Does your socioeconomic status influence your trust in science?

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Abstract

During the COVID-19 pandemic, effective science communication has become very important for both scientists and governments, especially with misinformation spreading around. This study investigated the influence of uncertainty communication and communication source on people's trust in information about booster shots. I further wanted to find out whether socioeconomic status (SES) determines which source you trust more. To test these hypotheses, we ran an online experimental survey study (N =311). Participants read one of six different texts which were manipulated to either stem from the government, scientists in a scientific journal, or scientists on social media and either included uncertainty or did not. The results showed that whereas people did perceive uncertainty when it was communicated, neither uncertainty communication nor the communication source influenced people's trust in the message. SES did not seem to influence people's trust in the source. These findings indicate that scientist could be more open when communicating results without influencing trust.

Keywords: SES, science communication, trust, socioeconomic status, subjective socioeconomic status, uncertainty communication

Does Your Socioeconomic Status Influence Your Trust in Science?

Science communication gained a lot of importance throughout the last two years. As the world had to deal with a global pandemic it was of upmost urgency that new findings about the virus would be communicated clearly and fast. With a lot of uncertainty and misinformation spreading around at the beginning of the outbreak (Toth et al., 2020), scientists had to find a way to inform the public and, more crucially, their political leaders of the potential risks and measures necessary to slow down the infection rates. Although governments all around the world invested in big campaigns to update the public about the current insights, there are still big groups of citizens convinced that the information is not trustworthy as can, for example, be observed by the worldwide hesitancy to get vaccinated (Roozenbeek et al., 2020). This raises the question which factors determine whether a person will trust the information they are introduced to.

Thus, our research aims to study the influence of the communication source, as well as whether scientific uncertainty is communicated, on trust in the information. We believe this to be relevant, because in the context of the COVID-19 pandemic, science is communicated by both scientists and the government alike. However, people might have different existing views, relationships or even biases towards these communicators. This might be especially true for individuals with a low versus high socioeconomic background as they can often feel excluded from the science community and feel left alone by higher authorities, such as politicians (Dawson, 2018). Thus, our research aims to study the connection between the communication source as well as communication of uncertainty on trust in the information. We are asking ourselves whether there is an ideal way to communicate science. Personally, I will investigate the link between SES and the type of communicators that different social classes prefer to trust. The research question I will additionally focus on is whether your social status influences which type of communication source you trust more.

Trust in the Communicator

Two factors in particular have been the focus of past research on science communication: firstly, what makes scientists seem trustworthy and secondly, what makes the content of the message reliable. Trust in the communicating scientist as well as perceiving the content as credible are both vital factors, especially for successful science communication (Weingart and Guenther, 2016). Fiske and Dupree (2013) have studied what makes scientists seem trustworthy. They argued that in order to be convincing two conditions must be met. On the one side, the communicator has to present themself as a warm and friendly person, showing that their intentions are good. On the other side, they have to strike one as a competent and reliable source of information (Fiske & Dupree, 2013). While applying this concept to a study they conducted where participants had to indicate how warm and competent they view people in different jobs, they found that while scientists may be respected by their audiences, they are not automatically perceived as trustworthy or warm. Fiske and Dupree (2013) argue this is a problem for the science community that needs to be addressed. Another aspect that Longnecker (2016) highlights as an important external factor in her article on the Koru model of science communication is that people tend to believe other members of the same perceived ingroup more, which means that the message communicated needs to be in line with the person's own beliefs about their social identity (Longnecker, 2016).

Reliability of the Message and Uncertainty Communication

In addition, several studies investigated what makes the content of the message be perceived as reliable. Cooke and colleagues (2017) recommend, based on prior research, that scientist should be honest about their knowledge and avoid speculating about what they do not know. Similarly, van der Bles et al. (2020) argued that a way to gain readers' trust could be to communicate uncertainty openly. An often-raised concern by science communicators is

whether communicating uncertainty about their findings will lower people's trust in their message, but very little empirical research had been conducted to validate this concern. Van der Bles et al. (2020) found in fact that communicating uncertainty, especially numerically, did not have a large impact on people's trust in the information communicated, and did in fact not significantly lower trust in the source of the message. Thus, could be a way for scientists to publish their work in a more transparent way, which in fact could lead to more trust in the scientists. However, this has not been studied in the context of the pandemic, which is characterized by a lot of scientific uncertainty with a major impact on people's daily lives.

Socioeconomic Status

An additional factor that may plays into the public's trust in science is the socioeconomic status (SES) of individuals. When individuals have limited access to educational resources, due to low SES, their knowledge about scientific principles is also limited, thus participation in science communication is restricted (Dawson, 2018). This exclusion from the science community starts early on with families not having the resources to provide an environment which prioritizes education due to a lack of money and time (Dawson, 2018). Educational experiences such as museum visits can be "broadly unappealing and inaccessible" (Dawson, 2018, p. 8) for certain communities.

Inequalities like these were argued to lead to a knowledge gap between low SES and high SES individuals. More specifically, higher educated individuals are assumed to be more advanced cognitively which makes communication, gaining knowledge, belonging to highly educated and informed social groups and being interested in expanding their horizons knowledge-wise easier (Ho, 2012). In his study conducted during the H1N1 flu pandemic Ho (2012) found significant differences in the knowledge about the virus between the two groups. Both education and income were significantly linked to H1N1 related knowledge, implying that science communication had failed low SES communities as their status position seems to

highly influence their health outcome by being less knowledgeable about the virus. A similar finding of worse health in different social classes was found by Elgar et al. (2020).

However, it was found that individuals who paid high attention to news broadcasted through the television were able to reduce the discrepancy between the two groups (Ho, 2012). This was explained by the reduced cognitive demands of watching the TV compared to other, more sophisticated, information sources (Ho, 2012). Likewise, Dawson (2018) concluded from her field study in the UK that sources such as television and the internet were higher in relevancy and accessibility for individuals with a low SES background compared to other more academic forms of science communication.

Know Your Target Audience

For the reasons named above, scientist have argued that we need to customize our science communication for different audiences (Cooke et al., 2017; Longnecker, 2016). The message has to be communicated in a way that is easily understandable and through a medium used by the targeted audience in question (Longnecker, 2016). Moreover, scientists must make sure that recommended changes in behavior are accessible to everyone (Longnecker, 2016). If a person works in a low paying retail job, they might not be able to, for example, adhere to social distancing recommendations as they are in constant contact with costumers and do not have the financial liberty to take time off work (Van Bavel et al., 2020). In addition, Longnecker (2016) uses prior research by Lee and Garvin (2003) and Harré (2011) for her science communication model and makes the argument that accepting or refusing new information is largely linked to personal attitudes, values, cognition and beliefs, so it should be the scientists' responsibility to encode their message in a way tailored to the individual.

Misinformation

If we now reflect on the COVID-19 pandemic we can see that the public needed answers and help quickly, which led to a new approach of "rapid information sharing, even

before peer review" (Koerber, 2021, p.2). While these publications were shared and welcomed it also led to a significant amount of misinformation being spread (Roozenbeek et al., 2020). Studies have suggested that individuals from low SES backgrounds are more susceptible to believe in conspiracy theories (Roozenbeek et al., 2020), again showing that trust in science seems to be influenced by SES. Likewise, higher numeracy skills were linked to being less susceptible to fake news (Roozenbeek et al.,2020), which also highlights a problem with low SES. This belief in misinformation can have serious consequences for the public as it has been shown to increase vaccination hesitancy (Roozenbeek et al., 2020). Weingart and Guenther (2016) emphasize that without a basis of trust in the information, citizens cannot make a logical decision about their health and thus will be led by personal assumptions and hearsay.

The Present Research

Our research will focus on the question "How can science communication contribute to trust in scientific information?". We will concentrate on two factors: uncertainty (no uncertainty versus uncertainty) and source (government versus scientific journal versus scientist on social media). In addition, my personal research question will focus on whether SES influences people's trust in scientific information. We will do so by manipulating the source as well as the uncertainty of statements about the efficiency of the COVID-19 booster-shot. As the connection between SES and science communication has not been extensively researched yet, this study would help the science community to find more efficient ways to communicate their findings. In my analyses, I am expecting to find a relationship between SES and the type of information source that is trusted. I hypothesize that low SES individuals will have more trust in information communicated by scientists on social media compared to scientists in a traditional science outlet and compared to the government as a source. I expect this because previous research shows that they are largely excluded from the science

community and thus will identify more with the more casual information outlet, social media. Another reason for the social media preference could be that low SES individuals feel disappointed and left alone by the government due to their social standing. Vice versa I am expecting high SES individuals to trust the government and medical journal more compared to the tweet as they are most likely part of those communities or have prior positive experiences with them. I will also examine whether there is a difference between people with low compared to high SES in trust in the information when uncertainty is communicated versus when it is not, but I do not have a specific hypothesis about this potential difference.

Method

Participants

As part of the group research project, we also recruited a convenience sample of German participants through the network of the researchers and snowball sampling, but due to time constraints these data were not included in this Bachelor thesis. The Dutch sample consisted of 311 participants recruited via the website Prolific in exchange for a monetary compensation of £1 (1.19 €). These participants were selected to currently live in the Netherlands and speak Dutch as their mother language or fluently. After removing incomplete data, the sample consisted of 296 participants (152 females, 137 males, 7 other). The ages ranged from 18 to 72 with a mean of 28.62 and a standard deviation of 9.27. We used G*power to calculate our power, which showed that we would need 251 participants to be able to detect a medium effect (f = 0.25) with 95% power (α= 0.05) and decided to recruit a sample of 300 participants.

Research Design, Manipulations and Procedures

After consenting to participating in our study, participants were asked to indicate their country of residency in order to be allocated to the correct questionnaire. We used a 2x3 between subject study design to manipulate the source (government, scientific journal, social

media), as well as the uncertainty level (uncertainty, no uncertainty) of fabricated texts about the COVID-19 booster shot. Participants were asked to read a randomly assigned text. This text could either be presented as a tweet, as a text on the website of a Dutch/German medical journal or an official government website. Additionally, the text either conveyed no uncertainty or included uncertainty both numerically and verbally.

All six fabricated texts are presented in Appendix A, but the standardized message was as follows: “A recent report by (source) states that the protection against COVID-19 decreases over time after being vaccinated. This means that people are more susceptible to getting infected with the virus, though with less severe symptoms and a lower risk of hospitalization. A third vaccine dose, or “booster shot”, refreshes immunity to similar levels as when first fully vaccinated. For example, with a booster shot of the Pfizer vaccine (BioNTech) the effectiveness rate increases to 95.6%, which is equal to the effectiveness rate when first fully vaccinated. A boost in immunity is also expected for alternative brands of the COVID-19 vaccine”. The source was either stated as “Ministerie van Volksgezondheid”, “Nederlands Vakblad voor Medische Wetenschappen”, or implied by the fabricated twitter account “@NVMW”. In the uncertainty conditions, the sentences in the text were adapted to reflect uncertainty (e.g., “people might be more susceptible” versus “people are more susceptible”), and uncertainty information was added to the effectiveness rate of 95.6%, with the following statement: “(with some uncertainty around this number: the estimate is expected to be between 89.3% to 98.6%)”. The factual basis for our fabricated texts was general information about booster shots by the Dutch Ministry of Health, Welfare and Sport, and a study conducted by the vaccine manufacturer Pfizer (2021). After reading the text participants answered several questions about the content as well as additional measures. At the end of the study participants were able to read a debrief in which the purpose of our study was explained in detail. Participants were reinsured that their data would be dealt with in a responsible and

ethical way. We also gave them the opportunity to contact our supervisor dr. Anne Marthe van der Bles and the Ethical Committee of the University of Groningen. The survey was approximately 8 minutes long.

Measures

Manipulation Checks

Following the randomly assigned texts, participants were asked to indicate how negative or positive they felt towards the information they just read on a feeling thermometer ranging from 0- negative/unhappy to 10- positive/happy. In order to check whether our manipulation was efficient we asked them to write down the effectiveness rate of the booster shot that they had just read about in the text. Further, they answered a question about whether the text implied uncertainty (yes, no, I don't know, I don't remember).

Trust in the Message

Next, we measured our key dependent variables which were adapted from van der Bles et al. (2020), all on 7-point Likert scales. We assessed *perceived uncertainty* with two items, "To what extent do you think that this number is certain or uncertain?" (very uncertain-very certain) and "How much uncertainty do you think there is about this number?" (not at all- a great deal) with a correlation of r= 0.48. *Trust in the number* was assessed by asking "How reliable do you think this number is?" (not reliable at all-very reliable), "How trustworthy do you think this number is?" (not trustworthy at all- very trustworthy) and" To what extent do you believe this number to be credible?" (not at all-completely) (*Cronbach's α* = 0.94). Further, *trust in the message* was measured by two items: "How much do you trust the information about the efficacy of booster shots given in the message you have just read?" (not at all-completely) and "How reliable do you think the information about the efficacy of booster shots given in the message you have just read is?" (r= 0.85) (not reliable at all-very reliable). Lastly, the subscale *trust in source* consisted of two items ("To what extent do you

think the people who wrote this text are trustworthy?" (not trustworthy at all-very trustworthy)," To what extent do you think the people who are responsible for the numbers about the effectiveness of the booster shot are trustworthy?" (not trustworthy at all-very trustworthy)) which correlated at r= 0.76.

Further, we also asked them: "How uncertain does this information make you feel?" (not at all uncertain-very uncertain), "How much do you trust information about the efficacy of booster shots in general?" (not at all-completely), "To what extent do you think government statistics in general are reliable?" (not reliable at all-very reliable) and "To what extent do you think scientific statistics in general are reliable?" (not reliable at all-very reliable).

Action Intentions

Afterwards, we measured the participants action intentions on a 7-point Likert scale by asking how likely it is that, when offered, they would take a booster shot (not likely at all-extremely likely) and whether they would recommend it to a friend (strongly disagree-strongly agree). We also asked about their current adherence to COVID-19 measurements by asking if they always were face masks when institutionally recommended and if they always adhere to social distancing rules.

Feeling Thermometer

Another feeling thermometer was added which was inspired by Fiske et al.'s warmth-competence map of trust (2014). Participants received a slider scale from 1-10 in which they indicated how cold/warm they feel towards civil servants, scientists, politicians, journalists and content creator on social media. Additionally, another slider asked to indicate the perceived competence of the same groups.

Political Opinions

Next, we measured opinions towards the government (Dutch or German) of their country of residency. These questions were taken from the European Social Survey. We asked them to indicate to what extent they agree or disagree with four different statements about trust ("I trust the Dutch/German government", "I trust Dutch/German politicians", "I trust scientists", "I trust scientific knowledge"). Furthermore, we asked how satisfied they are with the way the government is doing their job, the way the democracy works in their country, the present state of their economy and how the government is managing the corona virus crisis (very dissatisfied-very satisfied). Then, we measured how interested they are in politics, to what extent they identify with the current governing parties (not at all-a great deal) and lastly where they would place themselves on a scale about their political views ranging from very liberal to very conservative.

Intolerance of Uncertainty

Another measure we included was the intolerance scale of uncertainty by Carleton et al. (2007). The scale consisted of 12 items, for example "Unforeseen events upset me greatly." measured on a 5-point scale. Also, we included Khubchandani et al.'s scale (2021) to measure psychological distress. The scale had four items, as for example "Feeling nervous, anxious or on edge" and was measured on a scale from 1-4.

COVID-19

After, we asked about the perceived severity of the virus ("Coronavirus is a serious infection for me to contract.") taken from a study by Olagoke et al. (2020), whether they are vaccinated (yes, no, prefer not to say) and left a blank space for the participants to express any personal thoughts about the pandemic if necessary.

Demographics and SES

Then, we collected demographic data of the participants. We asked them to indicate their age and gender (male, female, non-binary/diverse, prefer not to say) and followed with

measures on socioeconomic status, which I will analyze in depth further on. Firstly, participants were asked to indicate their highest obtained educational qualification (or the degree they are currently striving to obtain) to establish an idea of their educational level. The answer options in each language can be found in Appendix B. Secondly, we asked for their current employment status to estimate their financial situation. Most importantly, we used the MacArthur Scale of Subjective Social Status (SSS) by Nancy Adler et al. (2000) to get an even clearer understanding of where the participant sees themselves in a social hierarchy. After reading an explanation ("At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, worst jobs, or no job") the participants were asked to place themselves on a ladder in the rank (1-10) that best describes where they think they belong. For the analysis I decided to categorize our participants into a low or high SSS categories. This was done by using a theoretical criterion of 1 through 5 belonging to the low group and 6 through 10 to the high group. That meant that 77 individuals belonged to the low category and 219 to the high one, thus we might need to be a bit careful in interpreting the results as group sizes are not equal.

Social Media

At the end, we measured information about social media usage. On a 7-point Likert scale, we asked how many times they use specific sites, how often they plan to use theses in the next months, how often they use Twitter specifically and how trustworthy they find Twitter as a company.

Results

Following the data cleaning process, 15 participants were excluded from my analysis process. This was due to missing consent in participation of the study, unwillingness of data

processing or unreasonable reading times (<8 seconds). The following analysis was thus based on a sample of 296 participants.

Before running my ANOVAs, I checked the assumptions of independence, normality and homogeneity of variances. As our participants were questioned about their own personal beliefs, feelings and opinions and thus answered the survey individually, I concluded that there was no indication that the independence assumption was violated. To test the assumption of normality I conducted a Shapiro-Wilk test, which was not significant for our four dependent variables ($p < 0.00$). However, our relatively large sample size could be the reason for the normality assumption not being met. This violation means that we have to be a bit careful when interpreting the results. Lastly, I concluded that the homogeneity assumption held up since Levene's test provided me with a p-value bigger than 0.05, indicating equal variances between the different groups.

I originally intended to look at employment status as well was education level as an indicator of SES. However, throughout my analysis employment status lost relevancy to me when trying to make assumptions about income of our participants. Furthermore, it turns out that in our sample only a minority of individuals have indicated to have a low (n= 47) compared to high (n= 249) education level. The low group size in the low education level group means there are only between 4 and 12 people per condition of our experiment, thus does not yield results that I can feel confident interpreting. Therefore, it was excluded as an indicator of SES in my analysis, and I solely focused on SSS.

The Effects of Uncertainty Communication, Source and Socioeconomic Status

Perceived Uncertainty

To test our hypothesis, I conducted a 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) two-way ANOVA with the dependent variable *perceived uncertainty*.

I found a significant main effect of uncertainty communication ($F(1,290)= 12.53$, $p<0.00$), no significant main effect of source ($F(2,290)= 0.21$, $p= 0.81$) and no significant interaction effect ($F(2,290)= 0.04$, $p= 0.96$). The results show that across the various sources, participants perceived the number that was communicated in the text to be more uncertain when uncertainty was communicated around it ($M= 3.73$, $SD= 1.11$) then when uncertainty was not communicated ($M= 3.29$, $SD= 1.04$). This suggests that people do perceive uncertainty when it is communicated around scientific information about COVID-19, and that this perception does not differ for scientific compared to governmental sources.

As I am interested to see whether one's socioeconomic rank influences these results, I ran a 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) x 2 (subjective social status: low vs. high) ANOVA. The findings showed that SSS had no significant main effect on *perceived uncertainty (*$M= 3.59$ *vs.* $M= 3.50$, $F(1, 284)= 0.40$, $p= 0.53$*).* However, the results showed two significant interaction effects between SSS and uncertainty communication ($F(1,284) = 3.98$, $p = 0.047$, see Figure 1) and source ($F(2,284) = 3.47$, $p = 0.03$, see Figure 2). Members of the low SSS group seem to react more strongly to uncertainty communication: they perceive the text to be more uncertain when uncertainty is communicated *(*$M= 3.98$, $SD= 1.41$) compared to when it is not ($M= 3.07$, $SD= 0.84$), but this difference is larger than for high SSS individuals, who also perceive more uncertainty reading the text communicating uncertainty ($M= 3.64$, $SD= 0.95$) than the no uncertainty version ($M= 3.36$, $SD= 1.09$). In addition, Figure 2 shows that low and high SSS individuals perceive similar levels of uncertainty when the source of the message were scientists or scientists on social media, but low SSS individuals perceive more uncertainty ($M = 4.06$, *95%CI*[3.54; 4.59]) than high SSS individuals ($M = 3.41$, *95%CI*[3.17; 3.65]) when the source of the message was the government. The three way

interaction between uncertainty communication, source and SSS was non-significant ($F(2,284) = 0.89$, $p = 0.41$).

Figure 1

Perceived uncertainty level of the low vs. high SSS group in the uncertainty levels

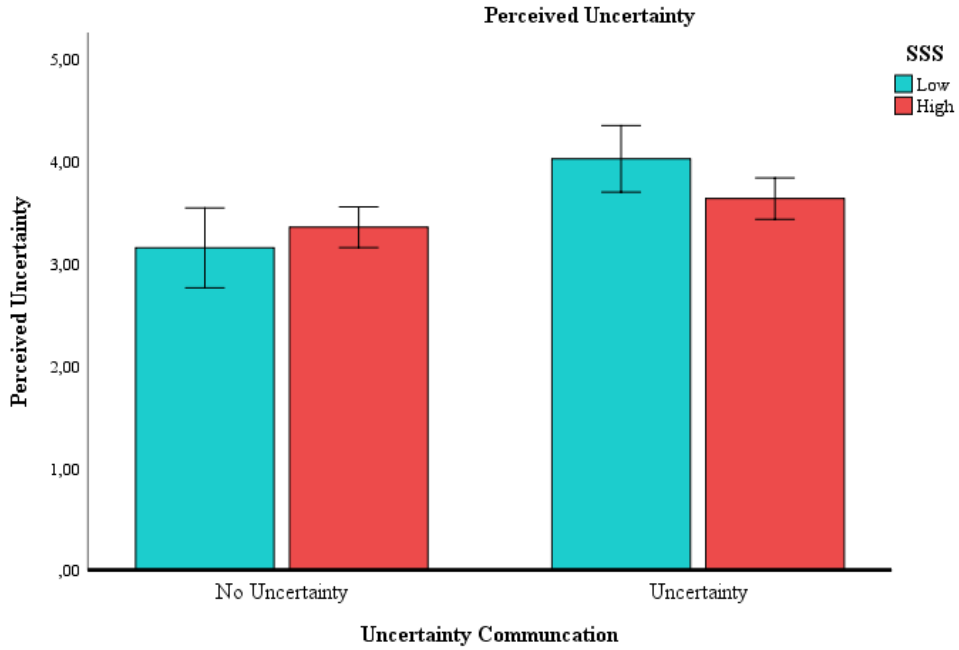
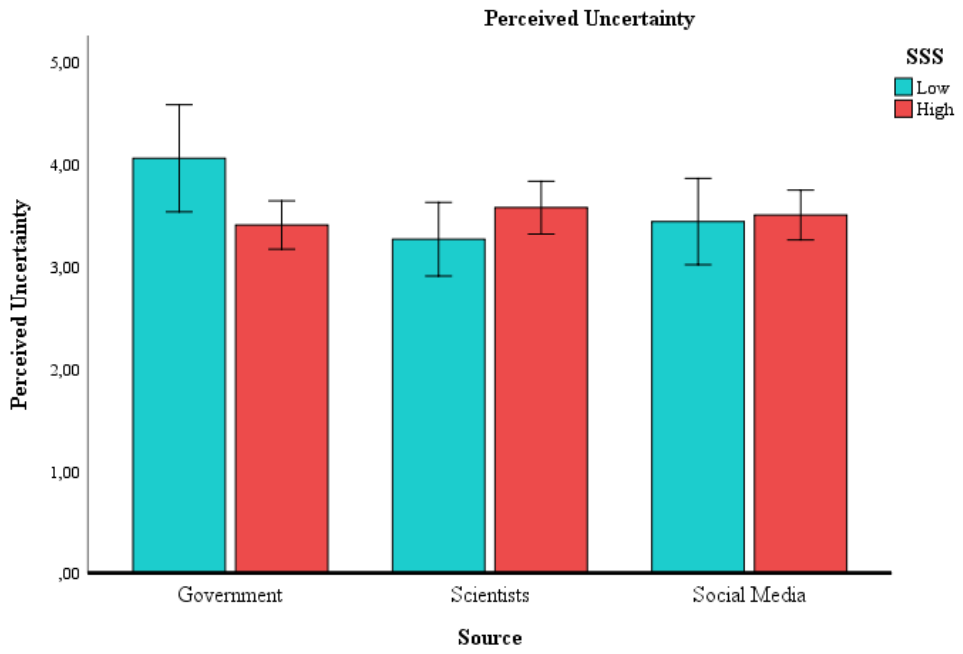


Figure 2

Perceived uncertainty level of the low vs. high SSS group in the different sources



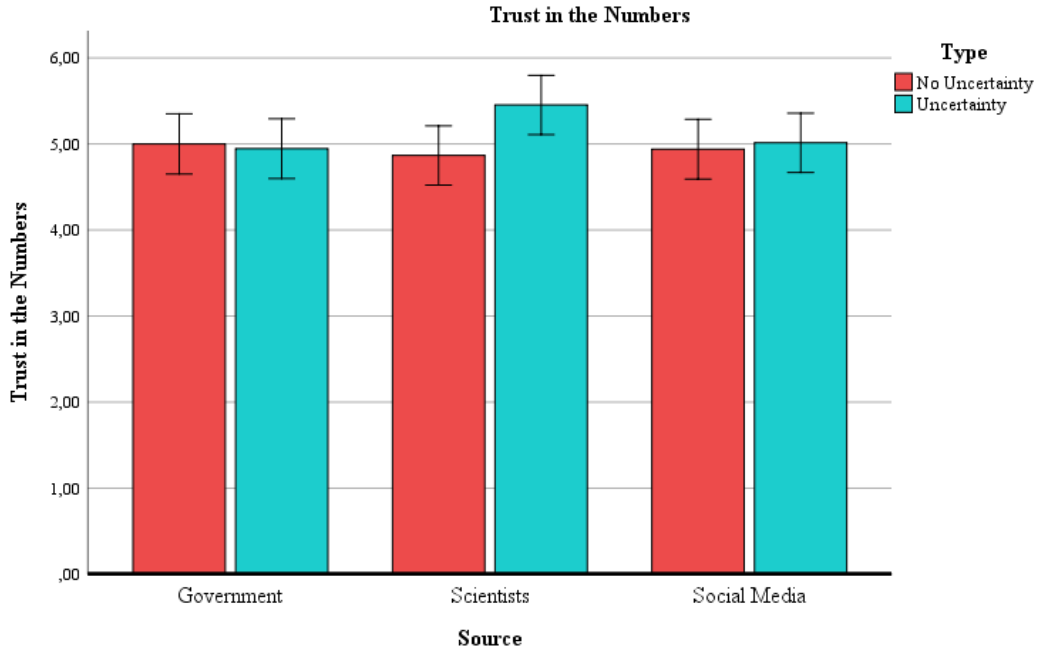
Thus, these results indicate that whether you do or do not communicate uncertainty does influence the perceived uncertainty level of the individuals reading a text. Moreover, both the interaction between SSS and uncertainty communication as well as SSS and source seem to influence *perceived uncertainty*. This means that belonging to a certain social group may influence your uncertainty levels.

Trust in Numbers

A 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) ANOVA on the dependent variable *trust in numbers* was run. The analysis revealed no significant main effect results for uncertainty communication ($F(1,290)= 1.98$, $p= 0.16$), source ($F(2,290)= 0.75$, $p= 0.48$) or their interaction effect ($F(2,290)= 1.86$, $p= 0.16$). Although not significant, the bar graphs show an interesting pattern which suggests that individuals trust the numbers about the same level throughout, except for when scientists communicate uncertainty, then they trust the number a bit more. This can be observed in Figure 3 below and might be of interest for future research.

Figure 3

Interaction effect between uncertainty communication and source on trust in numbers



In the second 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) x 2 (subjective social status: low vs. high) ANOVA on *trust in numbers* SSS was not shown to be significant *(M*= 5.04 *vs. M*= 5.03, *F(*1,284*)*= 0.002, *p*= 0.97*)*. Likewise, the two interaction effects with uncertainty communication (*F(*1,284*)*= 0.94, *p*= 0.33) and source (*F(*2,284*)*= 0.53, *p*= 0.59) respectively were non-significant in the analysis. Additionally, the three way interaction showed no significance (*F(*2,284*)*= 1.68, *p*= 0.19).

We can conclude that trust in numbers seemed to not be influenced by the type of source our participants saw or whether uncertainty was communicated to them. Moreover, we could conclude that SSS did not influence whom people trusted in our study.

Trust in Message

To explore my findings on the dependent variable *trust in message* I run a 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) ANOVA. I could not find a significant main effect for uncertainty

communication ($F(1,290)= 0.00$, $p= 0.99$), source ($F(2,290)= 0.39$, $p= 0.68$) or the interaction effect ($F(2,290)= 1.78$, $p= 0.17$).

In the 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) x 2 (subjective social status: low vs. high) ANOVA on *trust in message* SSS could not be shown to be significant *(*$M= 5.14$ *vs.* $M= 5.20$, $F(1,284)= 0.10$, $p= 0.75$*)*. The interaction effect of SSS with uncertainty communication ($F(1,284)= 1.74$, $p= 0.19$) and source ($F(2, 284)= 0.31$, $p= 0.73$) respectively was also non-significant, however the three way interaction of all factors showed significance ($F(2,284)= 4.00$, $p= 0.02$). Here it is interesting to observe that looking at the estimated marginal means the most trusted combination of manipulations in low SSS individuals was the no uncertainty government condition with $M= 6.00$ and $SD= 0.52$. Vice versa the least trusted condition in the low SSS group was the government text with communicated uncertainty ($M= 4.42$, $SD= 0.37$).

This means that trust in our message was not significantly changed when belonging to one of our manipulations. The findings of the second ANOVA suggest that the three factors uncertainty communication, source and SSS work together on influencing trust in the message. It indicates that at least one of the two-way interactions in our analysis differs across the levels of the SSS variable.

Trust in Source

For our last dependent variable, I conducted a 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) ANOVA on *trust in source*. The main effect for uncertainty communication ($F(1,290)= 0.001$, $p= 0.98$), source ($F(2,290)= 0.16$, $p= 0.85$) as well as their interaction was non-significant ($F(2,290)= 0.66$, $p= 0.52$).

Lastly, a 2 (no uncertainty vs. uncertainty) x 3 (government vs. scientists in a medical journal vs. scientists on social media) x 2 (subjective social status: low vs. high) ANOVA was run. Once again, we could not find significance. The main effect for SSS was non-significant at *(M*= 5.37 *vs. M*= 3.44, *F(*1,284*)*= 0.17, *p*= 0.68*).* Both interaction effects, namely with uncertainty communication *(F(*1,284*)*= 1.02, *p*= 0.31*)* and source *(F(*2,284*)*= 0.83, *p*= 0.44*),* showed no significance. Likewise, the three way interaction was not significant too *(F(*2,284*)*= 1.48, *p*= 0.23*).*

This data suggests once more that our manipulations, uncertainty communication and source, did not influence trust levels. Also, the second ANOVA shows that SSS does not have a significant effect on the dependent variable.

Discussion

Key Findings and Interpretations

These findings suggest that our main hypothesis, that the communication of uncertainty and the different types of sources would influence trust levels, was not supported. In none of our three trust-related dependent variables could I find a strong enough link between uncertainty communication or type of communication source. The only significance was linked to perceived uncertainty. When uncertainty was communicated, individuals in fact perceived the text as more uncertain than if not.

Additionally, I could only partially find significant statistical evidence on my personal main hypothesis about the influence SES plays into trusting certain sources. The findings indicate some sort of interaction between the SSS of a person and the interaction of uncertainty communication and source on trust in message, but not any significant interaction between SSS and the source directly. This suggests that there is no difference in who different social classes trust more, which can be seen as a positive finding.

My findings go hand in hand with prior research conducted by van der Bles et al. (2020). As well as in their study, I could find that there was no significant difference in the trust in the number levels between no uncertainty communicated and it being communicated. This further suggests that communicating uncertainty around a number does not necessarily decrease trust levels. This can be interpreted as another incentive for scientists to be open and honest about their work and possible uncertainties they are dealing with. These results indicate that being open about the uncertainty that exists around COVID-19 information does not harm people's trust in the information. Further so, scientists communicating uncertainty could be helpful in establishing trust, but this needs to be investigated by future researchers.

The results do not fit with the findings of Dawson (2018) that lower class individuals feel disconnected and excluded from the scientific community, thus it might be a new insight in understanding social class and their relationship with science, especially science communication. These differences could exist since we had issues in collecting a sufficient amount of low SES participants, while Dawson conducted a field study with minorities. Additionally, Dawson's study took place in London. One could argue that the social divide in the United Kingdom is bigger than what we know from the Netherlands. My findings could show that individuals with lower social rank want to be part in the science community and in fact *do* trust science and scientist. It could be an incentive for the science community to work harder to include socioeconomically challenged people and make scientific findings more accessible for them. If the source is irrelevant for the science communication, scientists and political leaders can use more far-reaching sources, such as social media, to connect to a wider range of people without having to worry that trust is compromised.

Another interesting observation is that overall, in all conditions, the trust level is relatively high. Thus, we can assume that most people we surveyed do not mistrust the government or scientists. This is especially interesting in the context of the current pandemic.

It is particularly exciting when thinking about Fiske and Dupree's (2014*) warmth-competence map of trust* mentioned earlier. In their work scientists were seen as competent, but cold, suggesting that they are not that trustworthy. Even worse did people categorize politicians. Those were seen as semi-competent and also rather cold, suggesting that trust also should not be the highest.

Furthermore, it is interesting to speculate whether in another more divided country trust levels would have been lower overall. Our sample only consisted of Dutch citizens. In order to get a more accurate representation a more divers sample would be necessary. Conducting the same study in a more socially divided country, such as the United States, could have yielded different results.

Although not part of my hypothesis, I could find significance for the interaction between SSS and uncertainty communication as well as for SSS and source on the perceived uncertainty. This implies that there is some correlation between your social rank and whether uncertainty is communicated or not on how uncertain one perceives a text. Furthermore, there appears to be a link between your place in the social hierarchy and the type of communication source on perceived uncertainty. This could suggest that one has to be aware of whether they are communicating uncertainty with certain social groups.

Furthermore, there is very little research that has been conducted in the context of this current pandemic and thus these findings give researchers and governments a better understanding of how much citizens trust them and how to communicate in the best way.

Limitations

The generalizability of the results is limited by a few factors. First, our sample was biased since it was drawn from Prolific, a survey website mostly known to the scientific community. Thus, we most likely received more responses by people already inclined to trust science and less by social minorities.

Second, when looking at the descriptive statistics of our sample I noticed that most of our participants were students or full-time employed, which indicates higher education and income. Additionally, over two-thirds of our sample considered themselves to be in the high SSS condition. Both points show that we did not have an accurate representation of the lower socioeconomic status group. Future studies should aim to study specifically a sample of low SES individuals to gain more insight into these questions.

Lastly, our study is revolving around the pandemic, specifically the booster shots. We started collecting data when the public debate surrounding booster shots was still at its peak. This means most people were already aware of the booster shots and its efficacy and thus might have already had formed opinion. This could have lowered the impact our manipulations had.

Recommendations

Further research is needed to establish a clear link between socioeconomic status and the sources they trust the most or to find further evidence for a nonexistence of such connection. To find clearer results future researchers should consider a couple of things. In order to make the uncertainty communication clearer a revised version of our study could consider emphasizing the uncertainty more by including a wider range of the confidence interval or by adding more uncertainty related words in the manipulation.

Another interesting change could be to have a random user communicate the text on social media instead of a scientist. It would be interesting to see if individuals still trust the data as much when it is not communicated by a scientific source and whether then we would be able to find a difference in which source is preferred in different social classes.

As mentioned before, a more randomized sample consisting of participants from specific countries with historically lower trust in the government or science, for example, and more divers social backgrounds could be beneficial in future research. By having more variety

in our data, we would be able to make more generalizable conclusions and perhaps find more significant data.

Conclusion

This research aimed to find out whether trust in scientific information about COVID-19 booster shots is influenced by uncertainty communication, the source of the communication, and individuals' SES. The results showed that overall, the type of source and whether uncertainty is communicated does not influence trust levels. In addition, my findings indicate that SES does not influence what source individuals' trust more. This suggests that scientists can communicate their findings freely without having to worry about a drop in trust levels of their readers. Although several limitations of this study hinder drawing strong conclusions about SES, my findings suggest that contrary to previous literature low SES individuals can trust scientific sources when they communicate information in the context of COVID-19.

All in all, the study shows how important it is to investigate how people perceive uncertainty and different science communicators. This means that scientists might not need to be afraid to communicate uncertainty when it is there. Additionally, the analysis on SES shows that, as my findings do not align with prior research, future research needs to focus on the influence of social rank on science communication more. I hope this study is an incentive for other researchers to focus more on investigating possible differences between social ranks and the influence on trust in science. Ultimately, this could lead to a more equal and fair science community where everyone is and feels welcomed.

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Appendix A

The six manipulations used in our Dutch study:

Image 1

Government, no uncertainty

Image 2

Government, uncertainty

Image 3

Scientific journal, no uncertainty

Image 4

Scientific journal, uncertainty

Image 5

Scientists on social media, no uncertainty

Image 6

Scientists on social media, uncertainty

Appendix B

Table 1

Answer options in all three languages on education level

	Dutch	German	English
Low	Basisonderwijs VMBO HAVO VWO MBO-1 MBO-2 MBO-3 MBO-4	Frühkindliche Bildung (niedriger als Grundschulabschluss) Grundschulabschluss Abgeschlossene Sekundarstufe I (z.B. Realschulabschluss) Abgeschlossene Sekundarstufe II (z.B. Abitur) Abgeschlossene postsekundäre, nicht tertiäre Ausbildung (z.B. Lehre, Ausbildung) Kurzfristige tertiäre Bildung (z.B. Volkshochschule)	Early childhood education (Less than primary education) Primary education completed Lower secondary education completed (e.g. low high school diploma) Upper secondary education completed (e.g. high school diploma) Post-secondary non-tertiary education

			completed (e.g. apprenticeship) Short-cycle tertiary education (e.g. community college)
High	HBO Bachelor HBO Master WO/Universiteit Bachelor WO/Universiteit Master PhD	Bachelor oder gleichwertiger Abschluss Master oder gleichwertiger Abschluss Doktorat oder gleichwertiges Niveau	Bachelor's or equivalent level completed Master's or equivalent level completed Doctoral or equivalent level
additional	Anders Zeg ik liever niet	Ich bevorzuge es, diese Frage nicht zu beantworten	Prefer not to say