Article

Sick for Information?

Information Needs and Media Use of the Dutch Public During the Covid-19 Pandemic

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Abstract

During a pandemic outbreak, timely and accurate information that matches the information needs of the public is vital to inform the public. In April 2020, 977 individuals completed a questionnaire that measured the Dutch public's health information needs and media consumption during the early stages of the coronavirus outbreak. Results show that respondents sought information about prevention of contamination, (the severity of) symptoms, treatment, and vaccination. News outlets, both online and offline, were the most preferred sources for information. Older people were more likely to search for information in traditional media, such as on TV, in newspapers, and on the radio. Younger people more often used news websites to find information. Respondents with lower levels of education obtained information via TV more frequently than respondents with higher levels of education, who in turn used newspapers more frequently. This study, guided by the Risk Information Seeking and Processing (RISP) model, was conducted *during* the early stages of the pandemic in the Netherlands to provide information that public health officials and governments can use to optimise information provision during pandemics. Presently, news media have the highest degree of coverage and impact and should thus be used first to convey reliable information.

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Keywords

In December 2019, the first human was infected with the novel coronavirus in Wuhan, China. In rapid time the virus started to spread around the world (World Health Organization (WHO), 2020a). At the end of February 2020, the first human was tested positive for Covid-19 in the Netherlands. In March 2020, the World Health Organization labelled the coronavirus outbreak a pandemic (World Health Organization (WHO), 2020b). At that time, worldwide, 118,000 people were infected, and 4,300 corona-related deaths were reported (World Health Organization (WHO), 2020c). In the Netherlands, the number of positive tests first peaked in early April 2020 ($N = 1,394$ on 10 April) and started to decrease after 17 April (RIVM, 2021a). Between 10 and 24 April, 495 people in the Netherlands passed away due to the coronavirus, bringing the total number of diseased people in the Netherlands since February to 4,786 (RIVM, 2021b). In Early April 2020, the Netherlands, like many other countries worldwide, was in lockdown; schools and public places were closed, and group gatherings were prohibited. A 1.5-meter distance between persons had to be maintained at all times.

Since the start of the pandemic, researchers rapidly started working en mass to reveal the characteristics of the virus, and to develop vaccines and treatments. In tandem, public health officials and governments informed the public about the virus and communicated which measures to take to prevent the virus from spreading (Garfin et al., 2020). In the Netherlands, particularly the government and the National Institute for Public Health and the Environment (RIVM), were responsible for informing the public about the virus and communicated the measures required to prevent the virus from spreading.

Like the outbreak of a previous pandemic (i.e., A/H1N1; Vasterman & Ruigrok, 2013)the current pandemic received massive media attention in the Netherlands and has been a front-page topic ever since. However, during a health crisis, various subpopulations of the general public will have specific questions and concerns about the crisis that all need to be addressed (Henrich & Holmes, 2020). Not providing information that matches the public's needs via the channel of their preferences, inhibits information processing, psychological adaption to the illness, prevention of spreading the virus, and adequate treatment (Campbell & Quintiliani, 2006; Lustria et al., 2016). To optimally inform and persuade the public, public health officials and governments should acknowledge the differences in information needs and media usage of the public. For example, while adolescents might prefer the internet to find information, older people might prefer to read this information in a newspaper. Timely and accurate information tailored to subpopulations is vital to inform the public and persuade people to adhere to prevention measures, and to minimize the spread of infection (Henrich & Holmes, 2011). However, research is scarce in exploring which information the public needs during a pandemic, and how the public seeks for and receives information. The goal of the current study is to gain a better understanding of the Dutch public's information needs and media consumption during the early stages of the Covid-19 pandemic.

Information Needs and Media Consumption During an Outbreak

This study is guided by the Risk Information Seeking and Processing (RISP) model to understand how people seek information during a crisis and how the related media consumption may differ between people (Griffin et al., 1999). Information is essential when a person feels threatened, especially in an uncertain situation such as the Covid-19 outbreak (Yang et al., 2014), a situation characterized by a lack of knowledge. Information insufficiency is a central concept of the RISP model and represents the discrepancy between people's perceived current knowledge and the knowledge needed to deal with a given risk such as Covid-19 (sufficiency threshold). In other words, information insufficiency represents a person's information needs (Griffin et al., 1999; ter Huurne et al., 2009). The discrepancy between current knowledge and knowledge one needs, that is, the perceived knowledge gap, furthermore, determines the level of information people feel they need, and the effort invested in seeking information (Griffin et al., 1999). Particularly, information insufficiency thus triggers people to start seeking information (Kahlor, 2010). Information seeking, in turn, can be defined as a deliberated process of selecting a specific medium to seek information that fulfils the information needs of the seeker and thus solves the issue of information insufficiency for this person (Griffin et al., 2012). The RISP model suggests that, aside from information needs due to information insufficiency, people have different levels of information needs depending on the perceived severity of the disease at hand (ter Huurne et al., 2009; Li & Zheng, 2020). The Covid-19 pandemic can be considered a threatening situation for which there is a lack of knowledge among the public, especially in the early stages of the pandemic. Based on the RISP model, the question thus arises what information needs people have at the time of an outbreak of an unfamiliar and severe disease and how these needs differ between people.

Explorations of the Dutch public's information needs and preferences during a previous pandemic revealed that people mostly prefer information about symptoms, prevention, and treatment (Bults et al., 2011; van Velsen et al., 2012; Wong & Sam, 2010). Although situated in a very different context, a study conducted in Malaysia also shows a need for information about prevention and treatment (Wong & Sam, 2010). Moreover, a focus group study conducted in Canada revealed that, in the case of a future pandemic, people would like to receive information about the risk of infection and severity of symptoms (Henrich & Holmes, 2011). These studies were, however, conducted retrospectively (i.e., not during the pandemic) or asked respondents to imagine a pandemic. Therefore, the validity of the results may be compromised. It is, furthermore, difficult to make comparisons between pandemics as they all develop within specific contexts related to the nature of the disease itself but also to the political environments in which the pandemic develops. Currently, many editorials and reviews are written about the importance of adequate information provision during the Covid-19 pandemic (e.g., van den Broucke, 2020, Garfin et al., 2020, Fagherazzi et al., 2020). However, up to now, scarce empirical research has investigated the information needs and preferences of the (Dutch) general public during the Covid-19 crisis.

Research on media coverage of the Covid-19 pandemic has mostly focused on framing of the news (e.g., Ogbodo et al., 2020; global context), politicization and polarization in news coverage (e.g., Hart, Chinn, & Soroka, 2020; U.S. context), effects of Covid-19 related media coverage on mental wellbeing and fear (e.g., Bendau et al., 2020; German context), media coverage on

television (e.g., Villena-Alarcon & Caballero-Galeote, 2020; Spanish context), and quality of online information (e.g., Hernandez-Garcia & Giménez-Júlvez, 2020; online context, main focus United States and Spain), but less on specific *information needs* related to Covid-19. The few studies investigating information needs related to Covid-19 were all conducted in non-European contexts and reported that most people wanted information to reduce their anxiety and worries about a possible Covid-19 infection (Jo et al., 2021; Ke et al., 2021). Research on Chinese mass media reports on the coronavirus, for example, shows that information about prevention and control procedures, medical treatment and research are most dominantly presented in the Chinese media (Liu et al., 2020). A Vietnamese study shows that at the beginning of the pandemic there was a high need for updates about the pandemic as well as information about disease symptoms, treatment, and prevention (Le et al., 2020). These results are comparable to the information needs of the Dutch general public reported during the H1N1 pandemic in 2009. However, more research is warranted to be able to provide information about the information needs of the public in a European context, to improve information provision during future pandemics.

Obtaining reliable and accurate health information has always been a challenge (Diviani et al., 2016) and this is especially true in an early stage of an outbreak, partly due to the uncertainty about the virus (Jo et al., 2020). For this reason, it is important to select communication channels that have the highest degree of coverage, credibility, and impact. The RISP model proposes that, in addition to information insufficiency, information seeking is affected by the extent to which people feel confident in seeking information (perceived information gathering capacity) and the beliefs they hold regarding certain channels (relevant channel beliefs; Griffin et al., 1999; Griffin et al., 2012). For example, people who feel less confident in using online sources or people who assume that news media are biased may opt for differing channels to seek information. Especially during a health crisis, various subpopulations of the general public may thus have specific and differing preferences regarding the channel they use.

The RISP model furthermore proposes that particularly information insufficiency motivates people to use different channels to satisfy their information needs (Griffin et al., 2019). During previous pandemics, the Dutch public mostly relied on traditional mass media resources, namely television and newspapers (Brug et al., 2004; Bults et al., 2011) and in addition, reported to prefer information from health institutes, general practitioners, the internet and schools (Bults et al., 2011). Similar results were found in Canadian, Malaysian and American-Chinese contexts (Henrich & Holmes, 2011; Wong & Sam, 2010; Yip et al., 2009). Results from previous pandemics therefore show that people use several channels to find information about a pandemic.

Since the last pandemic (A/H1N1), more people use the internet as a source for health information. In the European Union, searching for online health information has increased from on average 20% in 2007 to more than 50% in 2019 (Eurostat, 2020). In the Netherlands, presently almost eight out of ten people search for health information online, compared to less than 50% in 2012 (Dubbeldam, 2016; Eurostat, 2020; Link et al., 2021), making it the most often used source for health information, followed by the general practitioner (Van de Belt et al., 2013). This trend is also visible in crisis communication (Bridgman et al., 2020). In comparison to other European countries such as Switzerland, Austria and Germany, the percentage of internet users for health-related information is significantly higher in the Netherlands (Link et al., 2021). It is therefore not unlikely that during the Covid-19 outbreak, the preference for traditional channels may have

shifted towards mass media 2.0, referring to online sources such as search engines, social media, forums, blogs, health websites and news sites.

To gain a better understanding of the Dutch public's information needs during a virus outbreak and to inform public health officials and governments in selecting the media channels that have the highest degree of coverage and impact on today's western society in the early stages of a pandemic, the following RQs were formulated:

RQ1: What content-related health information needs do people have during the current pandemic?

RQ2a: Which media channels do people use to inform themselves about the coronavirus?

RQ2b: How often do they use these channels?

RQ3: How do groups of people (based on age, biological sex and level of education) differ in their information needs and media channel use during the pandemic?

Methods

Procedure and Respondents

Data were collected from April 17 to April 24, 2020. Panel members ($N = 1,747$) of the ISO-certified research agency Flycatcher received an invitation to the online questionnaire. Participation was voluntary and anonymous; respondents were informed and were asked to sign an online informed consent. A total of 1,068 respondents completed the questionnaire (response rate of 61.1%), of which 91 respondents were removed because they spent less than five minutes filling in the questionnaire. This resulted in a final sample of 977 respondents. Data were collected using a stratified proportional sampling technique, resulting in a representative[1] sample of the Dutch population regarding biological sex, age, education, and province of residency in the Netherlands. Respondents were on average 52 years old ($M = 51.69$, $SD = 17.53$, ranging from 18-90). Approximately half of respondents (49.6%) were female. 31.8% were lower educated, 39.1% had a medium level of education and 29.1% were highly educated.[2]

Measurements

Content-Related Information Needs. To explore the public's information needs, we asked the respondents what type of information about the coronavirus they desired when thinking about the past seven days. Respondents could indicate on a five-point scale ranging from 1 (*never*) to 5 (*very often*) how frequently they had experienced the need for information about the following topics: a) causes of the coronavirus, b) severity of the symptoms, c) type of symptoms, d) treatment, e) chance to be admitted to the Intensive Care (IC), f) vaccination, g) prevention of contamination, and h) stories of people infected with the coronavirus. See Figure 1 for an overview of means, standard deviations, and 95% confidence intervals for the separate items.

Media Channels. To explore Covid-19 related media use, we asked respondents to indicate how frequently they had searched for information related to the virus in the past seven days, on 12 different media channels. We assessed this on a five-point Likert Scale, ranging from 1 (*never*) to 5 (*very often*). See Figure 2 for an overview of means, standard deviations and 95% confidence intervals for the separate items.

Information Preferences. To measure the public's information preferences, an adapted version of the Information Satisfaction Questionnaire (ISQ) was used (Thomas et al., 2004). Rossiter (2002) proposes that if the concept can be conceptualized as concrete and singular, it does not require multiple items to represent it in the measure. For this reason, we included only one item of the ISQ to measure information preference. This scale has been widely used in the field of oncology to assess overall information preferences and need for involvement. We asked respondents to indicate on a five-point Likert scale (1 = *completely disagree* to 5 = *completely agree*) to what extent they would like to have as much information as possible about the coronavirus: "Some people would like to know everything about the coronavirus, others just want to know the main points or prefer to know as little as possible. Can you indicate to what extent the description below applies to you? – I want to have as much information as possible about the coronavirus".

Results

Content-Related Information Needs

To answer RQ1, we asked respondents to indicate their content-related information needs in relation to the coronavirus. Interpretation of 95% confidence intervals (Figure 1) revealed that respondents were significantly more in need of information about prevention of contamination compared to all other needs. Results furthermore showed a significantly higher need for information about symptoms, treatment, vaccination, and the severity of the symptoms, compared to the other needs. Respondents had a significantly lower need for information about stories of other people infected with the virus.

Media Channels

Regarding RQ2, results revealed that respondents mostly sought out information about the coronavirus through news outlets. Comparison of the 95% confidence intervals revealed that news broadcasts on television were enquired significantly more often than all other channels. Following, current affairs programs on television, radio news broadcasts, newspapers (online and offline), news websites and governmental websites were consulted significantly more often than other sources such as health websites and social media (see Figure 2). Respondents did not seem to prefer online over offline media channels.
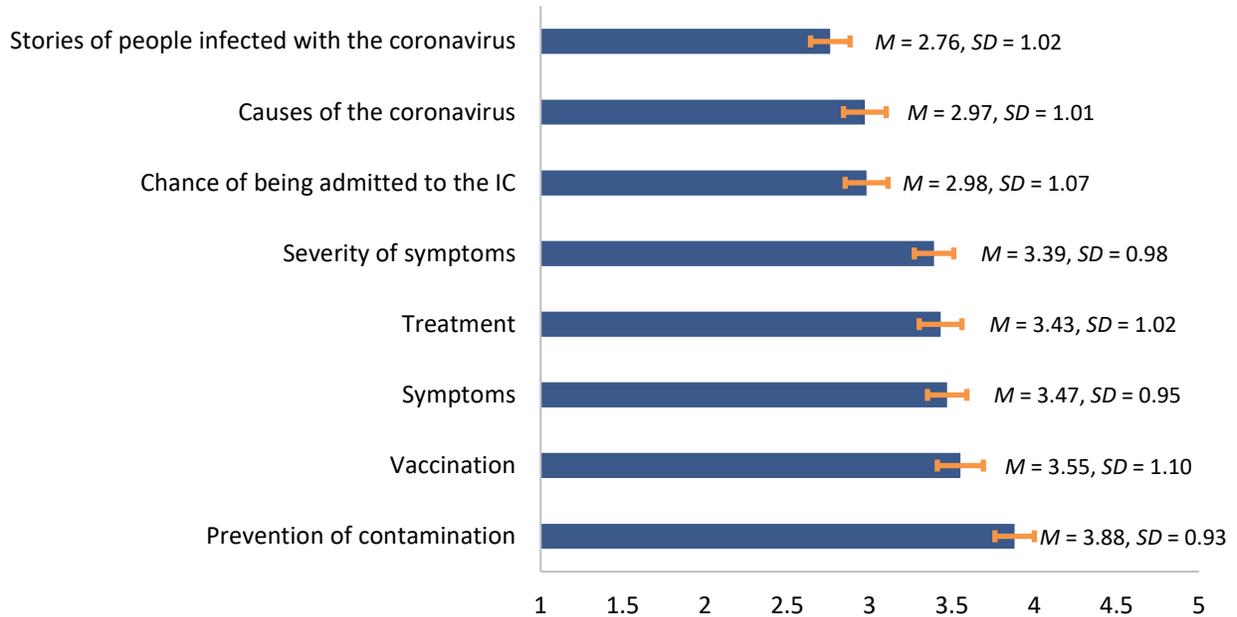
Figure 1. Content-Related Information Needs regarding Covid-19
Note. Means, standard deviations and 95% confidence interval error bars per information need (*N* = 977).
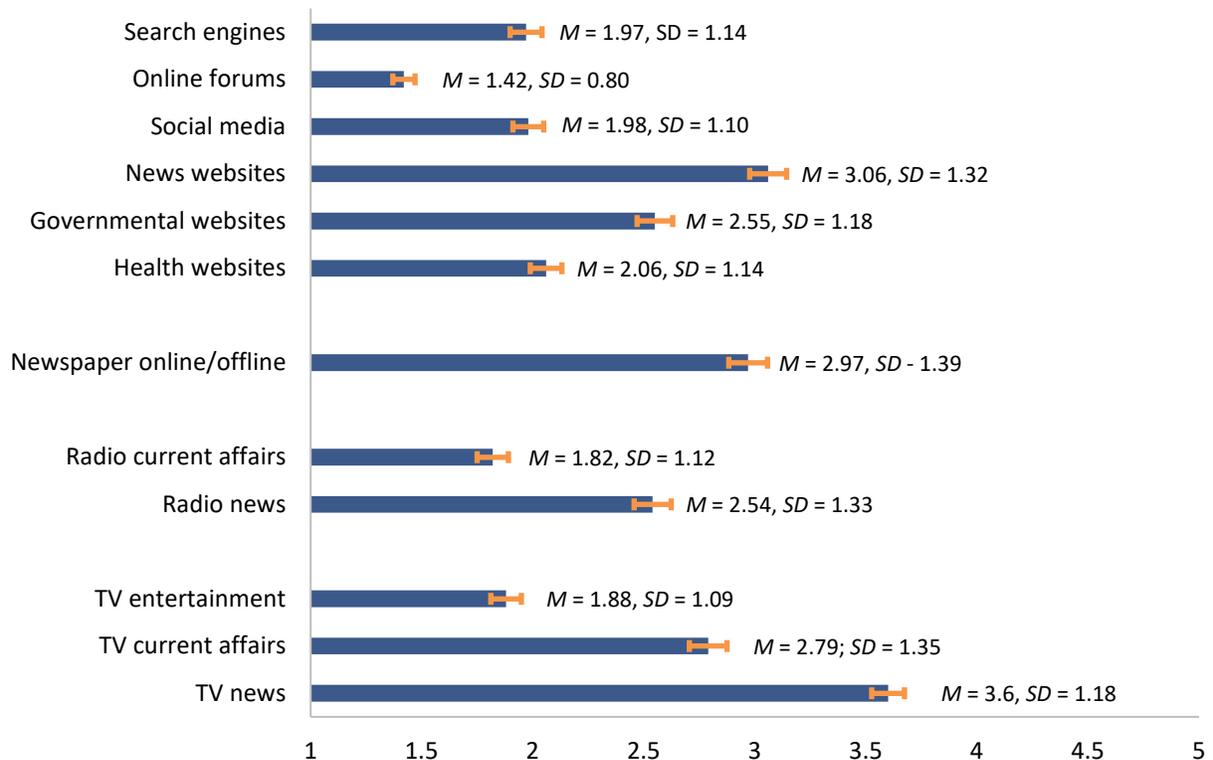

Figure 2. Media Channel Usage for Information about Covid-19
Note. Overview of means, standard deviations and 95% confidence interval error bars per information channel consulted for information about Covid-19 (*N* = 977).

Demographic Differences in Information Needs and Media Use

Results pertaining to RQ3 firstly revealed a significant but very weak positive association between the ranked age and ranked need for as much information as possible about Covid-19, $r_s = .10$, $p < .01$. Next, a Mann-Withney U test indicated that the need for as much information as possible was comparable for men (mean rank = 487.79) and women (mean rank = 490.23), $U = 118715.00$, $p = .887$. Similarly, a Kruskall-Wallis test revealed no difference in this need between respondents with low (mean rank = 504.03), middle (mean rank = 492.18), and high levels of education (mean rank = 468.72), $H(2) = 2.71$, $p = .258$. See Table 1 for an overview of mean and median scores.

When investigating the separate content-related information needs, results revealed that age is significantly positively but weakly associated with the need for information about causes of the virus ($r_s = .21$), symptoms ($r_s = .19$), severity of symptoms ($r_s = .22$), treatment ($r_s = .16$), chance of being admitted to the IC ($r_s = .22$), vaccination ($r_s = .15$), prevention of contamination ($r_s = .23$), and stories of other people infected with the virus ($r_s = .09$), all $p < .01$. Separate one-way ANOVAs[3] with the eight content-related information needs as dependent variables and level of education and biological sex as independent variables revealed that lower educated respondents had a higher need for information about causes of the virus than middle and higher educated respondents. No other differences were found (see Table 2 for means, univariate tests and post hoc tests).

Regarding media channel use, correlation analysis revealed that age is significantly (all $p < .01$) positively associated with looking for information about the virus via television news ($r_s = .25$), current affairs programs ($r_s = .38$), entertainment shows ($r_s = .14$), radio news broadcasts ($r_s = .15$), radio current affairs programs ($r_s = .26$), newspapers ($r_s = .29$), online forums ($r_s = .13$) and health websites ($r_s = .07$, $p < .05$). Negative significant but very weak associations were found between age and checking governmental websites ($r_s = -.07$, $p < .05$), news websites ($r_s = -.14$, $p < .01$), and social media ($r_s = -.15$, $p < .01$).

Table 1.   Mean and Median Scores for the Need for as much Information as Possible by Biological Sex and Level of Education

	M (SD)	*Median*
Men	3.47 (1.00)	4.00
Women	3.47 (0.95)	4.00
Level of education		
Low	3.54 (0.97)	4.00
Middle	3.48 (0.95)	4.00
High	3.39 (1.02)	4.00

Note. N = 977; possible range 1-5.

Table 2.   Demographic Differences regarding Content-Related Information Needs During the Covid-19 Pandemic

Dependent variable	Level of education								Biological sex					
	low		middle		high				female		male			
	M	*SD*	*M*	*SD*	*M*	*SD*	*F*(2, 973)	*p*	*M*	*SD*	*M*	*SD*	*F*(1, 973)	*p*
Causes of the coronavirus	3.13[ab]	1.02	2.87	0.99	2.92	1.03	5.44	.004*	2.93	1.04	3.00	0.98	0.38	.538
Symptoms	3.60	0.91	3.38	0.98	3.46	0.95	4.99	.007	3.48	0.97	3.46	0.94	0.46	.496
Severity of symptoms	3.50	1.00	3.35	0.99	3.33	0.93	2.58	.077	3.38	0.98	3.40	0.98	0.02	.898
Treatment	3.55	1.03	3.35	1.04	3.41	0.97	3.51	.030	3.43	1.01	3.43	1.03	0.05	.823
Chance of being admitted to the IC	3.09	1.07	2.91	1.08	2.96	1.06	2.05	.130	2.92	1.07	3.04	1.07	2.12	.145
Vaccination	3.65	1.11	3.51	1.12	3.49	1.05	1.68	.186	3.50	1.11	3.60	1.09	1.39	.239
Prevention of contamination	3.98	0.88	3.82	0.98	3.85	0.93	2.54	.079	3.87	0.95	3.89	0.92	0.00	.968
Stories of people infected with the coronavirus	2.86	1.06	2.75	1.02	2.66	0.96	3.63	.027	2.84	1.01	2.69	1.02	6.48	.011

Note. Eight one-way ANOVAs with level of education and biological sex as independent variables and information needs as dependent variables; assumption of equality of variances met (all *p* > .05); *N* = 977;
*Univariate test significant at *p* < .006 (Bonferroni correction for multiple testing);
[a]Tukey HSD posthoc test of difference between low and medium significant at *p* < .05;
[b]Tukey HSD posthoc test of difference between low and high significant at *p* < .05;
[c]Tukey HSD posthoc test of difference between medium and high significant at *p* < .05.

Table 3.   Demographic Differences regarding Media Channel Usage During the Covid-19 Pandemic

Dependent variable	Level of education								Biological sex					
	low		middle		high				female		male			
	M	SD	M	SD	M	SD	F(2, 973)	p	M	SD	M	SD	F(1, 973)	p
TV news[+]	3.80[ab]	1.09	3.52	1.18	3.48	1.23	6.42	.002*	3.55	1.20	3.64	1.15	0.59	.444
TV current affairs	3.11[ab]	1.31	2.63	1.34	2.68	1.35	11.06	.000*	2.67	1.32	2.92	1.37	5.76	.017
TV entertainment	2.17[ab]	1.16	1.93[c]	1.14	1.49	0.81	31.99	.000*	1.89	1.08	1.86	1.11	1.13	.288
Radio news	2.66	1.34	2.51	1.33	2.46	1.32	1.83	.161	2.51	1.35	2.57	1.32	0.26	.614
Radio current affairs[+]	1.98	1.15	1.77	1.12	1.70	1.08	4.09	.017	1.67	1.05	1.96	1.17	14.07	.000*
Newspaper online/offline	2.97	1.34	2.93	1.41	3.15	1.39	4.52	.011	2.91	1.41	3.02	1.37	1.43	.233
Health websites	2.04	1.11	2.04	1.12	2.10	1.15	0.36	.702	1.97	1.09	2.14	1.17	6.11	.014
Governmental websites	2.52	1.29	2.56	1.28	2.57	1.27	0.06	.946	2.61	1.27	2.49	1.29	2.18	.140
News websites	2.88[b]	1.32	3.03[c]	1.30	3.31	1.33	8.30	.000*	3.08	1.37	3.05	1.28	0.00	.980
Social media	1.95	1.14	1.97	1.09	2.01	1.09	0.11	.896	2.06	1.12	1.90	1.08	4.85	.028
Online forums[+]	1.53	0.84	1.36	0.79	1.33	0.75	4.26	.014	1.38	0.76	1.46	0.83	1.45	.229
Search engines	1.98	1.11	1.93	1.11	2.01	1.22	0.40	.674	1.96	1.12	1.98	1.17	0.03	.870

Note. Twelve one-way ANOVAs with level of education and biological sex as independent variables and information channels as dependent variables; assumption of equality of variances met (all $p > .05$) unless otherwise indicated; $N = 977$;
[+]assumption of equality of variances not met ($p < .05$);
*Univariate test significant at p < .004 (Bonferonni correction for multiple testing);
[a]Tukey HSD posthoc test of difference between low and medium significant at $p < .05$;
[b]Tukey HSD posthoc test of difference between low and high significant at $p < .05$;
[c]Tukey HSD posthoc test of difference between medium and high significant at $p < .05$.

Separate one-way ANOVAs[3] with the 12 media channels as dependent variables and level of education and biological sex as independent variables (see Table 3 for an overview of means, univariate tests and post hoc tests) firstly revealed that lower educated respondents more often watched television for information about the coronavirus (i.e., news broadcasts, current affairs programs and entertainment shows) than middle and higher educated respondents. It should be noted that results pertaining to television news broadcasts should be interpreted with care because variances were not equal between levels of education (Levene's $F = 3.48$, p = .004). Although lower educated people indicated to watch entertainment shows significantly more often than middle and higher educated people, they still only watch these shows rarely to get information about the virus. Current affairs programs and news broadcasts, on the other hand, are consulted sometimes and often, respectively. Results further revealed that higher educated people more often checked news websites than middle and lower educated people. Regarding biological sex, results show that men listen to current affairs programs on the radio more often than women, although overall, people indicated to listen to these programs rarely for information about the virus.

Discussion

During a pandemic, it is vital to adequately inform the public to enable them to protect their own health and the health of others efficiently. It is therefore crucial to gain more insights into their health information needs and media use practices during an outbreak such as Covid-19. The current project, guided by the RISP model, contributes to this pressing need by examining these factors *during* the present pandemic (i.e., not relying on retrospective data) in a representative sample of the Dutch population. Results showed that most people needed information about the (severity of) symptoms, treatment, vaccination, and prevention of contamination. News outlets, both online and offline, were the most preferred sources for such information.

Results from the current study in a Dutch context demonstrate the highest need for information about the prevention of contamination from the virus. A recent content analysis shows that this topic is most dominantly covered in the Chinese media during the coronavirus outbreak (Liu et al., 2020). An in-depth analysis of media coverage in a European context is, however, not available. Results of the current study further show that news media (offline and online) are most often used to gain information about the virus. This is in line with previous research demonstrating that the more traditional mass media are being used by people during a pandemic, as seen in the Netherlands and Malaysia (Brug et al., 2004; Wong & Sam, 2010). Unexpectedly, no strong preference for online channels over offline channels was found. This is surprising considering current trends towards online and mobile news consumption (Molyneux, 2018). Thus, contrary to research into media use during previous pandemics, our results demonstrate that the public continues to rely more on traditional mass media recourses such as television and newspapers (Brug et al., 2004; Bults et al., 2011; Wong & Sam, 2010; Yip et al., 2009) compared to online media such as health websites or search engines. The results of this current study are supported by the results from a recent large international survey, based on which, it was concluded that most people worldwide indicate that they watch more TV since the pandemic, and specifically the news (Statista, 2020).

Several factors might explain the preference for traditional media over online media. A first explanation of our results can be found in the RISP model (ter Huurne et al., 2009). According to the model, a factor that affects the channel that is being used to gather risk information are the beliefs about that channel (i.e., relevant channel beliefs). If a particular channel is thought to fulfil the information needs of the information seeker, the seeker will most likely select this channel (Griffin et al., 2012). Particularly traditional mass media, such as news media, have a longstanding reputation of being responsible for informing and educating the public about political, social, economic, scientific, health, and cultural developments in society. During the current pandemic, we do see that broadcasters are responding to this need for information and education by keeping the public up to date with daily updates, live-stream reporting, interviews with experts etc. A second explanation can be found in the weekly press conferences held by the Dutch government during the period of data collection. Inspired by the correspondence paper of Wang (2020) and the global consistency in the use of traditional media during a pandemic, we encourage health communication professionals to take a critical function in responding to emerging diseases such as Covid-19. Consortia should be built to take advantage of the lessons we learned during the current pandemic and a protocol for global communication efforts should be developed with a strong focus on traditional news media.

Compared to previous research into health information seeking (Dobransky & Hargittai, 2012), surprisingly, people in the current study reported to make almost no use of health websites, forums, social media, and search engines when looking for information about the coronavirus. Online health information is often of low quality, difficult to understand, irrelevant to people's specific situation, and may cause information overload (Chung, 2013; Korp, 2006; Kwakernaak et al., 2019; Lee, 2008). Additionally, information found online, particularly on social media and forums, or unreliable websites found via search engines is often conflicting because it does not always align with the information provided by, for example, governments or health organizations. The coverage and quality of the information in mass media about the coronavirus is critical (Sharma et al., 2020) and the current study shows that at least in the early stages of a pandemic, Dutch people mostly get their information from news media that are generally considered objective and reliable. Aside from the previously mentioned explanation that people choose relevant channels based on their beliefs about these channels, an explanation for this reliance on news media may be that in general crises, such as the current pandemic, people might prefer information about facts, while in personal crises or when being ill themselves, people might have a higher need for social support and personal stories (Tanis, 2008). This is underscored by the fact that in the present study, people indicated that they did not often search for personal stories of people infected with the virus. It should be noted, however, that in April 2020 many people were not yet infected with the virus, meaning that they may not have had a need for this information at that time.

Results furthermore revealed that older people more often prefer as much information as possible about the virus than younger people. Older people also more often sought information via traditional media (television, radio, and newspapers), and in particular, news broadcasts and current affairs programs were watched more often as age increased. Although the association was very weak, results did reveal that younger people in turn more often used online news media. This can be explained by lower levels of digital competence of older adults, an antecedent of digital

self-efficacy (De George-Walker & Tyler, 2014). Hence, a preference for non-digital channels by older adults may be explained by a lack of information gathering capacity based on the RISP model (Griffin et al., 2012). Interestingly, lower educated people more often watched television for information about the virus compared to middle and higher educated people. Higher educated people more often consulted newspapers for information about the virus. This underlines the need for clear and understandable communication about the virus via traditional mass media whereby the educational level of the media user must also be taken into account.

Previous studies in this area were predominantly carried out retrospectively. Therefore, a strength of the current study is that we collected data *during* the coronavirus pandemic, possibly resulting in more ecologically valid results. Although it is unknown to what extent our results are representative to other countries, the results are in line with results from comparable studies in the Netherlands and other countries during the previous pandemic (Bults et al., 2011; Henrich & Holmes, 2011; van Velsen et al., 2012; Wong & Sam, 2010), thereby furthermore showing that information needs appear to be comparable across countries and when it concerns different pandemics, also outside a European context. Another strength is that the current study made use of a stratified sample, resulting in data representative of the Dutch population regarding biological sex, age, level of education and province of residency in the Netherlands. Nevertheless, it must be noted that the survey was administered online, and the sample is therefore only representative of Dutch people with working Internet connection and sufficient ICT skills. Results of the current study, however, indicated that people mostly used offline sources to enquire about the coronavirus, and we therefore expect that the proportion of the Dutch population without internet connection at home (3% in 2019; CBS, 2020a) or sufficient ICT skills[4] reveals similar information seeking behavior. A final strength of the current study pertains to the size of the sample, resulting in increased test power.

This study was conducted during the coronavirus pandemic to provide information that governments and public health officials can use to optimize information provision during this and potential future pandemics. Based on our study, we conclude that, at least in the early stages of a pandemic, the news media have the highest degree of coverage and impact in today's society and should thus, first of all, be used to convey reliable information, particularly tailored to people with a low level of education. The coverage and quality of the information about Covid-19 in mass media is critical (Sharma et al., 2020) and in the case of an *infodemic* as stated by the WHO (Cuan-Baltazar et al., 2020) there is a responsibility for these media to provide accurate, non-biased and reliable information, and prevent the spread of misinformation (Sharma et al., 2020). This also puts great responsibility on governments and health officials to disseminate clear, unambiguous information suited for all educational levels and accessible for people with low health literacy, which can then be picked up by news media. Finally, although social media could be a suitable outlet for crisis communication during a virus outbreak (Freberg et al., 2013), our results reveal that the Dutch public is less receptive to these channels in the early stages of a new pandemic, and they are therefore not recommended as one of the prime information channels.

Notes

1. The numbers used to determine the representativeness come from the "Golden Standard". This is a calibration tool that has been developed by the MOA (Center for Marketing Insights, Research & Analytics) in collaboration with Statistics Netherlands.

2. Low education level ranges from no education to having a degree for the lowest level of secondary education (pre-vocational), middle education level includes senior general secondary education and pre-university education, high education level is specified by having a higher vocational education or university degree.

3. Because dependent variables were not clearly linearly associated, multivariate testing was not possible, and we therefore opted for separate univariate tests with Bonferroni correction.

4. In 2019, 89% of the Dutch population was digitally skilled to find information online (CBS, 2020b).

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