

Bachelor Thesis

Countering messages by the anti-vaccine movement on social media

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This paper explores the use of countering messages, which were introduced by the WHO for the purpose of responding to vocal vaccine deniers in public situations, in the context of social media, applied to the example of the HPV vaccination. The goals of the executed study were to establish if vaccine critical content on social media has a negative influence on the attitudes towards the HPV vaccination and if a countering message is an effective tool to cancel this negative influence out. To address these issues, an online experiment with three different conditions was executed. Two conditions were focused on exposing participants to vaccine critical content on the social media platform Facebook, whereas one of them included additionally an appropriate countering message towards the Facebook content. A third condition which exposed participants to an online article about late eating and obesity was used as a control group. The countering message, that was used in one of the conditions, was designed under consideration of the guidelines provided by the WHO. After being exposed to one of the conditions, all participants received a questionnaire to assess their attitudes towards the HPV vaccination. The results of the study showed no negative influence of the vaccine-critical Facebook content on the attitudes towards the HPV vaccination and did not identify countering messages in the context of social media as an effective tool to counter against vaccine critical content. As this study was intended to function as a pilot study, its design provides an insight in what needs to be considered while applying countering messages in the context of social media and offers a basis for future research in this direction to work on. In order to draw conclusions from this research some limitations, especially in regard to its limited sample size need to be taken into account.

Introduction

Vaccination has become a controversial topic in our society, due to receiving a lot of criticism among the public. Critical views on vaccination focus mainly on the risks of certain vaccinations and to what extent vaccinations are a necessity (WHO, 2017). In general, vaccination is known as the most cost-effective method to save a huge amount of people from a number of illnesses, disabilities, and deaths. Although vaccination is a common practice among Europe, diseases for which vaccinations are available still pose severe threats to the European population (www.euro.who.int).

Due to this, raising awareness and informing the population about immunization is described as crucial by the WHO Europe. A major task hereby is the reaction towards vaccine criticism and the spread of a negative image of vaccination among the public, as this endangers the population to perceive vaccination as dangerous or unnecessary. In order to react appropriately towards public vaccine criticism, the WHO has published guidelines to counter the threat of a negative influence on the public's attitude towards vaccination (WHO, 2017).

Currently, one of the most important channels for the communication about risks of health-related topics and growingly used as a source of information about vaccinations, are social media platforms. These have developed to be an important factor in influencing the public opinion of different health-related topics (Jennings & Russel, 2019).

Through a huge scope and easy accessibility, social media platforms offer ideal conditions to spread information among the public, but simultaneously pose a high risk for the dissemination of wrong, unscientific information. In the case of vaccination, such dissemination could lead to the development of controversies and a spread of conspiracy beliefs regarding different vaccines, having the consequence of a lower vaccine acceptance among the public (Featherstone, Bell, & Ruiz, 2019).

Taking this information regarding vaccination and related criticism into consideration, this paper mainly addresses two subjects. The influence of messages of vaccine deniers on social media platforms, on the public's perception of vaccination and ways to communicate with the public in order to counter against content which poses a threat to the public's perception of vaccination.

The aim of this paper is to explore, if the guidelines published by the WHO, are applicable on social media platforms in order to counter against negative and wrong content related to vaccination, as this is necessary to eliminate a possible negative influence on the public's perception of vaccination.

Vaccination and Immunization

The main principle for applying vaccination is avoiding illness through the assumption, that prevention is a more effective option than later treatment. Hereby, the capacity of the human immune system to "remember" is used for the purpose of prevention (www.euro.who.int).

Specifically, if the human body is confronted with a threat once, it is able to develop an immunity against it for several years or even a whole lifetime. This process, which is called immunization, is the broad principle vaccination relies on upon (www.euro.who.int).

Reaching immunization through vaccination works in the following way. A copy of the antigen with the concerned illness is injected in the body, in order to evoke the reaction of the immune system that would be the consequence, if an actual virus or bacteria is recognized (www.euro.who.int).

During this process, white blood cells which are referred to as B-lymphocytes, create certain proteins acting against the antigen, these are called antibodies. Subsequently, a reproduction of the antibodies takes place, so that if in the future the same antigen is recognized, the body is prepared for an appropriate reaction against it (www.euro.who.int).

The HPV Vaccination

As already mentioned, certain vaccinations are perceived as controversial by the public. An example for such a vaccine is the HPV vaccination, that acts against the human papillomavirus and prevents the development of cervical cancer in women because it is often brought into relation with having dangerous side effects (Fernandes, Potter & Little, 2018).

Cervical cancer was found to be one of the most prevalent types of cancer and the third leading cause of cancer deaths among women worldwide. Especially prevalent is this type of cancer among young women (Fernandes, Potter & Little, 2018). In 2018, approximately 570000 new cases of cervical cancer occurred worldwide, around 311000 of them lead to death (www.euro.who.int).

One of the most popular ways to prevent people from developing cervical cancer is the HPV vaccination. The HPV vaccination acts against different types of human papillomavirus, which are known to be the cause of about 90% of cervical cancer cases worldwide. The virus, which is mainly transmitted sexually, can cause an enduring infection with cervical cancer as a consequence (D'Andrilli, Bovicelli & Giordano, 2010).

The two most common HPV vaccinations that are currently available, are Gardasil and Cervarix. Both of them are proven to be efficient, prophylactic methods to protect against the

human papillomavirus and offer protection for a prolonged period of up to approximately six years per vaccine dose (D'Andrilli, Bovicelli & Giordano, 2010).

Although a combination of the HPV vaccination and cervical cancer screening was proven to be the most effective possibility to protect from cervical cancer, it is a highly criticized vaccination among the public (www.euro.who.int). To justify a critical view of the vaccine, opponents of the HPV vaccination question its safety and refer to vaccine-critical publications, which link the vaccine to side effects in form of severe health threats (Kelan, Pavri, Balakrishnan, & Wilson, 2010).

A massive public controversy about the HPV vaccination did arise when cases became public in which the deaths of young women were linked to side effects of the HPV vaccine. For these cases, researchers investigated, a relation between the vaccine and brain lesions that lead to the death of patients, which also received the vaccine a few months before. However, no clear relation between both variables was established (Tomljenovic & Shaw, 2012).

Considering that no health procedure is one hundred percent safe and always poses a certain risk on the patient, no clear proof exists that the HPV vaccination poses an abnormally high risk on the patients. Therefore, the conclusion can be drawn that this vaccine is an effective way to fight against cervical cancer. Anyway, it remains controversial due to the criticism it receives and is, therefore, a good example of a vaccine that is at risk to be perceived especially negative by the public.

Theory of Planned Behavior

In order to understand human behavior in the context of vaccination, this paper uses Icek Ajzen's Theory of planned behavior as a theoretical framework. It became popular for examining the processes underlying human behavior and has often been used to explore health-related behavior in humans (Fernandes, Potter & Little, 2018).

The main assumption of the theory is that human behavior is formed based on three components, which are 'attitude towards behavior', 'subjective norm' and 'perceived behavioral control' (Figure 1). Presuming that those three factors predict human behavior, the assumption can be made that vaccination behavior can be predicted by them as well.

Attitude towards a behavior refers to the positive and negative beliefs a person holds concerning a certain behavior. The subjective norm describes the beliefs of a person, about what others in her environment would think about a certain behavior. Perceived behavioral control states, how difficult or easy a person assesses the execution of behavior to be and

refers to the degree of capability a person feels to have concerning that behavior (Ajzen, 1991).

Taking into consideration, that the aim of this study is to explore how social media platforms influence vaccination behavior and examine if countering messages work in order to alter an individual's attitude towards vaccination after a negative influence, especially the factor attitude plays an important role. It is necessary to assess the perception of vaccination and the related beliefs an individual holds and how those are influenced by information received through social media.

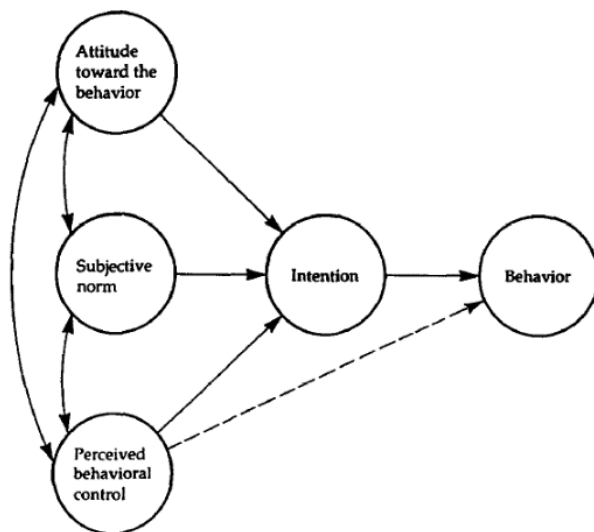


Figure 1. Theory of planned behavior, Ajzen 1985.

Vaccine Deniers

Among our society, a group of people which publicly disapproves vaccination exists, which is often referred to as "the anti-vaccination movement". Members of this movement, perceive vaccination as a threat and disseminate anti-vaccination information among various channels to the public, which had a recognizable influence on vaccination policies, the individual and community health in the past (Kata, 2010).

According to the WHO (2017), more precise distinctions between different types of vaccine critics are necessary, as not all fall in the sample of the aforementioned "anti-vaccine movement". Those will be described more detailed in the following, to categorize the different dimensions of vaccine criticism.

In the article of the WHO, people who criticize or even refuse recommended vaccinations are referred to as vaccine deniers, vaccine skeptics or vaccine refusers. Hereby, a vaccine denier is defined to be "someone who does not accept the process of vaccination while denying scientific evidence and employing rhetorical arguments to give the false appearance of legitimate debate" (WHO, 2017).

Vaccine skeptics are persons that have a critical view on vaccination but take scientific evidence into account while their decision-making process, whereas a vaccine refuser tends to be convinced of opinion against all types of vaccination, but is still open to a discussion with the opposite side (WHO, 2017).

Taking these classifications into account, the most extreme form of a vaccination critic and therefore the group of individuals which are most difficult to address to change their attitude towards vaccination are vaccine deniers and the least extreme form with the highest probability to change their attitude are vaccine skeptics (WHO, 2017).

What is criticized about vaccination

The main points of criticism concerning vaccination can be summarized into five main categories. The first is the threat of the disease vaccination is intended for. Vaccine deniers argue that the risk of the disease is not high enough to justify the risks a vaccination would bring (WHO, 2017).

Another category concerns the trust towards clinical institutions and health authorities. Vaccine deniers often consider health authorities as not trustworthy and believe that those tell lies about vaccination. Moreover, the effectiveness of vaccination, in general, is questioned by vaccine deniers and if vaccination is a successful prevention method for several diseases (WHO, 2017).

The last two themes that are often addressed by vaccine deniers are the general safety of vaccinations and alternatives for it. An argument against vaccination from vaccine deniers is for example that vaccination is not a safe prevention method and can have severe health consequences as a cause. Also, it is stated, that there are better alternatives functioning as prevention methods than vaccination (WHO, 2017).

Vocal Vaccine Deniers

As aforementioned, the most extreme form of vaccination critics is vaccine deniers. A part of this group consists of individuals which do not only refuse vaccination for their own personal regard but feel a need to share their opinion and try to convince others of their negative view

of vaccination (WHO, 2017).

This group is referred to as vocal vaccine deniers by the WHO (2017) and, more commonly used, as "the anti-vaccine movement", which endangers the public's acceptance of vaccination (Featherstone, Bell, & Ruiz, 2019).

Vocal vaccine deniers spread messages against vaccination in several ways and among different channels. Common actions or strategies used by them are for example to reject or ignore scientific evidence, only considering arguments that support a negative view of vaccination, censorship of evidence against their opinion and attacking the opposite side which is supporting vaccination (WHO, 2017).

Social Media

One possibility for a vocal vaccine denier to share vaccine critical content and therefore endanger the public's attitude towards vaccination is social media. It provides individuals with ideal conditions to share an opinion, by being easily accessible, fast and having a huge scope (Westermann, Spence, & Van der Heide, 2014).

Social media has proven to be increasingly used by the public as a source for gathering different kinds of information, for example, health-related information (Westermann, Spence, & Van der Heide, 2014). In addition to this, social media platforms became a crucial space for individuals to exchange opinions about health-related topics (Jennings & Russel, 2019).

In the case of vaccination, there is the risk that, receiving information which shed a negative light on vaccination via social media, alters the perception of vaccines in a way that leads to vaccine refusal. An examined consequence hereby could be a compelling impact on vaccine coverage in a community (Bhattacharyya, Vutha, & Bauch, 2019).

Facebook as an example of a social media platform

Among all social media platforms, the platform Facebook is the market leader with about 2320 million active users per month (Statista, April 2019). It offers users to share content in the form of posts, which can be commented and reacted on by other users.

Therefore, it offers room for an active exchange of opinions and online discussions. Through these functions, Facebook provides optimal conditions for an exchange on health-related topics resulting in a public discussion (Jennings & Russel, 2019).

Social Media and Vocal Vaccine Deniers

Taking the fact into consideration that social media platforms are increasingly becoming a channel for the communication of health-related topics, it can be assumed that social media platforms have a growing influence on the way the public perceives vaccination (Jennings & Russel, 2019).

On the one hand, this means that the communication concerning health-related topics is enhanced and that health organizations have the possibility to bring important information to the public fast and efficient. Hence, on the other hand, social media platforms like Facebook allow everyone to share content, which can have the spread of misinformation as a consequence (Jennings & Russel, 2019).

Especially for sensitive topics like vaccination, this can influence the public's image of vaccination negatively. Vocal vaccine deniers tend to disseminate messages that evoke fear against vaccination and question the credibility of health authorities (WHO, 2017).

The individual decision-making process for vaccination is influenced by an interplay of different factors. Social media tends to play a role in the social component of such a decision-making process and is, therefore, able to alter the attitude towards vaccination in a negative manner (Bhattacharyya, Vutha, & Bauch, 2019).

Because people use social media as a source of information and it, therefore, influences their attitudes and actions related to vaccination, it is crucial to find ways of countering content on such platforms that conveys a false image of vaccination in the public.

WHO Guidelines 2017

In order to appropriately handle the aforementioned phenomenon of vocal vaccine deniers, the WHO (2017) published a paper with the name: "How to respond to vocal vaccine deniers in public". This paper aims to provide guidelines on how to react adequately to a vocal vaccine denier in a public discussion (WHO, 2017).

Handling such a situation means in terms of the WHO guidelines, responding to a statement of a vocal vaccine denier with a countering message, which aims to cancel out the negative influence of the vocal vaccine deniers message.

For the purpose of responding to vaccine denialism in public, three crucial steps were identified (WHO, 2017). The first step "identify the technique" aims to unmask which strategy was used by the vaccine denier in order to frame a vaccine critical message.

Commonly used techniques of vaccine deniers are for example: spreading conspiracy theories, citing fake experts, selectively present negative information about vaccination, set

impossible expectations towards vaccinations and the misinterpretation or false logic of underlying research (WHO, 2017).

After identifying one or more applied techniques, the second step aims to "identify the topic" which is addressed by the vaccine denier. As mentioned in an earlier section, there are five broad categories in which the topics of vaccine criticism can be summarized which are: trust towards health care institutions, the actual threat of disease, effectiveness of vaccines, the safety of vaccines and alternatives for vaccination (WHO, 2017).

The third step which is formulated as “respond with a key message”, focuses on summarizing the results of the first two steps into an evidence-based message. This message contains an explanation of the way a vocal vaccine denier spreads misinformation and provides scientific and honest information about the topic which was addressed by the vaccine denier.

The content of such an evidence-based message could, for example, be the explanation that no health procedure is one hundred percent safe, but that vaccines are the safest and most effective alternatives for the protection from a high number of illnesses, when responding to a vaccine denier that questions the trust in vaccination by setting impossible expectations regarding its safety.

Executing the described steps when dealing with vaccine critical content in public discussions, provides a way to effectively counter against possible negative effects of such content, by providing scientific and honest information about the concerned topics to the public.

Application of the guidelines in the context of social media

The guidelines published by the WHO on “how to respond to vocal vaccine deniers in public”, originally aimed to be applied in the context of public discussions with an audience such as TV interviews and similar situations. This research aims to apply the guidelines on a social media platform, to explore if those are applicable in the context of social media in order to fulfill the purpose of countering messages of vaccine deniers.

As already mentioned, social media is growingly used as a source to gather information about health-related topics and therefore has the possibility to influence the vaccination-related attitudes of its users (Jennings & Russel, 2019). Due to this, it is crucial to make sure that users have the possibility to get reliable and scientific information concerning health-related topics like vaccination while using social media.

Because social media is easily accessible to everyone, a spread of misinformation happens rapidly and is not always recognizable to users on the first sight, which makes it easy for vocal vaccine deniers to share false information about vaccination (Westermann, Spence, Van der Heide, 2014). Countering messages designed with the guidelines of the WHO, offer the opportunity of directly reacting to users that spread misinformation and are therefore the first step to make health-related information for users more reliable.

As the countering message that is designed in this research addresses social media users, is it important to take this into consideration in the process of designing a countering message with the help of the aforementioned steps provided by the WHO in 2017. This means that a countering message needs to be adapted to the language used in social media in order to fit in its context (Schwarz et al. 2013).

Current Study

As mentioned before the focus of this study lies mainly on two points. The first is to explore if exposure to vaccine critical content on social media platforms leads to a negative attitude towards the HPV vaccination.

The second is, to examine if the use of countering messages designed with specific guidelines for reacting to vaccine denial in public discussions, published by the WHO in 2017, is an appropriate way to react to unscientific vaccine critical messages on social media platforms.

Originally, the guidelines of the WHO were published to react towards vaccine denialism in a public discussion. As mentioned before, social media platforms are increasingly influencing the public when it comes to forming attitudes about health-related topics as vaccination and offers ideal conditions for a public discussion.

Due to the recency of the phenomenon of social media, research on applying countering messages in this context is rather limited. It is crucial to explore if countering messages are applicable in the setting social media and if they are an effective way to respond to topics as vaccine denial, which endanger the public's attitude towards important health-related topics.

This study's purpose is to function as a pilot study with the intention of exploring the use of countering messages in the context of social media, with a focus on vaccination. It, therefore, holds the aim to establish if an application of the WHO guidelines (2017) is possible on social media platforms, and what future research in this direction needs to consider to be effective.

Resulting from that the research question can be formulated in the following way:
Are the guidelines on "how to respond to vocal vaccine deniers in public", provided in the WHO article from 2017, applicable in the context of social media and, if so, are they effective to counter the impact of anti-vaccine messages?

To examine this question, the HPV vaccination was used as an example of vaccination, to make the research more concise and specific. This vaccination was chosen because it was discussed a lot in public and on social media platforms due to the high amount of criticism it received.

In order to make the research more vivid and realistic for the participants, an example of a social media platform was chosen, which is the social media platform Facebook. Due to its huge scope and providing ideal conditions for online discussions it appears to be the most appropriate platform.

To answer the research question, it is necessary to examine the influence social media platforms have on the attitude towards vaccination. Because it is assumed, that there can be a negative influence due to the content shared by vocal vaccine deniers the first hypothesis can be formulated as,

H1: Exposure to an anti-vaccine post on the social media platform Facebook leads to negative attitudes towards the HPV vaccination.

To explore if the guidelines proposed by the WHO are a possibility to act against the negative influence vocal vaccine deniers have on the public opinion the second hypothesis can be defined as,

H2: Exposure to a countering message after reading an anti-vaccine post on the social media platform Facebook, leads to a more favorable attitude towards the HPV in comparison to only being exposed to the anti-vaccine post and not to a countering message.

For the purpose of testing the two hypotheses, an online experiment will be executed, using two conditions involving exposure to vaccine-related content in form of Facebook posts and a control condition which is not exposed to any vaccine-related content. The attitudes on the HPV vaccination of the participants will be assessed with a questionnaire, based on the theory of planned behavior, that assumes attitude to be one of the main components of human behavior.

Methods

Participants

To recruit participants the test subject pool “SONA” of the University of Twente and the personal network of the researcher were used, so that the final sample could be expected to mainly consist of undergraduate university students from Germany and the Netherlands.

Participants were required to be female and between 18 and 26 years old. In total, 127 participants took part in the online experiment of which 50 needed to be excluded so that the final sample consisted of 77 participants. Three participants were excluded as they did not fulfill the age or gender requirements and 47 participants due to not answering the manipulation check questions right. Thereof, 50 participants needed to be excluded in total.

Considering the final sample more detailed, the mean age was found to be 21.14 with a standard deviation of 2.018.

Materials

To conduct the study, the online tool “Qualtrics” was used to design the experiment. The study design was an online experiment with three different conditions, for which different text materials were used as manipulations. To examine the influence of the manipulations, all participants were asked to fill out the same questionnaire after being exposed to one of the manipulations.

Manipulations

In total, three different manipulations were designed, consisting of text materials that resemble the content of a social media platform (Appendix A). Two of them were framed as Facebook Posts and one as an Online Article. Every participant was allocated randomly to one manipulation and asked to read it carefully before proceeding with the questionnaire.

The two manipulations which were framed as Facebook posts were actually related to the HPV vaccination, whereas the third manipulation which was framed as an Online Article did not address any vaccination-related content, because its purpose was to function as a comparative control condition.

Subsequently, a detailed description of every manipulation will follow. The three manipulations can be classified in the following way, the "Post" condition, the "Post and Countering" condition and the "Control" condition.

The “Post” condition consisted of two texts which proposed a negative view of vaccination. The two texts were actual Facebook posts and directly retrieved from the social

media platform. In order to take into account that the risk perception of individuals might differ and therefore different variables in the text materials influence the participants to a distinct extent, two Facebook posts were used in this condition. One post that contains more figures and statistics and a second with a focus on emotional appealing narratives (De Wit, Das, & Vet, 2008).

The “Post and Countering” condition, contained the same two texts as the “Post” condition and additionally a third text which had the function of a reaction towards the first two texts. The aim of this reaction was to function as a countering message towards the vaccine-critical content of the first two texts, in the context of social media.

Therefore, it was designed with the help of the WHO guidelines (2017). To do so, the afore-described three-step technique was used, which included analyzing the posts for the techniques used and topics that were addressed in relation to vaccine denial. The results of this analysis are described in the following paragraph.

In the first post, two topics were addressed which are, the safety of vaccines and trust in health authorities. Techniques that were used are conspiracies, selectivity, impossible expectations, misinterpretations and false logic. The second post addressed the safety of vaccines and the actual threat of the disease as topics and used the techniques: selectivity, impossible explanations, and conspiracies (WHO 2017).

The third step of the process, recommended by the WHO, included designing an evidence-based message based on the results of the first two steps. Thereof, the countering message was formulated based on the topics and techniques that were found in the two posts. Furthermore, adapting the message to the context of social media by using an appropriate language was crucial for this research.

The "Control" condition consisted of an online article about the relation between late eating and obesity. While designing a control condition, the focus was on keeping the conditions as similar as possible, by exposing the participants to a text which addresses a health-related topic and fits in the context of social media, but to cancel out an influence on their vaccination behaviour, which was reached by choosing a text with no relation to vaccination.

Questionnaire

The questionnaire used was retrieved from a similar study by Fernandes, Potter, and Little (2018), which aimed to assess the attitudes of undergraduate University women towards the HPV vaccination (Appendix B). It is based on the theory of planned behavior, and therefore

included measures for attitude towards the HPV vaccination, subjective norm and perceived behavioral control towards getting the HPV vaccination (Ajzen, 1991).

The questionnaire consists of two different versions, one version for participants that already received the HPV vaccination and one version for participants who did not. Due to this, the first question assessed if participants already received at least one dose of the HPV vaccination. Based on this answer, participants are assigned to the appropriate version of the questionnaire.

The next section assesses for both versions the attitudes towards the HPV vaccination and consists of 25 items, with six subscales in the form of 7-Point Bipolar scales, that include 22 of the items. In the following, the attitude towards cervical cancer screening is assessed in 9 items with three subscales in the form of a 5-Point Bipolar scale.

For the purpose of assessing the components subjective norm and perceived behavioral control, the next part measures motivations and barriers related to the HPV vaccination with 12 items in form of a 6-point scale ranging from "very influential" to "not influential at all".

Dependent on the version the participants were allocated to, questions assessing the vaccination behavior followed. Vaccinated participants were asked if they intend to finish the vaccination series if applicable whereas not vaccinated participants were asked if they intend to get the HPV vaccination in the future.

Two sections of the original questionnaire, assessing the attitude towards safe sex practices and the knowledge of the HPV vaccine were excluded in this research. Furthermore, all participants answered two questions for a manipulation check and three questions to assess demographic variables. In total, the questionnaire consisted of 47 items for the version of vaccinated participants and 59 items for the version of unvaccinated participants.

Procedure

Before the study was executed the permission of the Ethics Committee of the University of Twente has been received.

At the start of the experiment, participants of all three conditions received the information that the study aims to contribute to research on the perception of health-related topics, like the HPV vaccination, and social media and that the participation is expected to last around 15 minutes. To make sure that participants were informed about the vaccination, a short information text was included at the beginning of the questionnaire.

At the start of the study, informed consent was obtained from the participants, ensuring the participants participated voluntarily and agreed to the conditions of the survey. It was ensured to the participants that all data would be anonymized.

After reading the information about the survey and agreeing to the informed consent, participants were exposed to one of the three experimental conditions. The allocation to the different conditions was randomly and executed by a function of the Qualtrics Website. Participants were asked to first read the text carefully and to fill out the questionnaire about the HPV vaccination afterwards.

After filling out the questionnaire, participants were thanked for taking part in the study and provided with the mail address of the researcher which could be contacted for further questions.

Data Analysis

Before the start of the actual data analysis, the data set was prepared in order to make sure it fulfills the required conditions for the analysis. To do so, the data structure which was achieved by using two different versions of the questionnaire was improved, by condensing two similar items into one item. This was done to ensure the possibility of obtaining one measure out of both versions.

During the next steps, participants that were not female or in the defined age group were excluded and the manipulation check was executed by sorting out participants that did not answer the two manipulations questions right.

Afterwards, Cronbach's alpha was calculated for the mean value of the attitudes section and its six subscales to account for acceptable reliability of the measure that would be used to test the two hypotheses. An acceptable value of Cronbach's alpha was defined to be > 0.70 (Dooley, 2009). Cronbach's alpha of the attitudes scale was found to be $\alpha = .905$ (Table 1).

The final step was executed to test the hypotheses and was carried out in form of a post hoc analysis of variance (ANOVA) with a significance level of 0.05, which was done for the nine subscales and the mean value of the attitude section (Dooley, 2009).

Table 1.

Reliability Estimates for Attitude and Subscales.

(Sub) Scale	N items	Cronbach's α	$M(SD)$	N participants
Attitude (total)	25	.905	5.62(.76)	77
Attitude towards getting vaccinated	5	.919	5.49(1.21)	77
Attitudes towards the risk of genital warts	3	.834	6.27(.93)	77
Attitudes towards the risk of cervical cancer	3	.750	6.40(.95)	77
Attitude towards cervical cancer screening	3	.329	5.58(1.51)	77
Attitude towards vaccinating sexual inactive females	4	.924	5.19(1.15)	77
Attitude towards vaccinating sexual active females	4	.867	5.79(1.15)	77

Results

The mean value of attitude towards the HPV vaccination was found to be 5.62 with a standard deviation of .76, indicating generally high scores on the attitudes scale among the participants.

For the purpose of testing both hypotheses a post hoc test with an analysis of variance (ANOVA) was executed for the attitudes scale (Table 2). For the first hypothesis, the analysis revealed no significant effect for the attitudes scale, comparing the here relevant conditions 'post' and 'control', $F(2,74) = .504, p > 0.05$.

While comparing the two relevant conditions for the first hypothesis among the six subscales, no significant effect was found either: attitude towards getting vaccinated: $F(2,74) = 1.931, p > 0.05$; attitudes towards the risk of genital warts $F(2,74) = 1.144, p > 0.05$;

attitudes towards the risk of cervical cancer $F(2,74)= 1.231, p> 0.05$, attitudes towards cervical cancer screening $F(2,74)= .435, p> 0.05$; attitudes towards vaccinating sexual inactive females $F(2,74)= .248, p> 0.05$; attitudes towards vaccinating sexual active females $F(2, 74)= .389, p> 0.05$.

Considering the second hypothesis, no significant effect was found comparing the conditions 'post' and 'post and countering message' for the attitude scale, $F(2,74)= .504, p>0.05$, as well as for its six subscales: $F(2,74)= 1.931, p> 0.05$; attitudes towards the risk of genital warts $F(2,74)= 1.144, p> 0.05$; attitudes towards the risk of cervical cancer $F(2,74)= 1.231, p> 0.05$, attitudes towards cervical cancer screening $F(2,74)= .435, p> 0.05$; attitudes towards vaccinating sexual inactive females $F(2,74)= .248, p> 0.05$; attitudes towards vaccinating sexual active females $F(2, 74)= .389, p> 0.05$.

Table 2.

Mean, Standard Deviation and N per condition (Attitude Scale)

Condition	M(SD)	N Participants
Control	5.67(.66)	34
Post	5.38(.99)	15
Post and Countering Message	5.67(.77)	28

Discussion

In order to explore the research question: *Are the guidelines on "how to respond to vocal vaccine deniers in public", provided in the WHO article from 2017, applicable in the context of social media and, if so, are they effective to counter the impact of anti-vaccine messages?* and for the purpose of testing the two related hypotheses, an online experiment with three different conditions was executed.

Hereby, two of the conditions included manipulations directly related to the research question and the third condition, which functioned as a control condition, only included a manipulation fitting to the context of social media. Participants were randomly allocated to one of the three conditions and received the same questionnaire, assessing their HPV vaccination-related attitudes, after being exposed to the manipulation.

Subsequently, the two hypotheses were tested with a one-way analysis of variance. For both hypothesis no significant effects were found, resulting in that both hypotheses need to be rejected. Therefore, it could not be shown in this study, that there is a negative influence of Facebook content on the attitudes towards the HPV vaccination or, that the guidelines published by the WHO, are able to act against the consequences of negative content towards vaccination on social media platforms.

Relating this to the research question the answer can be given, that from the perspective of this study it was not possible to show that the guidelines of the WHO are applicable in the context of social media to effectively counter against the impact of vaccine-critical messages spread by vocal vaccine deniers.

Limitations

In order to draw conclusions from this research, it is necessary to consider possible limitations that might influence this study in regard to reliability and validity. Turning to the limitations of this research, one striking point is that the first hypothesis and the second are related to each other in a way that impedes testing them independently. As the first hypothesis assumes a negative impact of vaccine-critical Facebook posts on the attitude towards vaccination and the second hypothesis anticipates that this negative impact can be inhibited by a countering message, the second hypothesis implies the first one to be true.

Therefore, it is not possible to consider both hypotheses completely regardless of each other. Because both hypotheses were tested independently from the other, and both needed to be rejected, the results of this research are not conflicting in this regard. An option to improve this would be a one-way analysis comparing all three conditions.

A point where the results of this research appear to be conflicting is the comparison with already existing studies on the influence of vaccine-critical content on social media platforms on attitudes towards vaccination. Several studies showed, that social media is growingly used by users to inform themselves about health-related topics, which in turn has an impact on their attitude towards those topics (Jennings & Russel, 2019).

Especially vaccination is a topic for which a great amount of exchange and information can be found in the online community. That, in turn, poses the risk of influencing the user's attitudes towards vaccination in a negative way, due to exposure to vaccine critical content (Kelan, Pavri, Balakrishnan, & Wilson, K., 2010).

A limitation that needs to be taken into consideration, is the sample size that was used for the study. Due to assigning the sample to three different conditions, a comparison between

three groups needed to be done for which a bigger sample size would have been needed to account for finding medium and small effects, as in this case, the sample was only sufficient to find main effects. An approximate sample size of 150 would have been advisable (G*Power).

Furthermore, the size of the comparisons groups resulted in being unequal, although the same number of participants was randomly assigned to different conditions. One reason for this unequal size was the high number of participants that had to be excluded because the manipulation check was not passed by them.

Whilst drawing conclusions from the results of this study, it is crucial to consider that the small sample size clearly impedes the reliability of this research. Therefore, an improvement of the sample size is an important point to focus on for future research. A first step hereby would be to consider possible reasons for the limited sample size.

One possible reason is the high number of participants that did not answer the questions for the manipulation check right. A cause for this might be, that a certain number of participants was recruited by the online participant pool of the University of Twente, the 'SONA System'. All students of the Faculty of Behavioural, Management, and Social sciences are required to collect points in this system, by participating in studies. This might have decreased the motivation of certain participants, in a sense that they did not follow the instructions carefully, and thereby biased the outcome of the manipulation checks.

Another potential reason which should be considered in this regard is the formulation of the manipulation checks. There is a chance that the questions were not formulated in an understandable way and that this accounts for the high number of failed manipulation checks.

Furthermore, considering that the rate of participants that did start but not finish the study almost accounts for 50%, it can be assumed that the experiment included features impeding the participant's motivation while completing the survey. Out of 239 started surveys, 127 surveys were completed, which shows that it is crucial to improve the survey in regard to the participant's motivation to finish it.

A possible factor hereby are the text materials that were included for the manipulation. One could assume, that the reading duration of them appeared to be too long for the participants and this, in turn, decreased their motivation to continue with the experiment.

Also, the countering message which was designed as a manipulation for this study needs to be considered in this regard. While designing the countering message the aim was to make it applicable in the context of social media which means, its intention was to address social media users. Due to the high amount of participants that needed to be excluded or did

not finish the study, the possibility that the countering message was not designed appropriately for the context of social media, needs to be taken into consideration.

Assets

Although the expected outcomes of this research are rejected after executing the study, it showed some assets, that will be elaborated on in the following. As a first asset, the use of Facebook as an example of a social media platform can be mentioned. Facebook was an appropriate choice as it is the most popular social media platform in the world and includes a large number of anti-vaccine related content in form of public discussions, posts or groups, which enhanced the process of finding appropriate text materials for the manipulations (Statista, April 2019).

The next asset which can be named for this study is its realistic manipulations, as the Facebook comments were directly retrieved from the social media platform. To improve the susceptibility of risk information among the participants, two rather different posts were chosen. One of them was formulated in a more emotionally appealing way and the other was formulated in a more rational manner and supported by statistics (De Wit, Das, & Vet, 2008).

Another aspect to be mentioned in this section is the use of the Theory of planned behavior to explore vaccination-related behavior. Due to the theory being very popular and used to a high extent in research exploring health-related behavior it can be stated, that it is an appropriate theory to explore vaccination-related behavior (Fernandes, Potter & Little, 2018). Also, the theory includes two more factors influencing human behavior, which were not explored in this study but might be an interesting point for future research to focus on to explore vaccination behavior.

The last point which can be mentioned in regard to the assets of this study is the application of the WHO guidelines. In order to design an appropriate and genuine condition to apply the guidelines provided by the WHO in this experimental context, a countering message as an answer to a vaccine critical Facebook post was chosen. To successfully apply the guidelines by the WHO, these were followed stepwise and afterward the content and framing of the message were adjusted to social media language. Through this stepwise analysis, it is ensured that the design of the countering message follows a clear structure.

Therefore, an accurate application of the WHO guidelines was successful in the context of this study, which can be considered as an asset of this research. Anyway, a high number of participants needed to be excluded, which makes it important to reconsider the

countering message in regard to its appropriateness for the context of social media and the related target group.

Implications for further research

Giving attention to the purpose of this study, to function as a pilot study, particular attention should be given to improvements in the study design itself. As mentioned before, strengths hereby were the authenticity of the manipulations and the accurate application of the WHO guidelines.

A clear necessary point of improvement is the understanding of the manipulations and the questions of the manipulation check for the participants. It is striking, that a substantially higher amount of participants understood the control condition in comparison to the other two conditions. As the sample consisted of 30 participants for the control condition, but only out of 15 for the post condition and 25 for the post and countering condition, the reliability of comparing the three conditions was restrained, therefore this is a crucial point of improvement for future research.

To realize a better understanding of the manipulations in the future, assessing the English level of participants would be an option to ensure that the content of the manipulations is understandable to the participants. Due to a high extent of participants having the German or Dutch nationality, the assumption can be made that the majority of the participants were no native English speakers which might have caused a language barrier.

An improvement of the manipulation check itself should be considered too, to enhance the comprehension of the manipulations. From the feedback of three participants, the conclusion can be drawn that one summarised manipulation check for all three conditions could have been confusing to the participants.

This might have been caused by participants reading the answer options of the manipulation check questions, which included statements about text materials that were not presented to them. For future research it is thereof more advisable, to design an individual manipulation check for each condition.

Furthermore, a crucial factor that could lead to an improvement in future studies is to revise the study design in regard to the participant's motivation to finish the study. A possibility hereby is to shorten the duration of participation, by including shorter text materials for the manipulation and possibly make use of a shorter questionnaire.

Considering the limitations of the study, the content of the manipulations should be taken into consideration either. Hereby, especially the countering message needs to be

acknowledged not only in regard to an improvement for future research but also to the successful application of countering messages on social media platforms to act against vocal vaccine deniers.

As already mentioned, the application of the guidelines of the WHO was effective through following the provided steps to design a countering message precisely. Hereby it became clear, that it is possible to apply the guidelines of the WHO in the context of social media as the analysis of social media content under this regard appeared to work successfully.

It can be concluded from this that not only an accurate application of the WHO guidelines is necessary to design an appropriate countering message, but that it might be necessary to adapt the message to a higher extent to the context of social media. Although in the process of designing the countering message, attention was already given such an adaption, it was not successful, which can be recognized by the high rate of participants that needed to be excluded or did not finish the study.

An improvement of the countering message, therefore, needs to focus on addressing the participants, to account for better understandable manipulations and on being more appealing towards participants in order to increase their motivation to finish the study. Taking into consideration that the countering message is intended to be applied in the context of social media in which users are having access to a huge amount of information simultaneously, working on an attractive design might be crucial as well. This would imply to focus on developing a message, which is appealing enough towards a social media user to be recognized and focalized on, next to a great amount of other available stimuli, which are present on a social media platform (Schwarz et al. 2013).

Therefore, following an additional guideline next to those of the WHO might be advisable to address the aforementioned issues. Such a guideline can be formulated in the following way: “*Adapt the content of the evidence-based message to the context of social media, by using an appropriate design and language to address users of social media platforms*” and serves as an additional last step in the process advised by the WHO. Adding this guideline aims to ensure that future research focuses to a greater extent on the way the countering message is perceived by the participants and a higher adaption to the target group of social media users.

For the purpose of applying this guideline, it might be necessary to adapt the language used further to the context of social media, through shortening the countering message, as for the communication on social media the abbreviation of messages is common. Also, paying greater attention to using a language that is easy to understand might be advisable to take into

account that social media is accessed by a wide range of users with different levels of knowledge on particular topics (Schwarz et al. 2013).

Furthermore, making the message more appealing and lucid by editing its outer appearance, should be dealt with in order to increase the user's motivation to read the message, as content and framing of the message are crucial to consider in this regard (Schwarz et al. 2013). Thereof, an improved version of the countering message applied in this study, that takes into account the new guideline and aims to serve future research as an orientation, has been drafted (Appendix C).

While designing the new countering message, the results of the analysis with the WHO guidelines were processed, under consideration of the new guideline and the aforementioned aspects to an improvement of the countering message. To do so, the used language was further adapted to the context of social media. This means, the general content of the message was formulated in simpler and more common terms, specialist terms were omitted. The message intends to be easily understandable to account for the broad range of users on social media platforms.

For this purpose, and to give more structure to the message, common concerns about vaccination were formulated as questions, followed by a direct answer containing the most important information regarding the concern. By doing this, the answers towards vaccine denial, based on the outcome of the analysis, were directly connected to the concerns about vaccinations that were expressed in the Facebook Posts.

Furthermore, the message was shortened to increase the readers' motivation to read it. Hereby, important statements were summed up into shorter messages, aiming to be clear and easy to memorize for the reader.

Using social media language was realized through the use of shortcuts, special punctuation and visually highlighting important parts, e.g. writing them in bold letters. This contributes also to another aspect that was focused on, to make the message more appealing. To implement this, important parts were underlined and different kinds of font were used, which makes the message more outstanding, which is crucial in the context of a social media platform.

Moreover, assessing the social media use of participants might be an appropriate option to make further conclusions about different platforms that are used by participants to gather health-related information. As already mentioned, Facebook is the most widely used social media platform worldwide and therefore an appropriate option to start with, but

assessing which social media platforms have the highest relevance among users to explore health-related information, might be an important aspect for future studies.

Also, taking other aspects of the theory of planned behavior into consideration is a crucial point to focus on in future research. As current research mostly focuses on the way attitudes are influenced by social media content, this research focused on those as a part of the theory of planned behavior. Nevertheless, subjective norm and perceived behavioral control are two other important parts of human behavior, and therefore an interesting topic of investigation or an option to widen the perspective on vaccination-related behavior in this regard.

Summing up all results and conclusions of this research, it can be stated that the guidelines of the WHO are not applicable to counter against the negative effects of vaccine-critical content in the context of social media.

Nevertheless, different limitations like small sample size, a high rate of participants who did not finish the survey and a high number of participants that did not pass the manipulation check need to be advised when it comes to drawing conclusions from this research.

Regarding this research as a pilot study it can be stated that, it offers a starting point for further research on how to deal with vaccine deniers in public, by taking anti-vaccine content on social media platforms into consideration, which are recently becoming an important tool for the public communication of health topics and offering a framework on how to apply the guidelines provided by the WHO (2017) in this context.

It is advisable for further research to improve the limitations of this study by making the manipulations more understandable for the participants and increase the participant's motivation to finish the survey. To do so, an additional guideline for designing a countering message was formulated based on the results of this research. This guideline aims to enhance the design process for countering messages in future studies.

Also, extending the sample size and taking into account other vaccinations than the HPV vaccination or even different health-related topics might be a good option to reconsider the relevant points of this research, in an extended and improved manner, and to widen the perspective on the application of countering messages in the context of social media.

In conclusion, this study has shown that an application of countering messages in the context of social media is possible, but that such requires new, additional standards that go beyond previously known advice on the use of countering messages in public discussions.

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Appendices

Appendix A

- Manipulations

"Post" Condition

The two following texts are **Facebook comments** on the HPV vaccination. Please read them carefully before proceeding with the questionnaire.

1)

"I'm making it aware the HPV is linked to several illnesses with hopes one will learn to educate themselves on the dangers of the HPV vaccine that was barely tested before being put on the market.

Our young folks are DYING (over 400) from this dangerous vaccine. And, over 50,000 have been harmed. If these stats were on how many were harmed by a Ford truck, the truck would be deemed unsafe for us. If we want to end diseases like the dysautonomic syndrome and many other horrible illnesses, we've got to wake up to the truth...vaccines are not safe. And, we need to demand they be banned."

2)

"Did you know the HPV vaccine is linked to OVARIAN FAILURE?? A study showed: "All patients developed secondary amenorrhea following HPV vaccinations, which did not resolve upon treatment with hormone replacement therapies. All patients experienced a range of common non-specific post-vaccine symptoms including nausea, headache, sleep disturbances, arthralgia and a range of cognitive and psychiatric disturbances."

When the risk of getting cervical cancer is 1 in 40,000...yet severe reactions are estimated in 1 in 500 girls is the vaccine really worth it??

In fact more than 55,000 serious reactions, including deaths, have been reported in the US alone.

Make sure you do real research before getting this shot!!"

"Post and Countering Message" Condition

The two following texts are **Facebook Comments** on the HPV vaccination.

1)

"I'm making it aware the HPV is linked to several illnesses with hopes one will learn to educate themselves on the dangers of the HPV vaccine that was barely tested before being put on the market.

Our young folks are DYING (over 400) from this dangerous vaccine. And, over 50,000 have been harmed. If these stats were on how many were harmed by a Ford truck, the truck would be deemed unsafe for us. If we want to end diseases like the dysautonomic syndrome and many other horrible illnesses, we've got to wake up to the truth...vaccines are not safe. And, we need to demand they be banned."

2)

"Did you know the HPV vaccine is linked to OVARIAN FAILURE?? A study showed: "All patients developed secondary amenorrhea following HPV vaccinations, which did not resolve upon treatment with hormone replacement therapies. All patients experienced a range of common non-specific post-vaccine symptoms including nausea, headache, sleep disturbances, arthralgia and a range of cognitive and psychiatric disturbances."

When the risk of getting cervical cancer is 1 in 40,000...yet severe reactions are estimated in 1 in 500 girls is the vaccine really worth it??

In fact more than 55,000 serious reactions, including deaths, have been reported in the US alone.

Make sure you do real research before getting this shot!!"

The following text is an **answer towards the two previous Facebook comments**.

As almost everything, vaccination has two sides, a positive and a negative one. Opponents of vaccination often concentrate on presenting the negative effects of vaccination in a very selective way. But it is important to understand: to expect a vaccination to be 100% safe is not realistic! As every other medical procedure vaccinations cannot be a 100% safe.

Anyway we can be a 100% sure that, vaccinations are very important and the safest and most effective prevention methods for a huge number of illnesses – for example HPV.

Why? Vaccinations are developed by experts, which aim to make them as safe as possible. Before a vaccination is published, a lot of research is done to minimize the risks it may bring. Often, anti-vaccine activists rely on conspiracy theories of fake experts and spread knowledge which was not scientifically tested. Controversies about vaccination often present possible side effects, which were never fully proven to be related to a vaccine.

It is also important to understand – vaccinations bring a lot more benefits than harm!!! They are one of the most successful forms of health interventions and save a lot of human lives every year. Vaccinations have the power to act against serious and dangerous illnesses. The HPV vaccination for example is able to protect women from one of the most prevalent cancer types and the third leading cause for cancer deaths among the whole world!

We CAN consider vaccination from a critical perspective – but we NEED to be realistic and scientific.

The following article was published by an online magazine. Please read it carefully before proceeding with the questionnaire.

Want to stay trim? don't eat in the evening, study finds

Maybe you rush around with work and activities during the day, then settle in for a large, relaxing meal in the evening. But new research says the later in the day you eat, the more weight you're likely to pack on.

That's the takeaway from a week-long study involving 31 overweight and obese patients, mostly women.

"We evaluated meal and sleep timing in patients with overweight/obesity at the beginning of a weight loss trial, before participants started the intervention," said lead author Dr. Adnin Zaman, an endocrinology fellow at the University of Colorado School of Medicine. Her team found that "eating later into the day was associated with a higher body mass index (BMI) and greater body fat." BMI is a measure of body fat based on height and weight.

For the study, participants were enrolled in a weight-loss trial comparing daily calorie limits to time-restricted feeding. In other words, once the trial launched, they could only eat during certain hours of the day.

Ninety percent of the participants were women. Their average age was 36.

A week before the study, they were outfitted with electronic devices to monitor their activity and sleep. They also were asked to snap cellphone photos of everything they ate. The photos were time-stamped using an app called MealLogger. Zaman and colleagues did not define which hours would amount to "late-day eating" and did not track calories or nutritional values. The team did note that participants who ate later in the day also went to bed later, though all averaged seven hours of sleep a night.

The participants' food consumption spanned 11 hours a day, with the last nosh typically clocked around 8 p.m. Those who ate later tended to have a higher BMI and body fat, the study found.

Though most participants were women, Zaman said the findings may "also apply to men."

But, she added, the study was purely observational and more research is needed to understand why late-day eating might lead to obesity. Her team is already exploring whether eating earlier in the day, when people tend to be more active, might help prevent obesity.

"Future studies are also needed where these methods are applied to people with normal BMIs, and compared to a population with overweight/obesity," Zaman said.

Lona Sandon is program director with the Department of Clinical Nutrition at the University of Texas Southwestern Medical Center. She got a sneak peek of the findings and was not surprised. Sandon has her own theories about why late-day eating might lead to weight gain. "When you eat more of your food calories earlier in the day, they may be more likely used for energy and less likely stored as fat due to different levels of hormones," she said. You may also feel more satisfied with fewer calories. "Eating later in the day, more so at night, seems to be linked to storing more body fat due to hormone differences at this time of day," Sandon added. Her advice: Eat breakfast and enjoy a hearty lunch. "If you are skipping breakfast, having a light lunch and finding yourself eating late into the night because you have barely eaten all day, simply cutting back at night is not going to work," Sandon said. "Making the lunch meal the largest meal of the day, with at least a little something for breakfast, has worked for some of my clients to be able to cut back at night or be satisfied with a light dinner."

The findings are slated for presentation on Saturday at a meeting of the Endocrine Society, in New Orleans. Research presented at meetings is considered preliminary until published in a peer-reviewed journal.

Appendix B

- Questionnaire used for the study

English Questionnaire

The survey you are about to do is about your attitudes about the Human Papillomavirus (HPV)

vaccine. This survey can be completed regardless of whether or not you have ever received the

vaccine. Please respond as honestly as possible.

The Human Papillomavirus (HPV) is a virus that is responsible for a variety of genital infections.

It is also the primary cause of cervical cancer, which is one of the most common types of cancer

in women worldwide. The Papanicolaou test, more commonly known as a Pap test or a Pap smear, is used to detect cervical abnormalities and pre-cancerous or cancerous lesions.

1) Are you female or male?

- Female
- Male (Will be redirected to the thank you page of the survey)

2) Have you been vaccinated with at least 1 dose of an HPV vaccine?

- Yes (Will be directed to the next question)
- No (Will be directed to Question 16)

3) How many doses of the HPV vaccine have you had?

- 1
- 2
- 3
- 4 or more
- I'm not sure

Section 1a: Attitude about HPV vaccines and getting the HPV vaccine

In this section, you will be asked about your opinions of the HPV vaccine. Though some of the questions may seem similar, please answer each of them. The questions in this section are mostly

based on a 1 to 7 rating scale. For each statement, indicate the number on the scale that you think best reflects your opinion or belief.

4) To me, getting vaccinated against HPV was...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

Worthless 1 2 3 4 5 6 7 Useful

Effective 1 2 3 4 5 6 7 Ineffective

5) Getting the HPV vaccine has decreased my risk of getting genital warts.

Extremely likely 1 2 3 4 5 6 7 Extremely unlikely

6) Decreasing my risk of getting genital warts is...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

7) Getting the HPV vaccine has decreased my risk of getting cervical cancer.

Extremely likely 1 2 3 4 5 6 7 Extremely unlikely

8) Decreasing my risk of getting cervical cancer is...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

9) Getting the HPV vaccine has decreased my need for cervical cancer screening in the future.

Extremely likely 1 2 3 4 5 6 7 Extremely unlikely

10) Cervical cancer screening is...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

11) Vaccinating all eligible girls/women against HPV, if they are not sexually active is...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

Important 1 2 3 4 5 6 7 Unimportant

12) Vaccinating all eligible girls/women against HPV, if they are sexually active is...

Beneficial 1 2 3 4 5 6 7 Harmful

Undesirable 1 2 3 4 5 6 7 Desirable

Good 1 2 3 4 5 6 7 Bad

Important 1 2 3 4 5 6 7 Unimportant

13) I intend to finish my HPV vaccine series

- Yes, as per the vaccine schedule
- Yes, but it will take longer than the scheduled time frame
- I have already gotten all my vaccine doses
- No (Reason:)

14) Please indicate the extent to which you agree or disagree with the following statements.

a) Getting the HPV vaccine has changed my intentions to get cervical cancer screening

Strongly Agree 1 2 3 4 5 Strongly Disagree

b) I intend to get cervical cancer screening in the future

Strongly Agree 1 2 3 4 5 Strongly Disagree

c) HPV vaccination has not affected my decision about cervical cancer screening

Strongly Agree 1 2 3 4 5 Strongly Disagree

Section 2a: Motivations and Barriers

In this section we would like to ask you about what influenced your decision to get the HPV vaccine.

	Very Influential	Somewhat Influential	Neutral	Not Very Influential	Not At All Influential	× Not Applicable
My doctor recommended it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I saw advertisements for it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friends got the vaccine or were about to get it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think I am susceptible to HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a history of cervical abnormalities in my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know someone who has/had cervical cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My parents recommended it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friend(s) recommended it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was covered by my health insurance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was offered to me through my school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most girls/women my age were getting the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very Influential	Somewhat Influential	Neutral	Not Very Influential	Not at all Influential	× Not Applicable
It may protect me against the HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It may protect me from getting genital warts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
It may protect me from developing cervical cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Will be directed to section 3]

Section 1b: Attitude about HPV vaccines and getting the HPV vaccine

In this section, you will be asked about your opinions of the HPV vaccine. Though some of the questions may seem similar, please answer each of them. The questions in this section are mostly based on a 1 to 7 rating scale. For each statement, indicate the number on the scale that you think best reflects your opinion or belief.

	Very Influential	Somewhat Influential	Neutral	Not very Influential	Not Influential at all	× Not applicable
My doctor recommended it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I saw advertisement(s) for it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friend(s) got the vaccine or were going to get it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think I am susceptible to HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is a history of cervical cancer abnormalities in my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know someone who has/had cervical cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My parents recommend it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friend(s) recommend it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was free or covered by my Health insurance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was offered to me through my school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaccine cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most girls/women my age were getting the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It may protect me against HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It may protect me from getting genital warts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very Influential	Somewhat Influential	Neutral	Not very Influential	Not Influential at all	× Not applicable
I have not heard of the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know where the vaccine is offered	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The vaccine costs too much	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The vaccine is not covered by my health insurance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm in a monogamous relationship and therefore do not need the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm not currently having sex and therefore do not need it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My parents don't want me to get the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know enough about the vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know enough about the vaccines potential side effects	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know if the vaccine works	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned that the vaccine will hurt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I already have HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Demographics

Age

Nationality

- German
- Dutch
- Other

Gender

- Male
- Female

Appendix C

- new formulated Countering Message based on the results of this study

Vaccinations are proven to be the safest and most effective prevention methods for a huge number of illnesses. – WHO, 2017

BUT?!?!

- *Are vaccinations 100% safe?* -> To expect vaccination to be 100% safe is not realistic! In EVERY health procedure, there is a certain risk involved.

- *How can I trust vaccinations then?*-> Vaccinations are developed by experts, which aim to make them as safe as possible. Before a vaccination is published, a lot of research is done to minimize the risks it may bring.

- *What about all those critical views of vaccination I found on the Internet?* -> Opponents of vaccination often show us selectively only its negative effects . Vaccine critics often use conspiracy theories and the knowledge of fake experts to spread misinformation about vaccination. On social media a great amount of statements concerning vaccinations exists, which is NOT based on scientific knowledge.

- *And about the HPV vaccination? I heard so often that it is very dangerous..*-> The HPV vaccination is able to protect women from one of the most prevalent cancer types and the third leading cause for cancer deaths among the whole world! For a lot of vaccines, there exist conspiracy theories which were never fully proven to be related to a vaccine. The HPV vaccination brings a lot more benefits than harm.

Vaccination brings more benefit than harm!!!

- We CAN consider vaccination from a critical perspective – but we NEED to be realistic and rely on scientific knowledge.