



On the Relationship Between Skepticism Towards and Reactance to Health Messages: The Special Case of Online Communication on Tick-Borne Encephalitis

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Specialty section:

This article was submitted to
Health Communication,
a section of the journal
Frontiers in Communication

Received: 07 July 2021

Accepted: 06 August 2021

Published: 17 August 2021

Citation:

Koinig I and Kohler S (2021) On the Relationship Between Skepticism Towards and Reactance to Health Messages: The Special Case of Online Communication on Tick-Borne Encephalitis. *Front. Commun.* 6:737800. doi: 10.3389/fcomm.2021.737800

In general, health communication messages intend to change individuals' behaviors, applying both cognitive reasoning and increasingly personal accounts to achieve these changes. Nonetheless, against the background of increasing skepticism towards scientific findings and patronizing message claims, health messages fail to achieve their intended results. By use of a quantitative survey with Austrian respondents ($n = 271$), the study at hand intends to uncover individuals' level of skepticism towards Tick-Borne Encephalitis (TBE) as well as their evaluations of online vaccination-related information on TBE. Moreover, as skepticism is likely to lead individuals to reject health message content altogether, we also test for the relationship between skepticism and reactance. Results indicate that there is only a marginal relationship between the two variables in the TBE communication context. For this reason, other variables might have to be included in future research to derive more comprehensive results and recommendations. Since skepticism has proven to be of lesser importance in TBE message reception, government or health officials are recommended to prioritize additional constructs, such as trust, which can be elevated through more affective communication.

Keywords: health communication, vaccination, tick-borne encephalitis, skepticism, reactance

INTRODUCTION

In recent years, the topic of vaccination has received a lot of public exposure. Thereby, news coverage and public debates have shown that people discuss vaccination and even refuse to vaccinate themselves or their children (Schoeppe et al., 2017). This phenomenon has been widely discussed as vaccination hesitancy, described as "the reluctance to accept recommended vaccines" (Dube et al., 2020). The growing refusal of e.g., measles vaccination led to the discussion that some vaccines should be mandatory instead of voluntary (Gesser-Edelsburg et al., 2015), and it often originated out of cost-benefit analysis to reduce the burden on cost-ridden healthcare systems (Chang et al., 2018). Against this background, a growing need for information on vaccines seems to be necessary (Kessler and Zillich, 2019), which can influence not only vaccine demand and acceptance but also people's attitudes towards vaccination and willingness to vaccinate (Betsch et al., 2017). This seems to be even more pressing, given the current discussions on COVID-19 vaccines (Jacobsen Vann et al., 2018; Ball, 2020). Increasingly, individuals consult the

Internet for health-related information (Din et al., 2019), which allows for a swift dissemination of health information to diverse audiences (Boulous and Wheeler, 2007). Unfortunately, the Internet also provides anti-vaccination groups with a platform to spread false and divisive information (Davis, 2019). As online media has been found to influence individuals' perceptions of vaccination (Betsch et al., 2017), the false information encountered might reduce their willingness to vaccinate.

While a plethora of research on vaccination is available and has predominantly looked at the arguments presented for or against vaccination or determinants of vaccination hesitancy (Guay et al., 2019), studies have predominantly focused on vaccinations against HPV, MMR (measles, mumps, and rubella), and influenza. So far, only a limited amount of research has been conducted on Tick-Borne Encephalitis (TBE). Tick-borne encephalitis is a potentially fatal infectious disease that is transmitted by ticks. It occurs mainly in forest belted areas in Europe, such as Austria, Germany and Switzerland (Zavadska et al., 2018). If TBE is not treated, it endangers individuals' health and life. The relevance of getting vaccinated against TBE seems to become more important in a time of climate change, which has conditioned the spread of ticks in Europe due to milder and shorter winters and the early arrival of spring (Lindgren and Gustafson, 2001). It is particularly severe in central European countries, where an increased number of incidents of TBE is reported (Zavadska et al., 2018). If people got vaccinated, the burden on cost-ridden health care systems would be eased, also mitigating additional societal impacts (Chang et al., 2018).

This study aims to analyze the relationship between skepticism and reactance in the context of online health messages on TBE. In detail, we intend to inquire both individuals' level of skepticism towards Tick-Borne Encephalitis (TBE) and their evaluations of online vaccination-related information on TBE. Since skepticism has been found to lead individuals to reject health message content, we also scrutinize a potential relationship between skepticism and reactance. Through our research, we intend to advance the debate on reactance in health communication.

To date, most papers on the subject TBE have either focused on the medical or natural scientific aspects of TBE, addressing issues like the spread of ticks instead of raising awareness for the danger ticks pose to both society in general and social well-being in particular (Lindgren and Gustafson, 2001). While the most effective protection against tick bites are vaccination or personal protection measures like long clothes or tick-repellent sprays (Driver, 2011), both measures will not be sufficient if people are not aware of the risk associated with TBE. Therefore, educating the public about ticks and the diseases resulting from tick bites seems crucial. This, however, becomes increasingly difficult against the background of an increasing scientific skepticism and vaccination hesitancy (Larson et al., 2011; WHO, 2019; Badur et al., 2020; Habersaat and Jackson, 2020).

Given that the Internet is commonly consulted for health-related information in general and information on vaccination in particular (Din et al., 2019), one fruitful way of informing the public about the risks associated with TBE are websites. The Austrian website *zecken.at* is a joint project of the pharmaceutical company Pfizer and the Austrian government. On this website,

the risks associated with tick bites are thematized. Consequently, the website qualifies as a platform of public health communication (Bonfadelli and Friemel, 2020).

THEORETICAL BACKGROUND

Research has found that both individual risk perceptions, trust and distrust respectively can (positively and negatively) affect individual vaccination decisions and behaviors (Habersaat and Jackson, 2020). Responses and attitudes towards vaccines are influenced by social norms (Brewer et al., 2017) and a number of "individual motivation factors" (Habersaat and Jackson, 2020), including individuals' capability, risk perceptions, confidence, and concerns (Brewer et al., 2017; Jacobson-Vann et al., 2018). Vaccination decision making is subject to a number of factors, including trust in both the effectiveness of vaccines, and the system delivering them, trust in the competence of health care providers, the health-care system, and policy makers (Ball, 2020).

Vaccination Hesitancy

Having been identified as one of the most concerning global health threats according to the WHO (WHO, 2019), the WHO Vaccine Hesitancy Group describes vaccination hesitancy as the "delay in acceptance or refusal of vaccines despite availability of vaccine services" (WHO, 2014), which is subject to a number of factors, including "complacency, convenience, and confidence" (WHO, 2014). For 90% of countries worldwide, vaccination hesitancy poses challenges to national healthcare systems (Lane et al., 2018). In consequence, vaccination rates can be at best described as being "insufficient" (Habersaat and Jackson, 2020).

Classified as a people-made crisis by the WHO (2019), vaccination hesitancy is installed by a number of factors, including misinformation (Hussain et al., 2018), a lack of trust in and poor interaction with health professionals (Benninghoff et al., 2020), and movements towards more natural lifestyles, which reduce the necessity to vaccinate (Reich, 2016; Atwell et al., 2018). Vaccination hesitancy is even triggered by messages that strongly advocate vaccination uptake, which can induce highly skeptical individuals to reject vaccines even more strongly (Roose, 2020). The same was found to hold true for messages that contain a lot of information (WHO, 2019).

Vaccination-hesitant individuals have been found to have specific health information needs: they are best described as "active information seekers", who search for "balanced information" (Andre et al., 2008; Greenwood, 2014). They are eager to arrive at informed decisions by looking for arguments both in favor of and against vaccination (Andre et al., 2008; Greenwood, 2014). Given their specific health information needs, they also consult information that is released by parties other than health authorities, and are particularly drawn to scientific studies to aid their decision making (Ball, 2020).

Scientific Skepticism

Apart from increasing incidents of anti-vaccine movements (Dube et al., 2020), the ongoing vaccination controversy has

repeatedly addressed the risks and side effects associated with vaccines (Buts, 2020) or the skepticism towards scientific evidence regarding the effectiveness of vaccines (Larson et al., 2011; Badur et al., 2020). On the Internet, science critics (usually in the context of misinformation, fake news and denialism) coexist with science supporters (usually in the context of science advocacy and pro-science arguments) (Ervti et al., 2020; Agergaard et al., 2020). In recent years, individuals' trust in the validity of scientific findings has decreased considerably (Browne et al., 2015), which is accompanied by a rise in non-scientific approaches ("denialism") (Diethlem and McKee, 2009). This is conditioned by a "profound distrust in elites and experts" (Kennedy, 2019). Skeptical individuals doubt the validity of the information presented in advertisements or on websites and feel inclined to accept others' opinions instead of forming their own (Sayed Hussin and Iskandar, 2015).

Health communication is often unable to produce its intended effects (Wilde, 1993; Foxcraft et al., 1997; Dillard and Shen, 2005), and might even lead to adverse effects (Hornik, 2002). Some of these undesired responses are grounded in individuals' skepticism levels (Diehl et al., 2007; Koinig et al., 2018). Skepticism defines individuals' tendencies to meet information with disbelief (Obermiller and Spanberg, 1998), and is concerned with individuals' willingness to believe (and consider) or disbelieve (and dismiss) message claims (Obermiller and Spanberg, 1998; Obermiller et al., 2005). In the health communication context, studies have determined skepticism to be negatively associated with drug involvement, comprehensibility of ad content as well as advertising as a source of health information in general (Diehl et al., 2007; Tan and Tan, 2007; Huh et al., 2012). This leads us to hypothesize:

H1: The higher individuals' skepticism, the more negative are their message evaluations.

Reactance

As individuals have become skeptical and distrusting of government officials, doctors and pharmaceutical companies (Schnirring, 2010), the validity of scientific findings is questioned more frequently (Kennedy, 2019). This phenomenon has been commonly referred to as reactance (Dillard and Shen, 2005). Reactance thereby describes the failures e.g. in persuasive health communication to achieve its intended goals (Brehm and Brehm, 1981; Richards and Banas, 2015). While any persuasive message is able to motivate individuals to act upon the advocacy included therein, some messages might be met with reactance (Ringold, 2002), which occurs "when [individual] freedom is eliminated or threatened with elimination" (Brehm and Brehm, 1981). Reactance then originates out of individuals' need for self-determination and autonomy (Burgoon et al., 2002). It can be triggered by a variety of message features, such as counter arguments or weak reasoning (Dillard and Shen, 2005). Some authors even go as far as claiming that any message that intends to change individuals' behaviors can install reactance in individuals (Burgoon et al., 2002), who might fear that their freedom of

choice is threatened. Based on the information presented above, we deduce the following hypothesis:

H2: Skepticism and Reactance are (positively) correlated.

Following the professional skepticism scale (Sayed Hussin and Iskandar, 2015), which is specifically used in the financial context, skepticism is made up of six different traits: 1) questioning mind (i.e. an openness towards the validity of the information presented); 2) suspension of judgment (i.e. evaluations are not made in a rush but based on a continuous assessment); 3) searching for knowledge (i.e. curiosity drives individuals to search for information, and ultimately, form attitudes), 4) understanding interpersonal relationships (i.e. the motivations of the source or message sender are questioned), 5) self-determination (i.e. the active choices made by the person when evaluating the content), and 6) self-confidence (i.e. the extent to which a person's self-esteem drives their evaluations and judgments). The scale was chosen as a point of reference for the present study, since the items of the scale can be also applied to health-related information.

Research has confirmed that skepticism is indeed a powerful construct. For instance, in the advertising context, skepticism has induced individuals to change their responses towards advertising content (Obermiller and Spangenberg, 1998), and has been linked to various other constructs, such as "attitude toward the ad, believability of ad claims, perceived influence of the ads, and perceived untruths in the ads" (Obermiller and Spangenberg, 1998: p. 10). For this reason, we also expect individual responses to TBE information to be moderated by their skepticism levels (Obermiller and Spangenberg, 1998; Obermiller et al., 2005). As skepticism is negatively associated with comprehensibility of ad content as well as advertising as a health information source (Diehl et al., 2007; Huh et al., 2012), we expect highly skeptical individuals to exhibit higher levels of reactance, while less skeptical individuals are presumed to experience lower levels of reactance towards message content.

H3: Individuals' message evaluations will influence their reactance to message content.

H3a: For highly skeptical individuals, we presume a less significant relationship between the two variables.

H3b: For less skeptical individuals, we presume a more pronounced relationship between the two variables.

MATERIALS AND METHODS

Study Description

The goal of our study is to determine whether individuals' responses to online information on TBE are influenced by their skepticism levels, which are characteristic of the present-day vaccine communication environment (Kahan, 2017). Thereby, individuals' message evaluations will be used to determine their immediate message responses. Message evaluation is defined as individuals' judgement of message characteristics and feelings as experienced during message

reception (Burke and Edell, 1989). In a second step, individuals' reactance towards message content will be determined, which describes their rejection of message content (Richards and Banas, 2015).

For this purpose, we conducted an online survey, in which individuals were exposed to information on TBE. The website utilized for the purpose of the study was a government-run website, which was in parts funded by a pharmaceutical company. The information presented on the website predominantly focused on the risks associated with tick bites. After reading the texts, participants were asked several questions regarding message comprehensibility and evaluation, as well as if the texts evoked some form of reactance in them.

Method

We conducted an online survey and investigated whether there is a connection between the previously introduced constructs—skepticism and reactance. In that vein, we suppose, that individuals' levels of skepticism influence their evaluations of selected text elements from the Austrian website on TBE. Skepticism has been found to influence a number of affective and cognitive variables (Kessler and Zillich, 2019), including message evaluation and reactance. Hence, in our view, skepticism constitutes a trait. Based on this assumption, we propose individuals' levels of skepticism to influence their message evaluations and reactance levels respectively. Moreover, we propose skepticism and reactance to be correlated.

Material

We carefully selected our text material for the online questionnaire, which was taken from the Austrian website on TBE (www.zecken.at). This website is hosted by a pharmaceutical company, but the overall initiative is a joint endeavor with the Austrian Federal Ministry of Social Affairs, Health Care and Consumer Protection. We used an eye-tracking study to identify those texts on the website that drew readers' attention. We asked participants ($n = 15$) to gather information on TBE, giving them up to 10 min to search the website. Additionally, we controlled the experiment by asking other participants to gather information on bee-friendly gardening. Using both examples, we were able to analyze if there were significant differences between individuals' eye movements, which was not the case. We used scan paths and heatmaps to identify relevant text elements. If an area (and text) did not draw any (zero) attention in terms of looking or reading (scan paths show reading patterns), the specific text was not considered for the survey. If participants were included in the pre-test of the study, they were excluded from participating in the main study.

The stimulus material itself was likely to trigger reactance in respondents, since it contained some controlling language. For instance, the text highlights the risks associated with tick bites—e.g. severe and long-lasting symptoms—and also lists a number of severe illness forms. Even though it does not explicitly threaten individuals' freedom per se, the messages prompt individuals to get vaccinated to prevent the explicitly listed negative consequences of tick bites from occurring. By presenting several negative scenarios, and individuals'

vulnerability to tick-bites, the text induces a threat to individual freedom. We also included a link to the source, from where the text was retrieved.

Operationalization

The answers to each question were reported on a 7-point Likert scale ranging from (1) "I do not agree at all" to (7) "I fully agree." Factor analyses revealed the items of the all multi-item variables to load on one single factor and to have acceptable Cronbach α values. Thus, they were combined for analysis:

Attitude Towards Vaccinations | Vaccination Hesitancy was measured with 5C psychological antecedents of vaccinations scale (Betsch et al., 2018). Vaccination confidence was measured with two items (based on Betsch's confidence construct; $KMO = 0.500$, $p = 0.000$; $\alpha = 0.919$), while vaccination hesitancy was determined via two additional items (based on Betsch's complacency and constraints constructs; $KMO = 0.500$, $p = 0.000$; $\alpha = 0.729$).

Skepticism was inquired by use of the Professional Skepticism scale (Sayed Hussin and Iskander, 2015) and consisted of 8 items ($KMO = 0.746$, $p = 0.000$, $\alpha = 0.729$).

Message Evaluation was determined through 8 items (McKenzie and Lutz, 1989) ($KMO = 0.751$, $p = 0.000$, $\alpha = 0.782$).

Reactance was based on the construct of psychological reactance and was measured by four questions (Dillard and Shen, 2005) ($KMO = 0.760$, $p = 0.000$; $\alpha = 0.856$).

Additionally, we determined individuals' preferred sources of (health) information to justify our focus on online health information. Sources of health information were measured with single-item questions inquiring whether individuals used selected sources of health information. While most studies have used open questions, the present study followed previous examples (Stephens et al., 2004) by explicitly listing a number of sources which respondents could choose from.

Further we included a single-item (bi-polar) question to test respondents' familiarity with the subject area, which we listed in full as well in abbreviated form: Are you familiar with the term Tick-Borne Encephalitis (TBE)?

Supplementary Appendix Table S1 provides an overview of the individual constructs and the corresponding items.

RESULTS

Data Collection

Subjects for the study were recruited via sending out links and using the snowball principle. This non-probability sampling method leads to a non-student convenience pool. We asked students from a quantitative method class, which was conducted at a medium-sized university in central Europe, to distribute the questionnaire through social media or email to generate a diverse pool of responses. While this sample does not allow us to draw conclusions for the overall Austrian population, it does, however, ensure a higher degree of heterogeneity than a sample that is solely based on students (Leiner, 2016). Further, as we seek to investigate whether individuals' levels of skepticism impact respondents' evaluations of the TBE information, we are

still able to derive viable conclusions regarding potential differences among a more diverse sample.

After determining individuals' levels of skepticism as well as their attitudes towards vaccination, the questionnaire ascertained respondents' familiarity with the term TBE. Regardless of their answer, individuals were presented with a definition in order to ensure an equal state of knowledge before exposing them to the stimulus texts. After reading through the texts questions related to individuals' message evaluations were posed, before inquiring individuals' levels of reactance to the stimulus texts and the information presented therein. The questionnaire concluded with some demographic questions.

Sample

In total, 271 subjects were recruited to participate in the study. In terms of age, respondents were between 18 and 80 years old ($M = 36.3$ years, $SD = 13.50$). Approximately half of the sample was made up of students, while the other half of the sample was employed. More than 80% of the sample consisted of Austrian citizens. With regard to gender distribution, the largest part of the sample was made up of women ($f = 65.7\%$; $m = 34.3\%$), who are renowned to be more invested in health-related matters (Broom et al., 2009).

Familiarity With Tick-Borne Encephalitis

When inquiring individuals' familiarity with TBE, the majority of subjects (80.8%) indicated that they had heard the term before. With regard to their preferred sources of health information, non-media sources (e.g., family or peer group members, doctors, or pharmacists) were more commonly consulted than media sources (e.g., print media, radio/TV or the Internet) (Niedereppe et al., 2007). Nevertheless, media sources remain of importance; this is also backed by more recent research, which found that the so-called patient information landscape is made up of both people (non-media) and media sources (Kantar Media, 2017). Out of the number of media channels provided, the highest scores were obtained for government-run websites ($M = 4.01$, $SD = 1.88$) and the Internet in general ($M = 3.46$, $SD = 1.76$), supporting previous findings (Betsch et al., 2010; Kessler and Zillich, 2019). While scores are below average (the scale's mid-point), findings still support the notion that if media sources are used (as complementary sources of information) (Ruppel and Rains, 2012), people usually consult the Internet and Internet-based media sources.

Attitudes Towards Vaccination

In order to uncover respondents' attitudes towards vaccination and confirm a potential vaccination hesitancy, two sets of questions were posed, one in favor of vaccination the other opposing vaccination. Overall, respondents seemed to advocate vaccination ($M = 5.11$; $SD = 1.81$) rather than rejecting them ($M = 2.32$, $p = 1.45$). Highly significant differences in respondents' answers are noteworthy, whereby a clear and significantly higher tendency in favor of vaccination could be confirmed ($T = 16.081$, $p = 0.000$), which also reflects the German population's mindset: 58% and 19% of respondents respectively

were found to strongly or somewhat support vaccination (Statista, 2020b).

Skepticism and Reactance Towards Tick-Borne Encephalitis Information

Hypothesis 1 postulated that highly skeptical individuals would have a more negative evaluation of the message dealing with the consequences of tick-borne encephalitis. Results indicate that, in general, individuals seem to be somewhat skeptical of online health information. Nonetheless, scores are slightly below the scale's midpoint ($M = 3.97$, $SD = 0.64$), suggesting that the credibility and validity of online information is rarely doubted. This low score might be indicative of the fact that—particularly in the context of vaccine-related health decisions—individuals feel rather confident to judge the accuracy of online health information.

When testing whether individual skepticism had an effect on individuals' message evaluations, results of a linear regression fail to account for the presumed effect. The model fit turned out to be not significant ($R^2 = -0.001$, $F = 0.741$, $p = 0.390$). In this case, we have to consider that skepticism is a rather stable predisposition as one's skepticism does only marginally influence the direct perception of messages. Nonetheless, hypothesis 1 is confirmed.

According to hypothesis 2, individuals' skepticism and reactance would be positively correlated. This would mean that if individuals were skeptical of scientific or health information, they would be more inclined to question the information presented on TBE websites. Surprisingly, results do not support this assumption, and instead of a presumed relationship, we were not able to detect any correlation ($r = -0.022$, $p = 0.747$). This result might be explained as follows: since reactance usually triggers emotional reactions, the informative arguments presented on the website might surprise individuals, but not appeal to them emotionally. In consequence, they do not feel deprived of their control, and thus, are not likely to enter into a state of reactance (Dillard and Shen, 2005). Consequently, hypothesis 2 is rejected.

Hypothesis 3 presumed that message evaluations would influence individuals' reactance to message content. We predict responses to be subject to individuals' skepticism. Hypothesis 3a suggested highly skeptical individuals to hold more negative message evaluations, which would lead them to oppose the message arguments rather strongly and, thus, lead them to exhibit higher levels of reactance. In line with hypothesis 3a, hypothesis 3b presumed the opposite effect for less skeptical individuals: their message evaluations are expected to be more favorable, and therefore, we presume them to exhibit lower levels of reactance to message content.

We conducted a regression analysis and added age and gender as controlling variables. In this case the model fit turned out to be significant ($F(3,267) = 7.263$, $p = 0.000$). Neither gender ($t = 0.013$, $p = 0.999$) nor age ($t = 0.766$, $p = 0.444$) influenced reactance, yet we found a negative message evaluation ($t = -4.624$, $p = 0.000$) to result in a higher level of reactance. Nevertheless, the $R^2 = 0.065$ is not significant at all, suggesting that these three variables are not able to determine the level of

reactance sufficiently. When splitting the data into two groups (low skepticism vs. high skepticism), we found that the effect to be more pronounced for the less skeptical group ($R^2 = 0.192$; $F = 8.384$, $p = 0.000$) than for the more skeptical group ($R^2 = 0.096$; $F = 3.734$, $p = 0.013$). We are thus able to confirm both hypotheses 3a and 3b.

DISCUSSION OF RESULTS

While being solely explorative in nature, the present study was able to demonstrate that respondents in general claimed to be highly interested in their health. This interest corresponded with a pronounced health information seeking behavior ($M = 5.09$, $SD = 1.77$). Out of the variety of sources available, respondents indicated to still rely on non-media sources (i.e. interpersonal sources) to the largest extent; media sources, on the other hand, are relevant as well, but mostly used complementarily. Nonetheless, the Internet and government-run health websites obtained the second highest score, out-ranking traditional media sources as points of reference in health matters. Half of the Austrian population consulted the Internet for health-related questions (MMM, 2019), while numbers are significantly higher for other European countries, including Italy and the Netherlands (Statista, 2020a). Moreover, the Internet has been confirmed to be a reliable source of information for individuals trying to find out more about vaccination (Betsch, 2011; Nan and Madden, 2012; Nyhan and Reifler, 2015; Betsch et al., 2017; Kessler and Zillich, 2019).

Our survey also confirmed that respondents were familiar with the term TBE to the largest extent and also seemed to be in favor of vaccination altogether. In 2017, even 82% of Austrians claimed to have been vaccinated against TBE, while 62% confirmed to follow the recommended vaccination pattern (APA, 2018). This favorable attitude towards vaccination seems to correspond with an all-time high willingness on behalf of the German speaking population to get vaccinated (Statista, 2020b).

The study was further able to confirm that skepticism is not a major factor in the reception of information about TBE vaccination. While previous research has determined the necessity to take individual characteristics into account, which might influence both individuals' information search strategies and responses to health information (Ford et al., 2001; Ford et al., 2005), skepticism itself has proven to be only marginally relevant in the present investigation. Albeit we were able to confirm an influence on both message evaluation and reactance, the relationship itself was only meagerly pronounced. We therefore suggest taking a closer look at this result in future research, as well as consider additional factors, such as trust. At present, we can only offer the following explanations: 1) Either the skepticism scale we used in this study was not reliable or 2) skepticism needs to be regarded as a rather stable phenomenon, and, as a personal predisposition, does not affect individuals' message evaluations since it is neither context nor situation-specific (Bousch et al., 1994; Forehand and Grier, 2003). Another explanation might be that the chosen text elements are quite neutral and not provoking enough to make individuals fear for

loss of control or choice. Moreover, while the original scale was applied in a different context, it nonetheless proved useful in the TBE context. We were also able to establish the scale's validity through CFA.

As we, nevertheless, found that a negative message evaluation also resulted in a higher level of reactance, we might have to broaden our scope to other influencing factors. When thinking about the widely researched topic of vaccination hesitancy, it might be worthwhile to include additional constructs, such as risk perceptions (dis)trust or social norms (Habersaat and Jackson, 2020; Brewer et al., 2017; Jacobson-Vann et al., 2018; Ball, 2020).

IMPLICATIONS

The relevance of communication to positively shape and increase demand for vaccination (Habersaat and Jackson, 2020) builds upon cognitive deficit approach (Layton et al., 1993), which assumes that sufficient knowledge on the subject area (i.e., vaccination) will induce individuals to get vaccinated. Yet, against the background of increasing scientific skepticism and vaccine hesitancy movements, reaching individuals and appealing to their reason seems to be a challenging endeavor. This intention is complicated further by the underlining complexity of the vaccine debate, according to which vaccination communication needs to take situational factors and vaccine specifics into account (WHO, 2019).

Study results were able to demonstrate that despite the relevance of addressing (scientific) skepticism in health communication (Diehl et al., 2007; Tan and Tan, 2007; Huh et al., 2012; Koinig et al., 2018), the construct itself has proven to be of lesser importance in TBE message reception. Hence, government or health officials are recommended to prioritize additional constructs. One crucial construct to elevate message acceptance is trust (Ball, 2020; Habersaat and Jackson, 2020). Individuals are only likely to take up vaccination if they have confidence in its effectiveness and trust health authorities to have their best interest in mind. If trust is lacking, communicative efforts will be unable to reach their objectives (WHO, 2013; Williamson and Glaab, 2018). Hence, messages should appeal to recipients' values and be framed in such a way that recipient trust is elevated (Kahan, 2013). This corresponds with previous research, according to which prevention frames in HPV messages positively resonated with recipients (Vorpahl and Yang, 2018). In this case, it also matches to our findings, which demonstrated that a negative message evaluation leads to a higher level of reactance. Kohler and Koinig (2020) also found health frames (i.e. affective and emotional message claims) to be more effective than scientific frames (i.e. neutral and informative message claims), the prior holding the potential to increase individual involvement with the health topic (Kohler and Koinig, 2020). Given the striking result, we recommend government officials and policy makers to present their arguments in form of positive or neutral text elements within the vaccination debate to increase the impact of their health messages.

In a time, when vaccination rates are at best labeled "insufficient" (Habersaat and Jackson, 2020) and vaccination

hesitancy is higher than ever (Lane et al., 2018) – which might be conditioned by the fact that anti-vaccine articles have been found to be more engaging than pro-vaccine articles (Xu, 2020) – it is more important than ever to provide transparent and credible information, including details on vaccine development, testing and safety standards. The present study tried to shed light on the concept of skepticism towards TBE health information, by testing whether skepticism had an influence on message evaluation and, in a second step, also on reactance. This argumentation followed the rationale that individual characteristics have to be considered during information search and retrieval, and might influence both individuals' search strategies and responses to health messages (Ford et al., 2001; Ford et al., 2005). It also presents a response to increasing calls for more academic research on the concept of reactance (Rains and Turner, 2007), referring to states in which individuals either reject or ignore message content, or engage in counter-behaviors ("boomerang effect") (Ringold, 2002).

CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

While our explorative study was innovative in examining a research area (vaccination against TBE) that is not yet at the center of scientific attention, there are several limitations to our study. First, our quantitative survey was based on a small convenience sample that does not allow us to draw conclusions that are applicable to the general Austrian population. If future research intends to elucidate how the Austrian population responds to TBE health information, it should be replicated with a larger and more diverse sample. Likewise, as the present study only focused on texts addressing the risks associated with TBE, future studies might want to explore different content (e.g., videos or social media content), which might trigger a broader range of responses. For this purpose, including additional (qualitative and quantitative)

research methods might be worthwhile. Moreover, the differentiation of whether content drew respondents' attention or did not draw their attention might be an interesting aspect for future research. Other aspects related to web-based studies (e.g., a substantial self-selection of study participants or a social desirability bias) should also be accounted for in future studies.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusion of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

Conceptualization, IK and SK; methodology, IK and SK; software, IK; validation, IK; formal analysis, IK and SD; data curation, IK and SD; writing-original draft preparation, IK; writing-review and editing, IK and SK; project administration, IK. All authors have read and agreed to the published version of the manuscript.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fcomm.2021.737800/full#supplementary-material>

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