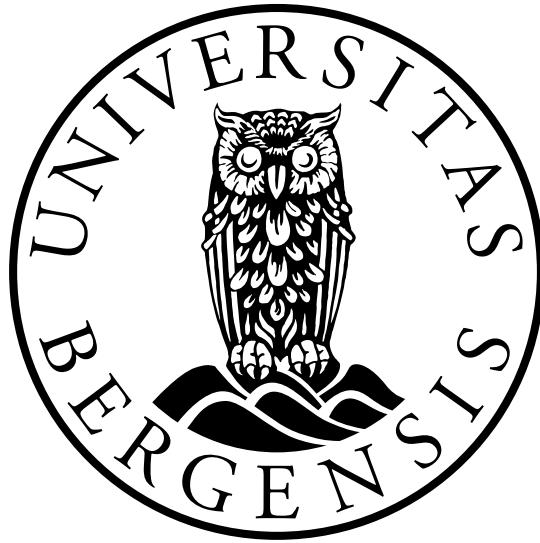# UNIVERSITY OF BERGEN

Department of Information Science and Media Studies

MASTERS THESIS

Investigating the Effects of Instagram Filters on Perceived Trust in Online News Posts

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Abstract

The increasing overgrowth of information is only getting harder to navigate through and the spread of fake news and misinformation is concerning. With the shift towards digital delivery of news and concerns about the accuracy and reliability of information shared on social media, it is important to understand the factors that contribute to trust in social media news. Motivated by these challenges, this study aimed to investigate what effect Instagram filters have on users' perceived trust in online news posts. Trust ratings of four different articles with four different image filters, including the original image, were collected through an online user study. Also, the role of general trust and familiarity with the topic and the context of the different topics were explored. We did an online experiment with 204 participants recruited from a crowdsourcing platform. Participants were asked to answer six questions per online news post shown. Our analysis revealed that while Instagram filters overall may not affect perceived trust, specific visual characteristics of the filters such as brightness and contrast may play a role. Additionally, individual differences in general trust and attitude towards the topic may influence the users' perception of trust. The study also found that there may be differences in perceived trust across different news topics. Thus, there could be other factors influencing the users' participants of trust.

Acknowledgment

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Chapter 1

Introduction

1.1 Motivation

News is considered a vital component of any democratic society as it serves as a primary source of information and knowledge. It helps people stay updated on current events and issues, facilitating informed decision-making, promoting critical thinking, and encouraging public discourse. Furthermore, the media has the power to promote social change and raise awareness of important social issues such as inequality, social injustice, and human rights violations. Therefore, the news is not only important for individual citizens but for the overall well-being and progress of society as a whole.

The dissemination of news has undergone a rapid evolution from its traditional paper-based format to electronic forms that are accessible via computers and mobile devices. The modern landscape of news delivery offers unprecedented accessibility and convenience, with the latest news stories from around the globe available at the click of a button. According to Pew Research Journalism in 2022, a substantial proportion of U.S. adults, roughly 82%, read news online through a smartphone, computer, or tablet at least "sometimes" or "often". And about half of Americans at least sometimes get news from social media [20]. The shift towards digital delivery of news offers numerous advantages over traditional newspaper formats, with the ability to update content in real-time and at any time. Therefore, it is becoming more and more important to understand how users consume and evaluate information on social media.

Despite the widespread availability of news on social media platforms, concerns regarding the accuracy and reliability of information shared online have been raised. Therefore, it is important to understand the factors that contribute to trust in social media news. Trust in

news media has been steadily declining over the past four decades, also illustrated in Figure 1.1 [26]. And since 2013, the World Economic Forum (WEF) has been emphasizing the risk of extensive digital information as a primary concern among other technological and geopolitical risks [25]. Users have a tendency to restrict themselves to a particular narrative, selectively reading and sharing content that aligns with it, while disregarding other information [12].

Visual information is processed faster than text, and images are more likely to capture people's attention and be remembered. Several studies have found that adding images to news articles can increase the amount of time readers spend on the article, as well as their engagement with the content [6]. Understanding how the use of images in news articles can affect readers' trust, or attitude is crucial. By investigating this topic, researchers can provide insights into how news media can more effectively communicate important information to their audience.
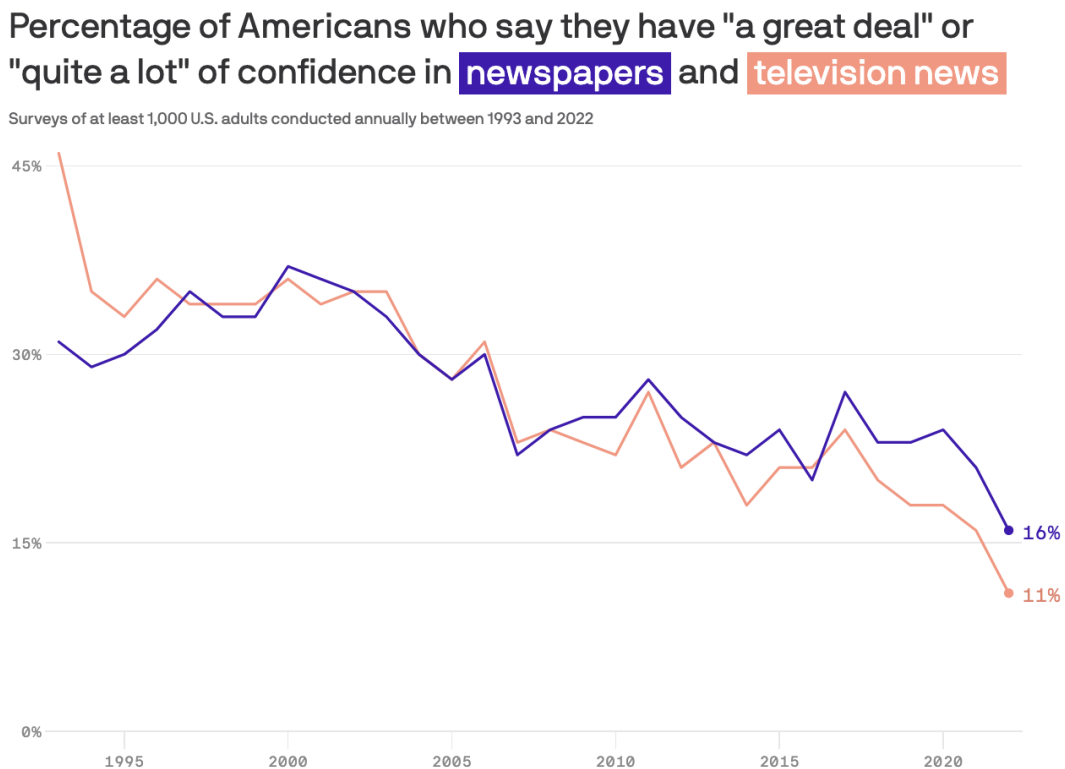
Figure 1.1: Graph from a survey done by Gallup annually between 1993 and 2022 [17]

1.2 Problem

This thesis is a response to a larger issue of growing distrust towards news media. The purpose of this research is to investigate the potential impact of filtered images presented with online news articles on user behavior online, as well as to explore the role of users' attitudes to the topic of the news article. By examining the relationship between trust, filters, and different news topics, researchers can gain valuable insights into how news media can effectively communicate information on these topics to its audience, and how to establish and uphold trust in this process. Additionally, the research could provide valuable insights into how users consume and evaluate information on social media.

1.3 Objectives / Research questions

The primary goal of this master thesis is to investigate the relationship between trust, filtered images, news topics, and users' attitudes toward online news articles. Specifically, the research aims to examine whether filtered images influence users' trust and whether this effect varies depending on the news topic and the user's attitude toward the news. The conceptual model created for this thesis is illustrated in Figure 1.2. To this end, the following research questions are addressed:

- **RQ1**: To what extent does the use of Instagram filters in news media affect perceived trust?

- **RQ2**: Does general trust and attitude on a news post's topic affect perceived trust in that news post?

- **RQ3**: Is there a difference in the context of perceived trust across different topics which are usually perceived as more or less polarized in the media such as abortion, climate change, gun control, and entertainment?

1.4 Relevance of this work

- The importance of trust in news media in the modern digitalized world

- How images play a role in shaping users' perception of online news articles on social media.

- Understanding how the topic of a news article can greatly influence users' trust in the information presented.

- The research is relevant for several groups of people: those who conduct research on trust and news in social media, journalists, those who decided on what an online news article should include, and those who read news on social media.

- By exploring the interplay between images and trust in news on social media, this work aims to provide insights into how news media can effectively engage with their audience.
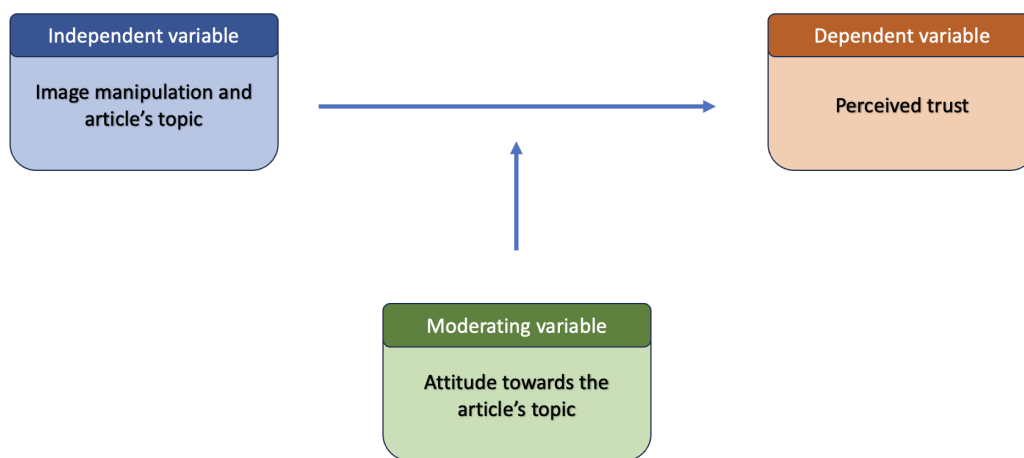
Figure 1.2: The conceptual model created for this thesis to represent the relationships between image manipulation, the article's topic, and perceived trust for online news posts in social media, moderated by the user's attitude towards the article's topic.

1.5   Thesis outline

The thesis is split into five chapters. The first Chapter 1 is the introduction, it details the research questions, motivation, and relevance of this thesis. Chapter 2 reviews related work, such as research done on trust and credibility of news media, the different topics of the news articles, definitions and measurements of trust, and visual cues and manipulation. Chapter 3 describes the data and methods used in this thesis. It provides insight into how the data was retrieved, the decision of filters and articles used in the study, the development of the questionnaire, and a short description of the statistical methods used to analyze the results. Chapter 4 presents the results of the study. Lastly, Chapter 5 discusses the given results of the study, limitations, and proposes future research directions. Additionally, the Appendix A provides further insights into the questionnaire used in the study.

Chapter 2

Background

This chapter gives an overview of previous work relevant to the context of this thesis and is split into 5 sections. Section 2.1 will begin by providing a general introduction to online news and the news topics of the study. It will then move on to Section 2.2 which will give an overview of the visual cues and manipulations, and Instagram filters. Further, Section 2.3 will discuss trust and the challenges of measuring it. Following, Section 2.4 describes a summary of the related work to the study done in this thesis and elaborates on the differences between previous work and this research. Lastly, Section 2.5 concludes the chapter and details the contributions of this thesis.

2.1 Online News

In the past few decades, the rise of the Internet and digital technology has dramatically transformed the way we consume and interact with news media. In an effort to keep up with the rapid development of technology, news companies have been migrating to a more active web presence, publishing news both on their own websites but also on social media platforms. The amount of people finding their news from social media is increasing and for a lot of young people, it is their primary source of news [1]. Indeed, social media platforms have become so popular for news organizations that they have become indispensable in the news business.

But the increased usage of social media has led to concerns regarding the potential development of echo chambers and 'filter bubbles'. The phenomenon of self-selection, reinforced by the increasingly sophisticated and responsive algorithmic selection, may result in individuals only being exposed to content that aligns with their existing preferences while dissenting

viewpoints and perspectives are obscured or altogether absent [43].

Additionally, in light of the prevalence of fake news, Flintham, Karner, Creswick, Bachour, Gupta, and Moran [19] have reported that a significant proportion, namely one-third, of their survey respondents experienced being exposed to fake news they initially believed to be true. Allcott and Gentzkow [3] definition of fake news describes articles that are intentionally and demonstrably false and could mislead readers. And a study by Vosoughi, Roy, and Aral [63] found that false news stories are 70% more likely to be retweeted than true stories. Moreover, the traditional methods of accessing news are shifting away, as social media becomes an increasingly popular source [19]. According to a 2020 Pew Research Center survey, about half (53%) of U.S. adults say they get news from social media "often" or "sometimes", 36% of these U.S adults reported getting their news from Facebook, and 23% reported getting their news from Youtube [52]. Thus, Facebook is the biggest (2022) social media platform with 2.9 billion monthly active users and the key vector of fake news [9, 3, 40].

Heuer and Breiter [24] conducted research considering the challenges posed by online misinformation and fake news. Their study aimed to evaluate how users rate the trustworthiness of online news items and to what extent a platform's social navigation features, such as the number of Facebook likes, and comments, influence a user's trust ratings. Although the study did not find any effect or influence of the social navigation features, the study provides evidence that users can quantify their trust in news items.

Furthermore, a study done by Karlsen and Aalberg [27] investigates the effect the distribution of a news story on social media (Facebook) has on the news message's credibility. In their study, the participants were exposed to the same news story, but either on an original news website or shared on Facebook. Their results suggest that people find news less credible when they are exposed to it through Facebook. This confirms what other studies also have found, that people, in general, have less trust in social media, such as Facebook [39].

2.1.1 Polarizing news topics

As mentioned earlier, the news media plays a crucial role in shaping public opinion and discourse. However, not all news topics are created equal. Some topics are inherently polarizing, eliciting strong and often divergent reactions from different segments of society. News can be broadly categorized into two types: hard and soft news. Hard news covers topics of national and global importance, such as international affairs, politics, and economics [49, 15]. Soft news, on the other hand, focuses on entertainment, celebrities, and personal interest stories [49, 15]. Fan, Liu, Pei, Wu, and Zhu [15] found in their research that partici-

pants considered hard news to be less credible when reported in news media, such as social media, than in traditional media, such as traditional newspapers. We can define the three news topics relevant to this thesis, abortion, climate change, and gun control, as hard news, and entertainment as soft news.

Climate change. This is a topic that has gained significant coverage in news media in recent years, and its coverage has been associated with issues of trust and polarization. A lot of research has been done on the American public beliefs and trust in media coverage of climate change. A 2018 study found that 73% of the public believes that global warming is happening and about 34% say they hear about global warming in the media [33]. Findings by Feldman and Hart [16] show that images that focus on climate-oriented actions can evoke emotions, such as hope, fear, and anger.

Abortion. This is a highly debated topic in American society. This topic has a significant impact on cultural, personal, and political beliefs in the United States [10]. A survey done by Pew Research in 2022 reports that a 61% majority of U.S. adults say abortion should be legal in all or most cases, while 37% think abortion should be illegal in all or most cases [23]. Abortion is commonly presented in the American news media as a political issue rather than a matter of public health [65].

Gun control. Gun control is a highly polarized news topic in the United States, with people holding strong opinions on both sides of the debate. This is due to a variety of reasons, including political ideology, cultural values, personal experiences, and media framing of the issue. According to a survey done by Pew Research in 2021, about half of Americans (48%) say gun violence is a very big problem, and only 6% say it is not a problem at all [8]. But they also report that about 41% say they live in a household with a gun, whereas 30% say they personally own one [8]. However, the US Centers for Disease Control and Prevention reported 48,830 gun-related deaths in the U.S. during 2021 [61].

Entertainment. Petersen [45] defines entertainment news as "any structured discourse concerning film starts, television personalities, recording artists, and other public figures, including the products in which such discourse appears" and can be referred to as soft news [15]. Celebrity news reporters establish their credibility not by delivering verifiable, evidence-based reports, but by demonstrating the quality of their access to the sources of celebrity news [60].

2.2   Visual cues and manipulation

Visual information is often considered an important component in news dissemination, as it can be rapidly and effortlessly processed. News consumers tend to engage with news content through visuals, such as pictures or graphics, and tend to prioritize their attention towards them before moving on to verbal information [22]. And under specific circumstances, visual information can have a greater impact than verbal information [47]. This is because visual elements have a symbolic nature that allows for a more immediate comprehension in contrast to verbal information, thereby making them more persuasive [36].

The results of a study done by Starke, Willemsen, and Trattner [54] in the food domain suggest that the manipulation of visual information can have a significant impact on user behavior and decision-making. In their study, Starke et al. [54] found that users were more likely to choose healthier recipes when they were accompanied by visually attractive images and when they appeared at the top of search results. These findings suggest that recipe websites can use visual attractiveness and re-ranking as an effective strategy to promote healthy food choices.

Moreover, the use of manipulated photos can be intentional. It has been demonstrated that journalists tend to use unfavorable camera angles, images, and visual cues when reporting about, for instance, a political candidate involved in a scandal [29]. Von Sikorski has done research on how visual background cues have an effect on a political candidate's evaluation [62]. They also looked into how the role of the individual's media trust has any effect. They found that visual background cues can have a polarizing effect on citizens' evaluation of political candidates and that mistrusting individuals showed more positive candidate evaluations, whereas trusting individuals showed more negative evaluations [62].

In addition to the research on the effects of visual cues in political reporting, there is also a growing body of literature on the factors that contribute to the popularity of photographs on social networking and photo-sharing platforms. A recent study investigated the role of both image content and social cues in predicting the normalized view count of images on Flickr [30]. The study found that image cues such as color, deep learning features, gradients, and objects present, as well as social cues such as the number of friends or photos uploaded, were important predictors of image popularity [30].

De Smaele, Geenen, and Cock [11] did a study to update and broaden previous research on visual gatekeeping processes, which refers to the process of selecting and deciding which visuals to use in news media. Their study focuses on a qualitative study at the photo news desk of a Flemish newspaper in Belgium. They found that the "newsroom culture" and the

"rhythm" of the newspaper have a stronger influence on visual selection than the individual preferences of photo editors [11]. In in-depth interviews with the photo editors from de Smaele et al.'s study explain that photoshopping the images that will be used in the news media is not acceptable as it leads to false representation of factual events, and it is only considered acceptable to enhance the quality of the picture. They explain truthfulness as it "not only applies to contents (what is pictured) but also to technical aspects (how it is pictured)" [11].

2.2.1   Instagram

The issue focused on filters and visual manipulation, we find Instagram to be a popular platform for such usage. Instagram[1], which is owned by Meta Platforms (formerly Facebook) [2], is a widely popular photo and video-sharing application that enables users to post their pictures for their friends or followers. Since its inception in 2010, Instagram has amassed a user base of over two billion monthly active users, making it the fourth most widely used social application worldwide [55]. 40% of Americans say they use Instagram. However, Instagram seems to be a more popular platform among the younger audience, 71% of American 18-to-29-year-old's say they use Instagram [44].

One notable feature of Instagram is the use of filters that allows users to enhance their images before sharing them with their followers. In a 2017 study of two million Instagram accounts, it was discovered that 18% of all photos on the platform employ a filter. The study further revealed that the top three most frequently used filters were Claredon, Juno, and Gingham [46]. Notably, a 2019 study conducted among women identified Juno as the "Most Flattering" filter, while Hefe was voted "Least Flattering" [46].

Instagram has not publicly disclosed the technical details or specifications of its filters, so it is difficult to say what manipulations were done or altered. However, the Lo-Fi filter is known for adding rich colors, strong shadows, and a warm temperature, and is commonly used by professional photojournalists [5]. The Nashville filter is known for adding a vintage, warm look to images by desaturating colors and adding a slightly pinkish tint [7]. It is also believed that it adds a vignette to the edges of the image. The Willow filter, which is one of Instagram's black-and-white filters, is known for being a monochromatic filter, and adding subtle purple tones and a translucent white border [5].

According to a study done by Canva, the Nashville filter is a popular fashion filter and the

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[1]https://www.instagram.com/
[2]https://about.meta.com/no/technologies/

Willow filter is seen used a lot for food images, however, the Lo-Fi filter does not seem to be as popular [7].

Borges-Rey conducted research on news images posted on Instagram, with the objective of examining how professional and citizen photojournalists use Instagram to create a hyperreal deception of the world, challenging the sense of authenticity characteristic of citizen journalism and the realism of professional photojournalism [5]. The research found that photojournalist uses aesthetic conventions and performative discourses that correspond to their roles as either amateurs or professionals, but each group tries to simulate the conventions and discourses of the other [5].

2.3 Trust

Trust in news and news sources is a crucial aspect of trust in media. There exist various definitions of the term trust in academic literature, including confidence, credibility, distrust, mistrust, and skepticism [13, 18]. As a result, providing a precise definition of trust can be challenging. Trust involves the relationship between two parties: the trustor, who places trust, and the trustee who is trusted [48]. In the context of news, most scholars contend that trust involves an active decision-making process, and trust, and credibility have often been used interchangeably or have been treated as a dimension of each other [31]. Otto and Köhler [42] described trust as an act that anticipates a particular future outcome, wherein individuals choose to rely on the selections made by others instead of making the selections themselves.

A layer model of trust in media has been proposed, which suggests that trust is built from a general propensity and consists of three layers: trust in the message or media itself, trust in the source or communicator of the content, and trust in the channel or medium used to disseminate the message [34]. These layers interact and influence one another, with trust in the information being influenced by trust in its source and medium.

The use of intermediaries such as social media can further complicate matters when it comes to trust and credibility. In addition to the original news platform's credibility, the intermediary platform and sender can also influence media credibility [27]. Trust is particularly important in the context of social media, where users must rely on the information presented to make decisions and form opinions. However, challenges such as misinformation and fake news can make trust in social media fragile.
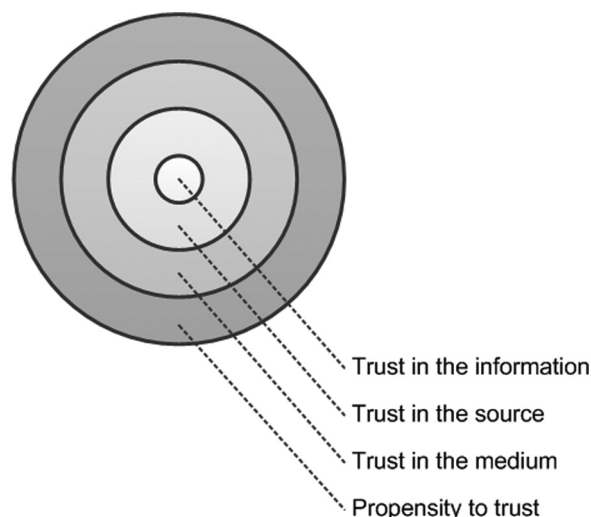
Figure 2.1: Lucassen and Schraagen [34] layers of trust

In the context of social media, trust is particularly important, as users must rely on the information presented on these platforms to make decisions and form opinions. However, as social media becomes an increasingly important source of news and information, it is becoming clear that trust in the information presented on these platforms is often fragile. Misinformation, fake news, and biased reporting are just a few examples of the challenges that social media users face when trying to determine the truthfulness of the information presented to them. According to Luhmanns [35], trust allows individuals to manage complexity and cope with risk. In the context of online news, Heuer and Breiter [24] argue that the risk associated with trust can range from trivial to server. For example, reading fake news may result in a trivial waste of time. However, believing a fake news story can have severe consequences, such as being misinformed and voting for a political candidate with negative implications for oneself, others, or the environment.

As we are constantly flooded with images and information through the internet and social media, it is important to be able to evaluate the credibility of the information presented to us. A study done by Shen, Kasra, and O'Brien [53] examined this issue by conducting a large-scale online experiment that probes how people evaluate image credibility across online platforms. Their study found that participants' internet skills, photo-editing experience, and social media use were significant predictors of image credibility evaluation. In contrast, most social and heuristic cues of online credibility had no significant impact [53].

Moreover, higher levels of trust in the news media have been found to correspond with greater effectiveness of news media in providing citizens with the necessary information for making political decisions. Conversely, low levels of trust may moderate the media's impact on its audience [37]. Although the evidence is not crystal clear, studies indicate that overall,

people's trust in news media is declining [40, 21, 27].

There are also some studies on how colors can influence trust when designing brands, logos, and web pages. The colors blue and green are often associated with trust, but research suggests that the context in which colors are seen can influence their association with trust [57, 2, 30]. Overall, there is limited research on the association between colors used in a news image context and perceived trustworthiness.

Also, trust must in a lot of cases be understood in light of the relationship with political ideology. Karlsen and Aalberg found in their study done in Norway that conservative supporters were less influenced than labor supporters because conservative supporters already found the news story less credible when it was presented on the original news site [27]. The divide of trust in-between political ideologies is also seen in other studies done in different other countries [38, 62].

Furthermore, news stories are typically trusted when shared by a reputable news outlet [58], personal connection, such as friends and family [4], or celebrities that have earned trust from their audience [56].

2.4   Summary of related work

Many approaches are made to try to understand trust in news media, either on news sites or on social media. Finding out what makes people trust or distrust news stories is important as we are seeing trust in news media decreasing. Also with this rise of fake news and misinformation being spread where we see that false news reaches more people than the truth [63].

The work of von Sikorski [62] is also examining the effect of image manipulations in the context of trust in news media. The key difference between their work and the current study is that they look specifically at visual background cues and news about political scandals in Germany. The current study has its focuses on the effect of filters on trust and is targeting Americans.

Furthermore, we see the study of Karlsen and Aalberg [27] is examining the effect on the news message credibility when it is published on Facebook. The key difference between their work and the current study is that they are examining the effect on trust based on where the user read the news.

Another study was also done with the social media platform Facebook is the work of Heuer

and Breiter [24]. Their study focused on manipulating the social navigation features, i.e. likes, shares, and comments, whereas these features were not included in the current study. However, similar to Heuer and Breiter, the Social Trust Scale from European Social Survey [14] was used.

In summary, while there has been a considerable amount of research on the factors that influence trust in the news media, none of the existing studies have directly examined the impact of images and filters on users' perceived trust in news. As a result, there is a gap in the literature that needs to be addressed in order to gain a more comprehensive understanding of the factors that shape users' perceived trust in online news sources, both on news sites and social media.

2.5   Contribution

- The main contribution of this thesis is how it provides insights into the potential impact of image manipulation on images presented with online news articles posted on social media, with a focus on perceived trust by the user, particularly in the context of news topics related to climate change, abortion, gun control, and entertainment.

- The research examines the role of user attitudes as a moderating variable in the association between trust in news media and news topics, which can help understand how users' pre-existing beliefs and attitudes affect their perception of news media and their trust in its coverage of certain topics.

- The research can also explore how people evaluate the reliability of news content and how this evaluation process might be influenced by factors such as the source of the content, the topic, and the way the information is presented.

- Using Instagram filters can provide a standardized, efficient, and familiar way to manipulate images in future studies.

- The study explores how the use of filters may affect these evaluations and may have implications for social media platforms, news organizations, and content creators who seek to establish trust with their audience.

- The research aims to contribute to the understanding of how social media users evaluate the credibility of information presented in news posts and the individuals involved.

Chapter 3

Methodology

To answer the research questions we conducted an online user experiment to examine the impact of Instagram filters and the article's topic on a user's perceived trust. This chapter describes the data and methods used in the study and is split into four sections. Section 3.1 describes the dataset used in the study, how the articles and filters were selected, and details about the specific features of the filters. Section 3.2 elaborates on the research design and the questionnaire that was used in the study. It details how the questionnaire was set up and what it entailed. Section 3.3 elaborates on the procedure of the online experiment. Section 3.4 describes the participants recruited for the study, and Section 3.5 which variables were measured in the study. Lastly, Section 3.6 describes the statistical methods used to analyze the data from the study.

3.1 Dataset

To collect data for this study, a manual web scraping method was used. This involved searching for and identifying online news articles on four specific topics - climate change, abortion, gun control, and entertainment - from various news websites and social media platforms. The selection of these topics was based on their potential to generate diverse opinions and emotions among readers, as well as their relevance to current social and political issues. The web scraping was carried out by manually searching through the websites and google using keywords related to the chosen topics to find relevant articles. The articles were then carefully selected based on their credibility, relevance, and suitability for the study. We also wanted all the images to include a person that was talked about in the article. This was also important so that all the articles had an image with the same motive. There was one arti-

cle picked out per news topic. From the web scraping, I gathered the image presented with the news article, the title, when it was published, and approximately 30-50 words from the beginning of the news article as shown in Table 3.1.

The four images are illustrated in Figure A.11. The images are retrieved from different sources. The image for article 1 is of the UN Cheif António Gueterres, depicted in Figure A.11a, and is retrieved from Anadolu Images [1]. The image for article 2 is of the Hungarian prime minister Viktor Orbán, depicted in Figure A.11b, and is retrieved from Getty Images. [2]. The image from article 3 is of the former President of the United States of America Donald Trump, depicted in Figure A.11c, and is captured by Kevin Lamarque for Reuters [3]. And lastly, the image for article 4 is of actress Jennifer Aniston, depicted in Figure A.11d, and is received from Getty Images [4].

For our study of news in social media, we focus on the social media platform Facebook. To create the social media post the design tool Figma[5] was used. The interface of the social media news post resembles the look and feel of Facebook, which is the focus of the study. Figure 3.4 demonstrates how the social media news post was put together after adding all the data from the web scraping.

Instagram filters.

For the selection of Instagram filters, several filters were considered that could be suitable for the type of images used in the study. It was important to choose filters that were different from each other and also filters that were not noticeable and overwhelming, as this could distract the participants. Among the selected filters were some of Instagram's first original filters that were introduced in 2010 [51]. The three filters chosen are Nashville, Willow, and Lo-Fi depicted in Figure 3.2. To further investigate the distinct differences between the filters, they were each run through an image feature extraction code made in Java. San Pedro and Siersdorfer [50] proposed a set of explainable visual features that could effectively measure the attractiveness of images posted on Flickr. Following their research, we examined every image with different filters. By doing this we were able to examine their low-level features (i.e., brightness, sharpness, contrast, colorfulness and Shannon entropy). The Java code uses the freely available OpenIMAJ Java Framework [6] in version 1.3.10. Further, details on the formulas and how the features are calculated are found in the work of Trattner et al. [59] and Pedro and Siersdofer's work [50].

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[1] https://www.anadoluimages.com/
[2] Attila Kisbendek/AFP/ via gettyimages.com
[3] https://www.reuters.com/
[4] Source: https://www.gettyimages.no/fotos/jb-lacroix
[5] https://www.figma.com/
[6] http://www.openimaj.org

Table 3.1: The title, first paragraph, and date of publication of the articles used in the study

Topic	Title	First paragraph	Date of publication
Climate change	"Climate change: IPCC report is 'code red for humanity'"	"Human activity is changing the climate in unprecedented and sometimes irreversible ways, a major UN scientific report has said. The report "is a code red for humanity", says the UN chief."	9. August 2021
Abortion	"Women must listen to embryo's heartbeat before abortion under new Hungarian law"	"Hungarian women seeking an abortion will be obliged to "listen to the foetal heartbeat" before they can access the procedure, according to a new decree issued by the government of the far-right prime minister, Viktor Orbán."	14. September 2022
Gun control	"What happened to Trump's promises on gun control reform?"	"US President Donald Trump said after recent mass shootings that he wanted the country to have stricter gun laws. "We don't want people who are mentally ill, people who are sick - we don't want them having guns", said President Trump in August."	11. November 2019
Entertaintment	"Jennifer Aniston says she's skipping the Emmys because of Covid-19"	"The actress has been vocal about her coronavirus safety concerns since the start of the pandemic. Speaking on Jimmy Kimmel Live! this week, Aniston said: "I will not be going. It is still a big step for me just to be here. It is just baby steps.""	14. September 2021

(a) The image of UN Cheif António Gueterres for Article 1 with the topic climate change

(b) The image of Viktor Orbán for Article 2 with the topic abortion

(c) The image of Donald Trump for Article 3 with the topic gun control

(d) The image of Jennifer Aniston for Article 4 with the topic of entertainment

Figure 3.1: The four original images used in the user study.

- **Image: Brightness.** This is a measure of how much light is emitted or reflected by the pixels that make up the image [50]. Brightness was extracted using the AvgBrightness[7] class, which employs the default NTSC weighting scheme and no mask. This class utilizes a standard luminance algorithm to determine the average brightness of an image.

- **Image: Contrast**. This is a measure of how much variation there is between the lightest and the darkest areas of the image. The contrast of an image, or the relative difference in luminance, can be computed using the intensity of each pixel. For this case, the root-mean-square contrast (RMS contrast) approach is used [59].

- **Image: Sharpness.** This measures the level of detail of an image and the clarity. The sharpness can be computed by using the Laplacian of an image, normalized by the local average luminance in the surroundings of each pixel [50].

- **Image: Colorfulness.** Colorfulness describes how chromatic a perceived color appears to be. It can be calculated using the individual color distance of an image's pixels [50]. To do this, the image was first converted to the sRGB color space.

- **Image: Entropy.** The entropy of an image can be thought of as the amount of information it contains. In this work, Shannon entropy is used to compare two images. To do

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[7]http://openimaj.org/apidocs/org/openimaj/image/feature/global/AvgBrightness.html

this, the images are first converted to grayscale, resulting in each pixel having a single intensity value. Then, the occurrence of each distinct value is counted [59].

Table 3.2: The mean of the low-level features extracted with Java code for each feature for each filter

Filters	Brightness	Sharpness	Colorfulness	Contrast	Entropy
Original image	0.398	0.107	0.225	0.188	7.392
Nashville	0.449	0.089	0.306	0.205	7.313
Willow	0.459	0.054	0.022	0.159	7.272
Lo-Fi	0.372	0.148	0.304	0.297	7.418

The results from the feature extraction code are depicted in Table 3.2 which summarizes the mean of each feature for each filter. All features had values between 0 and 1, except Entropy, which ranged from 6.91 to 7.65 ($M = 7.35$, $SD = 0.20$). As seen in Table 3.2 and Figure 3.2 there are some differences between the filters in terms of their low-level features. It appears that the Nashville filters increase brightness and colorfulness compared to the original image, while decreasing sharpness and entropy. The Willow filter, which is a black-and-white filter, scores lowest on colorfulness (*M = 0.022*). It increases brightness but decreases sharpness, colorfulness, contrast, and entropy. The Lo-Fi filter, which is known for adding rich colors and strong shadows [5], increase sharpness, colorfulness, contrast, and entropy, but decreases the brightness.

The differences may explain why some filters are more trustworthy or popular than others. According to previous studies [50], images with higher brightness, colorfulness, sharpness, and naturalness tend to be more appealing and engaging to viewers. Therefore, filters that enhance these features may increase the likelihood of the user engaging with the content. On the other hand, filters that degrade these features may decrease the attractiveness of the images.

(a) The Nashville Instagram filter   (b) The Willow Instagram filter   (c) The Lo-Fi Instagram filter

Figure 3.2: The chosen Instagram filters for the study shown on the image of Jennifer Aniston for article 4 with the topic Entertainment

3.2   Research Design

This section will detail the decisions and considerations that went into the development of this questionnaire.

To understand and examine what factors have an impact on the perceived trust of the participant when looking at news articles on social media, we conducted an online user experiment. The study was subject to a 4x4 within-subject experimental design to investigate the effect of image filters (Original, Nashville, Willow, Lo-Fi) and article topics (Abortion, Climate change, Gun control, Entertainment) on a user's perceived trust as the dependent variable. Experimental research is used when a researcher wishes to trace the cause-and-effect relationships between defined variables. The variable is the element or the factor that is under investigation [64]. To this date, experimental research remains one of the most effective approaches to finding data that can be generalized to larger populations [32]. For this study, we developed an online questionnaire. The dependent variable in this study is perceived trust from the participant and the independent variable will be the filters and topics. The questionnaire was self-administered and web-based, in contrast to Heuer and Breiter [24] who conducted their study at a German high school.

A questionnaire, also called a survey, is a well-defined and well-written set of questions to which the participants are asked to respond [32]. Further, a questionnaire makes it easier to quickly access a large sample without constraints on time or location and to process and analyze the data.

There are some drawbacks to the use of both online experiments and questionnaires. Answers can be misread or misunderstood, there are no possibilities to get back to the participants, or ask follow-up questions, and the answers can be shallow. There is also some bias expected when using a questionnaire, especially in the case of news where a user's interest and preferences can vary from the time of the day.

3.2.1   Questionnaire

The questionnaire consists of a consent form, questions about simple demographics, trust questions from STS [14], and the pages where participants were presented with the articles and statements. The questionnaire was hosted on Qualtrics[8].

Prior to commencing the questionnaire, participants were presented with introductory in-

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[8]https://www.qualtrics.com/uk/

formation about the research and a consent form. The participants were first asked to provide demographic information and a brief questionnaire related to their general level of trust with questions retrieved from the Social True Scale. Following this, they were presented with simulated social media news posts and statements for them to answer.

3.2.2   Latin Square

The order in which each participant saw the filter was decided by using a Latin square design. Participants were randomly assigned to one of four Latin square sequences. This method was only used when presenting the articles to the participants. Prior to this stage, all participants were subject to identical demographic and trust questions.

As there are four articles and four filters, the Latin square design is a good method to be able to check different variations. To use the Latin square design method, the number of rows and columns has to correspond to the number of treatment levels [28]. As seen in Table 3.2, every participant saw the same order of articles, but the in which order they saw the different filters on the images were different.

Using the Latin square design method is good to help control for potential order effects that may arise from survey items presented in a fixed sequence. Additionally, the method can help increase the generalizability of the results, as it allows for the evaluation of multiple treatments or conditions using a relatively small sample size.

Table 3.3: The order of the four Latin square conditions showing the order in which the filters are shown

Latinsquare conditions	Article 1	Article 2	Article 3	Article 4
Latinsquare 1	Original	Nashville	Willow	Lo-Fi
Latinsquare 2	Nashville	Willow	Lo-Fi	Original
Latinsquare 3	Willow	Lo-Fi	Original	Nashville
Latinsquare 4	Lo-Fi	Original	Nashville	Willow

3.3   Procedure

Participants were simultaneously recruited and assigned to one of the four Latin squares conditions as depicted in Table 3.3. The study procedure consisted of five steps: instructions, demographic questions, general social trust questions, the articles with questions, and debriefing at the end of the questionnaire. A page from the questionnaire employed in the

study is displayed in Figure 3.5. There were four articles involving statements that the partic-
ipants were asked to rank that were done in succession. The full overview of the procedure
is found in Figure 3.4.
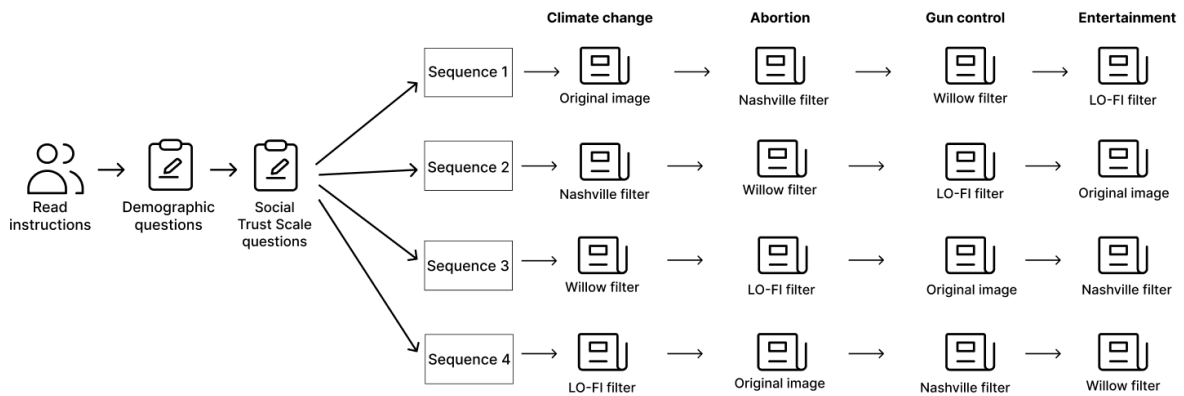
Figure 3.3: An overview of the full procedure for the study, including the within-subject re-
search design. Each participant is assigned one of four Latin square conditions after the
demographics questions. The participant completes a sequence of four tasks and 6 ques-
tions before completion.

3.3.1 Instruction

When participants joined the study they were given a brief description of the task of the
study: "You will be first asked to answer a few questions about your personal characteristics
and attitude towards trust in online news media. Next, you will be presented with four differ-
ent Facebook posts, which each provide a preview of a news article. About each news article
posted on Facebook, you will be asked a few questions". These institutions were uniform
across all Latin square conditions and did not contain any information regarding the inter-
pretation of the filters or topics of the news articles. Following the instructions, participants
proceeded to complete the demographic questionnaire.

3.3.2 Demographics Questionnaire

Participants were then requested to complete demographic questions that include inquiries
about their gender, age, country of residence, level of education, ranking of communication
methods for news consumption (5-point ranking scale), and how many times a week they
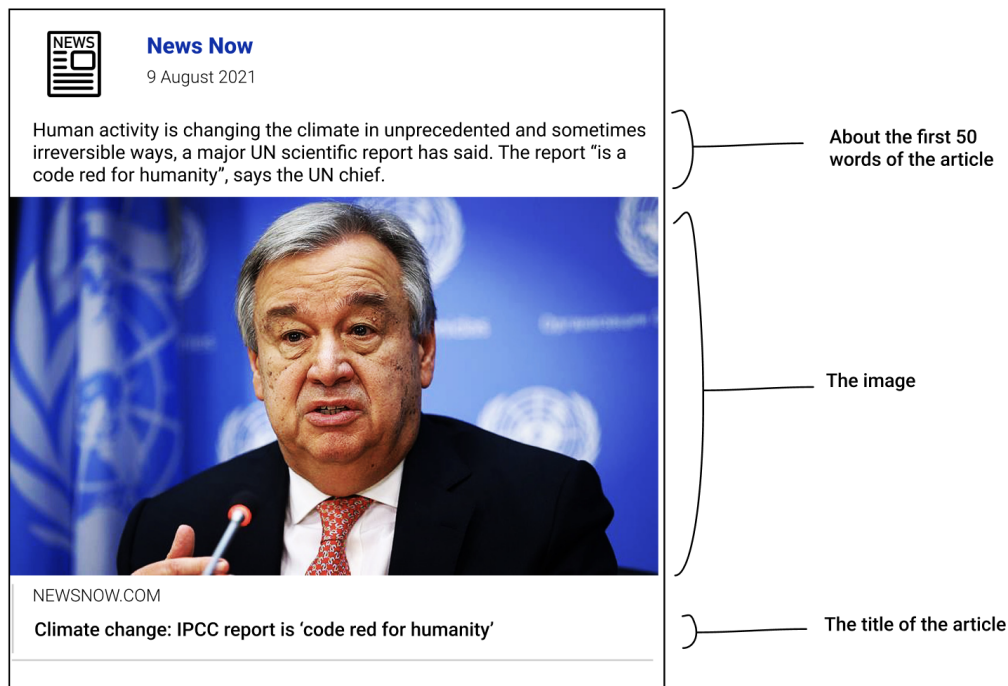
Figure 3.4: The social media post created for the study in Figma

read the news. When the participants were asked to rank different communication methods for news in terms of how they use it for news consumption, the following options were given: Social media (Facebook, Snapchat, Instagram, etc.), Newspapers, TV, Online News Media (e.g. BBC.com, thetimes.co.uk) and via family/friends. The demographic questions and scale used in the study are found in Table 3.3. Following the demographic questions, participants were moved on to the social trust scale questions.

3.3.3   Social Trust Scale

Participants were further asked to answer three questions about their general level of trust. The questions received from the Social Trust Scale [14] are found in Table 3.4. Details of the Social Trust Scale follow in Section 3.5.

Table 3.4: Questions used in the questionnaire for the study

Question	Scale
Demographic questions	
1. To what gender do you identify?	Scale shown in Figure 3.4
2. What is you age?	Numeric input
3. What is you country of residence?	Text input
4. What is the highest degree or level of education you have completed?	Scale shown in Figure 3.5
5. Listed below are different communcation methods for news. Please rank them in terms for news consumption.	Scale shown in Figure 3.7
6. How many times a week do you read news content across all platforms/communcation methods?	Scale shown in Figure 3. 6
Question from the Social Trust Scale (STS)	
1. Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?	Likert scale 1 (You can't be too careful) - 10 (Most people can be trusted)
2. Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?	Likert scale 1 (Most people would try to take advantage of me) - 10 (Most people would try to be fair)
3. Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?	Likert scale 1 (People mostly look out for themselves) - 10 (People mostly try to be helpful)
Article statements	
1. I trust the information presented in this news post	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)
2. I trust the person on the image	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)
3. I agree with the statements presented in the news post	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)
4. I think the topic discussed in the news post is important	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)
5. I feel strongly about the topic discussed in the news post	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)
6. I am very familiar with the topic presented in this news post	Likert scale 1 (Strongly disagree) - 5 (Strongly agree)

News Now
14 September 2022

Hungarian women seeking an abortion will be obliged to "listen to the foetal heartbeat" before they can access the procedure, according to a new decree issued by the government of the far-right prime minister, Viktor Orbán.

NEWSNOW.COM
Women must listen to embryo's heartbeat before abortion under new Hungarian law

Please carefully read the news article posted on Facebook above and respond to the statements below

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I trust the information presented in this news post	○	○	○	○	○
I trust the person on the image	○	○	○	○	○

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I agree with the statement presented in the news post	○	○	○	○	○
I think the topic discussed in the news post is important	○	○	○	○	○
I feel strongly about the topic discussed in the news post	○	○	○	○	○
I am very familiar with the topic presented in this news post	○	○	○	○	○

Figure 3.5: One of the pages from Qualtrics the participants saw from the developed questionnaire from the study

3.3.4   Facebook news posts

All participants were then presented with four news articles posted on social media. Participants were further given the following instructions: "In the next section you will be presented with a news post, a news article published on the social media platform Facebook. Please read the post carefully and answer the questions about it to the best of your ability". Under each social media news post, the participants were asked to answer six statements divided into two groups, one for trust-related statements and one for attitude/preferences-related statements. All questions and statements were measured with a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). The questions/statements are depicted in Table 3.4 under "Article statements".

3.3.5   End debriefing

At the end of the questionnaire, participants were provided with a debriefing statement that explained the purpose of the study and its goals. This information was given to ensure that participants fully understood the nature of the research and the significance of their contributions to the study.

3.4   Participants

To ensure a good amount of quality data the participants were recruited from the crowd-sourcing platform Prolific[9]. The study sample was limited to participants who were U.S. residents only. This approach was adopted given the relevance of the article's topic, and to explore the declining trust in news media in the United States, particularly following the presidential campaigns in 2016 [3, 40].

Ensuring that we only recruited high-quality crowdsourcing workers we set the approval rate to 99% and to join the study the participants had to be fluent in English. The questionnaire was estimated to take approximately six minutes to complete, and participants were reimbursed at a rate of 0.85£ per hour.

The study was set to recruit 210 crowd workers. This resulted in 204 completed surveys, and thus 204 evaluations per article. The users completed the survey at a median of 5 minutes and 18 seconds, which was slightly lower than anticipated.

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[9]https://www.prolific.co/

119 of the participants were male, 83 were female, and 2 replied other, as depicted in Figure 3.6. The average level of education was a bachelor's degree, as illustrated in Figure 3.7.
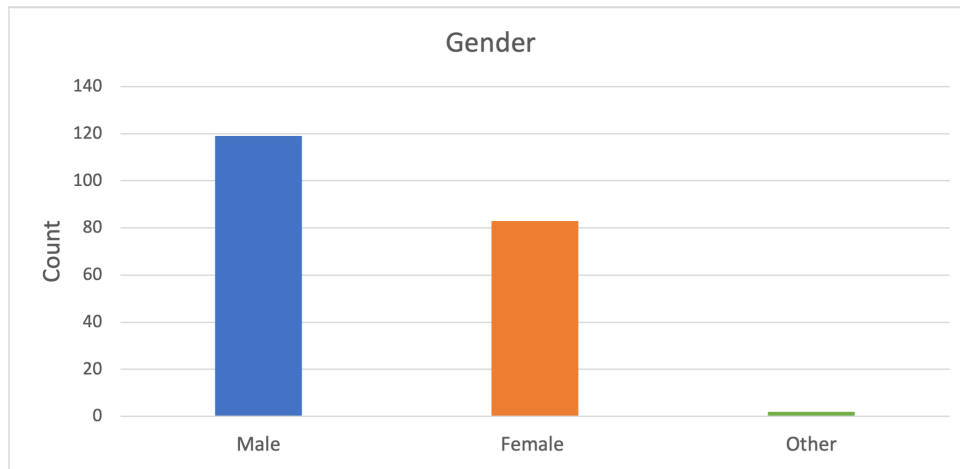
Figure 3.6: Frequency plot of the gender of the participants
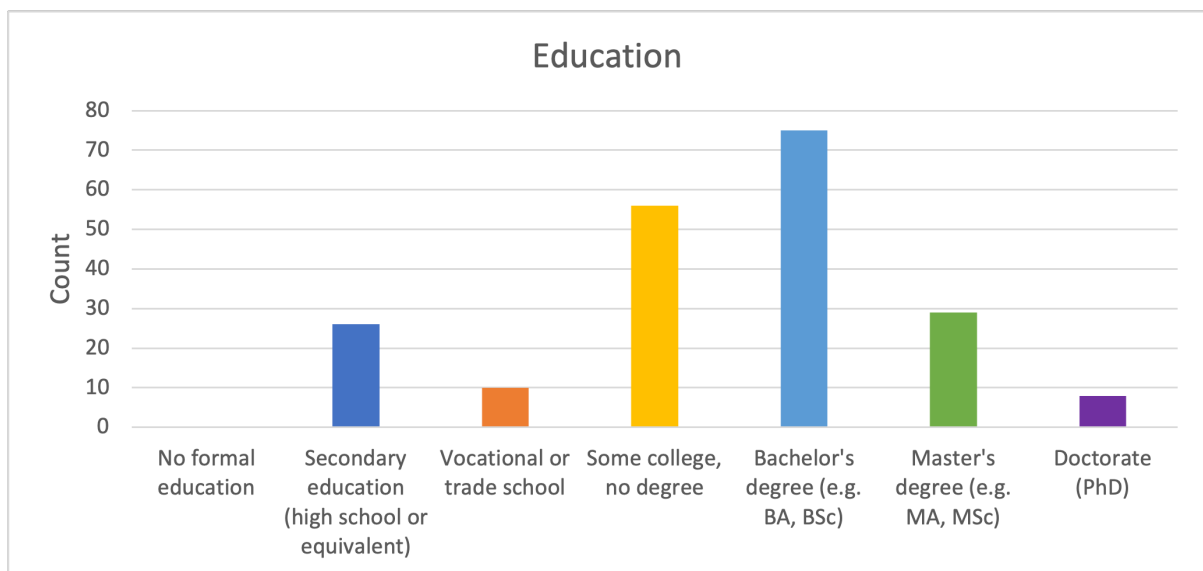
Figure 3.7: Frequency plot of the educational background of the participants

The mean age of the participants was 38.5 years, ranging from the youngest being 18 years old, to the oldest being 76 years old. Figure 3.8 shows how participants answered when asked "How many times a week do you read news content across all platforms/communication channels?" and we found that about half of the participants read news either "Every day of the week" or "Multiple times a day". Figure 3.9 shows how participants would rank the different communications methods in terms of news consumption. The most used platform for the participants in our study is Social media, followed by Newspapers and Online News Media.
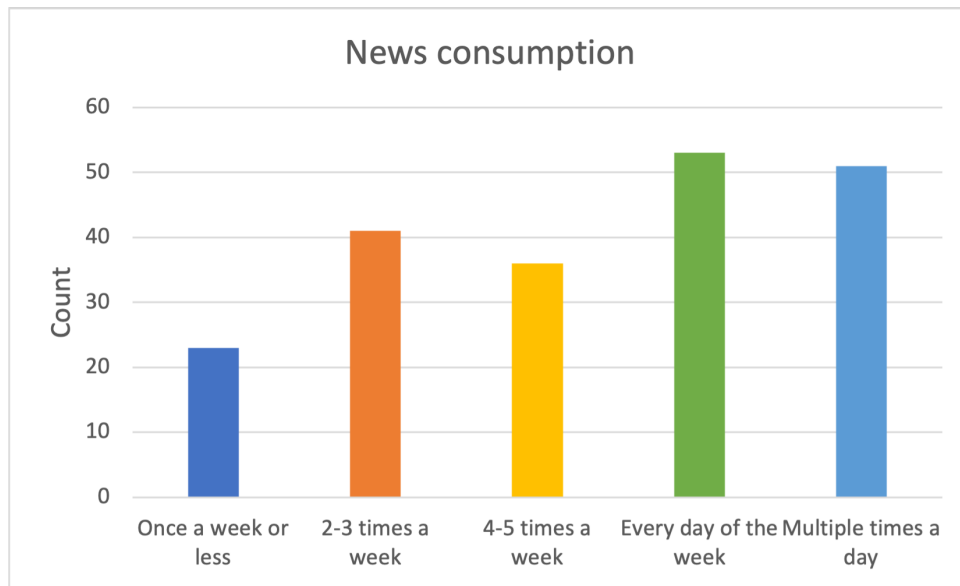
Figure 3.8: Frequency plot of how many times a week the participants read news

3.5 Measures

Perceived trust

The primary focus of this study was to examine the participant's perceived trust, which was assessed through two distinct questions pertaining to their trust in the information presented in the social media news post and the person depicted in the social media news post image.

Social Trust Scale (STS)

The European Social Survey Social Trust Scale (ESS-STS) [14] is a commonly used instrument to measure social trust, which is an essential component of social capital. The STS consists of three items that aim to measure the extent to which individuals believe that most people can be trusted. The scale has been validated in various European countries and has been found to have good psychometric properties. It is regularly administered every two years since 2001 to a large sample of 29 European countries. The scale consists of three items available in 27 European languages, which generalize statements about whether most people can be trusted, would try to take advantage of the respondent, and try to be helpful. Social trust has been shown to have significant implications for a range of outcomes, such as political participation, health, and economic growth. The STS was based on a sample size of N= 54,673. Cronbach Alpha measured the internal consistency of the scale as .72 for the United Kingdom and .78 across all European Union (E.U.) countries (N=54,673).

Ranking in terms of news consumption
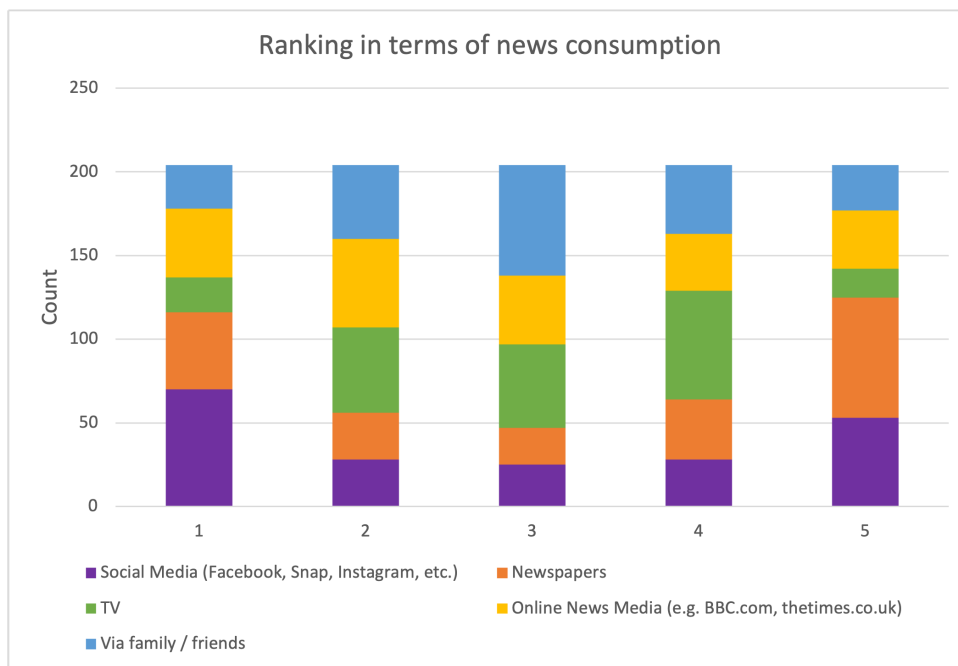
Figure 3.9: Stacked frequency chart of participants ranking in terms of news consumption

Similar to Heuer and Breiter [24], we used the Social Trust Scale from the European Social Survey as it proved to work well in their study. The STS consists of three items and measures to what extent respondents expect fairness from, and trust, other people. The questions were asked before the participant started the main part of the study to make sure that the study would not interfere with the participant's general trust.

Attitude towards news topic

To measure the participant's attitudes and preferences, four statements were presented that they needed to form an opinion on. The statements assessed the extent to which they agreed with the statements presented in the post, the perceived importance of the topic discussed in the article, the strength of their feelings towards the topic, and their familiarity with the topic.

3.6   Statistical analysis

We employed statistical analysis to identify for significant variances between conditions and variants. To this end, various statistical methods are used. A one-way analysis of variance (ANOVA) was conducted to analyze how independent variable filters affected the dependent variable's perceived trust. A series of linear regression models were used to assess the impact of filter features on perceived trust. Multiple Linear regression was used to analyze how

general trust and attitude on the topic affected the dependent variable perceived trust. A one-way ANOVA was also conducted to compare the effect of the topic of the news post on perceived trust, and a two-way ANOVA was conducted to examine if the effect was essentially made by a filter being applied. For the ANOVA test that returns a statistically significant value ($p < 0.05$), the post-hoc Tukey's Honestly-Significant-Difference (Tukey HSD) test is used to check which groups are different from one another.

Chapter 4

Results

We conducted a questionnaire where participants were presented with four different news articles posted on social media, the image accompanying the article was either applied with a filter or not. Participants were asked about their trust in the information and person shown in the news post on social media. They were also asked some questions about their attitude on the news topic in the article. We examined to what extent Instagram filters have on perceived trust. We also examined whether general trust, attitude on the topic, and the topic itself had any effect on perceived trust. We recruited 204 participants from Prolific that are all included in the final analysis. This chapter provides an overview of the results of the statistical analysis. The sections in the chapter are organized by research questions, and the analysis to answer them.

Table 4.1: Correlation table with all the questions from the online experiment. q1 - q6 are the statements from Table 3.4 under 'Article statements'.

	q1	q2	q3	q4	q5	q6
q1	1.000					
q2	0.514	1.000				
q3	0.352	0.343	1.000			
q4	0.252	0.122	0.409	1.000		
q5	0.204	0.077	0.242	0.694	1.000	
q6	0.085	0.107	0.192	0.374	0.447	1.000

4.1 RQ1: Instagram filters effect on perceived trust

4.1.1 Factor analysis

To determine if we could use the mean of the answers to the two different trust questions asked in the questionnaire as a single trust factor, we conducted a Principal Component analysis (PCA). All questions were measured on a 5-point scale. The loading of the factor analysis is presented in Table 4.2. As seen in Table 4.2, the factor analysis indicates that one factor is possible that combines question 1 and question 2. The correlation table, seen in Table 4.1, also shows a strong correlation between question 1 and question 2. However, we found that question 3 had a lower loading. After considering the results and the content of the questions, we decided not to include question 3 in the final analysis because the question was more about agreeing than trusting, which was not the focus of my analysis. A single factor was eventually formed, which was further labeled 'Perceived trust'.

Table 4.2: The results from the factor analysis for RQ1

	Questions	Loadings
1	I trust the information presented in this news post	0.8157
2	I trust the person on the image	0.8431
3	I agree with the statement presented in the news post	0.6049

4.1.2 One-way ANOVA

To address the first research question "To what extent does the use of Instagram filters in news media affect perceived trust?", a one-way analysis of variance (ANOVA) was conducted based on the single-factor analysis above. Specifically, we performed a one-way ANOVA to compare the effect of filters on perceived trust. The results of the first ANOVA run on 204 participants are reported in Table 4.3.

We used Levene's test to check the homogeneity of variances, the p-value is not less than the significance level of 0.05. The Shapiro-Wilk test on the ANOVA residuals ($W = 0.98$, $p < 0.001$) suggests that normality is violated, however, ANOVA test results are often robust to violations of this assumption. This can also be reasoned by the small sample size of users used in the study.

As reported in Table 4.3 the one-way ANOVA revealed that there was not a statistically significant difference in perceived trust between the filters ($F(3, 812) = 2.05$, $p = 0.10$).

Table 4.3: The results for the one-way ANOVA

	Sum sq.	df	Mean sq.	F value	p
Filter	5.587	3.0	1.862	2.051	0.105
Residual	737.322	812.0	0.908		
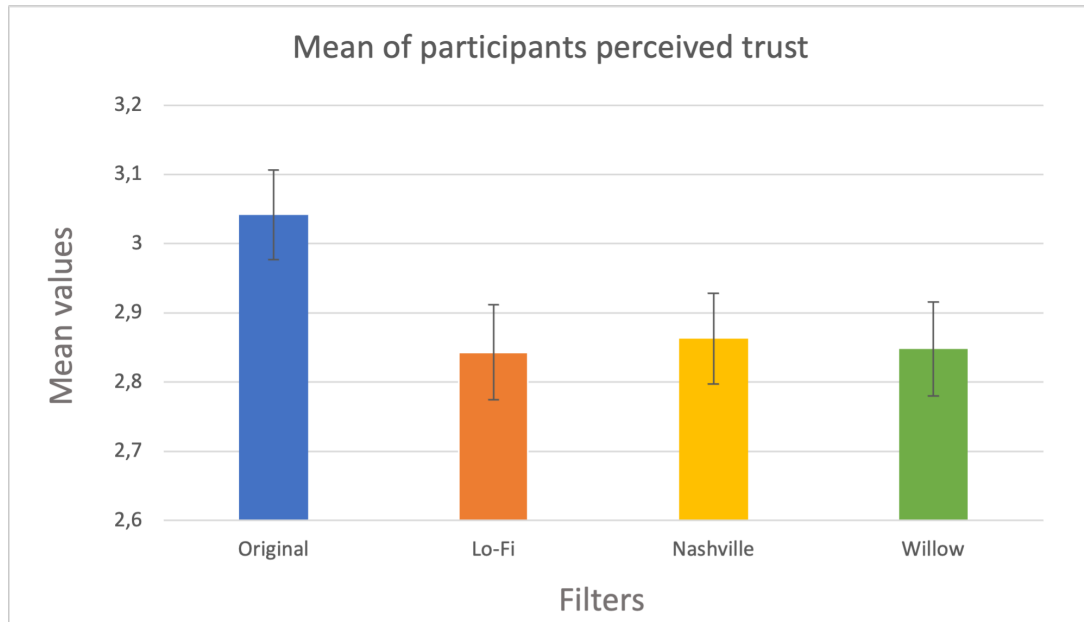
Figure 4.1: Bar plot with standard error bars of the mean of the perceived trust between the different filters

Since no statistical significance was found between the main effects, a posthoc test was not conducted. However, looking at the mean trust ratings of the filters, as seen in Figure 4.1, it shows that the original image (the image with no filter) had a slight difference, but was not large enough to be significant.

4.1.3   Linear Regression

To examine if any of the features of the filters had any impact on perceived trust, we conducted a series of linear regression analyses. The independent variables included brightness, sharpness, contrast, colorfulness, and entropy, while perceived trust served as the dependent variable.

Prior to analysis, we checked for multicollinearity among the independent variables and found no evidence of it (tolerance values > 0.2 and VIF values < 5). We also assessed the assumptions of normality, linearity, and homoscedasticity of the residuals and found them to be met. The results of all the linear regression models are presented in Table 4.4.

The model for brightness, depicted in Table 4.4a, revealed a significant negative relationship between brightness and perceived trust (β = -0.945), but the effect size was small (R^2 = 0.007). No significant relationships were found for sharpness, depicted in Table 4.4b, or colorfulness, depicted in Table 4.4c. The model for contrast, depicted in Table 4.4d, revealed a significant negative relationship between contrast and perceived trust (β = -1.993), with a small effect size (R^2 = 0.025). No significant relationship was found for entropy as presented in Table 4.4e.

Table 4.4: Linear Regression Analyses of Low-Level Features Predicting Perceived Trust

(a) Linear regression model for brightness

	Coef.	St. error	t	P >|t|	95% - CI
Intercept	3.291	0.168	19.580	< 0.001	[2.961; 3.621]
Brightness	-0.945	0.397	-2.381	0.017	[-1.723; -0.166]

(b) Linear regression model for sharpness

	Coef.	St. error	t	P >|t|	95% - CI
Intercept	2.936	0.074	39.840	< 0.001	[2.792; 3.081]
Sharpness	-0.375	0.659	-0.569	0.570	[-1.668; 0.919]

(c) Linear regression model for colorfulness

	Coef.	St. error	t	P >|t|	95% - CI
Intercept	2.936	0.065	44.866	< 0.001	[2.807; 3.064]
Colorfulness	-0.174	0.264	-0.657	0.511	[-0.693; 0.345]

(d) Linear regression model for contrast

	Coef.	St. error	t	P > |t|	95% - CI
Intercept	3.318	0.098	33.859	< 0.001	[3.126; 3.510]
Contrast	-1.993	0.439	-4.453	< 0.001	[-2.854; -1.132]

(e) Linear regression model for entropy

	Coef.	St. error	t	P > |t|	95% - CI
Intercept	4.382	1.234	3.552	< 0.001	[1.960; 6.804]
Entropy	-0.202	0.168	-1.203	0.230	[-0.532; 0.128]

Personal Factors

Prior research has indicated that an individual's general trust can influence their perceived trust [24, 62]. Thus, it is of interest to investigate whether personal characteristics such as

age, general trust, and news source affect perceived trust in social media news posts.

In the prior research [24, 62], it was assumed that people with low general trust will also give low perceived trust in the study, and vice versa for high general trust. The results from our study supported this assumption. Participants who scored below 4 on the general trust measure had a lower mean of perceived trust ($M = 2.89$) compared to those who scored above 7 which had a higher mean of perceived trust ($M = 3.35$). Although the difference was small, it suggests a relationship between general trust and perceived trust.

We also examined whether age affected perceived trust and general trust. Our results indicated no particular difference in perceived trust among different age groups. However, for general trust, participants over the age of 55 had higher average scores compared to other age groups, with the exception of two participants who scored below 5. This suggests that older participants had higher levels of general trust, as illustrated in Figure 4.2.
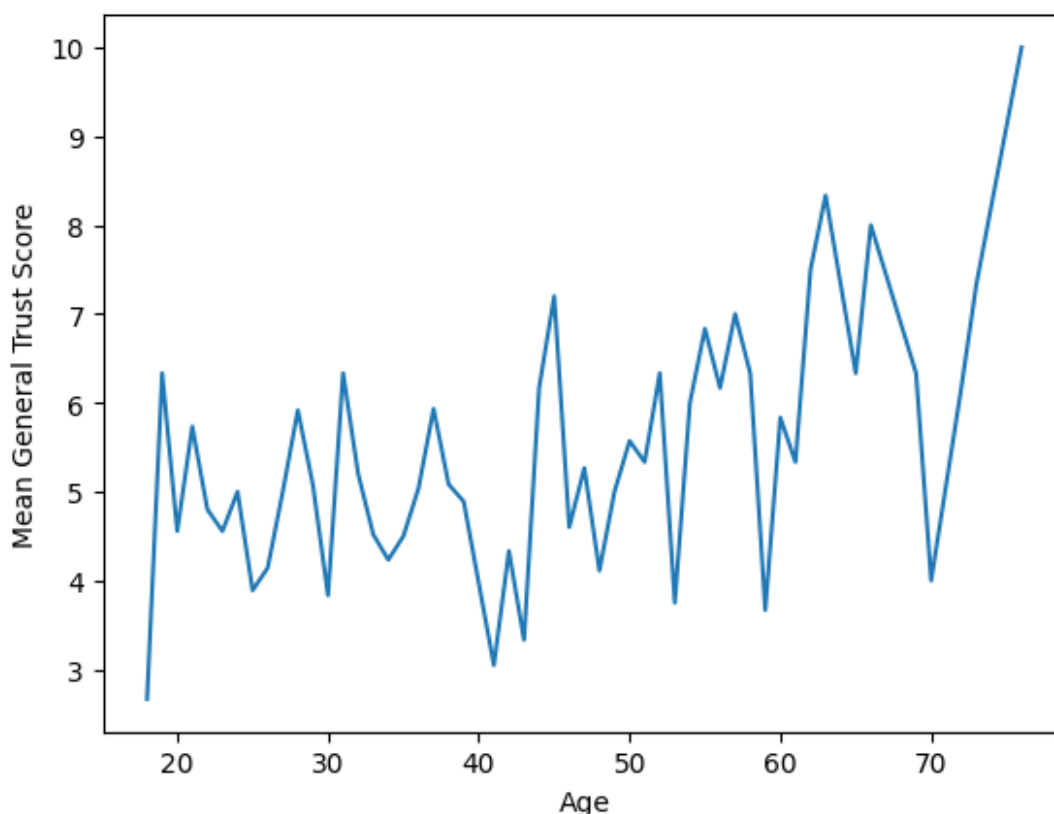
Figure 4.2: Line plot of the mean of the general trust between the different ages of the participants

We also investigated whether there were differences in perceived trust and general trust between participants who primarily obtained their news from social media and those who ranked social media as their least preferred news source. Results indicated that participants

who ranked social media as their primary news source had a higher mean perceived trust rating ($M = 3.14$) than those who ranked social media as their least preferred news source ($M = 2.91$). This finding is particularly relevant given that the online experiment was conducted with an interface of a social media platform.

4.2 RQ2: Effect of general trust and attitude on perceived trust

Before using the questions from the STS, we check the internal consistency of the questions. A Cronhbach's Alpha test was conducted showing an alpha score of $\alpha = 0.84$ which is an acceptable level of reliability [41]. The three items from the STS are collectively referred to as 'General trust'.

To address the second research question, which concerns the potential effects of general trust and attitude towards the topic on perceived trust, a multiple linear regression analysis was conducted. This analysis was used to test whether general trust and attitude toward the topic were significant predictors of perceived trust. Prior to analysis, we checked for multicollinearity among independent variables and found no evidence of it (tolerance values > 0.2 and VIF values < 5). We also assessed the assumptions of normality, linearity, and homoscedasticity of the residuals and found them to be met.

The overall regression analysis, shown in Table 4.5, revealed that both General Trust and attitude had a statistically positive effect on perceived trust. ($R^2 = 0.058$, $F(2, 813) = 24.94$, $p < 0.05$). The R^2 value of 0.058 indicates that the model explained 5.8% of the variance in the dependent variable, suggesting that other factors may also influence perceived trust. The 95% confidence interval for the general trust coefficient was [0.033; 0.098]. The 95% confidence interval for the attitude coefficient was [0.111; 0.236]. These results suggest that both the participant's general trust ($\beta = 0.065$, $p < 0.001$) and attitude ($\beta = 0.173$, $p < 0.001$) are important factors in shaping individuals' perceptions of trust. However, it should be noted that the model only explains a relatively small proportion of the variance in perceived trust, indicating that additional factors may also play a role in shaping trust perceptions.

Table 4.5: Multiple Linear Regression Analysis of General Trust and Familiarity Predicting Perceived Trust

	Coef.	St. error	t	P > |t|	95% - CI
Intercept	1.910	0.144	13.285	< 0.001	[1.628; 2.192]
General trust	0.065	0.017	3.919	< 0.001	[0.033; 0.098]
Attitude	0.173	0.032	5.452	< 0.001	[0.111; 0.236]

4.3   RQ3: Perceived trust across polarized topics

4.3.1   Factor analysis

To determine if we could use the mean of the answers to the three different attitude questions asked in the questionnaire as a single attitude factor, we conducted a Principal Component analysis. All questions were measured on a 5-point scale. The loading of the factor analysis is presented in Table 4.6. As seen in Table 4.6, the factor analysis indicates that one factor is possible that combines question 4 and question 5. The correlation table, seen in Table 4.1, also shows a strong correlation between question 4 and question 5. Question 6 was not included in the single attitude factor because its factor loading was lower than those of questions 4 and 5, and because it measured familiarity with the topic rather than the attitude towards it. A single factor was eventually formed, which was further labeled 'Attitude'.

Table 4.6: The results from the factor analysis for RQ3

	Questions	Loadings
4	I think the topic discussed in the news post is important	0.8462
5	I feel strongly about the topic discussed in the news post	0.8757
6	I am very familiar with the topic presented in this news post	0.7005

4.3.2   One-way ANOVA

To address the third research question, which asks whether there is a difference in perceived trust across topics that are typically perceived as more or less polarized, we conducted a one-way analysis of variance (ANOVA) based on the single factor identified by the factor analysis described above. A one-way ANOVA was performed to compare the effect of the topic of the news post on perceived trust. The results of the ANOVA run on 204 participants are reported in Table 4.7. Prior to analysis, we used Levene's test to check the homogeneity of variances, the p-value is not less than the significance level of 0.05. The Shapiro-Wilk test on the ANOVA residuals ($W = 0.99$, $p < 0.001$) suggests that normality is violated, however, ANOVA test results are often robust to violations of this assumption. This can also be reasoned by the small sample size of users used in the study.

A one-way ANOVA revealed that there was a statistically significant difference in perceived trust between several groups ($F(3, 812) = 34.0$, $p < 0.001$).

Table 4.7: Results of One-Way ANOVA Examining the Effect of News Topics on Perceived Trust (RQ3)

	Sum sq.	df	Mean sq.	*F* value	*p*
Topic	83.038	3.0	27.679	34.060	< 0.001
Residual	659.871	812.0	0.813		

A Tukey's HSD Test was used to compare the mean values of perceived trust across different levels of topics. The results are shown in Table 4.8. The test found that the mean value of perceived trust was significantly different between the following pair of topics: Abortion and Climate change ($p < 0.001$, 95% C.I. = [0.130, 0.590], Abortion and Entertainment ($p < 0.001$, 95% C.I. = [0.417, 0.877]), Climate change and gun control ($p < 0.001$, 95% C.I. = [-0.766, -0.307]), Entertainment and Gun Control ($p < 0.001$, 95% C.I. = [-1.053, -0.594]), and Climate change and Entertainment ($p = 0.007$, 95% C.I. = [0.057, 0.516]). There was no significant difference in mean values of perceived trust between abortion and gun control ($p = 0.197$, 95% C.I. = [-0.406, -0.053]).

Table 4.8: Post-Hoc Tukey HSD Test Results for examining the effect of all pairs of news topics on perceived trust (RQ3)

Term	Contrast	Mean diff.	Conf. low	Conf. high	*p*
Topic	Abortion-Climate change	0.360	0.130	0.590	< 0.001
Topic	Abortion-Entertainment	0.647	0.417	0.877	< 0.001
Topic	Abortion-Gun control	-0.176	-0.406	0.053	0.197
Topic	Climate change-Entertainment	0.286	0.057	0.516	0.007
Topic	Climate change-Gun control	-0.537	-0.766	-0.307	< 0.001
Topic	Entertainment-Gun control	0.823	-1.053	-0.594	< 0.001

4.3.3 Two-way ANOVA with interaction effect

As there was such a statistical difference in the topics on perceived trust I wanted to look if the effect was essentially made by a filter being applied. Since we know that there was no specific filter had a significant difference in the impact on perceived trust, we further explore filters in the sense of if it was applied a filter or not.

A two-way ANOVA was conducted to examine the effects of the topic and filter, as well as their interaction, on perceived trust. The main effect of filters was statistically significant ($F(3, 808) = 6.266$, $p = 0.012$). The main effect of the topic was statistically significant ($F(3, 808) = 34.881$, $p < 0.001$). Additionally, the interaction between the topic and filter was also statistically significant ($F(3, 808) = 7.810$, $p < 0.001$).
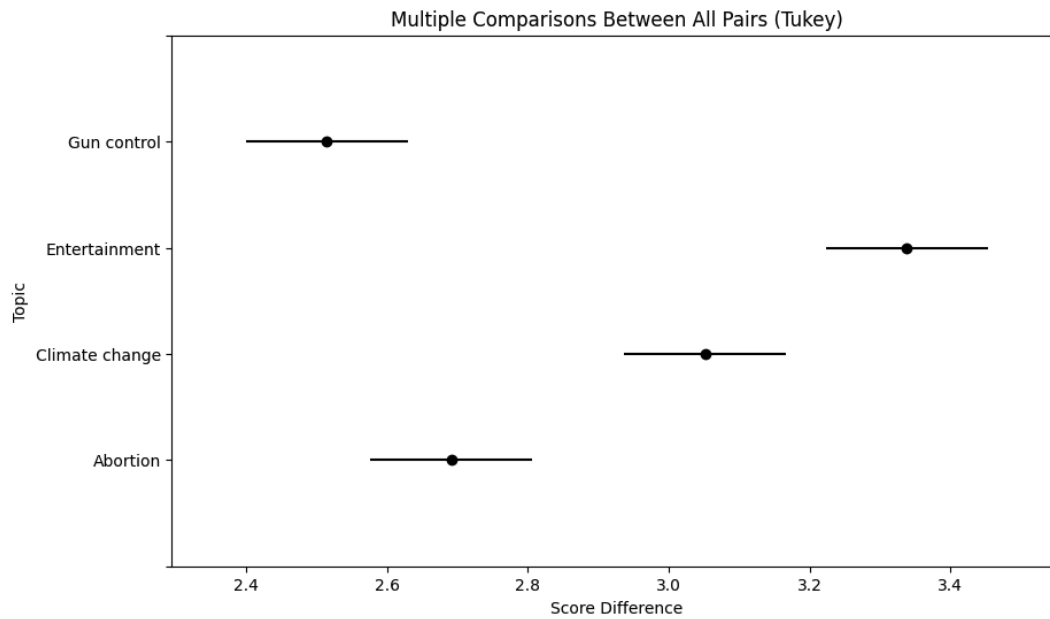
Figure 4.3: Multiple comparison plot displaying the results of the Tukey HSD test for the third research question.

A Tukey's HSD test was conducted to examine the difference in mean values of perceived trust across all pairs of news topics and filtered or unfiltered images. The results of this analysis are presented in Table 4.10. The test revealed that several pairs had statistically significant differences in their mean values of perceived trust. Specifically, at a significance level of 0.05, 13 pairs were found to have significant differences. Notably, six out of these thirteen pairs included the topic 'Gun control'. As depicted in Figure 4.4, filtered images were generally perceived as less trustworthy for the topics 'Climate change' and 'Gun control', while they were perceived as more trustworthy for the topics 'Abortion' and 'Entertainment'.

Table 4.9: The results from the interaction effect

Term	Sum sq.	df	Mean sq.	F value	p
Filter	4.936	1.0	4.936	6.266	0.012
Topic	82.429	3.0	27.476	34.881	< 0.001
Topic*Filter	18.457	3.0	6.152	7.810	< 0.001
Residuals	636.478	808.0			
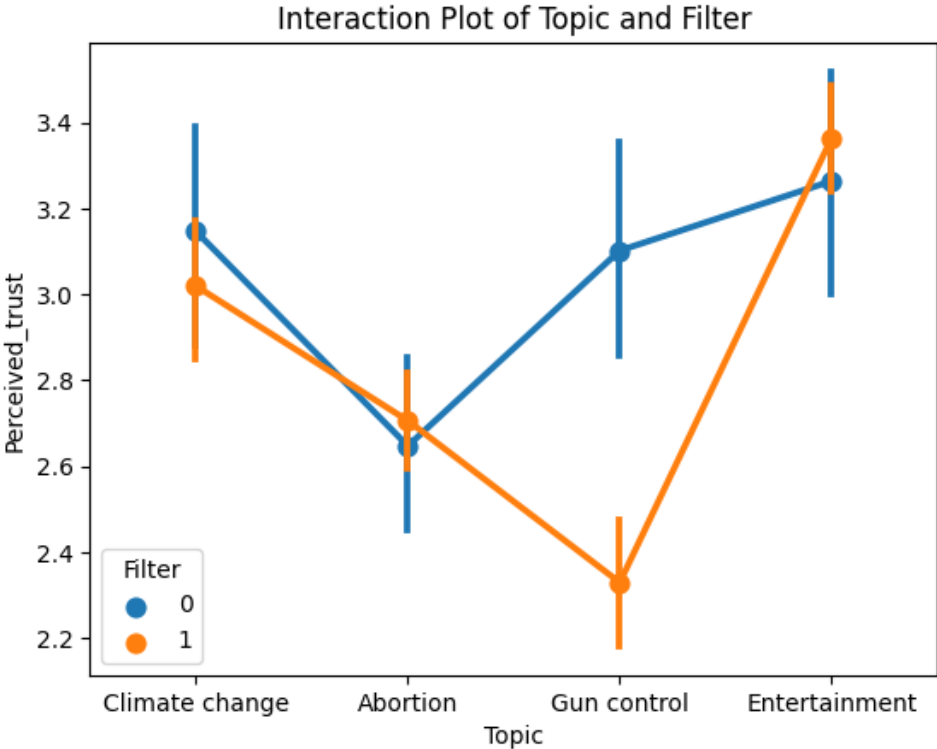
Figure 4.4: Interaction plot for the interaction between the topics and filters whereas 0 represent the images with no filter and 1 the images that is applied a filter.

Table 4.10: Post-Hoc Tukey HSD Test Results for examining the effect of all pairs of news topics and filter on perceived trust.

Term	Contrast	Mean diff.	Conf. low	Conf. high	p
Topic:Filter	Climate change:No filter-Abortion:No filter	0.500	-0.034	1.034	0.086
Topic:Filter	Entertainment:No filter-AbortionNo filter	0.617	0.088	1.146	0.009
Topic:Filter	Gun control:No filter-Abortion:No filter	0.454	-0.084	0.994	0.171
Topic:Filter	Abortion:Filter-Abortion:No filter	0.058	-0.377	0.494	0.999
Topic:Filter	Climate change:Filter-Abortion:No filter	0.372	-0.063	0.808	0.158
Topic:Filter	Entertainment:Filter-Abortion:No filter	0.717	0.280	1.153	< 0.001
Topic:Filter	Gun control:Filter-Abortion:No filter	-0.318	-0.753	0.117	0.340
Topic:Filter	Entertainment:No filter-Climate change:No filter	0.117	-0.411	0.646	0.997
Topic:Filter	Gun control:No filter-Climate change:No filter	-0.045	-0.584	0.494	0.999
Topic:Filter	Abortion:Filter-Climate change:No filter	-0.441	-0.877	-0.005	0.045
Topic:Filter	Climate change:Filter-Climate change:No filter	-0.127	-0.563	0.308	0.987
Topic:Filter	Entertainment:Filter-Climate change:No filter	0.217	-0.219	0.653	0.801
Topic:Filter	Gun control:Filter-Climate change:No filter	-0.818	-1.253	-0.382	< 0.001
Topic:Filter	Gun control:No filter-Entertainment:No filter	-0.162	-0.696	0.372	0.983
Topic:Filter	Abortion:Filter-Entertainment:No filter	-0.558	-0.988	-0.128	0.002
Topic:Filter	Climate change:Filter-Entertainment:No filter	-0.244	-0.674	0.185	0.668
Topic:Filter	Entertainment:Filter-Entertainment:No filter	0.100	-0.330	0.530	0.996
Topic:Filter	Gun control:Filter-Entertainment:No filter	-0.935	-1.364	-0.506	< 0.001
Topic:Filter	Abortion:Filter-Gun control:No filter	-0.396	-0.838	0.046	0.118
Topic:Filter	Climate change:Filter-Gun control:No filter	-0.082	-0.525	0.360	0.999
Topic:Filter	Entertainment:Filter-Gun control:No filter	0.262	-0.181	0.705	0.622
Topic:Filter	Gun control:Filter-Gun control:No filter	-0.773	-1.215	0.330	< 0.001
Topic:Filter	Climate change:Filter-Abortion:Filter	0.313	0.313	0.622	0.042
Topic:Filter	Entertainment:Filter-Abortion:Filter	0.658	0.348	0.967	< 0.001
Topic:Filter	Gun control:Filter-Abortion:Filter	-0.376	-0.684	-0.069	0.005
Topic:Filter	Entertainment:Filter-Climate change:Filter	0.344	0.035	0.654	0.016
Topic:Filter	Gun control:Filter-Climate change:Filter	-0.690	-0.997	-0.383	< 0.001
Topic:Filter	Gun control:Filter-Entertainment:Filter	-1.035	-1.343	-0.726	< 0.001

Chapter 5

Discussion

In this final chapter of the thesis we will summarize the findings from the study, possible limitations, and provide possible directions going forward.

The primary objective of this thesis was to investigate the impact of Instagram filters on users' perceived trust in news posted on social media. Previous research [54] suggests that images can influence users' online choices and behavior. This study aimed to determine whether this also applies to how users read and select news articles to trust. Additionally, the study examined the effects of familiarity, preferences, and attitudes toward the news topic on the users' trust. To accomplish this, news articles were manually scraped and three different Instagram filters were applied to the accompanying images. The social media news post was then distributed via a questionnaire to participants recruited from Prolific. Participants were asked about their trust and attitudes towards the news articles and the image shown, as well as their user characteristics and demographics. The results indicate that Instagram filters do not significantly affect users' perceived trust in social media news posts. However, the topic of the news article does influence users' perceived trust. The findings of this master thesis can be summarized as follows:

RQ1: To what extent does the use of Instagram filters in news media affect perceived trust?

To answer this research question, a one-way ANOVA was conducted. The results of the analysis indicated that there were no effects of filters on perceived trust. However, we could find a slight difference in the perceived trust in the original image compared to the others with filters when looking at the mean trust ratings. This suggests that the filters did not have a big impact on the user's perceived trust, but that the original image is preferred. It could also be possible that other factors, such as the content of the news post or the person on the image, maybe is more important in shaping users' perception of trust. However, we

also conducted a series of linear regression models to examine if low-level image features could predict perceived trust. The results revealed that certain features of the filters, such as brightness and contrast, were found to have a small but significant negative relationship with perceived trust. This suggests that while the use of Instagram filters overall may not affect perceived trust, the specific visual characteristics of the filters may play a role.

The finding that brightness and contrast have a small but significant negative relationship with perceived trust in news media is consistent with the work of von Sikorski [62], who found that visual background cues can have a polarizing effect on users. This indicates that the specific visual characteristics of news media content, whether it be the use of filters or the presence of certain background cues, can impact how users perceive and trust the information presented.

Further, our analysis revealed that participants with lower levels of general trust had lower perceived trust ratings in our study, while those with higher levels of general trust had higher perceived trust ratings. These findings are consistent with prior research [24, 62] that also utilized validated trust scales, indicating that individual differences in the general trust may play a role in how people perceive and trust news media

Additionally, our study found that social media was the most popular platform for consuming news among our American participants, in line with findings from Pew Research Journalism [20]. This highlights the importance of understanding how social media platforms, and the features they offer such as Instagram filters, impact perceived trust in news media.

RQ2: Does general trust and attitude on the news post's topic have an effect on perceived trust in that news post?

To answer this research question a multiple linear regression model was conducted. The results suggest that both the participant's general trust and familiarity with the topic had a positive effect on perceived trust. This suggests that individuals who have higher levels of general trust and who are more familiar with the topic of a news post are more likely to perceive it as trustworthy. A potential reason for this could be that individuals who have a higher level of general trust may be more likely to give others the benefit of the doubt and perceive information as trustworthy. Similarly, individuals who are more familiar with the topic may have more background knowledge and context to evaluate the information. However, the R^2 value of 0.058 suggests that there are other factors beyond general trust and familiarity that may influence perceived trust in an online news post. This is again, also in line with the research of von Sikorski and Heuer and Breiter [62, 24].

Prior research suggests that familiarity with the topic or person features in a news post may

influence perceived trust [62, 56]. For example, studies have found that news post featuring celebrities [56] or political candidates [62], who is known to the public, may be perceived as more trustworthy. This indicates that the familiarity of the topic or person features in a news post may play a role in shaping users' perception of trust in news media.

RQ3: Is there a difference in the context of perceived trust across different topics which are usually perceived more or less polarized?

To address the third research question, we conducted a one-way ANOVA with a post-hoc Tukey HSD test. The results of our analysis revealed that there is a statistically significant difference in perceived trust between several groups of topics. Specifically, our Tukey's HSD test found significant differences in the mean value of perceived trust between several pairs of topics, with the exception of the pair consisting of abortion and gun control. These findings suggest that the topic of a news post can significantly influence its perceived trustworthiness among readers. Notably, our findings indicate that entertainment news was perceived as more trustworthy compared to all the other topics. One possible explanation for this observation is that entertainment news is often considered less controversial or polarizing than other types of news, which may be perceived as more serious or heavy. In this context, our results suggest that soft news is generally perceived as more trustworthy than hard news. These findings are consistent with previous research by Fan et al. [15], who reported that participants considered hard news to be less credible when reported by news media.

In addition to our one-way ANOVA, we also conducted a two-way ANOVA to examine the effects of both topic and filer on perceived trust, as well as their interaction. Surprisingly, we found that the effect of filters was statistically significant when we considered only whether a filter was applied or not, in contrast to our examination of the effects of different filters in the first research question. Furthermore, we observed a statistically significant interaction between the topic and filter. A post-hoc Tukey's HSD test revealed significant differences in the mean values of perceived trust between several pairs of news topics and filtered or unfiltered images. In particular, we found that the topic of gun control news paired with a filtered image was perceived as less trustworthy compared to other pairs of topics and filtered/unfiltered images. One potential explanation for this result is that the image used for this topic depicted Donald Trump, a highly polarizing political figure with both supporters and opponents. Furthermore, following the 2016 U.S. presidential election, concerns regarding the dissemination of fake news were raised, particularly in relation to Trump's credibility [3, 40]. These findings align with previous research by von Sikorski [62], who reported that visual cues can have a polarizing effect on citizens' evaluations of political candidates.

5.1   Limitations and Future Work

This thesis has several limitations that should be taken into consideration when interpreting the results. Firstly, the dataset used in the study is relatively small. While this was done to gain more control over the content and images of the news articles it also means that the results may only be applicable to the specific articles included in our study. Additionally, the relevance of the content may have changed over time due to the rapidly evolving nature of news. Another limitation is that our results may only apply to the specific topics covered by the chosen articles: climate change, abortion, gun control, and entertainment. These topics are quite broad and our findings may not generalize to all articles within these categories. Further research could explore these findings with other types of news topics and images.

Our study only examined three different Instagram filters and their specific features. This means that other filters and their potential effects on perceived trust in online news posts were not considered. Further research could explore the underlying mechanisms behind these effects and how they interact with other factors such as the platform on which the news is published and perhaps in combination with the social navigation features present.

The sample size of recruited participants was relatively small and may not be representative of the general population. Further, the participants were only recruited from the USA, where trust in the media was proven to be declining. As such, the results might have been different if participants were recruited from another country with higher trust in media, such as Norway.

Measurement error is another potential limitation of our study. Perceived trust is a complex and abstract construct with many definitions, which may introduce some errors in how it is measured. To minimize measurement error, similar to Heuer and Beiter [24], we used a valid and reliable measure such as the Social Trust Scale. However, it is still important to acknowledge the potential for measurement error and its impact on the validity and generalizability of the results.

Finally, our experiment was conducted online, which has both advantages and disadvantages. While this approach allowed us to reach a large number of participants, it also meant that we had less control over the experimental setting. Distractions such as notifications or other applications could have affected participants' attention during the experiment. Although this lack of control may introduce some limitations to our data, attempting to exert greater control over the setting could further distance our study from a realistic setting. Future research could explore the effects of filters in a more naturalistic setting by observing users' behavior on social media platforms when browsing for news.

While our study has several limitations, it also provides valuable insights into the effects of filters on perceived trust in online news posts. By acknowledging these limitations and suggesting ways to address them in future research, we hope to inspire further exploration of this important topic.

5.2 Open Science

To make this study reproducible, the code from the image feature extraction, the data from the user study, and the code used in the statistical analysis are shared freely along with the results from the study. All resources and code used in the study are available in a GitHub repository[1]. The repository includes the Java code for image feature extraction, the dataset, and the data analysis. The folder 'Data_Analysis' contains several Jupyter Notebook[2] Python files with code for each research question with the statistical analysis, and some R-script used for some parts of the analysis. The folder also includes the cleaned dataset used for each analysis.

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[1]https://github.com/Annahn/InstaFiltersTrustMaster
[2]https://jupyter.org/

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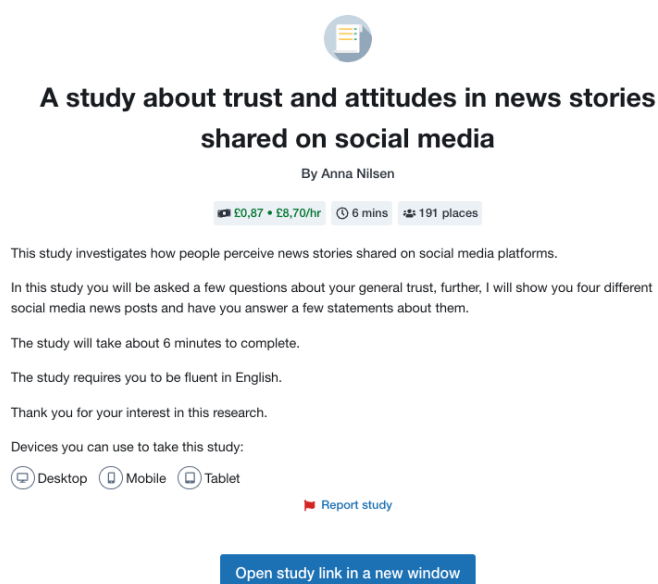
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Appendix A

Appendix A: User study questionnaire

This appendix contains screenshots of each step from the questionnaire hosted on Qualtrics for the user study.

Figure A.1: The instructions given to the participants recruited on Prolific

Figure A.2: The instructions given to the participants recruited on Prolific on Qualtrics

Demographic characteristics

Please answer the short questions below. This information will be processed anonymously and cannot be traced back to you.

To what gender do you identify?

○ Male

○ Female

○ Other

○ Prefer not to say

What is your age?

What is your country of residence?

Figure A.3: The demographic questions given to all participants

What is the highest degree or level of education you have completed?

- ○ No formal education
- ○ Primary education (elementary school)
- ○ Secondary education (high school or equivalent)
- ○ Vocational or trade school
- ○ Some college, no degree
- ○ Bachelor's degree (e.g. BA, BSc)
- ○ Master's degree (e.g. MA, MSc)
- ○ Doctorate (PhD)

Listed below are different communication methods for news. Please rank them in terms use for news consumption, ranking the most used option as '1' and the least used option as '5'.

	1	2	3	4	5
Social Media (Facebook, Snap, Instagram, etc.)	○	○	○	○	○
Newspapers	○	○	○	○	○
TV	○	○	○	○	○
Online News Media (e.g. BBC.com, thetimes.co.uk)	○	○	○	○	○
Via family / friends	○	○	○	○	○

How many times a week do you read news content across all platforms / communication channels?

- ○ Once a week or less
- ○ 2-3 times a week
- ○ 4-5 times a week
- ○ Every day of the week
- ○ Multiple times a day

Figure A.4: The demographic questions given to all participants

Below you will be asked a few questions about your general level of trust.

Please read the statement below and provide a score between 1 and 10

| | You can't be too careful (1) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Most people can be trusted (10) |

Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people? ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

Please read the statement below and provide a score between 1 and 10

| | Most people would try to take advatage of me (1) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Most people would try to be fair (10) |

Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair? ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
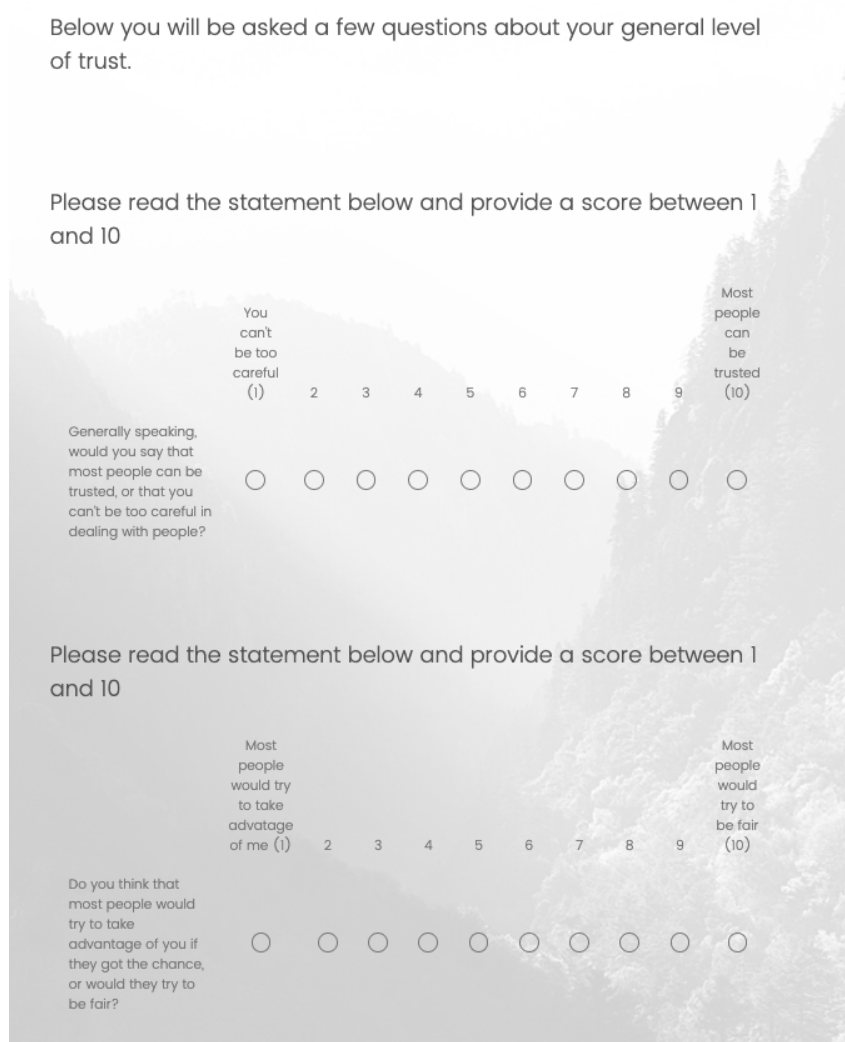
Figure A.5: The two first Social Trust Scale questions given to all participants

Please read the statement below and provide a score between 1 and 10

| | People mostly look out for themselves (1) | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | People mostly try to be helpful (10) |

Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves? ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

→

Figure A.6: The last Social Trust Scale question given to all participants

Figure A.7: The six questions that was similar for all pages with the social media news posts

(a) Article 1 with no filter

(b) Article 2 with the Nashville filter

(c) Article 3 with the Willow filter

(d) Article 4 with the Lo-Fi filter

Figure A.8: The four social media posts presented to participants who were assigned Sequence 1 - Latin square condition 1

(a) Article 1 with the Nashville filter

(b) Article 2 with the Willow filter

(c) Article 3 with the Lo-Fi filter

(d) Article 4 with no filter

Figure A.9: The four social media posts presented to participants who were assigned Sequence 2 - Latin square condition 2

(a) Article 1 with the Lo-Fi filter

(b) Article 2 with no filter

(c) Article 3 with the Nashville filter

(d) Article 4 with the Willow filter

Figure A.10: The four social media posts presented to participants who were assigned Sequence 3 - Latin square condition 3

(a) Article 1 with the Willow filter

(b) Article 2 with the Lo-Fi filter

(c) Article 3 with no filter

(d) Article 4 with the Nashville filter

Figure A.11: The four social media posts presented to participants who were assigned Sequence 4 - Latin square condition 4