laptop/desktop, mobile phone, and tablet.

The webpage versions for the experimental condition (i.e., UIC) included a built-in filter that permitted users to self-select as many of the abovementioned COVID-19-related prevention or detection behaviour topics as they wanted (i.e., content-tailoring), as well as customise whether the selected leaflets on the webpage were presented in a text-only or text with illustrations format (i.e., mode-tailoring). This interactive filter feature was not available in the webpage versions for the control condition (i.e., generic websites including text-only or text with illustrations). Instead, these generic versions enabled users to only navigate between two menu pages: (1) testing for COVID-19 (health detection version only) or protecting against COVID-19 (health prevention version only) and (2) frequently asked questions. Each menu page linearly presented the aforementioned COVID-19-related prevention or detection behaviour topics. Users had to scroll down if they wanted to read the next leaflet.

The different versions of the webpage were pretested with a small sample of participants ($N = 13$) to assess perceived customisation in general and across device type (i.e., laptop/desktop, mobile phone, tablet), including perceived ease of use, and perceived health behaviour type (i.e., "When using this webpage, did you feel that you were reading information about COVID-19 [*prevention/detection*] guidelines?"). The results were used to propose slight adjustments to the stimuli materials to improve perceived ease of use and perceived customisation per device type, which was also tested for in the final results. All results and adjustments are explained in the Supplementary Material A and B. Figure 1 (and Appendices A and B) include examples of the different final versions of the webpage.

Procedure

Data collection commenced on December 2, 2020, and ended on December 25, 2020. Participants were recruited using a convenience and snowball sampling approach. Recruitment messages contained a Qualtrics link to the experiment and were distributed on different social media platforms (i.e., Facebook, Instagram, LinkedIn and Twitter).

The online experiment was conducted in English with an average completion time of 15 minutes and 43 seconds. Participants were told that the study was about the public's perceptions to online health information surrounding COVID-19, which was followed by asking for informed consent. Next, participants were randomly assigned to either the prevention or detection condition. Afterwards, participants were randomly assigned to the UIC or generic conditions that asked them to explore a webpage that corresponded with their assigned health behaviour condition.

Participants could look at the webpage for as long as they wanted. In the UIC condition, participants could customise the webpage information by the aforementioned topic(s) and preferred presentation mode(s). Upon opening this version of the webpage, all topics and presentation modes were deselected in the filter and participants started with a blank page. This was used as a means to ensure that participants engaged in at least some form of UIC. In

comparison, the generic versions were static and displayed the same webpage information in either a text-only or text with illustrations format. After exploring the webpage, participants completed a manipulation check and were asked what device they used to access the webpage. Participants were then asked to state their perceptions of their behaviours on the webpage (i.e., sense of control, attention, and elaboration) and their attitudes towards the COVID-19-related health behaviours they read about. The final set of questions asked about participants' personal and demographic background. Before response submission, participants were debriefed about the nature of the experiment. Participants were not incentivised upon study completion.

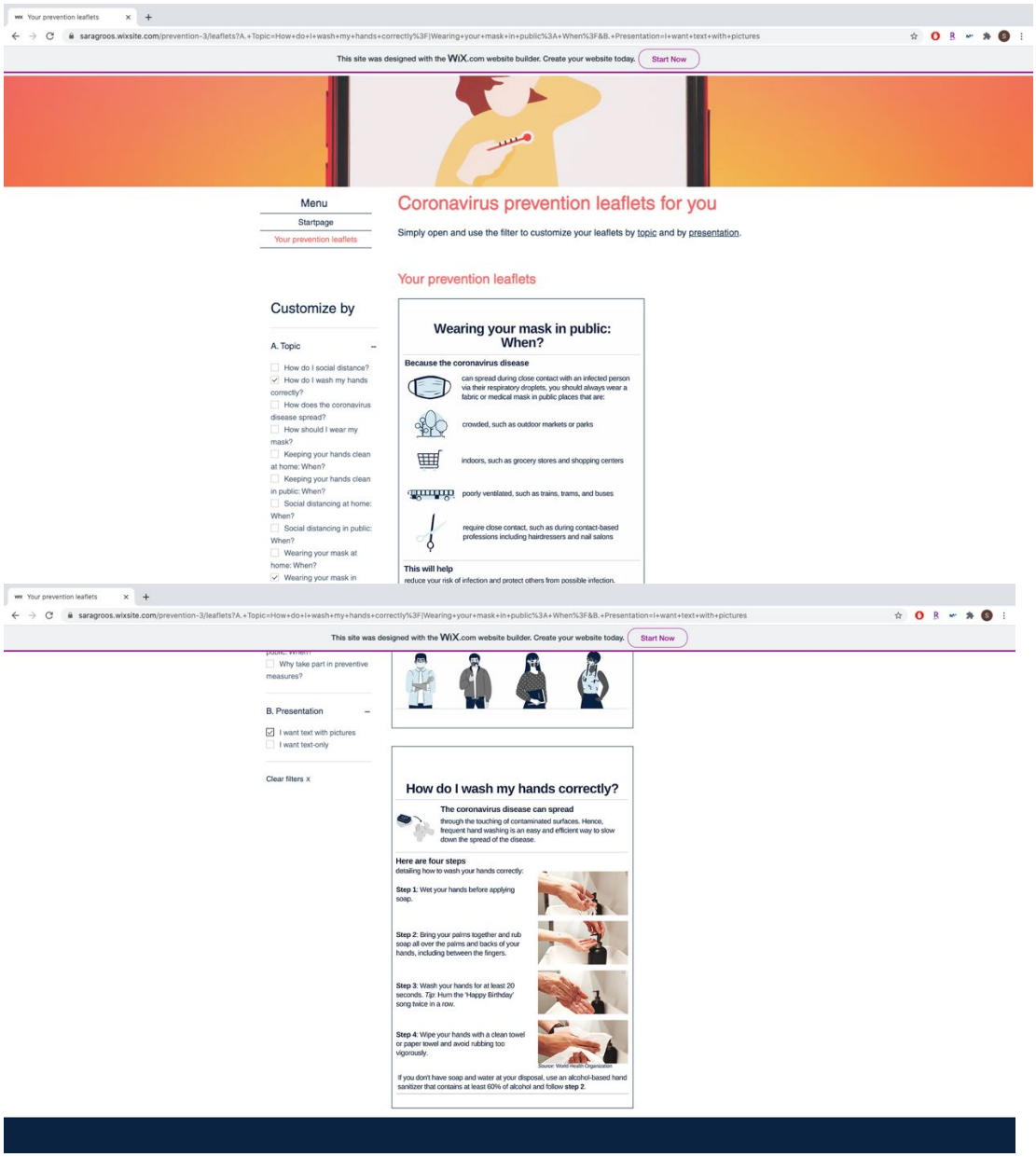

Figure 1. Example of Final UIC Version Containing Information About the COVID-19-Related Prevention Behaviours (With Two Topics and One Presentation Mode Selected)

Note. Published on: https://saragroos.wixsite.com/prevention-3/leaflets.

Participants

Qualtrics recorded 445 responses. Responses were excluded if participants ended the experiment: (1) directly after providing informed consent ($n = 49$); (2) directly after viewing the webpage ($n = 179$); or (3) prior to their assessment of personal and demographic characteristics ($n = 39$; i.e., completed less than 91% of the experiment). After applying the exclusion criteria, a total of 178 participants were included in the sample for data analysis (37%). The majority of participants were female (71%), between the ages of 19 and 71 ($M = 30.1$, $SD = 11.9$), and highly educated (47% Master's degree, 39%, Bachelor's degree). Most participants completed the experiment on a laptop/desktop device (57%) or mobile phone (40%). Almost all participants indicated that their preferred learning style consisted of reading information in text with illustrations (90%). Only 8% of participants reported a current or past COVID-19 infection.

Measures

Mediator Variables

Sense of Control. Marathe and Sundar's (2011) adapted sense of control scale was used to assess participants sense of control over the webpage (adapted from Ariely & Levav, 2000; Venkatesh, 2000; Witmer & Singer, 1998). The 15-item scale was further adapted to a 14-item scale due to item similarity and the words 'interface', 'environment' or 'portal' were substituted with either 'webpage' or 'leaflet(s)' to fit the context of the current study. Examples of adapted items include: "I was able to control my interaction with the webpage," and "I was able to influence how one or more leaflet(s) looked." Participants' responses were measured on a seven-point Likert-scale (1 = *strongly disagree* to 7 = *strongly agree*). Items were reverse coded when needed and subsequently averaged, resulting in a mean scale where higher scores indicate higher levels of sense of control with a Cronbach's alpha of .91 ($M = 4.0$, $SD = 1.4$).

Attention. The four-item website enjoyment scale by Lin et al. (2008) was used to measure attention to the webpage. Each item (e.g., "While visiting the webpage…(1) I was deeply engaged; (2) I was absorbed intently;…") was assessed using a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). All items were summarised into a mean scale where higher scores indicate increased levels of attention, resulting in high internal consistency between items ($\alpha = .92$, $M = 4.0$, $SD = 1.6$).

Elaboration. Previous research has operationalised elaboration as the degree to which people are able to make mental connections between newly and previously acquired information or experiences (Cortese & Lustria, 2012; Lustria et al., 2016). Following previous research, the current study measured participants' elaboration during webpage exploration using a six-item elaboration scale developed by Cortese and Lustria (2012). Examples of items include: "I tried to relate what I read to my own experiences," and "I tried to see the connection between the topics I read." All items were rated on a seven-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*) and subsequently averaged. The resulting Cronbach's alpha for the mean elaboration scale was .92, with higher scores indicating deeper levels of elaboration ($M = 5.3$, $SD = 1.3$).

Dependent Variable

Attitudes Toward COVID-19-Related Behaviours. To ensure that participants attitudinal responses occurred as a result of viewing the webpage, participants were first asked whether they "read anything about [hand washing], [social distancing], [mask wearing], or [coronavirus testing]" with 1 = *yes* or 2 = *no* as response options. All "yes" responses were followed with a seven-item semantic differential scale that measured participants' attitudes toward the COVID-19-related behaviour they read about (adapted from Ajzen, 2002). For example, if a participant indicated that they read about hand washing, they were asked to separately assess the extent to which they believed "[handwashing] with soap or an alcohol-based disinfectant in the forthcoming month" was: 1 = *Bad* or 7 = *Good*; 1 = *Harmful* or 7 = *Beneficial*. All items were summarised into a mean scale per type of health behaviour. This was followed by the summation into separate mean scales measuring either attitudes toward the COVID-19-related prevention (M = 6.3, SD = 0.9) or detection (M = 6.2, SD = 0.7) behaviours, with higher scores indicating more positive attitudes toward the behaviours.

Other Variables

Background Variables. The current study measured participants demographic characteristics (e.g., age, education), preferred learning style (e.g., text-only, or text with illustrations), and experience with COVID-19.

Manipulation Checks. First, to measure the manipulation of the moderator variable (i.e., health behaviour: prevention vs. detection) participants were asked: "Did the webpage you just looked at include COVID-19 [*prevention/detection*] leaflets?" Second, to assess the manipulation of the independent variable (i.e., webpage: UIC vs. generic conditions) participants were asked: "Did the webpage you just looked at include a filter that allowed you to customise those [health prevention or detection] leaflets by topic and by presentation?" Responses for both manipulation checks were recorded using a 1 = *yes* or 2 = *no* answer format.

Statistical Analyses

The data was analysed using IBM SPSS Statistics Version 25. Chi-square tests were conducted to test for successful manipulation and randomisation. First, the hypothesised serial mediation effects model in H1 was tested in its entirety using PROCESS Model 81 for SPSS version 3.5 in which the control condition was pooled for the analysis (i.e., generic websites with text-only or text with illustrations; Hayes, 2018). For PROCESS Model 81, UIC was included as the independent variable, sense of control as the first mediator, attention and elaboration as the second mediators, and attitudes toward COVID-19-related health behaviours as the dependent variable. Afterwards, the hypothesised *moderated* serial mediation effects model in H2 was tested in two parts as an appropriate PROCESS macro model does not yet exist for testing H2 in its entirety. Part 1 included testing the interaction effect between health behaviour type and UIC on sense control with a two-way analysis of variance (ANOVA), followed by Bonferroni-corrected post-hoc tests if statistically significant effects emerged (i.e., at $p < .05$) to compare mean differences across groups. In part 2, the *moderated* serial mediation effects models of attention and elaboration were separately tested using PROCESS Model 85 for SPSS version 3.5 (Hayes, 2018) in which the control condition was pooled for the analysis, and attention was included as the second mediator for model 1 and elaboration was included as the second

mediator for model 2. In both PROCESS Model 85 models, UIC was included as the independent variable, sense of control as the first mediator, health behaviour as the moderator, and attitudes toward COVID-19-related health behaviours as the dependent variable. Templates for PROCESS Model 81 and PROCESS Model 85 for SPSS version 3.5 as depicted in Hayes (2018) can be found in the Supplementary Material D and E.

Results

Manipulation Checks and Randomisation Checks

The manipulation of health behaviour was successful, $\chi^2(1) = 0.87$, $p = .350$. The majority of participants correctly reported reading COVID-19-related information that corresponded with their assigned health behaviour condition (i.e., 96% prevention, 92% detection). A separate chi-square test revealed a statistically significant moderate association between the webpage conditions and participants filter usage, $\chi^2(2) = 68.21$, $p < .001$, $\tau = .38$. This indicates that the manipulation of UIC was successful. The reported use of a filter for customising content was greater in the UIC condition (91%) than in both generic conditions (i.e., 27% text with illustrations, 22% text-only). Lastly, additional chi-square tests indicated that the background variables did not differ per condition, demonstrating that the randomisation of all conditions was successful (see Supplementary Material C).

Hypothesis Testing

H1 posited that UIC (vs. generic webpages) will enhance sense of control (H1a), which will consequently lead to higher attention levels and deeper elaboration of information and in turn result in greater positive attitudes toward health behaviours (H1b). This serial mediation effects model was tested using PROCESS Model 81 (Hayes, 2018). Table 1 shows the regression model parameters for the simple effects, and Table 2 shows the regression model parameters for the direct and indirect effects. As hypothesised, the serial mediation model with attention ($b = 0.10$, boot $SE = 0.05$, 95% CI [0.01, 0.20]) and elaboration ($b = 0.06$, boot $SE = 0.03$, 95% CI [0.01, 0.14]) was statistically significant, as displayed in Figure 4 ($R^2 = .17$). The results showed that sense of control elicited by UIC ($b = 1.53$, boot $SE = 0.18$, 95% CI [1.17, 1.87]) enhanced attention ($b = 0.60$, boot $SE = 0.10$, 95% CI [0.41, 0.79]) and elaboration ($b = 0.31$, boot $SE = 0.09$, 95% CI [0.14, 0.48]) which, in turn, positively influenced participants attitudes toward the displayed COVID-19 health behaviours (attention: $b = 0.11$, boot $SE = 0.05$, 95% CI [0.01, 0.21]; elaboration: $b = 0.13$, boot $SE = 0.06$, 95% CI [0.02, 0.25]). Importantly, the direct effect of UIC on attitudes and the separate indirect effects of sense of control, attention, and elaboration on attitudes were insignificant. This suggests that the significant positive effect of UIC on attitudes can be explained by the study's hypothesised serial-mediation pathways, confirming H1.

Table 1. Simple Effects of the Hypothesised Serial Mediation Effects Model

Variable	*b*	boot *SE*	95% CI [boot LL,UL]
SOC			
UIC	1.53	0.18	[1.17, 1.87]*
Attention			
UIC	-0.35	0.27	[-0.89, 0.20]
SOC	0.60	0.10	[0.41, 0.79]*
Elaboration			
UIC	-0.32	0.26	[-0.83, 0.20]
SOC	0.31	0.09	[0.14, 0.48]*
Attitudes			
UIC	0.12	0.14	[-0.15, 0.38]
SOC	0.02	0.06	[-0.09, 0.14]
Attention	0.11	0.05	[0.01, 0.21]*
Elaboration	0.13	0.06	[0.02, 0.25]*

Note. N = 162. Unstandardized *b*-coefficients (*b*), bootstrapped standard errors (boot *SE*) and confidence intervals (95% CI [boot LL,UL]) using 5000 bootstrapped samples. UIC (0 = *generic*; 1 = *UIC*) was recoded into a dummy variable. Statistically significant effects are marked by an asterisk's (*). Abbreviations: UIC = user-initiated customisation, SOC = sense of control.

Table 2. Direct and Indirect Effects of the Hypothesised Serial Mediation Effects Model

Pathways	*b*	boot *SE*	95% CI [boot LL,UL]
UIC → Attitudes	0.12	0.15	[-0.17, 0.41]
UIC → SOC → Attitudes	0.03	0.09	[-0.14, 0.22]
UIC → Attention → Attitudes	-0.04	0.03	[-0.11, 0.26]
UIC → Elaboration → Attitudes	-0.04	0.04	[-0.14, 0.03]
UIC → SOC → Attention → Attitudes	0.10	0.05	[0.01, 0.20]*
UIC → SOC → Elaboration → Attitudes	0.06	0.03	[0.01, 0.14]*

Note. N = 162. Unstandardized *b*-coefficients (*b*), bootstrapped standard errors (boot *SE*) and confidence intervals (95% CI [boot LL,UL]) using 5000 bootstrapped samples. UIC (0 = *generic*; 1 = *UIC*) was recoded into a dummy variable. Statistically significant effects are marked by an asterisk's (*). Abbreviations: UIC = user-initiated customisation, SOC = sense of control.

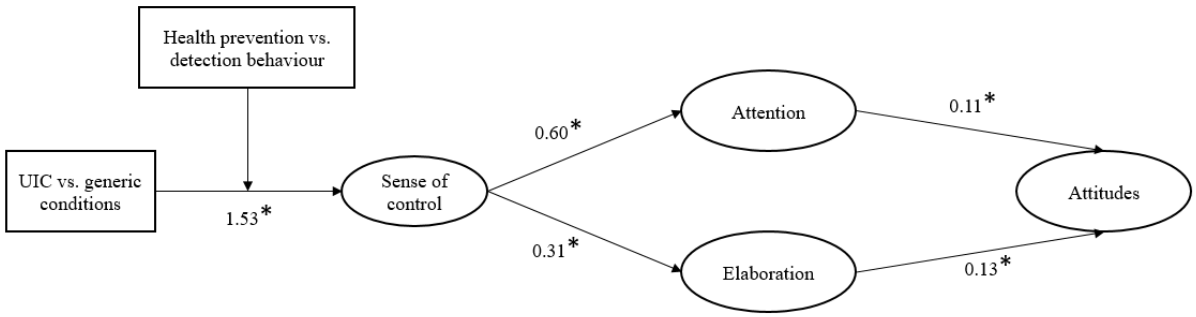

Figure 2. The Hypothesised Underlying Mechanisms Between UIC and Attitudes Toward Health Behaviours

Note. $N = 162$. Path estimates are unstandardized *b*-coefficients using 5000 bootstrapped samples. UIC (0 = *generic*; 1 = *UIC*) was recoded into a dummy variable. Statistically significant effects are marked by an asterisk's (*). $R^2 = .17$. Abbreviations: UIC = user-initiated customisation.

Table 3. Means and Standard Deviations by Condition with Sense of Control as the Dependent Variable

Condition		Sense of control	
	n	*M*	*SD*
UIC			
Health detection behaviour	25	5.1	1.2
Health prevention behaviour	30	4.9	1.1
Text with illustrations			
Health detection behaviour	31	3.4	1.2
Health prevention behaviour	29	3.4	1.2
Text-only			
Health detection behaviour	33	3.6	1.2
Health prevention behaviour	30	3.7	1.4

Note. $N = 178$. Means (*M*) and standard deviations (*SD*) of sense of control are displayed following the 3 (webpage: UIC vs. generic with text-only vs. generic with text with illustrations) x 2 (health behaviour: detection vs. prevention) between-subjects design. Abbreviations: UIC = user-initiated customisation.

H2 posited that the effect described in H1 will be stronger for participants in the UIC health detection versus prevention condition. Table 3 displays the means and standard deviations for the two-way ANOVA testing the interaction effect between health behaviour and UIC on sense control. The Levene's *F*-test of equal population variances demonstrated that equal variances between conditions can be assumed, $F(5, 172) = 0.23$, $p = .948$. The two-way ANOVA did not reveal a statistically significant interaction effect between UIC and health behaviour on sense of control, $F(2, 172) = 0.18$, $p = .832$. In other words, participants' mean sense of control did not significantly differ when the webpage allowed for the UIC of health behaviour detection ($M = 5.1$, $SD = 1.2$) or prevention ($M = 4.9$, $SD = 1.1$) information. Thus, the hypothesised interaction effect of health behaviour type in H2 was not supported by the data. As a result, the moderated serial mediation analyses with PROCESS model 85 were not conducted further.

Robustness Checks

Lastly, we performed additional robustness checks where we compared the text-only condition and text with illustrations condition against the UIC condition separately. Specifically, we conducted four one-way ANOVAs with UIC (versus text-only versus text with illustrations) as the independent variable and sense of control, attention, elaboration, and attitudes toward COVID-19-related health behaviours as the dependent variables, respectively. Bonferroni post hoc tests showed that sense of control was significantly higher in the UIC condition compared to the text-only ($p < .001$) and text with illustrations ($p < .001$) conditions. There was no statistically significant difference in sense of control between the control conditions (text-only vs. text with illustrations). The results showed no statistically significant differences between the UIC and control conditions in attention, elaboration, or COVID-19-related health behaviours. The robustness checks yielded consistent results, supporting the conclusion that the hypothesised serial-mediation pathways (i.e., H1) hold within the context of this study.

Discussion

To fully grasp the persuasive potential of UIC in online health communication efforts, this study extends previous research by examining the extent to which UIC can facilitate information processing through the central route via sense of control and whether the effects hold in different health behavioural contexts. Users were able to self-tailor both the content and mode of online information by use of a built-in filter in a webpage about the COVID-19-related health detection (e.g., PCR-test) and prevention (e.g., handwashing) behaviours. The results demonstrate that, compared to the generic conditions, UIC was significantly more effective at enhancing users' sense of control, which consequently led to greater attention and deeper elaboration of online information. This led to more positive attitudes toward COVID-19-related behaviours. The strength of the aforementioned effect did not vary depending on the type of health behaviour (i.e., detection vs. prevention). The effects of UIC on attitudes could be explained through the hypothesised pathways (i.e., sense of control, attention, and elaboration) demonstrating the importance of eliciting these underlying mechanisms.

Theoretical and Practical Implications

The first important finding of our study was that the results confirmed the key assumptions made by the agency model of customisation that UIC activates the psychological state of self-as-source, which contributes to users enhanced senses of control over the online content (Kang & Sundar, 2016; Konijn, 2008; Marathe & Sundar, 2011; Sundar & Marathe, 2010). Sense of control was higher for users in the UIC compared to the generic conditions. Thus, users in the UIC condition may have indirectly experienced the psychological state of self-as-source during the customisation of online health information. This study corroborates Nguyen, Bol, and Lustria's (2020) finding by also demonstrating its importance in UIC of both the content and mode of online health information. The significant indirect effect of UIC on attitudes did not emerge when sense of control was removed from the serial mediation effects model, suggesting that sense of control is a key mechanism in explaining the effects of UIC on health behaviour-related attitudes.

Indeed, past research has examined whether UIC can facilitate better information processing (e.g., Kang & Sundar, 2016; Nguyen, Bol, & King, 2020; Nguyen, Bol, & Lustria, 2020). However, this study is novel in that it demonstrates how UIC of online health information can facilitate central route processing of information via the proposed mechanisms of attention and elaboration (Petty & Cacioppo, 1986). Contrary to what Kang and Sundar (2016) found, our findings suggest that providing users with enhanced feelings of control over a webpage's content can activate the central route to persuasion. Our manipulation of UIC differed from that of Kang and Sundar (2016) in that we gave users the opportunity to directly customise online health information to both their topical needs and learning preferences, which could also explain why users paid greater attention to, and engaged in deeper elaboration of information.

Interestingly, the results show that the activation of central route processing via UIC was not influenced by the type of health behaviour (i.e., detection vs. prevention). UIC facilitated central route processing in both behaviours, suggesting that sense of control is effective at increasing motivation and ability irrespective of the type of behaviour. A possible explanation for this unexpected result could be due to users' involvement with the given health behaviour. Research related to system-initiated personalisation (SIP) has shown that topic involvement—the degree to which people understand the importance of a given health behaviour—can

enhance persuasion via perceived personal relevance irrespective of participants' tailoring condition (Lustria et al., 2016). In the context of our study, the constant urgency by governments to adopt COVID-19-related health behaviours may have caused this study's sample to display high topic involvement with both the prevention and detection behaviours. Research has indicated that, under conditions of high involvement, users are more motivated to use system functionalities to search for information (Liu & Shrum, 2009). Thus, topic involvement with the behaviour may have had a stronger impact on the opportunity to customise online information in this study instead of the possible threat outcomes associated with performing the behaviour.

Another explanation for the unexpected result between UIC and health behaviour type on sense of control could be due to the chosen health detection and prevention behaviours. While COVID-19-related health behaviours were chosen as they constitute both prevention and detection behaviours, it could be that users did not perceive COVID-19-related detection behaviours as a high enough threat to one's current health status and therefore did not engage in coping strategies to reduce the perceived threat (Leventhal et al., 1983; Leventhal & Cameron, 1987; Millar & Millar, 1996), such as customising online health information. As a result, participants in the health detection condition did not experience a heightened sense of control compared to participants in the health prevention condition. A fruitful area for future research is to replicate the current study in a different health behavioural context using prevention and detection behaviours that vary in topic involvement and perceived threat to distinguish for what health behaviours UIC may act as a positive peripheral cue (i.e., reduced attention and elaboration; Liu & Shrum, 2009).

Lastly, in terms of practical implications, our findings show that offering users control over a webpage's content and mode of delivery can elicit positive attitudes toward health behaviours that are more predictive of behaviour change (DiClemente et al., 2009; Petty et al., 1983). As proposed by user control theory, enhanced feelings of control can increase users motivation and ability to process information, two important attributes for activating the central route to persuasion (DiClemente et al., 2009; Eveland & Dunwoody, 2001; Petty et al., 1983). As such, government and public health officials should consider incorporating webpage filters that allow users to customise both the topic and the delivery mode of online information about the COVID-19-related behaviours as a way to more effectively battle the COVID-19 pandemic and future outbreaks.

Limitations and Future Research Directions

A strength of this study was its ability to demonstrate the importance of sense of control in UIC, which has been shown in prior research to positively influence UIC-related outcomes (Nguyen, Bol, & Lustria, 2020). This study allowed users to self-tailor both the delivery mode and content of online health information by including a built-in filter in the UIC version of the webpage. However, while we included two types of generic webpages in the control condition (text-only and text with illustrations) to account for delivery mode preferences, this approach does not fully address potential variation in delivery mode preferences, as it assumes evenly distributed preferences and contrasts with the UIC condition where participants self-tailored their delivery mode preferences. As a result, this limitation restricts the current study's ability to isolate the effect of UIC from delivery mode preference alone. Moreover, we did not ask participants whether they used the filter to engage in more content and/or mode customisation,

making it unclear whether perceptions of control and subsequent outcomes occurred as a result of user-initiated content, or mode customisation, both, or neither. Similarly, we did not record participants' webpage use, which could have provided valuable insights into how participants used the different webpages generally, and the filter for customisation specifically. Such usage patterns could shed light into the amount of time spent on customising online information and whether there are individual differences among users, which could further nuance our understanding of for whom UIC would be most beneficial and whether engagement within UIC is affected by the type of health behaviour content. For example, Sundar and Marathe (2010) found that in the case of power users, a user-initiated *content* customisation strategy was favoured over SIP due to increased perceptions of control. Thus, future research should reproduce the stimuli material of this study and explore webpage usage patterns as a means to strengthen causal inferences, and optimise filter designs for the UIC of online health information for different types of users and different types of health behaviours. Future research should also focus on comparative studies examining the two UIC strategies and their potential differential effects on sense of control, information processing outcomes, and persuasive outcomes.

Another strength of this study was its ability to demonstrate the importance of teasing out the underlying mechanisms of UIC. However, the indirect effect of UIC on health behaviour-related attitudes was small, suggesting that other underlying mechanisms are likely at play, such as perceived convenience (Sundar & Marathe, 2010), sense of identity (Marathe & Sundar, 2011), topic involvement (Liu & Shrum, 2009), website engagement and/or reduced cognitive load (Nguyen, Bol, & King, 2020). Thus, future research could explore additional mechanisms that are relevant to gain a more comprehensive understanding of effective UIC for online health information. Furthermore, we did not manipulate the mediators of sense of control, attention and elaboration. We acknowledge that this can produce misleading inferences about the causal pathways described in this study. Specifically, we recognize that the relationship between the mediators (i.e., sense of control, attention, and elaboration) and the relationship between the mediators and the dependent variable (i.e., attention, elaboration, and health behaviour-related attitudes) could possibly be reverse, as these variables were measured after exposure to the stimuli material (Coenen, 2022; Kline, 2015). Additionally, the causal pathways proposed in this study require the strong assumption that no unmeasured third variables are correlated with the mediators and the dependent variable – an assumption that may be violated given the plausible influence of such variables on attention to health information and attitudes or sense of control.

A further strength of this study was the operationalisation of UIC in the webpage versions for the experimental condition. We included a built-in filter that allowed users to self-select the COVID-19-related online content to both their topical needs and delivery mode of preference (i.e., text-only, text with illustrations). However, including audio-visual formats in the UIC versions of the webpage was not feasible and therefore outside of the scope of this study. While research shows that text-only and text with illustrations formats of online health information enhances information recall in younger adults (i.e., 25–45), this is not the case in older adults (i.e., 65+; Nguyen et al., 2017). Given that the mean age of participants was 30, our operationalisation of mode-tailoring in this study presents limitations to the generalisability of the results to older adult populations. Additionally, while the robustness checks revealed no statistically significant differences between the two control conditions (i.e., text-only and text with illustrations), potential heterogeneity in the baseline should be considered when

interpreting the results of this study. Future research could treat the generic webpage of text-only and text with illustrations as separate control conditions to further explore the efficacy of UIC for communicating health behaviour-related information.

Similarly, the current study had an overrepresentation of females and highly educated individuals. Research examining gender differences in information seeking behaviour, has shown that females, compared to males, are more likely to seek for health information online (Manierre, 2015). In turn, level of education has been found to positively influence COVID-19-related knowledge (Gomes Da Silva et al., 2021). Thus, gender and knowledge may have influenced whether or not users customised online information in this study. Future research should explore whether the results of this study are comparable among a representative sample of the general population.

Conclusion

This study examined the persuasive effects of UIC incorporated in webpages about COVID-19-related health behaviour information. The results contribute to current tailoring research by demonstrating that the opportunity to customise both the content and mode of online health information, positively strengthens users' attitudes explained via the underlying mechanisms of sense of control, attention, and elaboration. Furthermore, while the results did not differ for detection versus prevention behaviours, they instead demonstrate that UIC can facilitate central route processing via sense of control for both types of health behaviour content. The insights from this study highlight the importance of taking users' informational needs (i.e., by content tailoring) and learning preferences (i.e., by mode tailoring) into account when developing health informational webpages in practice.

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Conflict of Interest

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

Ethical approval for this study was provided by the ethics committee of the Amsterdam School of Communication Research (reference number: 2020-PC-12817). All participants provided informed consent prior to commencing data collection.

Supplemental Online Material

Supplementary material for this article is available online (link to supplementary).

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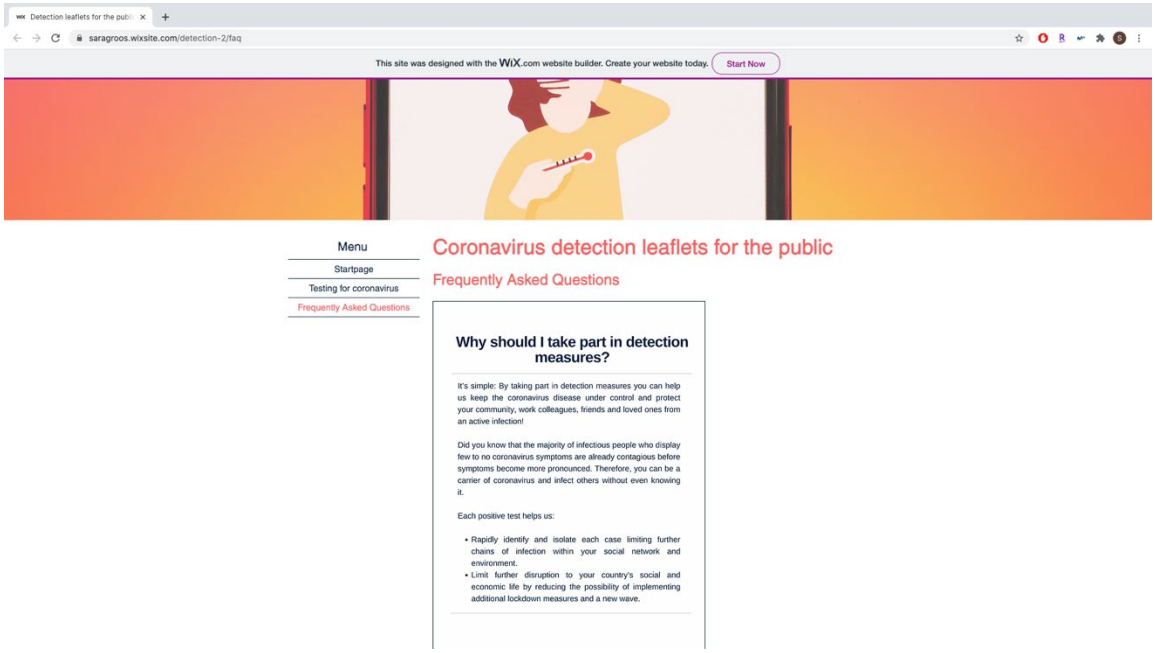
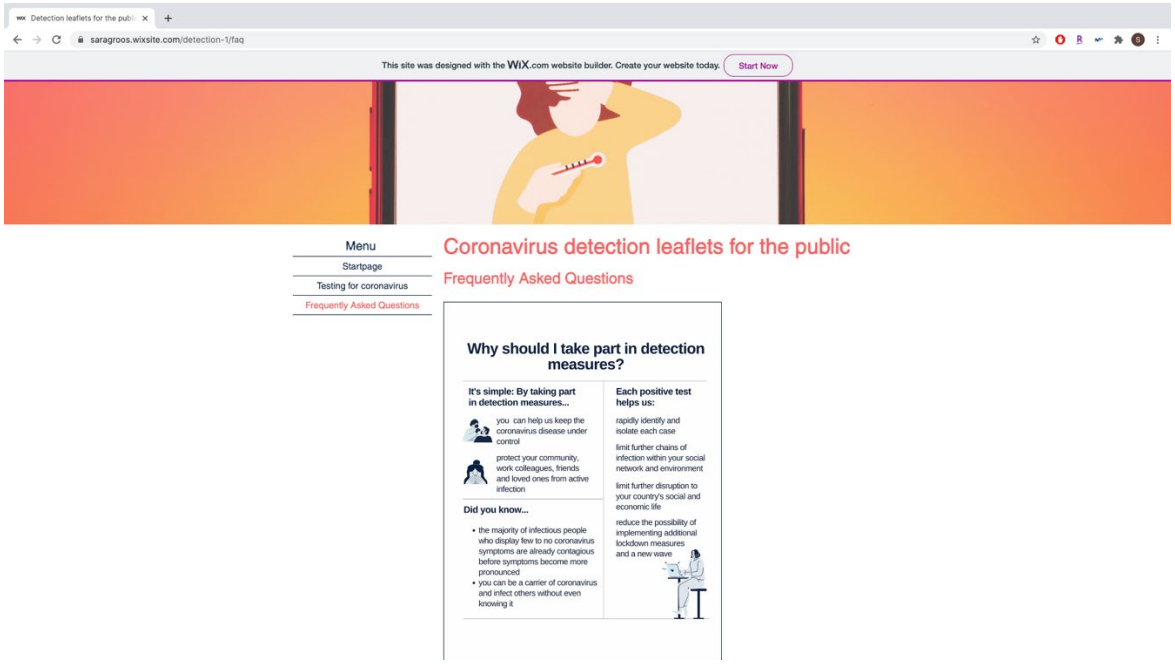
Appendix

Appendix A. Example of Final Generic Text-Only Version Containing Information About the COVID-19-Related Detection Behaviours



Note. Published on: https://saragroos.wixsite.com/detection-2/faq.

Appendix B. Example of Final Generic Text with Illustration Version Containing Information About the COVID-19-Related Detection Behaviours



Note. Published on: https://saragroos.wixsite.com/detection-1/faq.