Scientists in the Public Spotlight:
An Examination of Trust in Scientists on Social Media and its Repercussion

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Bianca Nowak
aus
Dattlen

1. Gutachter: Prof. Dr. Nicole Krämer
2. Gutachter: Prof. Dr. Stefan Stieglitz

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Annotation of the Contributions

Parts of this dissertation are based on previously published work, presentations at (inter)national conferences, or on manuscripts that are publicly available as preprints. The respective experimental studies presented in Chapter 4 closely follow earlier versions that are available as preprints. Minor adjustments were made for clarity and consistency, but the content remains substantially unchanged. Please refer to the following references for more information:

Theoretical Approach

Nowak, B., Meier, Y., & Krämer, N. (2025). Challenges in Defining and Measuring Trust and Distrust in Science. In A. Fage-Butler, L. Ledderer, & K. H. Nielsen (Eds.), *Science Communication and Trust* (pp. 365–384). Springer Nature Singapore. https://doi.org/10.1007/978-981-96-1289-5_18

Content Analysis

Biermann, K., **Nowak, B.,** Braun, L.-M., Taddicken, M., Krämer, N. C., & Stieglitz, S. (2024). Does Scientific Evidence Sell? Combining Manual and Automated Content Analysis to Investigate Scientists' and Laypeople's Evidence Practices on Social Media. *Science Communication*, *0*(0). https://doi.org/10.1177/10755470241249468

Experimental Study 1

Nowak, B., & Krämer, N. (2025). Dr Who? Examining the Impact of Visibility in Media, Gender, and an Academic Title on Scientists' Perceived Trustworthiness Online. Open Science Framework. https://doi.org/10.31219/osf.io/y4u7f_v1 (Preprint)

Nowak, B., & Krämer, N. C. (2023). *What makes scientists trustworthy: An analysis of epistemic trust on social media.* Paper presented at the ICA (International Communication Association) 2023 Post-Conference Epistemic Injustice and the Role of Authenticity in the Media, Toronto, Canada.

Nowak, B., & Krämer, N. C. (2022). *Dr. Who? The Effects of Familiarity, Gender, and an Academic Title on the Perception of Scientists Online.* Paper presented at the Online Conference Scientific Expertise, Communication and Trust (SECAT), Aarhus University, Denmark.

Experimental Study 2

Nowak, B., & Krämer, N. C. (2025). When The Public Disagrees. Differential Effects of Negative User Comments and Form of Evidence on Scientists' Trustworthiness. Open Science Framework. https://doi.org/10.31219/osf.io/meb36 (Preprint)

Nowak, B., & Krämer, N. C. (2024). *When The Public Disagrees. Differential Effects of Negative User Comments and Form of Evidence on Scientists' Trustworthiness.* Paper accepted for Presentation at the 53rd Congress of the German Association for Psychology (DGPs), Vienna, Austria.

Experimental Study 3

Nowak, B., & Krämer, N. C. (2025). Do You Share What You Believe? An Empirical Investigation of Recipients' Motivations and Their Reactions to Scientists' Posts on Social Media. Open Science Framework. https://doi.org/10.31219/osf.io/dh728 (Preprint)

Nowak, B., & Krämer, N. C. (2024). Stumbling over Science Communication: An Empirical Investigation of Scientists' Use of Jargon and Recipients' Motivational Goals on Social Media. Paper presented at the Human Tech Transition: Crises in Mediatized Politics, Society & Economy (ICA Regional Conference), Warsaw, Poland.

Nowak, B., & Krämer, N. C. (2023). Speaking of Science Communication: An Investigation of the Motivations Leading to Engagement with Science Information on Social Media. Paper presented at the 13th Conference Of Media Psychology Division of the German Association for Psychology (DGPs), Esch-sur-Alzette, Luxemburg.

Experimental Study 4

Nowak, B., Langener, S., & Meier, Y. (2025). Are You Sure About That? Investigating the Effects of Endorsement Cues and Source Reputation on Credibility Evaluations and Knowledge Confidence in Short-format Videos. PsyArXiv. https://doi.org/10.31234/osf.io/4k7cv_v1 (Preprint)

Abstract

Trust in science and science-based information is crucial for everyday decisions, such as environmentally conscious behaviour or the acceptance of new technologies. While social media platforms provide easy and quick access to this information and its exchange, they also present various difficulties. In social media, where the boundaries between trustworthy and dubious sources are blurred, identifying reliable sources can be challenging for users. Knowing whom to trust is particularly important regarding scientific information, which often requires specific background knowledge and experience to understand fully. This is precisely the role scientists have taken on during the COVID-19 pandemic: disseminating science-based information, which has put them in the public spotlight. Therefore, this dissertation aims to identify and understand the factors that contribute to the perceived trustworthiness of these directly communicating scientists, the credibility of their communication, and the impact on the public.

To achieve this goal, I have developed a conceptual framework to outline this process. Using this framework, I describe the process by which recipients judge whether a directly communicating scientist is trustworthy based on the cues available to them, the individual boundary conditions of this processing, and the effects of the final evaluation. In line with the theoretical distinction between trust and distrust presented in this dissertation, I conducted four experimental studies, which exhibit the following results:

In the first experimental study ($N = 306$), the influence of different cues was investigated at the sender level. Using a 2 (academic title: yes/no) × 2 (visibility: real/fictitious scientist) × 2 (gender: female/male) mixed-subjects design, the study shows that participants perceived senders with an academic title as having higher perceived expertise. However, there were no significant differences in the assessment of integrity and benevolence. Academic titles were highly influential for senders who were perceived as unfamiliar. While female scientists generally received a higher rating for expertise, this advantage decreased when an academic title was included in the user handle.

To gain further insights into the perception of scientists' trustworthiness online, the second study focuses on the effects of negative and emotionalised comments in combination with using different types of evidence by scientists at the message level. The experiment was implemented using a 2 (kind of evidence: scientific vs. anecdotal) × 3 (comments: neutral, negative-factual, negative-emotional) between-subjects design ($N = 301$). The analysis shows that using scientific evidence in negative and emotionally charged discourses can prevent the perception of scientists' trustworthiness and the credibility of their information from decreasing.

The third experimental study examines how recipients perceive scientists' communication in social media depending on various cues at the message level, as well as the traits of the recipients. It also examines how these factors are related to the willingness to interact with this content on social media (liking, sharing, commenting). Using a mixed-subject design ($N = 726$), the credibility of the posts proved to be a central factor for public

engagement. The results also indicate that motivational factors significantly influence the evaluation of posts. Different patterns emerged here, depending on the type of engagement and the recipients' preconceptions. In addition, the results emphasise the need to adapt the public communication style to the audience, as scientific jargon can increase and undermine content credibility.

The fourth empirical study ($N = 200$) focused on the interplay between contextual factors and source endorsement. It found that recipients judge the credibility of short videos presenting scientific information not based on endorsement cues (number of likes) but on the familiarity and reputation of the sources, as well as their trust in their prior knowledge. Furthermore, the results suggest that watching short videos can increase recipients' confidence in their knowledge if it is initially correct.

In light of the empirical findings, I propose practical and evidence-based recommendations for scientists and science communicators who want to engage in public discourse on social media. In short, the studies clarify that researchers should use and emphasise their epistemic authority at different levels. In addition to the practical implications, I derive theoretical implications from the results arising from the framework conditions in social media. These implications range from discussing the function of science and trust as heuristics over the influence of perceived familiarity with the source to determinants of public discourse around scientists.

Lay Summary

For many decisions, trust in science and scientific information is critical. Social media make it easy to access and share this kind of information, but they also have disadvantages. For example, it is difficult to know who to trust and who not to trust on social media. Understanding scientific information requires much knowledge and experience - that is what scientists can do. For this reason, my doctoral thesis focuses on what influences trust in scientists on social media.

To do this, I have conducted four experiments, and I have described a framework. I use this framework to understand how people judge scientists. I explain how people use the information they have to decide whether someone is trustworthy and the consequences of this decision. This is what you can learn from each experiment:

The first experiment looks at how different characteristics of scientists affect how people judge scientists. The results showed that sources with academic titles ("Prof. Dr.") were perceived as more knowledgeable. However, there were no differences in the way they viewed them as more honest or working for the greater good. Academic titles had the greatest influence when the source was unknown. Women were generally perceived as more competent, but this effect was smaller when an academic title was visible.

The second experiment focused on how negative and emotional comments affect the ratings of scientific posts. The results showed that they were rated more trustworthy when they used scientific proof rather than personal stories. Posts with scientific proof were rated more credible, especially when people read additional negative and emotional comments.

The third experiment looked at when people liked, shared, or commented on scientists' posts on social media. To do this, I looked at various features of the posts and the characteristics of the people who read them. The results showed that it is essential that people find the message credible. The factors that influence this vary a lot. For example, people find posts more credible if they match their opinions. The experiment also showed that posts must be easily understandable and credible.

The fourth experiment focused on how people judge the credibility of videos containing scientific information. The results showed that credibility depends not only on the reputation and familiarity of the source but also on the viewer's prior knowledge. Watching videos also increased viewers' confidence in their knowledge of the topic from the video.

At the end of my thesis, I give tips for scientists who want to discuss science on social media. I also explain what we can learn from the experiments to develop new research, as well as what we still need to discover. This knowledge is important to understand why you trust some people on the internet and not others.

Zusammenfassung

Das Vertrauen in Wissenschaft und wissenschaftsbasierten Informationen ist entscheidend für eine Vielzahl alltäglicher Entscheidungen, wie umweltbewusstes Verhalten oder die Akzeptanz neuer Technologien. Während digitale Medien einen einfachen und schnellen Zugang zu diesen Informationen, sowie den Austausch dieser ermöglichen, bringen sie gleichzeitig auch diverse Nachteile mit sich. Insbesondere in den sozialen Medien, wo die Grenzen zwischen vertrauenswürdigen und fragwürdigen Quellen verschwimmen, ist es nicht immer einfach, verlässliche Quellen zu identifizieren. Hier zu wissen, wem man vertrauen kann, ist besonders wichtig, wenn es um wissenschaftliche Informationen geht, da diese oft spezifisches Hintergrundwissen und Erfahrung zur Aufarbeitung erfordern. Genau diese Rolle haben Wissenschaftler:innen während der COVID-19-Pandemie übernommen und sind dadurch in sozialen Medien ins Rampenlicht der Öffentlichkeit gerückt. Ziel dieser Dissertation ist es daher, die Faktoren zu identifizieren und zu verstehen, die zur wahrgenommenen Vertrauenswürdigkeit dieser direkt kommunizierenden Wissenschaftler, zur Glaubwürdigkeit ihrer Kommunikation und zur Wirkung auf die Öffentlichkeit beitragen.

Um diesem Ziel nachzugehen, habe ich ein konzeptionelles Framework für vier experimentelle Studien entwickelt. Innerhalb dieses Frameworks beschreibe ich den Prozess, durch den die Rezipierenden beurteilen, ob ein:e direkt kommunizierende:r Wissenschaftler:in basierend auf den ihnen zur Verfügung stehenden Cues, sowie den individuellen Randbedingungen dieser Verarbeitung, vertrauenswürdig ist. Zudem beschreibe ich die Auswirkungen dieser finalen Evaluation. In Übereinstimmung mit der vorgestellten theoretischen Unterscheidung zwischen Vertrauen und Misstrauen zeigen die vier Studien folgende Einzelergebnisse:

Die erste experimentelle Studie (N = 306) untersucht den Einfluss verschiedener Merkmale auf Ebene der Sender:innen. Mit einem 2 (akademischer Titel: ja/nein) × 2 (Bekanntheit: realer/fiktiver Wissenschaftler:in) × 2 (Geschlecht: weiblich/männlich) Mixed-Subjects-Design zeigt sie, dass Teilnehmer:innen Informationsquellen mit akademischem Titel als kompetenter wahrnahmen. Es zeigten sich jedoch keine signifikanten Unterschiede in der Einschätzung von Integrität und Wohlwollen. Der Einfluss akademischer Titel war besonders bei als unbekannt empfundenen Sender:innen stark. Während Frauen in der Regel eine höhere Bewertung für Fachwissen erhielten, verringerte sich dieser Vorsprung, wenn ein akademischer Titel im User-Handle enthalten war.

Um weitere Erkenntnisse über die Wahrnehmung der Vertrauenswürdigkeit von Wissenschaftler:innen, sowie der Glaubwürdigkeit ihrer Nachrichten, zu gewinnen, konzentriert sich die zweite Studie auf die Auswirkungen negativer und emotionalisierter Kommentare in Kombination mit der Verwendung von unterschiedlichen Evidenzarten durch Wissenschaftler:innen. Das Experiment wurde in einem 2 (Art der Evidenz: wissenschaftlich vs. anekdotisch) x 3 (Kommentare: neutral, negativ-faktisch, negativ-emotional) Between-Subjects-Design (N = 301) umgesetzt. Die Analyse zeigt, dass die

Verwendung wissenschaftlicher Evidenz in negativen und emotional aufgeladenen Diskursen verhindern kann, dass die Wahrnehmung der Vertrauenswürdigkeit der Wissenschaftler:innen und der Glaubwürdigkeit ihrer Informationen sinkt.

Die dritte experimentelle Studie untersucht, wie Rezipient:innen die Kommunikation von Wissenschaftler:innen in sozialen Medien in Abhängigkeit von verschiedenen Merkmale auf Nachrichtenebenen sowie diversen Eigenschaften der Rezipierenden selbst wahrnehmen. Zudem untersucht sie, wie diese Faktoren mit der Bereitschaft zusammenhängen, mit diesen Inhalten in den sozialen Medien zu interagieren (liken, teilen, kommentieren). Unter Verwendung eines Mixed-Subject-Designs ($N = 726$) erwies sich die Glaubwürdigkeit der Beiträge als zentraler Faktor für das öffentliche Engagement. Die Ergebnisse deuten außerdem darauf hin, dass motivationale Faktoren die Bewertung von Beiträgen signifikant beeinflussen. Hierbei zeichneten sich unterschiedliche Muster in Abhängigkeit der Art des Engagements und der Voreinstellungen der Rezipierenden ab. Darüber hinaus unterstreichen die Ergebnisse die Notwendigkeit, den Stil der öffentlichen Kommunikation an die Zielgruppe anzupassen, da wissenschaftlicher Fachjargon die Glaubwürdigkeit von Inhalten erhöhen, aber auch untergraben kann.

Die vierte empirische Studie ($N = 200$) befasst sich mit dem Zusammenspiel von Kontextfaktoren und Eingeschalten der Quellen. Sie ergab, dass die Rezipient:innen die Glaubwürdigkeit von Kurzvideos, die wissenschaftliche Informationen präsentieren, nicht auf der Grundlage von Endorsement-Cues (Anzahl von Likes), sondern anhand der Vertrautheit und Reputation der Quellen, sowie ihres Vertrauens in ihr eigenes Vorwissen beurteilen. Darüber hinaus deuten die Ergebnisse darauf hin, dass das Betrachten von Kurzvideos das Vertrauen der Rezipierenden in ihr Wissen stärken kann, wenn dieses ursprünglich korrekt war.

In Anbetracht der empirischen Ergebnisse schlage ich praktische und evidenzbasierte Empfehlungen für Wissenschaftler:innen und Wissenschaftskommunikator:innen vor, die sich am öffentlichen Diskurs in den sozialen Medien beteiligen wollen. Kurz gesagt, die Studien machen deutlich, dass Forscher:innen ihre epistemische Autorität auf verschiedenen Ebenen nutzen und betonen sollten. Zusätzlich zu den praktischen Implikationen leite ich aus den Ergebnissen zudem theoretische Implikationen ab, die sich aus den besonderen Rahmenbedingungen in den sozialen Medien ergeben. Diese reichen von der Erörterung der Funktion von Wissenschaft und Vertrauen als Heuristiken über den Einfluss der wahrgenommenen Vertrautheit mit der Quelle bis hin zu Determinanten des öffentlichen Diskurses um Wissenschaftler:innen.

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Einfache Zusammenfassung

Das Vertrauen in die Wissenschaft und in wissenschaftliche Informationen ist wichtig für viele Entscheidungen. Soziale Medien erleichtern den Zugang zu diesen Informationen. Soziale Medien machen es einfach, diese auszutauschen, aber sie haben auch Nachteile. Zum Beispiel ist es schwer zu erkennen, wem man in sozialen Medien vertrauen kann und wem man besser nicht vertrauen sollte. Wissenschaftliche Informationen richtig zu verstehen, braucht nämlich viel Wissen und Erfahrung. Das haben Wissenschaftlerinnen und Wissenschaftler. Deswegen schaue ich mir in meiner Doktorarbeit an, was das Vertrauen in Wissenschaftlerinnen und Wissenschaftler in sozialen Medien beeinflusst.

Aus diesem Grund habe ich einen Rahmen für vier Experimente beschrieben. Damit erkläre ich, wie Menschen Wissenschaftlerinnen und Wissenschaftler beurteilen. Ich erkläre, wie Menschen mit Informationen, die sie haben, entscheiden, ob jemand vertrauenswürdig ist, und welche Auswirkungen diese Entscheidung hat. Aus den einzelnen Experimenten kann man das hier lernen:

In dem ersten Experiment geht es darum, wie sich verschiedene Eigenschaften der Personen darauf auswirken, wie Menschen Wissenschaftlerinnen und Wissenschaftler bewerten. Die Ergebnisse haben gezeigt, dass Quellen mit akademischen Titeln als fachkundiger wahrgenommen wurden, aber es gab keine Unterschiede in der Bewertung von Integrität oder Wohlwollen. Akademische Titel hatten den größten Einfluss, wenn die Quelle nicht bekannt war. Frauen wurden generell als kompetenter wahrgenommen, aber dieser Effekt wurde kleiner, wenn ein akademischer Titel zu sehen war.

Im zweiten Experiment ging es darum, wie negative und emotionale Kommentare sich auf die Bewertung von Posts, die Wissenschaftlerinnen und Wissenschaftlern geschrieben haben, auswirken. Die Ergebnisse haben gezeigt, dass sie vertrauenswürdiger bewertet wurden, wenn sie wissenschaftliche Beweise verwendet haben, anstatt von persönlichen Geschichten. Besonders, wenn Personen zusätzlich negative und emotionale Kommentare gelesen haben, wurden Nachrichten mit wissenschaftlichen Beweisen glaubwürdiger bewertet.

Im dritten Experiment habe ich untersucht, wann Personen die Beiträge von Wissenschaftlerinnen und Wissenschaftlern in sozialen Medien linken, teilen oder kommentieren. Dafür habe ich mir verschiedene Eigenschaften der Beiträge und Eigenschaften der Personen, die diese lesen, angeschaut. Die Ergebnisse haben gezeigt, dass es besonders wichtig ist, dass die Personen die Nachricht glaubwürdig finden. Wovon das abhängt, ist sehr unterschiedlich. Zum Beispiel finden Personen Beiträge glaubwürdiger, wenn sie zu ihrer eigenen Meinung passen. Außerdem hat das Experiment gezeigt, dass die Beiträge verständlich sein müssen, damit sie glaubwürdig wirken.

Im vierten Experiment ging es darum, wie Personen die Glaubwürdigkeit von Videos mit wissenschaftlichen Informationen beurteilen. Die Ergebnisse haben gezeigt, dass die Glaubwürdigkeit auf den Ruf und die Bekanntheit der Quelle, aber auch von dem

Vorwissen der Personen anhängt. Das Anschauen von Videos erhöhte auch das Vertrauen der Zuschauerinnen und Zuschauer in ihr Wissen zu dem Thema aus dem Video.

Am Ende meiner Doktorarbeit gebe ich Tipps für Wissenschaftlerinnen und Wissenschaftler, die in den sozialen Medien über Wissenschaft sprechen möchten. Ich erkläre auch, was wir aus den Experimenten für die Entwicklung neuer Forschung lernen können, aber auch, was man noch herausfinden muss. Das ist wichtig, um zu verstehen, wieso man manchen Leuten im Internet vertraut und anderen nicht.

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Chapter 1. Introduction: Scientists in the Public Spotlight

Getting vaccinated against diseases to protect both oneself and others, avoiding single-use plastic when making purchasing decisions to protect the environment, accepting new technology that can make life easier and at the same time drive society forward - these and a myriad of other decisions can be traced back to a common cause: Trust in science. Specifically, the COVID-19 pandemic demonstrated the importance of placing trust in science as it was directly linked to adherence to protective measures (Dohle et al., 2020). The importance of trust was particularly evident at the beginning of the pandemic when validated scientific information about the virus was still scarce. However, the public's need for information and guidance was immense. Unlike previous pandemics, such as the Spanish flu, the public had the opportunity to search for them directly on social media and took it. This circumstance created a scenario that had never been seen before on this scale: scientists from various academic disciplines stepped into the spotlight by directly addressing the public via social media. It is precisely this novel situation that motivates this work, as it raises the question of what constitutes the perceived trustworthiness of scientists who directly address the public via social media and what effects this direct contact has on recipients. Put simply, why do we trust people who talk about science online?

To investigate these questions, I will draw upon four experimental studies which are embedded into a conceptual framework concerning the recipients' evaluative process of a scientist's communication on social media. I will also present a theoretical perspective on the distinction between trust and distrust underpinning the experimental studies. In addition, a content analysis of the communication employed by highly visible scientists during the COVID-19 pandemic will be presented. Thus, to properly contextualise this work and its findings, it is essential to reconsider the circumstances surrounding the onset of the COVID-19 pandemic:

First and foremost, scientists became key figures in the public discourse, with laypersons, politicians, and the media looking for guidance from them (Broer, 2020; Safford et al., 2021). In the German media, several scientists were particularly visible during the pandemic, appearing on talk shows, podcasts, and news reports. Some scientists were chosen and consulted as experts by the media (Leidecker-Sandmann et al., 2022), whereas others communicated directly with the public using social media. Some employed both avenues of communication and researched a celebrity-like status (see Joubert et al., 2023; Szczuka et al., 2024). Specifically, given the growing presence of scientists who directly address their audience on social media, the question arises of how they are perceived depending on the relatively limited information available to recipients when they encounter scientists in their feeds. Even if incidental, these encounters can still influence a recipient's and subsequent reactions (e.g., Schäfer, 2023). It is necessary to understand the processes by which recipients determine which sources they trust, given that assessing the perceived trustworthiness of sources requires considering crucial background information that is not always directly available on social media platforms.

Understanding what makes scientists trustworthy sources of information on social media is crucial for several reasons. For instance, it can help to prepare scientists to understand how they can maximise their impact when disseminating information (e.g., Gisler et al., 2017) or making scientific methods and standards more transparent for the public to potentially increase trust in it (Reif & Guenther, 2021; Schäfer, 2016). Moreover, since public trust in science is bound to multiple forms of science (from scientific organisations to media displays), having scientists directly communicate with the public may increase trust in and positive attitudes towards science (e.g., Huber et al., 2019; Mihelj et al., 2022). To this end, establishing high trust in scientists and their findings may also help to improve the support of science-based political measures (e.g., Dohle et al., 2020; Plohl & Musil, 2021), especially since scientists appear to be more trustworthy than politicians or religious leaders (e.g., Hendriks et al., 2023; Hoogeveen et al., 2022; König & Breves, 2021). With scientists positioning themselves as a trustworthy source, they can also provide a reliable alternative to misinformation, just as health organisations can (e.g., Vraga & Bode, 2017). In this vein, directly communicating with scientists can facilitate the public's direct access to first-hand scientific information and, thus, provide them with a foundation for making informed decisions, as mentioned beforehand (Bromme, 2020; Intemann, 2023). To achieve these objectives, it is essential to understand the conditions under which social media users will place trust in a scientist – or, in other words, attribute high levels of trustworthiness. Bearing the potential of future pandemics and other possible crises in mind, along with the rise of anti-intellectualism associated with rejecting scientific consensus (Merkley, 2020) and the decline in public trust in science following the COVID-19 pandemic (Blümel & DZHW, 2024; WiD, 2023), it is crucial to comprehend how scientists, or other science communicators, establish and maintain trustworthiness. Therefore, scientists who communicate publicly on social media need to know how to address (different) audiences, which is particularly important if they face criticism or even hostility online (Nölleke et al., 2023; Royan et al., 2023).

Given the state of science communication in the media, dominated by (science) journalists or other intermediaries, the investigation of direct communication by scientists on social media represents a relatively underexplored area of research. While previous research has elucidated the means of highlighting the necessity and role of trust in science in general (e.g., Baram-Tsabari & Schejter, 2019), scientists' motives and aims to communicate (e.g., Besley et al., 2018; Dudo & Besley, 2016; Entradas et al., 2019), developing measures concerning trust in science and scientists (e.g., Hendriks et al., 2015; McCright et al., 2013), and the potential benefit as well as challenges of social media for science communication in general (e.g., Nisbet & Scheufele, 2009; Weingart & Guenther, 2016), there remains a dearth of investigation into the linkage of those concepts and the cognitive mechanisms and boundary conditions through which the perceived trustworthiness of scientist is established.

Here, the research demonstrating that scientists are perceived as trustworthy sources of information must be acknowledged. However, the factors contributing to this trustworthiness have not been as comprehensively researched in the field as expected. Given that science communicators and scientists can bypass traditional (journalistic) gatekeepers and media outlets to address the public via social media (see Dudo, 2015), the characteristics and cues they can (and cannot) control are of particular importance. This lens must be used to examine cues unique to scientists and their communication, such as scientific evidence or jargon, compared to those that are not, such as gender or public reaction. Filling those research gaps is of utmost importance given that a large body of research relating to the trustworthiness of scientists and the perceived credibility of information mainly focuses on journalistic sources (e.g., Lee & Jang, 2010; Nadarevic et al., 2020; Winter et al., 2015), who, like laypeople, do not conduct research first-hand. Further, said research mainly concentrated on news websites or traditional blogs (e.g., Knobloch-Westerwick et al., 2015; Winter & Krämer, 2016), which are being used less and replaced by social media platforms for obtaining information – specifically among younger generations (Newman et al., 2023; WiD, 2024).

Moreover, this results in further shortcomings of previous research into trustworthiness and credibility; it is based on selective exposure patterns in which news and information are selected directly and actively to avoid cognitive dissonance (e.g., Metzger et al., 2020). However, unlike forums, blog entries, or traditional news websites, social media provide an environment where users can do both: actively search for information and passively encounter various content, often without conscious selection (e.g., Schäfer, 2023; Weeks et al., 2017). Thus, it is essential to consider this new context of direct and diverse communication on social media platforms when examining how recipients encounter and potentially evaluate an online information source, such as a scientist. Popular social media platforms like Twitter/X differ from blogs in terms of their features and intended use. While science blogs can provide potentially unrestricted information and context, social media platforms are primarily limited regarding characters because they are designed to share short messages (Smith, 2015). However, they also offer unique contextual cues reflecting community-based responses (see Lee et al., 2022; Metzger & Flanagin, 2015; Wang et al., 2023).

However, to my knowledge, no empirically supported model focuses explicitly on trust perceptions of (science) communicators. This could assist recipients' evaluative processes when they encounter scientists on social media. Many influential models from related fields, which serve as the foundation for prior research and can help explain how and why scientists become trustworthy, often primarily focus on the perception of a message. In these instances, these models neglect the information sources or concern websites instead of actual persons, making it difficult to draw any systematic inferences regarding the communicators. Again, specifically with the ongoing growth of social media usage, this circumstance leaves a gap concerning a unifying theoretical perspective on digital

communication. For instance, the MAIN model provides a valid frame to scrutinise the heuristics used to evaluate web information's credibility and merely acknowledges the sources' role (Sundar, 2008; Sundar et al., 2019). Similarly, Metzger and Flanagin (2015) focus preliminarily on online information credibility assessment based on the message and website specifics, such as usability aspects, while framing the information source as subordinate to the message. Nevertheless, it does not explain how said source becomes trustworthy and further lacks integration of dominant influences that impact an individual's information processing, such as attitudes. Other influential models, such as the prominence-interpretation theory (Fogg, 2003), also primarily focus on message assessment rather than examining the source, particularly a person, such as a scientist, as the source. While its simple structure makes it quite universal in terms of its applications, it fails to provide an unambiguous distinction of how to classify further concepts.

A comparable pattern can be observed concerning well-known persuasion models and theories, which emphasise the message's effects (see heuristic-systematic-model: e.g., Chaiken et al., 1989; elaboration likelihood model: Petty & Cacioppo, 1986). While these models undoubtedly provide a systematic account of how people arrive at judgments, the message remains a central consideration. Consequently, these models consider the source of information as an element of message credibility (e.g., Chaiken et al., 1989; Hovland & Weiss, 1951) and, thus, miss out on providing a comprehensive understanding of how recipients establish and recognise a sender's trustworthiness. The source of information is still part of the message evaluation process, and so are its repercussions. Moreover, they were developed when the inevitability of social media in everyday life was not yet given.

Consequently, they inherently lack the perspective on contextual factors that can significantly influence content evaluation but are ubiquitous in social media settings. While they still provide a high value in assessing message credibility and guiding research, I argue that these models often overlook the intricate factors contributing to the sender's perception and take the sender as an additive variable for message effects rather than an individual entity. However, understanding whose information can be perceived as credible is of utmost importance, considering the chances of how information is being consumed. Information sovereignty no longer rests with reputable and reliable media outlets. Instead, in recent years, it has increasingly been fought out on social media.

Moreover, overarching frameworks connecting the psychological mechanisms that could explain the emergence of trustworthiness and further connect to its outcomes are scarce and rarely grounded in empirical evidence. For instance, the highly influential integrative model of organisational trust (IMOT) (Mayer et al., 1995) – just like other derived models (e.g., Cho et al., 2015) – explains the contextualisation and application of trust within a specific situation. However, it fails to explain the psychological mechanisms associated with the trust assessment itself. To address these gaps in the literature and provide evidence-based recommendations for science communicators, which are surprisingly scarce, this work will address three overarching questions:

1. How is the impression of trustworthy scientists formed based on the specific cues available to recipients on social media platforms?
2. What boundary conditions apply to evaluating senders (scientists) on social media?
3. What influence does direct contact with scientists on social media have on the recipients?

As this dissertation aims to identify and investigate the cues and factors that contribute to the perceived trustworthiness of scientists on social media, the effects of their messages, and the effects on individual social media users, I will first outline the relations between those concepts in Chapter 2. In detail, I will outline and define the relevant key concepts of this dissertation. Based on these considerations, I will present a conceptual framework to classify and understand how the trustworthiness of scientists is perceived when scientists communicate directly with the public to answer the questions raised above in Chapter 3. In Chapter 4, I will present four experimental studies addressing the above questions and contextualise them within the proposed conceptual framework. Lastly, I will discuss the results of the experimental studies, derive theoretical along practical implications, and address the overarching limitations in Chapter 5.

Chapter 2. Trust in Science and the Trustworthiness of Scientists

Scientific information and its understanding are crucial for everyday individual and social decisions (e.g., Baram-Tsabari & Schejter, 2019). Specifically, on social media platforms, recipients of scientific information are constantly faced with the challenge of distinguishing between false and reliable content. Those with no background in the respective field are confronted with a significant degree of uncertainty due to the inherent complexity of scientific knowledge, which they are often unable to validate independently. This circumstance causes laypersons to rely on trust (Baram-Tsabari & Schejter, 2019; Bromme & Gierth, 2021). Given that a solid understanding of scientific knowledge and trust in science are essential for navigating everyday challenges and making decisions, ensuring and promoting trust in science is paramount. Again, accurate information is relevant, especially in times of crisis, such as a pandemic. Hence, understanding these matters is essential to making health-related decisions, such as staying in quarantine (Webster et al., 2020).

To answer the question of what constitutes the perceived trustworthiness of scientists who directly address the public on social media, it is mandatory to define trust and trustworthiness. However, several contradicting definitions and meanings of those concepts exist based on the language used and the discipline they are viewed (McKnight & Chervany, 2000). Without a clear understanding of trust and trustworthiness, just like what they are not, it is nearly impossible to scrutinise them appropriately. Therefore, I will first elaborate on my understanding of trust to provide a common ground and outline for this dissertation.

2.1 Trust, Distrust, and the Trustworthiness of Scientists

In this section, I will explain what trust, specifically trust in science, is and is not. For this purpose, I outline the difficulties associated with defining and measuring trust and distrust in the context of science (parts of this argumentation have already been accepted; see Nowak et al., 2025). While trust (in science) is a well-researched and defined construct, distrust (in science) has not received the same amount of scholarly attention. Although it is often commented on in the literature, it is nevertheless seldom assessed (Reif & Guenther, 2022). Most importantly, if distrust is assessed, it is often defined as the opposite of trust. However, this seemingly straightforward solution can become problematic if not adequately defined and distinguished from trust. This lack of a clear definition can lead to difficulties in accurately gauging trust and distrust, which may ultimately impede or even reverse the advancement of theoretical conclusions. As we outlined (see Nowak et al., 2025), the description and measurement of trust and distrust often exhibit inconsistencies in the relationship between these two constructs. At times, the two concepts are viewed as two aspects of a single concept, while at other times, they are regarded as two distinct constructs. Furthermore, "trust" and "distrust" are frequently not explicitly specified. For instance, when both concepts are understood as two aspects of a single construct, it is unclear what "lack of trust" or "absence of trust" means.

Hence, the following section addresses trust and distrust in science from a theoretical viewpoint. Building on the theoretical outlines made by my colleagues and me (see Nowak et al., 2025), I will introduce definitions of trust and distrust, outline two perspectives on their relationship, and, specifically, the understanding of both for this dissertation. This understanding is mandatory to avoid any potential pitfalls in conceptualising and later measuring the trust and trustworthiness of scientists, respectively.

2.1.1 Trust in Science

To define trust, I refer to the formal description by Bhattacharya et al. (1998), which reads as follows: "Trust is an expectancy of positive (or nonnegative) outcomes that one can receive based on the expected action of another party in an interaction characterised by uncertainty." (Bhattacharya et al., 1998, p. 462). Thus, trust involves an, at least momentary, relationship between a trustor (performing trust) and a trustee (receiving trust). Here, the trustor is, at least to a certain degree, vulnerable due to a lack of knowledge about the trustee's future actions (Mayer et al., 1995). Depending on the expectations set towards a trustee, the trustor will either experience trust (positive expectation) or distrust (negative expectation). Hence, trust can be defined as a positive expectation that implies accepting uncertainty and vulnerability (McAllister, 1995). These expectations are determined by situational inputs and re-evaluated depending on the situation (Dietz, 2011; Six & Latusek, 2023). Later in this work, I will discuss further challenges from this universal definition (see section 2.1.3).

It is necessary to scrutinise the uncertainty to apply this definition of trust to trust in science. Within the realm of trust in science, uncertainties are mostly linked to the knowledge surrounding science, which can range from understanding basic principles to new research advances. Whether or not the information is integrated into one's knowledge and sequential decisions is based on accepting this uncertainty and taking the risk of being vulnerable to accepting false information. This kind of trust in (others') knowledge is called epistemic trust (Wilholt, 2013). Due to the complexity of science, there is no other alternative to epistemic trust and being vulnerable to false information (Origgi, 2012). This circumstance creates an imbalance between those who know about a specific issue (i.e., scientists) and those who do not (i.e., laypersons; O'Doherty, 2022; Schäfer, 2016). Without sufficient prior knowledge and first-hand experience, one is nearly unable to justify the correctness of a scientific claim and needs to rely on the pre-evaluation of those who can do so (Bromme, 2022). This imbalance of knowledge is why epistemic trust is crucial in these situations.

Since trust, as defined above, reflects positive expectations, the question arises as to how positive expectations come about. I argue that trust can relate to various aspects depending on one's impression and understanding of science, since it is a multidimensional construct. Reif and Guenther (2021) describe the multidimensionality of trust by splitting up the level at which the public can have positive or negative expectations towards science as a system (macro-level), science as an organisation (meso-level), and science on an individual dimension, i.e., scientists (micro-level). Further, they argue that direct contact, socially mediated contact, or contact via the media shapes the respective assessments of trust and distrust in science. Here, each level of trust (i.e., the object one refers to) has multiple dimensions that relate to specific properties (Reif & Guenther, 2021) or, in other words, factors determining trustworthiness. Each encounter with a scientist should influence recipients' general expectations of science, and both positive and negative expectations determine one's level of trust in science. In conclusion, trust in scientists becomes trust in science.

Other than trust, the concept of distrust has received less scholarly (Reif & Guenther, 2021). However, understanding the relationship between trust in science, distrust in science, and scientists is crucial, especially in light of the rise in anti-science tendencies and distrust in science, which is linked to the rejection of scientific consensus (Lewandowsky & Oberauer, 2016; Merkley, 2020). As the work aims to understand what the perceived trustworthiness of scientists constitutes, it is mandatory to understand what trust is and is not precisely. Only with this understanding is it possible to appropriately measure and assess the trustworthiness of scientists who directly address the public online. Consequently, it allows the integration of theoretical and practical implications into existing research transparently and coherently. Thus, I outline a distinction between trust and distrust in science in the following section to provide a clear context for this dissertation's topic and outline the scope of this work.

2.1.2 Distrust in Science

As mentioned above, I will outline trust's theoretical underpinnings in differentiating distrust. In particular, I will present different approaches outlined by my colleagues and me (Nowak et al., 2025). Other than trust (see section 2.1.1), distrust can be understood as having negative expectations about another party's behaviour (Bhattacharya et al., 1998; Lewicki et al., 1998). It represents an alternative route to trust, where uncertainty is mitigated (see Luhmann, 2018) by deliberately avoiding vulnerability to another party's actions. For trust and distrust, the choice to expose oneself to risk depends on specific contextual factors, guiding individuals to establish varying degrees of trust or distrust. These perceptions evolve over time, creating a cycle in which the other party's actions reinforce or alter the trustor's views of the trustee (Dietz, 2011; Six & Latusek, 2023).

Concerning science, laypersons may feel great uncertainty when presented with scientific data or information. As a result, they can become vulnerable to believing false information because they lack the means to verify it. Hence, laypersons risk accepting information that might be incorrect or incomplete and taking actions that may be useless or even harmful (e.g., refusing a medical treatment based on flawed beliefs or drinking bleach to prevent a COVID-19 infection). Given the complexity and breadth of science and its many fields, individuals cannot rely solely on their experience or knowledge to assess the truthfulness of information. This uncertainty brings about vulnerability and risk, contributing to the previously mentioned asymmetry in the relationship between scientists and laypeople (see O'Doherty, 2022; Schäfer, 2016). Since laypersons potentially have limited capacities to control the process of knowledge generation or fully comprehend scientific knowledge, they must depend on experts (Bromme & Gierth, 2021), which means trusting experts by placing trust in those experts and accepting this dependency (Schäfer, 2016). However, deciding to trust experts still depends on their expectations towards science.

2.1.3 Two Perspectives on Trust and Distrust

To clarify how trust and distrust in science (can) be seen concerning each other, I will now outline two perspectives on their relationship. Over three decades of trust research, different perspectives emerged describing the relationship between trust and distrust. Since then, the discussion on their relationship has been ongoing, with more and more research stating that trust and distrust are two different constructs (e.g., Lewicki et al., 1998; Sitkin & Roth, 1993). Nevertheless, some scholars argue that an entire lack of trust equals distrust, which appears to be a rather traditional view (e.g., Schoorman et al., 2007). For instance, Schoorman and colleagues (2007) state that since trust and distrust are frequently described as opposites (for an overview, see McKnight & Chervany, 2001), there is no added value in treating them as distinct variables. However, this perspective harbours problematic aspects, which I will address in the next section. Further, I will compare the two perspectives on

trust and distrust in science and, subsequently, present the perspective I choose for this work.

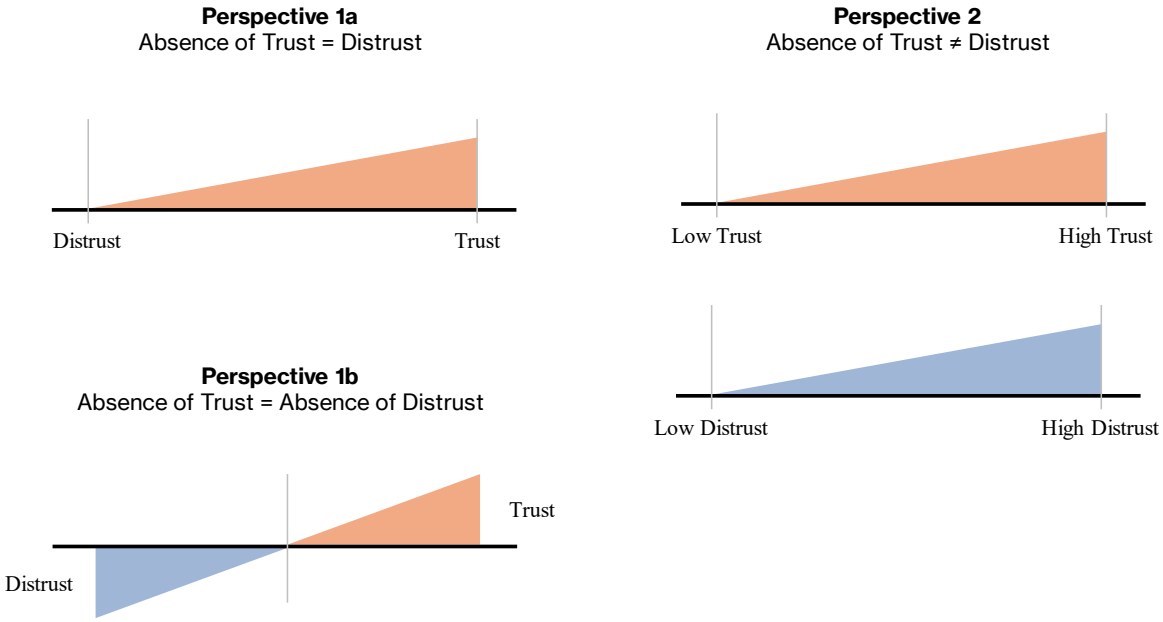
2.1.3.1 Perspective 1: Trust and Distrust as Two Sides of the Same Construct

In the traditional view, distrust is defined as "the lack or absence of trust" (The Merriam-Webster online dictionary; see visualisation in Figure 1, Perspective 1a). However, I argue that this perspective is deficient in describing distrust. The rationale behind this insufficiency is that viewing distrust as the mere absence of trust refuses the functions and purpose of distrust. The most prominent and vital function is reducing uncertainty and, thus, potentially decreasing vulnerability towards the trustee (Luhmann, 2018; Six & Latusek, 2023). Based on the earlier presented definitions, the absence of trust would be equivalent to the absence of positive expectations. However, distrust is dominantly described as negative (non-positive) expectations (Bhattacharya et al., 1998; Lewicki et al., 1998). Therefore, seeing distrust as a lack of trust leads to a conceptual inconsistency since not having positive expectations is not identical to having negative expectations. In consequence, distrust must exceed the simple absence of trust.

The continuation of this idea (Figure 1, Perspective 1b) slightly changes the traditional perspective further and can resolve the outlined issue: While remaining on a continuum, trust and distrust may occupy opposing ends, representing positive and negative

Figure 1

Two Perspectives on Trust and Distrust in Science



Note. The figure is adapted from Nowak et al. (2025)

values and expectations, respectively (see McKnight & Chervany, 2001). In this perspective, distrust retains functions such as mitigating uncertainty (Luhmann, 2017) or acting as self-protection against perceived risks, as one does not accept vulnerability towards another party (e.g., Six & Latusek, 2023). Consequently, describing distrust as the mere absence of trust overlooks its complexity, as it disregards the active functions of distrust (Six & Latusek, 2023).

Schoorman et al. (2007) argue that trust is specific to a particular domain, allowing for a more nuanced view of trust's complexity. This specification and concentration respond to critiques considering trust and distrust as separate entities (e.g. Lewicki et al., 1998). When the situation and object of trust are specified, trust and distrust can no longer coexist (McKnight & Chervany, 2001). When trust and distrust refer to the same attribute of a party, they are unlikely to coexist. Therefore, they must share a continuum due to their functional equivalence (Luhmann, 2018) (Figure 1, Perspective 1b). For example, if an individual trusts scientist X's expertise, they cannot simultaneously distrust them. However, the person might distrust scientist X's benevolence (see Hendriks et al., 2016). This means that trust and distrust at the same referential level are mutually exclusive and can only coexist if they do not refer to the same objective or expectation. Thus, distrust toward scientist X can only emerge if there is a shift in perspective or objective of (dis)trust. The conceptual division arises from the assumption that trust and distrust coexist but becomes redundant when considering different dimensions of trust, such as expertise, benevolence, integrity, or even transparency (Hendriks et al., 2016; Reif & Guenther, 2021).

Drawing on interviews and card-sorting data, Saunders and colleagues (2014) investigated the relationship between trust and distrust in a corporate setting. In particular, they scrutinised Lewicki et al.'s (1998) distinction of high/low trust and distrust, which posits the parallel existence of trust and distrust as distinct constructs. Based on their findings, they introduced the two intermediate categorisations: weak trust and distrust between the extreme poles of high and low expressions of trust and distrust. Except for the combination of high trust and high distrust, they discovered corresponding evidence supporting the other combinations. In one instance, weak trust and weak distrust coexisted, which supports Schoorman et al.'s (2007) argument that trust and distrust can relate to the same entity but in different contexts or domains, respectively. However, when trust and distrust are applied to the same entity, and no distinction within the (positive or negative) expectations of a trustor is made, Lewicki et al.'s (1998) perspective of trust and distrust as distinct constructs is supported (Saunders et al., 2014, Perspective 2).

2.1.3.2 Perspective 2: Trust and Distrust as Different Constructs

In contrast to the first perspective, other scholars suggest that trust and distrust are not two ends of the same spectrum but two different variables (e.g., McKnight & Chervany, 2001; Lewicki et al., 1998; Luhmann, 2017; Sitkin & Roth, 1993; Van De Walle & Six, 2014; Figure 1, Perspective 2). This consideration is based on the following assumptions: Both trust and distrust are described as strategies to reduce uncertainty and increase

certainty, respectively. While trust is linked to positive states such as hope and confidence, distrust is associated with negative states like cynicism or fear (McKnight & Chervany, 2001; Lewicki et al., 1998; Luhmann, 2017). Hence, they are associated with distinct emotions, thoughts, or actions (Lewicki et al., 1998; Saunders et al., 2014). Furthermore, low trust does not necessarily imply active distrust; it may simply reflect uncertainty about another's intentions (Van De Walle & Six, 2014). In parallel, high trust or distrust involves active expectations with lower uncertainty about the other party's actions.

It can also be assumed that trust and distrust can coexist, especially in situations of ambivalence in which one has positive and negative expectations regarding different aspects of the other's behaviour (Lewicki et al., 1998). Nevertheless, a study by Saunders and colleagues (2014) indicates that while low levels of trust and distrust can coexist, simultaneous high trust and distrust are unlikely. This notion supports the idea that trust and distrust are separate but mutually exclusive variables with distinct causes and outcomes. Consequently, it is reasonable to posit that trust and distrust can also be understood as existing on separate continua (see Figure 1, Perspective 2). Separating the continuum of trust and distrust makes it easier to think of them as two distinct - albeit mutually exclusive - variables associated with distinct causes and outcomes.

2.1.3.3 Necessities Arising from the Differentiation between Trust and Distrust

The question of how to define trust and distrust in science is complex but essential for understanding the public's perception of science and, thus, scientists. As we established (see Nowak et al., 2025), it is mandatory to consider the challenges of choosing an appropriate measurement for researching trust and science – just like it is for measuring trustworthiness. Therefore, I will continue to outline the challenges and recommendations that my colleagues and I proposed.

The first challenge of measuring trust and distrust in science (communication) is the lack of consistent definitions or a complete failure to define the constructs (Fage-Butler et al., 2022). Measurements of trust and distrust in science can vary significantly across studies, often failing to address specific research questions adequately. In this vein, Reif and Guenther (2021) note that researchers often attempt to assess either trust or distrust but measure the opposite variable, ultimately making it difficult to conclude whether they are distinct or the same variable. Furthermore, studies often blend measures of trust in scientists working for universities and those working for the industry (e.g., Anderson et al., 2012; Ho et al., 2010), potentially obscuring differences in perceptions. However, when measuring distrust and trust in science, the context must be evaluated to choose the appropriate measurement approach. Therefore, the specific construct that is used for the theoretical arguments should be measured (e.g., when the theoretical argument involves trust in science, trust and not distrust in science should be measured).

Even if trust and distrust are seen as separate constructs, they are unlikely to coexist at high levels in the same domain (see Saunders et al., 2014). Furthermore, the reasonable assessment of trust and distrust strongly depends on the circumstances and how fine-grained

the investigated matter is considered (Schoorman et al., 2007). In this light, superficial assessments can mask discrepancies in trust and distrust across different dimensions, which leads to conceptual and, thus, measurement problems. For example, someone may expect that science benefits society in general (i.e., high trust in the benefits of science). Nonetheless, they may also believe that scientific methods can be inaccurate (i.e., high distrust in scientific methods). When asked about their trust and distrust in science, they may indicate both. Therefore, it can be inferred that trust and distrust are not interchangeable variables. This notion aligns with research that indicates that unidimensional scales often oversimplify these constructs (Besley et al., 2021; Reif & Guenther, 2021). Thus, my colleagues and I emphasise that defining and measuring trust and distrust in science is mandatory using more detailed dimensions, depending on the specific question.

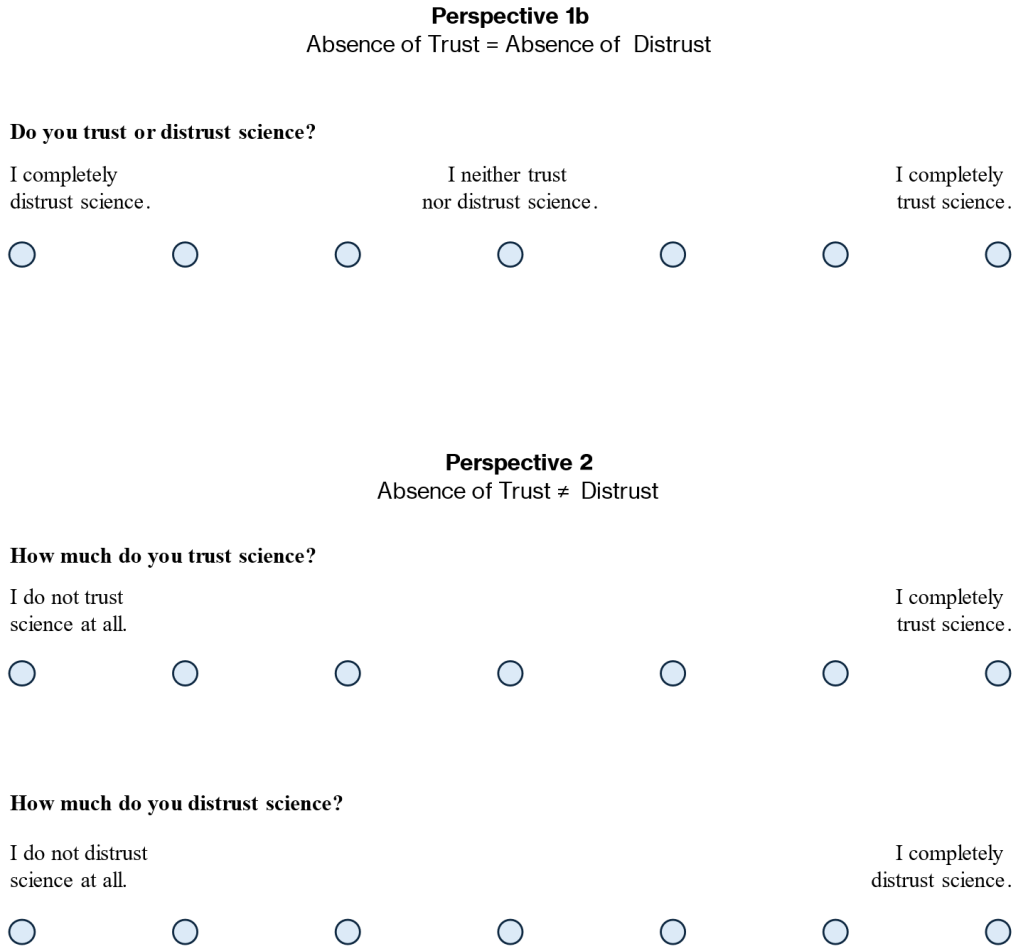
When choosing measurements, it is crucial to consider the relationship between trust and distrust carefully. This is because scales such as the Trust in Science and Scientists Inventory (Nadelson et al., 2014), which contain both positively framed items that indicate trust in science and negatively framed items that indicate distrust in science, can reveal issues with the factor structure (e.g., Byrd et al., 2022; Krüger et al., 2022). This issue may reflect different response patterns, support of perspective two (see Figure 2), or the fact that these survey variables do not measure the same construct. Therefore, regardless of the definition of trust and distrust in science, caution must be applied when combining items that measure trust and distrust in science. Furthermore, scales that mix positively and negatively worded items should be avoided.

Given those considerations, my colleagues and I (Nowak et al., 2025) recommend an alternative measurement method based on the provided definitions to supplement the frequently used approaches. For perspective 1, which represents the idea of trust and distrust as two sides on one continuum, we propose measuring trust and distrust in science on a bipolar scale, as illustrated in Figure 2 (see “Perspective 1b”). In this approach, the lack or absence of trust equals the scale’s middle point. Consequently, we advise against a scale with an even number of response categories to address the possibility of a recipient having neither positive nor negative expectations towards science. Concerning perspective 2, which represents trust and distrust in science as two separate variables, we suggest using *at least* two different items. This operationalisation allows it to capture high trust and distrust, even though it is unlikely to do so simultaneously.

Nevertheless, it must be emphasised that both options to measure trust and distrust in science are highly superficial and only appropriate to address general tendencies. Measuring trust and distrust must be grounded on a consciously chosen theoretical perspective. Only this clarification allows it to achieve a comparable standard for trust and distrust in science, which can be used to identify these concepts and to develop the measurements further. It is, therefore, equally crucial for the further development of research in theory and practice.

Figure 2

Two Alternatives of Measuring Trust and Distrust in Science



Note. The illustration corresponds to the recommendations of Nowak et al. (2025).

In sum and based on the considerations set out in the described chapter (Nowak et al., 2025), trust and distrust in science are distinguishable by cognitive mechanisms (e.g., hope vs doubt), are caused by different events (e.g., trust may decrease as a result of perceived misconduct, while distrust increases as a result of questioning the intentions of another party), and can exist simultaneously, albeit in different domains. For example, one may trust scientists to give valuable advice to politicians based on their research and knowledge, but still distrust their underlying motives. However, given the lack of empirical investigations on the relationship between trust and distrust in science, it is unclear whether they share a mutual continuum or are separate yet negatively related variables.

However, to reliably assess trust and distinguish it from distrust, it is mandatory to define the respective object of interest and choose an appropriate measure reflecting this choice. Furthermore, it must be acknowledged that trust and distrust are complex constructs that require differentiation during investigation. Considering the two perspectives above on trust and distrust, I will refer to the first perspective outline for this work. My main reason for this choice is that approaches that identify trust and distrust as two poles of one construct (e.g., Bigley & Pearce, 1998; Lewicki & Bunker, 1996) fail to account for the different levels to which trust and distrust relate or the expectations individuals might hold.

Thus, I will treat and measure trust as the positive end of a spectrum reflecting a specific reference to one particular aspect a recipient online will have positive (and not negative) expectations towards (see Nowak et al., 2025). In this light, all mentions of trust and trustworthiness in this dissertation refer to trust as the positive (vs negative) beliefs concerning scientists. Hence, I view trust as the opposite of distrust, with its qualities and causes of existence beyond the mere absence of trust (see Figure 1, Perspective 1b).

2.1.4 Epistemic Trust and Trustworthiness

After presenting my understanding of trust as a prerequisite for the upcoming parts of this dissertation and discussing how and why it differs from distrust, I will now go into more detail about the specific kind of trust this dissertation concentrates on. In particular, I will focus on epistemic trust and trustworthiness.

Epistemic trust is the trust placed in someone else's knowledge and is mandatory to balance one's knowledge deficits across various domains (Hendriks et al., 2016; Whyte & Crease, 2010; Wilholt, 2013). In contrast to trust, *trustworthiness* is a quality based on a set of characteristics attributed to an information source or trustee, while *trust* is a state of vulnerability resulting from this attribution. Since laypersons mainly depend on experts' knowledge, evaluating them is now a question. As I assume that positive expectations describe trust, I will now look at the properties that legitimise these positive expectations for scientists and, thus, the respective dimensions of trust (Reif & Guenther, 2021). Grounding on Mayer et al. (1995), the perception of trustworthiness primarily comprises three properties that must be attributed to a person to create said perception: expertise, integrity, and benevolence – with expertise being the specific ability of a scientist a trustor needs to trust in (Hendriks et al., 2015, 2016). This is justified as follows: Expertise encompasses the extent to which a scientist is perceived as qualified, well-educated, and able to make professional judgements (Hendriks et al., 2015). Furthermore, integrity is defined as honesty and presumed adherence to scientific and moral standards. Here, the scholars discussed that integrity is an additional attribute to evaluate a sender's trustworthiness because assessing expertise requires a minimum of insight into the relevant context. (Hendriks et al., 2015). Lastly, benevolence refers to a component of honourability in trustworthiness. Thus, it includes the extent to which sources are perceived as "ethical" or "responsible" (Hendriks et al., 2015). All three components are equally relevant to building the impression of a

trustworthy source and are prerequisites for trust overall (Hendriks et al., 2015; Mayer et al., 1995; Wintterlin et al., 2022). A meta-analysis by Colquitt et al. (2007) demonstrates the unique role of expertise/ability, integrity, and benevolence within trust and trusting behaviours. While they exhibit that these three components are strongly correlated, they also point to the distinct conceptual nature of these variables. To elucidate, on the one hand, expertise and ability refer to a trustee's capability. On the other hand, integrity and benevolence refer to a trustee's willingness to act with integrity, describing a "sense of fairness or moral character provides the kind of long-term predictability" (p. 911) and benevolence, describing an affective quality (Colquitt et al., 2007). Here, specifically, the differentiation between perceived integrity and benevolence requires further knowledge and, thus, time to be discerned from another (Mayer et al., 1995; Schoorman et al., 2007). Despite those three factors, research also discussed additional determinants of scientists' trustworthiness, such as authenticity (Saffran et al., 2020), transparency (Reif & Guenther, 2021), or independence from other instances (Rowland et al., 2022; Seyd et al., 2024). Nevertheless, in the context of this dissertation, I will employ the three fundamental dimensions of expertise, integrity, and benevolence to characterise the perceived trustworthiness of scientists.

2.1.5 Trust, Trustworthiness, and Credibility

A related concept in the context of science communication, and thus also in the communication of scientists who address the public directly via social media, is that of perceived credibility. I argued that trust and information credibility are intertwined concepts, as both can be used to assess the other. First and foremost, the most important differentiation between credibility and trust (just as trustworthiness) is the entity to which the respective evaluations are related. Tseng and Fogg (1999) have addressed this semantic ambiguity regarding credibility. In their work, they postulate that trust is understood as a dependency in a relationship, while credibility is equated with believability. A comparable distinction can be identified between the credibility of the source, traditionally defined as expertise and trustworthiness (see Yale-Studies; e.g., Hovland & Weiss, 1951), and the credibility of the message, which is contingent upon different reference points (message vs sender) (Metzger et al., 2003). In this work, I will make the same division. In order to synthesise the various perspectives and terms from different disciplines, it is necessary to clarify that in this dissertation, the term credibility is exclusively used to refer to the evaluation of the message or information, whereas trustworthiness (and *not* source credibility) is used to refer to the evaluation of the source or sender, respectively.

Although credibility refers to the message, it is still an elementary variable in assessing the trustworthiness of scientists on social media. The main argument is that it reflects the scientists' ability to provide believable information linked to the primary function of epistemic trust in science – bridging potential gaps between knowledge and uncertainty (e.g., Baram-Tsabari & Schejter, 2019; Bromme & Gierth, 2021). In other

words, because the credibility of information crucially depends on the source and the beliefs about it (Sanz-Menéndez & Cruz-Castro, 2019), only a trustworthy scientist can communicate credible, i.e., believable information (see Tseng & Fogg, 1999). This assumption is supported by studies that compare sources of different quality and uniformly highlight that trustworthy sources increase the perceived credibility of information (see Tormala et al., 2006). However, note that the recipient of the information determines this assessment (see section 3.2 for further information). Nonetheless, I assume that the credibility of the information hinges on trusting the source.

At this point, it should be noted that a source's trustworthiness and information's credibility are strongly linked and correlated (e.g., Yang & Beatty, 2016). For instance, a study by Reimer et al. (2005) suggests that the sources' perceived expertise mediates the relation between the perceived quality of an argument and attitudes. In this way, they demonstrated that evaluating the arguments can be a starting point for evaluating the expertise. The sender's perceived expertise can serve as an additional heuristic cue for evaluating content (Reimer et al., 2005). Similarly, Thomm and Bromme (2016) examined how students incorporate different sources of information into the credibility assessment and explanations of scientific statements. The results of this study highlighted that those students relied on their knowledge about the source's trustworthiness to interfere with the plausibility of their claims. In this sense, the credibility of a statement, and thus the believability and plausibility of that statement, respectively, is contingent upon the source's trustworthiness and the other way around (Bromme, 2020). This linkage and dependency between trustworthiness and credibility are also evident in the idea that trust is layered and can refer to different levels that depend on each other (Lucassen & Schraagen, 2012). Nevertheless, the trustworthiness of a source, just like the credibility of information, remains a perception that may differ between individual recipients based on various factors (Tseng & Fogg, 1999). Although both concepts appear to be highly intertwined, the perceived trustworthiness of scientists and the credibility (and believability) of the information they provide need to be separated to understand and analyse trust in science (Hendriks et al., 2016).

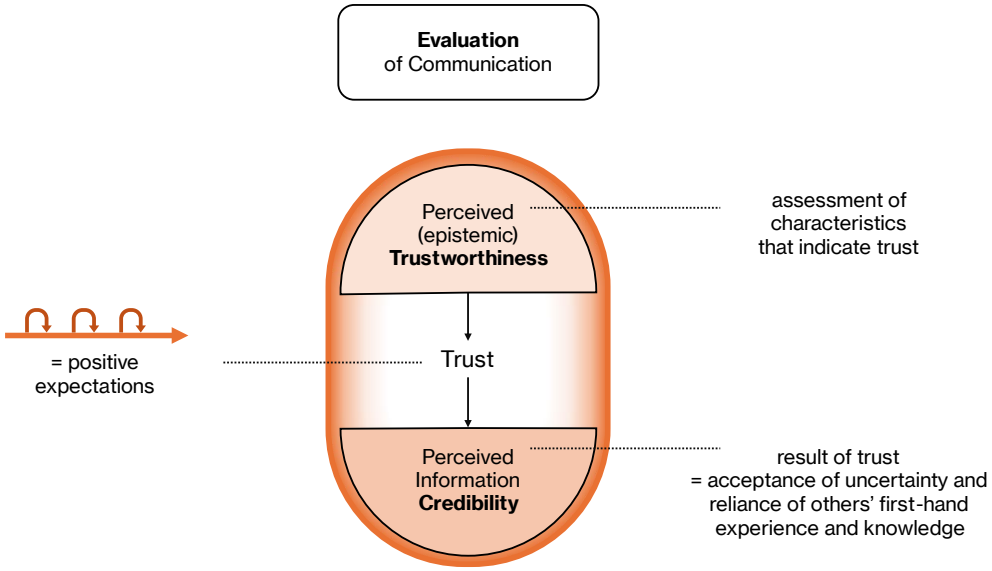
Given the previously mentioned considerations, and with the aim of comprehending how scientists who communicate directly on social media establish an impression of trustworthiness and the resulting consequences, I would like to summarise my current perspective on credibility: I assume that the credibility of the messages is closely linked to the perceived trustworthiness of scientists, both representing assessments of overall communication and indicators of trust. I define trust as accepting potential negative consequences, such as incorporating false information into a judgment, and accepting this risk based on anticipating a good outcome (see section 2.2.1).

Figure 3 illustrates a summary of these assumptions. I suppose that trust encompasses a scientist's positive expectations and communication. Furthermore, trustworthiness can be defined as the perception of specific characteristics that indicate and

cause trust. At the same time, message credibility represents acceptance of uncertainty. Thus, for this dissertation, credibility is seen as a consequence of trust at the message level. Trustworthiness, on the other hand, refers to an antecedent of trust on the sender level. In other words, credibility can be seen as the result of trust, which is based on a scientist's perceived trustworthiness.

Figure 3

Proposed Relationship between Trustworthiness, Trust, and Credibility



Chapter 3. Trust Assessment of Directly Communicating Scientists

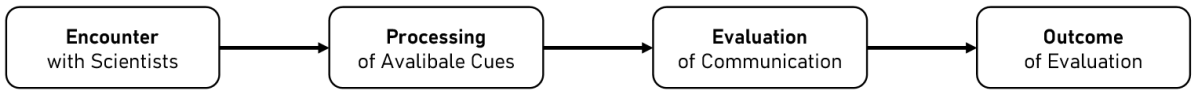
In this section, I will derive a conceptual framework to address the overarching aims of this work based on the literature presented so far. In this framework, I will address 1) how the impression of trustworthy scientists is formed based on the cues available to social media users and if they are unique to scientists, 2) the influence of boundary conditions applying to the evaluation of scientists, and 3) what influence the direct contact with scientists on social media has on the recipients. In doing so, I plan to close the research gap on how results focused on journalists or non-personalised content, such as blog posts, can be transferred to directly communicating with scientists and to what extent scientists have their unique position as communicators.

This framework describes the process in four steps: encounter, processing, evaluation, and outcomes (see Figure 4). In line with these steps, I will first describe how recipients encounter scientists on social media to explain the environment from which the characteristics, or cues, appear for evaluating scientists (see section 3.1). Then, I will explain how these cues are processed and highlight the conditions under which a scientist's communication is processed (see section 3.2). This section will address the situational and cross-situational factors influencing each recipient's evaluations. Afterwards, I will address the specific cues available to users on social media and how they will affect both the perceived trustworthiness of a scientist and the credibility of the information they provide (see section 3.3). As described in the previous section, I argue that the perceived credibility of scientists' messages and information is highly intertwined with the perceived trustworthiness of a scientist. Subsequently, I will address the outcomes of this evaluative process and discuss the associated consequences (see section 3.4).

I will use this framework to guide the four experimental studies that form the core of this dissertation in the next chapter (see Chapter 4. Empirical Approach). With these studies, I aim to elucidate the perceived trustworthiness of scientists on social media and its repercussions for recipients.

Figure 4

Conceptual Overview of Proposed Framework



3.1 Encounters with Science and Scientists on Social Media

Every encounter with science and scientists on social media plays a crucial role in the overall trust in science, as (social) media use can increase trust in science (e.g., Huber et al., 2019). In particular, trust in science depends on the trust of science communicators, which, particularly on social media, first needs to differentiate from questionable sources (Weingart & Guenther, 2016). In this section, I will describe the environment in which recipients encounter scientists, their communication, and other types of information that are available to them for this evaluation. In this vein, I will give examples of scientists' communication on social media. To provide insight into the communication between scientists and recipients on social media, I will address how scientists specifically communicated during the pandemic and how recipients reacted to the content of their

encounters with scientists. This objective is also subject to the question of whether the communication of scientists who address the public directly via social media contains "science" at all.

3.1.1 Science on Social Media

When addressing the public online, scientists disseminate information and represent science (Horst, 2013; Reif & Guenther, 2021). Previous research indicates that scientists have used platforms such as Twitter or Facebook to talk about science, express their views on political or social issues, and connect with scholars and the public even before the pandemic (e.g., Collins et al., 2016; Jünger & Fähnrich, 2020). On Reddit, where multiple scientific topics are discussed (Kaiser et al., 2023), scientists can engage with laypersons on Reddit, communicate their research in "ask me anything" threats, and discuss it (Hubner & Bond, 2022). On video-based platforms such as YouTube or TikTok, scientists use their reach to allow users glimpses of their lives as scientists and their work (Huber & Baena, 2023). Likewise, presenting oneself and one's research on Instagram can increase scientists' trustworthiness by granting insights into the labs (Jarreau et al., 2019).

These direct interactions, without any institutional or journalistic barrier, like in traditional media (Flanagin & Metzger, 2003), allow social media users not only to gain personal insights into scientific findings but also offer at least an opportunity for recipients and senders to build a trusting relationship through the platform – even if it is one-sided. Further, they allow social media users to ask for and get firsthand information from scientists (Hubner & Bond, 2022) and, thus, serve as the point of entry for assessing their trustworthiness. As addressed in the previous section, trust is multidimensional, and each encounter with a scientist online should influence their trust and their trust in science as a whole (Reif & Guenther, 2021). In this way, each encounter forms and shapes trust in science and scientists, influencing the subsequent encounter and potential future expectations regarding their trustworthiness (see Mayer et al., 1995). Thus, it is crucial to consider the circumstances in which recipients "meet" science online. This consideration includes the circumstances and the environment in which recipients encounter scientists and what scientists' public communication looks like.

Research on incidental exposure or incidental contact, which refers to the unintentional discovery of scientific information by users (Schäfer, 2023), indicates that this direct contact with science not only could enhance recipients' understanding of complex scientific topics like gene editing (Anderson et al., 2021) but also fosters their belief in the scientific consensus (Meier, 2024). Furthermore, it underlines that seeing content that may challenge a user's views can have positive consequences, just like negative ones. To elucidate, while challenging content may encourage recipients to explore different ideas, it may also drive the occurrence of selective exposure patterns and further drive polarisation. However, if and how users cognitively engage with the content is also substantial for the subsequent evaluation (see Schäfer, 2023 for literature review). Thus, it is crucial to

consider the conditions under which social media users may encounter science, science information, and scientists' communication online. These become crucial when a recipient notices content that catches their attention and automatically evaluates it (Greene et al., 2021). In essence, even without an explicit intention to encounter scientists on social media, contact may occur incidentally, exerting an influence on the recipient.

In this light, the seemingly limitless repository of readily available information for users not only presents a vast opportunity for science communication and public engagement with science but also stresses potential pitfalls. Social media platforms often miss any traditional or journalistic gatekeeping (Flanagin & Metzger, 2003), leaving users with the challenge of identifying whom to trust (Baram-Tsabari & Schejter, 2019) – particularly when they are incidentally exposed to science and scientists online.

In encounters where supposedly superficial information is disseminated, such as impressions from a laboratory setting, this does not initially present a significant issue. However, this changes when it comes to scientific information that can directly impact everyday decisions. Here, the COVID-19 pandemic is the prime example. During that time, the World Health Organisation (WHO) declared that this information flooding the media was an infodemic (WHO, 2022a). Within this infodemic, false and reliable information concerning COVID-19 has been disseminated similarly on multiple platforms with a prevalence of dubious sources and even verified "superspreaders" (Cinelli et al., 2020; Yang et al., 2021). Likewise, the spread of the infodemic was fuelled by the belief in false information, distress, and fearfulness among users (Pian et al., 2021). Although some individuals reported feeling well-informed about the virus, they also expressed feelings of confusion (Okan et al., 2020), and others kept searching for information on the internet about the COVID-19 virus (Bento et al., 2020; Murri et al., 2020).

Nevertheless, COVID-19 not only presented the issue of rapidly disseminating false information, but it also altered the landscape of science communication on social media, as scientists directly addressed the public through various media channels (e.g., Leidecker-Sandmann et al., 2022; Szczuka et al., 2024; Utz et al., 2022; Wormer, 2020), with some scientists even researching celebrity-like status (Joubert et al., 2023). Those users turned to scientists who directly engaged in science communication efforts, expressed greater self-efficacy and higher levels of knowledge, and were more likely to participate in protective measures (Szczuka et al., 2024; Utz et al., 2022). This circumstance prompts two questions: First, to what extent do these scientists and their direct communication influence recipients on an individual level (which I will address in detail within this work), but also, what does their communication look like? The second question is whether scientists' public communication resonates on social media, an obvious prerequisite for users to encounter them online.

According to a study by Pulido et al. (2020), while most information shared on Twitter appears to be primarily factual or fact-based, only a small portion of that information is classified as science-based. Nevertheless, those science-based tweets seem

more likely to be shared (retweeted) by other users than false information. Furthermore, science-based posts were about their actual number and were shared quite often. These observations highlight the role of "science" and references to it in the direct communication of scientists. Particular evidence, which "is a property of data that makes us alter our beliefs about how the world around us is working" (Goodman & Royall, 1988, p. 1568), is an apparent characteristic of science and an elementary part of scientific work, which is potentially reflected in scientists' communication online.

To understand how this evidence in its potential forms is present in scientists' communication and how it resonates in the public sphere, I will present the findings of a content analysis, which I was involved in creating, of public communication by visible scientists during the COVID-19 pandemic (see Biermann et al., 2024). As stated beforehand, the main objective is to a) scrutinise how scientists communicated in terms of their evidence use (i.e. reflect and refer to the scientific process) in their communication and b) if and how the public engages with it. In the next section, I will outline the premises and results of a manual and automated content analysis on scientists' use of evidence and the public's reactions.

3.1.2 Understanding Scientists' Communication and Engagement with the Public

As previously mentioned, Biermann, I, and colleagues (2024) analysed the development of evidence used by eight highly visible scientists on Twitter/X in Germany during six phases of the COVID-19 pandemic, as well as the proportion of evidence in their posts. Further, we examined whether it facilitates public engagement with scientists and how recipients respond.

To classify scientists' communication and their use of evidence, we differentiated between multiple types of evidence. On the upper level, evidence was viewed as either scientific or anecdotal. The term describes any type or form of evidence that refers to subjective experiences (i.e. anecdotes) that do not follow a strict methodology and are not subject to any claim of objectivity (Allen & Preiss, 1997; Dahlstrom, 2014; Kopfman et al., 1998). Instead, it relies on subjectivity and individual experiences (Moore & Stilgoe, 2009). On the other hand, scientific evidence encompasses all evidence that represents an approximation of objectivity. It includes all evidence based on many replicable data and statistics and is thus representative and generalisable (Allen & Preiss, 1997; Hoeken, 2001). The scientific evidence in the paper included references to data-based statistics, scientific studies, and methods, as well as references to experts.

The analysis focuses on eight scientists who are experts in virology and related disciplines, were affiliated with a university, and had at least 10,000 followers on Twitter at the time of data collection. The data surrounding their communication was tracked on an account basis and covered six time periods of 14 days each. The dates were chosen based on significant events during the COVID-19 pandemic in Germany, such as the start of lockdown periods. After all the collected posts were cleaned for duplicates and those posts

in which the scientists of interest only were mentioned, a total of 42,640 posts, including tweets, replies, and quotes, were analysed. Afterwards, a randomly drawn subset of tweets and replies was coded manually for the presence of evidence. Based on the manual coding of the posts, automated coding was used to identify the presence (vs absence) of scientific evidence in the complete dataset (see Biermann et al. (2024) for further details on the methods).

The results of the automated coding indicate that approximately 10% of the scientists' contributions included scientific evidence overall. Notably, the amount of scientific evidence concerning the COVID-19 pandemic increased over time, likely due to the increasing availability of scientific evidence paralleling the ongoing pandemic (Aviv-Reuven & Rosenfeld, 2021). The presence of scientific evidence in scientists' posts nearly doubled from the first to the last examined period.

Manual coding revealed that references to other experts were the most prevalent among the categories of scientific evidence, accounting for approximately 57% of the total amount of scientific evidence. Contrarily, the proportion of anecdotal evidence was relatively small, with around 3% in the manually coded data set. Moreover, the data analysis showed that social media users were significantly more likely to retweet posts with scientific evidence than those without. The analyses of the public's responses to the scientists' communication revealed that social media users' content only contained a marginal proportion of scientific evidence, falling below the 1% mark. If they did use evidence, it was more likely to be anecdotal, as evidenced by around 10% of the replies. However, if an initial post contained scientific evidence, the replies were more likely to do so. Lastly, the analyses indicated that while scientists' use of evidence in their communication was dominated by scientific evidence, the public's evidence use was dominated by anecdotal evidence. However, this only relates to the manually coded part of the available data (see Biermann et al. (2024) for further details on the results).

3.1.2.1 Conclusions on the Presence and Use of Evidence

Regarding the communication of visible scientists during the COVID-19 pandemic, the extent to which they employed evidence-based information and the degree to which these resonated in public discourse can be assessed as follows:

Although the proportion of general evidence use appears low at around 10%, this is not surprising given the periods analysed, as the communication of visible and, therefore, high-reach scientists was likely to be characterised by other themes, such as calls to action (Biermann & Taddicken, 2024). Nevertheless, it is worth noting that scientific evidence, if available, has the potential for greater reach since social media users are more likely to interact with posts that contain scientific evidence. This finding underlines the potential and relevance of evidence-based science communication in social media. In this sense, the apparent evidence imbalance in communication surrounding visible scientists should also be noted. It refers to the different use of types of evidence between the scientific community and the supposed lay public, where scientists provided scientific evidence and social media

users replied with anecdotal evidence, grounding individual experiences rather than in systemic samples (Dahlstrom, 2014; Moore & Stilgoe, 2009). Hence, the study demonstrates that using scientific evidence in communication on social media is a unique property of scientists' communication, as laypersons rarely use and thus disseminate it online. Further, the study highlights that evidence still has significant participatory potential and, thus, illustrates the role of scientists as a provider of scientific evidence and information, which is quite well received. Above all, scientists play an essential role as intermediaries of scientific information on social media (as laypersons do/cannot take on this role). Therefore, the resulting asymmetry in the use of evidence is a prime example of the need to trust scientists to obtain valid and scientifically sound information (see section 2.1.1)

However, it is essential to acknowledge that while offering significant opportunities for (evidence-based) science communication (Burns et al., 2003; Dudo, 2015), false information is still ubiquitous on social media platforms and spreads just like reliable information (Cinelli et al., 2020). As discussed at the beginning of this section, this circumstance presents non-scientists with the challenge of assessing the trustworthiness of their sources. Furthermore, even if recipients rely on scientists and the evidence-based information they provide, they first must identify them as such. This notion is particularly crucial given that users are often incidentally exposed to science.

Furthermore, the information presented on social media platforms is primarily limited in terms of characters, as they are designed for short rather than comprehensive messages and information about a source (Smith, 2015). Additionally, users are assumed to have limited capacity to inspect and check every bit of information they see in detail. This condition might be due to a lack of motivation, time, knowledge, or various other reasons. It can facilitate a decline in superficial processing (Meinert & Krämer, 2022), causing them to orient their judgment of scientists on several pieces of surrounding information or cues (Morris et al., 2012; Sundar, 2008). However, depending on the circumstances in which a recipient encounters a scientist on social media online, they may also integrate more complex information into their evaluation of the scientist's trustworthiness, as all types of cues can provide substantial value (Kruglanski & Thompson, 1999).

In the following section, I will outline how cues, such as scientific evidence, are processed to assess trustworthiness and the boundary conditions based on the individual recipients. Afterwards, I will discuss potential cues available to social media users to assess the epistemic trustworthiness of scientists on social media, along with the credibility of their information, classify them, and discuss how they affect the scientists' communication individually.

3.2 Processing of Cues Available to Users

In this section, I will address the boundary conditions under which the processing of available cues occurs. I will also provide detailed information about the factors that set the

framework for integrating cues into the trustworthiness assessment of directly communicating scientists in social media. Here, I distinguish between situational factors (i.e., states), which are of paramount importance in every encounter with a scientist, and cross-situational factors (i.e., traits), which influence how a recipient will evaluate a scientist's communication. I further categorise the latter recipients' characteristics into two sub-groups: stable and flexible. I assume both types constantly influence the recipient's information processing across various encounters. However, in the long run, the flexible cross-situational factors can be modified, albeit with difficulty. Before proceeding, I will begin with an overview of the conceptual framework of information processing that forms the basis for evaluating the trustworthiness of scientists in social media and answer how social media users process the available cues discussed above.

3.2.1 Framework Conditions: How do Social Media Users Process the Available Cues?

To understand how social media users construct their impression of a scientist's trustworthiness and the circumstances under which they may perceive someone as exhibiting a high level of expertise, integrity, and benevolence, it is essential to consider the constraints that shape the processing of available cues. In light of the inherent risks associated with trust, the necessity to trust entails the deployment of various strategies and heuristics to legitimise the trust itself (Origgi, 2012) and, therefore, (closely) examine all available information. To investigate how social media users interfere with the trustworthiness of scientists online when they encounter them, I orient myself to the lens model (Brunswik, 1956, 2023; Wolf, 2005). The model proposes that recipients will use a finite set of available cues as intermediaries to estimate an entity's true value. An evaluative process's different observable features and potential outcomes are brought together via a "lens". In other words, the perception of a scientist is shaped by a multitude of judgments based on various cues, which serve as lenses through which the factual trustworthiness of the individual in question is evaluated. Hence, whether users ultimately trust the scientists and thus their information depends on several factors.

In line with the prevailing dual-process theories of information processing, this occurs in two ways: effort-intensive and less resource-intensive heuristic processing modes (Evans & Stanovich, 2013). Two of the most prominent examples are the elaboration likelihood model (ELM; Petty & Cacioppo, 1986) and the heuristic-systematic model of persuasion (HSM; Chaiken et al., 1989; Chaiken & Ledgerwood, 2012). Both share two processes or ways information can be processed: central/systematic or peripheral/heuristic. In other words, people will invest cognitive capacities to evaluate a piece of information or not, which is either a heuristic cue or a message argument. Additionally, both models propose that the processing mode will vary depending on circumstances (e.g., Bohner et al., 2008).

In contrast, my approach to evaluating scientists' trustworthiness on social media is guided by an alternative premise. It is based on the unimodel (Kruglanski et al., 2006;

Kruglanski & Thompson, 1999), which critiques the two processes and postulates the processing of information along a singular route or mode, respectively (Evans & Stanovich, 2013). Although both models acknowledge the simultaneous application of both modes, there is considerable evidence supporting the adaptation of the unimodel, which bases itself on the individual qualities of heuristic cues and available message arguments. For example, as soon as the complexity of the information is equivalent, there are no longer any differences in their processing, which eliminates the need for a dual process (e.g., Erb & Kruglanski, 2005; Kruglanski & Thompson, 1999; Pierro et al., 2005). Other than the HSM or the ELM, the unimodel states that judgments are not built based on the type and quality of cues and arguments. Instead, judgments are built on all types of "evidence" available to a recipient, with each evidence having the same ability to change an opinion or influence an evaluation. The unimodel is based on lay epistemic theory, which suggests that recipients' judgments are based on and built upon learned if-then relations (Kruglanski, 1990; Kruglanski et al., 2018).

In this vein, the inclusion of evidence in the process is contingent upon the individual relevance of the decision, situation, or assessment. Thus, only the cues that are considered relevant are included in the process (Bohner et al., 2008; Kruglanski & Thompson, 1999). For instance, this also applies in situations of high involvement where "superficial" cues should be less critical while judging a message, but are still integrated if relevant (Pierro et al., 2005). Under these considerations, I state that all available cues (or evidence as a frame within the unimodel) - encompassing sender information, the nature of argumentation in the messages, and the quality of contextual information - are equally significant in assessing the trustworthiness of directly communicating scientists. In other words, only relevant cues, regardless of their supposed quality as heuristic or argumentative, are used to assess trustworthiness (Bohner et al., 2008; Kruglanski & Thompson, 1999). Further, the thoroughness of processing still affects the later persistence of an attitude or any evaluative outcome, yet all types of cues can contribute to this outcome (Kruglanski & Thompson, 1999; Pierro et al., 2012). At this point, it should be noted that the evaluation of said cues is nevertheless influenced by a specific set of boundary conditions, such as an individual's situation-specific motivation (Kruglanski & Thompson, 1999; see section 3.2.2 for further details).

At this point, it is necessary to reiterate my framework's classification to clarify the differentiation from the models I have presented so far. The HSM, ELM, and unimodel address the issue of persuasion. In the context of these theories and other perspectives, such as credibility research on online information (e.g., Fogg, 2003; Metzger, 2007), the source evaluation can be considered a cue of the information credibility that is processed as such. Thus, the source evaluation is seen as a singular element used to evaluate the message and predict the outcome of a persuasive process. According to these models, the source's trustworthiness should be a cue to message and information credibility, respectively, and is instead a predictor rather than a dependency. Nevertheless, the fundamental principles

outlined in these models can be extended to the assessment of the trustworthiness of communicators, including scientists. I assume that assessing the message's credibility and the sender's trustworthiness are subject to the same boundary conditions and follow the same set of premises.

In light of the lens model (Brunswik, 1956), multiple cues can foster a perception of trustworthiness among social users, which can be used as a proxy for scientists' potential ability to provide truthful information. I argue that this part of the evaluation and the lens Brunswik conceptualised are equivalent to a single processing route and will be further shaped by the recipient's situational and cross-situational properties.

Within the upcoming sections, I will further discuss why parts of these models are influential for evaluating scientists' trustworthiness online and the credibility of their information. In this vein, the following sections will examine situational and cross-situational modulating factors to understand the determinants for processing available cues better. I propose that these factors influence how cues can be processed and integrated into the judgement.

3.2.2 Situational Factors

Information and its processing can never be isolated from external or person-specific circumstances. Different reactions to social media content are expected depending on the interplay of situational and cross-situational factors (see section 3.2.3). In this section, I address how situational factors determine how an individual recipient will evaluate available cues, emphasising the importance of considering situational specifics when assessing how scientists will be perceived on social media. In general, situational factors encompass all elements that may vary between online encounters with scientists and are inherently linked to the recipients.

Examples of these situational factors include, but are not limited to, emotional states, cognitive load, goals, and associated motivations. For instance, both positive and negative emotional states can influence the level of processing one might be willing or able to invest in evaluating information, but also influence how information is weighted for an evaluation (e.g., Bohner et al., 1995; Garcia-Marques & Mackie, 2013; Petty & Briñol, 2015). Furthermore, cognitive load, or any other reduction in cognitive capacity, constrains the extent to which an individual will rely on different types of information (e.g., Tormala & Petty, 2004).

Another factor influencing how information is processed is the motivation present in the specific situation or the objective being pursued by the individual, such as the three motivations grounded in the HSM: accuracy, defence, and impression motivation (Chaiken et al., 1996). Particular accuracy and defence motivation are highlighted prominently in multiple lines of research due to their potential to shape information sections and processing. They are linked to respective goals (see Hart et al. (2009) for review). As elucidated by Kruglanski (1999), these motivations can also be classified into two distinct

categories alongside their corresponding goals: directional and non-directional. Although they can be unconscious, directional motivations – like confirming one's view, as seen in the defence motivation – are oriented towards a specific outcome of processing.

In contrast, the outcome of non-directional motivational processing is not predetermined, as seen in the accuracy motivation where no specific goal other than finding accurate information is set (Chaiken & Ledgerwood, 2012; Chen et al., 1999; Kruglanski, 1999). Nevertheless, a non-directional goal does not entail more intensive processing and can alter evaluations like a directional goal (Molden et al., 2021). However, the type of goal has a significant impact on the way cues are incorporated and weighted in the evaluation process. With a directional goal, cues are assessed based on their ability to facilitate attaining the pre-established goal, which can result in a selective and potentially biased evaluation. This perspective can also explain why individuals who have a directional goal or have been explicitly instructed to seek accurate information tend to display confirmatory tendencies (Winter et al., 2016). In other words, multiple motives co-occur.

Non-directional goals, on the other hand, entail the objective and comprehensive consideration of cues based on their individual relevance and substance. In other words, the motivation or goal is linked to the extent to which the cues are carefully processed and incorporated into a scientist's evaluation. For this reason, it is essential to recognise the relevant recipient's situational goals and corresponding motivations. In related scholarly investigations, the role of diverse motivations and objectives is equally apparent. For instance, the identification of false information is more probable when individuals are instructed to prioritise its accuracy (Pennycook et al., 2020), and the preference for content that aligns with one's views is selected more likely when asked to warrant one's opinion (Winter et al., 2016).

To conclude, different evaluation patterns can be expected with each new encounter with a scientist, as the specific goals and motivations of the recipient lead to a different weighting of specific cues within one processing route (Kruglanski & Thompson, 1999). Thus, this circumstance should result in a different assessment of the scientist's trustworthiness and the credibility of their information.

3.2.3 Cross-situational Factors

In addition to factors that are subject to change depending on the circumstances, such as motivation or emotional state, I posit that the assessment of a scientist's trustworthiness is also influenced by factors that are influential throughout multiple encounters with scientists on social media. These include stable cross-situational factors (i.e., traits), such as personality traits and predispositions, and flexible cross-situational factors. Here, the term "flexible" does not imply that these factors always exert a different effect and vary across encounters, as the situational factors do, but rather that they are susceptible to change in themselves in the long run. This section will first present the flexible factors and then examine the stable ones.

3.2.3.1 Flexible Cross-Situational Factors

In the following section, I will discuss the role of flexible cross-situational factors in evaluating scientists on social media. While cross-situational factors tend to be stable over time and across different contexts, they do not operate in isolation. Instead, they interact with other situational factors. They can be influenced by the specific circumstances of each encounter with a scientist can influence them in specific circumstances. Here, I will focus on two of them: attitudes and knowledge, as they are assumed to influence how scientific information is evaluated online (Hendriks et al., 2020).

3.2.3.1.1 Attitudes

It is vital to begin by noting that the attitudes described above influence the evaluation of scientists and the integration of cues at various points. These include, for example, the evaluation of opinions or positions expressed in posts by scientists (see section 3.3.2.1.1), as well as interactions with situational goals. They describe the long-term but changeable evaluation of an object or matter (Cacioppo et al., 1994). Unlike goals and the associated motivations, which are situational factors, attitudes are stable across different situations and are based on personal beliefs (Boer & Fischer, 2013; Hart et al., 2009; Kruglanski & Stroebe, 2005). While motivations determine the extent to which cognitive capacities are used to process information, attitudes determine whether the information is more likely to be accepted or rejected (Boer & Fischer, 2013; Hart et al., 2009) as well as how systematically specific cues will be processed (Chaiken et al., 1989).

The influence of attitudes can be observed in the assessment and evaluation even in the absence of explicit manipulation of situational motivation. Therefore, it is essential to examine the role of attitudes more closely. In particular, I argue that attitudes are decisive, especially regarding the message's contents. For example, when Gierth and Bromme (2020) tested the effects of critical user comments on the trustworthiness of scientists, they found that the participants' prior attitudes towards a topic were the most influential predictor regarding the posts' credibility and the scientists' epistemic trustworthiness. Both were in line with participants' prior attitudes. Thus, they argued that one's prior attitude potentially filled the gap between the knowledge needed to evaluate the experimentally manipulated comments and the information they had (Gierth & Bromme, 2020).

Similarly, Knobloch-Westerwick et al. (2015) demonstrated that individuals were more likely to select articles in science blogs on multiple topics that presented attitude-consistent information compared to those that presented inconsistent information, which partially reinforced existing attitudes. This tendency to actively choose attitude-consistent media content and information is known as selective exposure (Freedman & Sears, 1965; Sears & Freedman, 1967). In contrast, the tendency to be more likely to believe and rate attitude-consistent information as having more credibility is commonly considered a confirmation bias (e.g., Hart et al., 2009). The reason for this is to avoid cognitive dissonance by avoiding content that challenges one's attitudes (see Festinger, 1957; Metzger

et al., 2020). Aside from their differences, both demonstrate the influence of attitudes, particularly the alignment with them, which heavily influences how information is evaluated and selected.

Within my proposed framework, I propose that attitudes will exert the most influence on cues concerning the messages directly communicated by scientists (see section 3.3 for further information). Overall, attitudes play a central role in assessing scientists and their statements on social media, as they influence how information is processed and evaluated. While attitudes significantly influence the acceptance or rejection of information, general trust in scientists and the tendency to trust them are also decisive (see section 3.2.3.2.2).

3.2.3.1.2 Knowledge

In addition to attitudes, an individual's knowledge is one of the flexible, cross-situational factors that I expect to play a role in my framework for assessing the perceived trustworthiness of scientists in social media. The rationale behind including a recipient's knowledge in the domain of interest is that they could or can rely on their expertise when evaluating content (Kruglanski & Thompson, 1999; Lucassen & Schraagen, 2011; Metzger, 2007). Thus, they do not need to rely upon one another's source per se. Instead, they can use their own knowledge to verify a scientist's expertise or ability, as well as the information they provide. When evaluating a source and information online, knowledge may refer to one's ability – or know-how – to estimate the validity of information and domain-specific knowledge (Lucassen & Schraagen, 2011; Metzger, 2007). Previous research on various topics demonstrates the role of knowledge in evaluating and relying on specific cues, which is reflected in previous research on various topics. For example, Ou and Ho (2024) observed differences between experts and laypersons and their strategies for evaluating information on novel food. While experts evaluated the credibility of the information presented to them based on their prior knowledge, laypeople compensated for their lack of prior domain-specific knowledge by relying on simple cues. In a similar study, Brand-Gruwel et al. (2017) compared experts' and laypersons' search strategies for searching and selecting information on psychological topics online using eye-tracking data combined with a think-aloud approach. Their study indicates that experts relied on their previous knowledge and focused more on the information's reliability, making them more likely to identify trustworthy sources. At the same time, laypersons chose content based on superficial criteria, opinions, and feelings. Lucassen and colleagues (2013) investigated how novices and experts evaluate the credibility of online articles. They found that experts judge credibility based on semantic features like the article's accuracy, whereas persons unfamiliar with its content did not and relied more on superficial cues. These studies emphasise how prior knowledge in a domain influences how recipients evaluate information by applying different heuristics and how likely they are to rely on themselves (Chaiken & Ledgerwood, 2012; Hilligoss & Rieh, 2008). Yet, it is important to emphasise that knowledge and attitudes are not identical entities. Given that attitudes are grounded upon

supposed knowledge (Fabrigar et al., 2006), it can be assumed that both follow analogous mechanisms of action when evaluating scientists' communication.

At this point, I would like to emphasise the term "supposed" as I argue that it is not essential for evaluating what a recipient actually knows but rather how knowledgeable they feel. This makes the particular difference between objective knowledge, which reflects factually accurate information, and objective knowledge, which refers to a recipient's confidence in the correctness of their knowledge (Brucks, 1985; Park & Lessig, 1981). Against this background, subjective and not objective knowledge plays a decisive role in forming and reinforcing attitudes towards socio-scientific topics (Schäfer, 2020)**.** However, it can also be seen as a type of attitude (Kruglanski, 1990). Thus, I argue that one's subjective knowledge is equally, if not even more, critical to the evaluation of a scientist's trustworthiness online and the credibility of their message as one's attitudes in two ways:

Firstly, given that subjective knowledge and attitudes are highly linked, the potential for influence on situational motivations (e.g., confirming one's views vs searching for accurate information; see section 4.3.1) and their influence on the selection information and the thoroughness of their processing (Hart et al., 2009) should be similar to those of attitudes. In particular, those who neither have nor feel they do not have sufficient knowledge will supposedly be more likely to rely upon superficial cues and will not systematically process information (Chaiken et al., 1989; Chaiken & Ledgerwood, 2012).

Secondly, recipients' tendency to overestimate their knowledge of scientific topics (Light et al., 2022; Schäfer, 2020; Scharrer et al., 2017) should also reduce their subjective need to rely on someone else to judge the credibility of information. For example, laypeople tend to rely on their pre-existing knowledge. However, they are less likely to consult scientists or experts if they think a claim is easy to understand (Scharrer et al., 2017). Therefore, subjective knowledge is not solely contingent on the capacity to process information. It is also contingent on the general inclination or necessity to do so, as well as on the perceived relevance of specific cues regarding the credibility of the information and the trustworthiness of its source. This tendency becomes evident in studies on knowledge overconfidence, where subjective knowledge is high and objective knowledge is low. People who are overconfident in their knowledge tend to reject scientific consensus and assume the opposite in multiple matters (Light et al., 2022). Specifically, the subjective knowledge on a specific issue should, therefore, cause recipients to be less likely to rely on a directly communicating scientist or a scientific source when evaluating and judging the credibility of information online, which I assume to be a key indicator of a scientist's epistemic trustworthiness (see section 2.1.5).

In sum, I expect subjective rather than objective knowledge to be more influential in shaping individuals' perceptions of scientists' trustworthiness and the credibility of their messages. The rationale behind this is that subjective knowledge should exert similar effects on attitudes as indicated by the literature, and second, high levels of subjective knowledge should affect the recipients' desire to rely on others to assess the credibility of information.

3.2.3.2 Stable Cross-situational Factors

Other than the previously discussed flexible cross-situational factors, stable cross-situational factors include personality traits and long-term predispositions likely to influence a recipient's evaluation of a scientist. It is important to acknowledge that a multitude of personal, stable, and cross-situational factors can influence the evaluation of scientists and their communication. Examples include the need for cognitive closure, which describes one's desire to achieve completeness and unambiguous answers (Choi et al., 2008; Webster & Kruglanski, 1994). However, I will not provide further details on those, as this work aims to provide a framework and does not discuss all potential stable cross-situational factors. For the current framework, I will primarily concentrate on the need for cognition and a recipient's particular inclination to trust scientists, as these factors significantly influence an individual's processing of available cues.

3.2.3.2.1 Need for Cognition

The need for cognition (NFC) is considered a motivational personality factor that determines the degree to which people enjoy (or avoid) thinking and thus will invest cognitive effort in an evaluation (Cacioppo & Petty, 1982). People with high levels of NFC "naturally tend to seek, acquire, think about, and reflect on information to make sense of stimuli, relationships, and events in their world" (Cacioppo et al., 1996, p. 198). It can also be linked to the need to think independently rather than rely on others, like preferring an intense and active information search (Fortier & Burkell, 2014). Several studies have also demonstrated the impact of NFC on information assessment, which, as a result, influences the evaluation of scientists' trustworthiness. For instance, individuals exhibiting a higher NFC are more inclined to orient themselves towards user comments than those displaying a lower level (Winter & Krämer, 2016), which suggests the influence of this factor in incorporating diverse cues and one's need to find information. However, this only appears to hold for those interested in a topic and if the individual relevance is low (Winter & Krämer, 2016). This idea is also prominent in the results of (Knobloch-Westerwick et al., 2020), who showed that the NFC influenced the likelihood of choosing self-confirming content. Similarly, individuals who gain less pleasure from cognitive processes appear to be more susceptible to the influence of cues and messages that are more easily processed than those with high levels of NFC (Hinnant et al., 2016). In other scenarios, the propensity to engage in more intricate cue processing is similar. To illustrate, an online investigation by Shulman et al. (2021) demonstrated that individuals with a higher level of NFC exhibited lower processing fluency when comprehending scientific jargon.

Against this background, I argue that a recipient's NFC should also be an influential factor in evaluating the trustworthiness of scientists and, beyond, in the degree to which they subsequently rely on scientists as trustworthy sources. To elucidate, one might be inclined to actively and joyfully search for information and examine to what degree a scientist is worth trusting, given a particular set of cues. Since individuals exhibiting high

levels of NFC tend to place a high degree of trust in the opinions and credibility of experts (Bakker et al., 2013), they should be more likely to subsequently rely on the information provided by them once they have established that a scientist is such a source. Thus, I argue that a social media user's NFC should be an influential yet stable cross-situational factor in one's evaluation of scientists' epistemic trustworthiness online.

3.2.3.2.2 Propensity to Trust

Moreover, one additional decisive cross-situational factor is important to mention when addressing the perceived trustworthiness of scientists on social media: the propensity to trust. Mayer et al. and colleagues (1995) describe the propensity to trust as a trait and "a stable within-party factor that will affect the likelihood the party will trust" (p. 715). Furthermore, they argue that the propensity, or disposition, to trust is essential to predict if one will engage in taking the risk to trust and, thus, is necessary to evaluate how trustworthy a source is. In other words, some people are more likely to trust others and give them the benefit of the doubt, while others are less likely to do so. The influence of one's inclination to trust is also evident in research. For instance, Shaheen et al. (2020) showed that one's propensity to trust increases the perceived credibility and acceptance of online reviews.

In this vein, Mayer et al. and colleagues (1995) argue that one's propensity to trust will increase how likely one is to perceive a source as trustworthy (i.e., assigning high levels of ability, integrity, and benevolence to a source) and consequentially one's willingness to engage in the risk of trusting before knowing anything about a trustee. However, other than that proposed by Mayer and colleagues, I diverge from the idea that the propensity to trust is a trait-like disposition regarding trust in scientists and their communication. Once a recipient on social media deems a sender a scientist, the general trust in science and scientists should take over the role. In arguing so, I do not suggest that the universal propensity to trust is irrelevant in assessing trustworthiness; instead, the general trust in scientists specifically should exert a significant influence. This notion is supported by a study by Lucassen and Schraagen (2012) on the relationship between multiple aspects or layers of trust, respectively. In their study, they tested how the propensity to trust affected the trust in the medium (the internet), the source of information (Wikipedia), and the trust in the information per se. They demonstrated that the generic propensity to trust only influenced trust in the medium but lost its effects the more specific the object of trust (i.e. the source and the information) became. The study results indicate that the level of trust in scientists is more accurately influenced by targeted assessments of their credibility and expertise than by a general disposition to trust.

Moreover, given that this trust is likely to be shaped by encounters with science (see Reif & Guenther, 2021; Six & Latusek, 2023), the propensity to trust scientists cannot be regarded as a stable cross-situational factor. Instead, it is a flexible, cross-situational influence on evaluating scientists online, which resembles attitudes and beliefs (see section 3.2.3.1) and, thus, influences the evaluation of a communicating scientist similarly. In this light, one's specific trust in science remains cross-situational and, therefore, can be

considered a dispositional factor (Fage-Butler et al., 2022). Therefore, I anticipate that the purely stable cross-situational factors or traits, such as the NFC, affect how thoroughly a recipient seeks cues on the trustworthiness or even directly scientists' statements, one's disposition to trust a scientist should affect how likely this evaluation will be more likely beneficial. The latter is supported by the idea that trust in science, if seen as an attitude-like state, may facilitate a heuristic (Lewicki & Brinsfield, 2011) or promote a less thorough information processing.

3.2.4 Interim Summary: Boundary Conditions of the Evaluation of Cues to Scientists' Trustworthiness

The objective of this section was to provide an account of the circumstances under which the various cues available to social media users for assessing the trustworthiness of scientists online are processed. To this end, I initially set forth the fundamental assumptions regarding the nature and extent of processing, operating under the assumption of a singular processing route for information, wherein all available cues are of equal value if they are relevant (see unimodel: Kruglanski & Thompson, 1999). Further, I argued that the situational and cross-situational factors would influence this singular route. An example of the situational factors is the recipients' specific motivation (e.g., finding accurate information online), which will be different for every encounter with a scientist online but should always impact the cognitive effort invested in evaluating the available information. Further, I focused on NFC, one's specific propensity to trust a scientist, attitudes, and knowledge of a particular topic as examples of cross-situational factors. Just like situational factors, those should also influence the degree to which recipients seek out information and evaluate it thoroughly and, in consequence, affect how they assess a scientist's trustworthiness.

In conclusion, when individuals evaluate scientists online, they will process the available cues differently in each encounter, i.e., in each situation, under the influence of different (cross-)situational factors, resulting in varying evaluations of trustworthiness. In the lens model context, these factors modify the lens, influencing how the observed cues predict the actual trustworthiness.

3.3 Cues Available to Social Media Users

In examining the perceived trustworthiness of scientists in the context of social media, it is necessary to identify the specific cues available to users and those exclusive to scientists' communication. The premise underlying the examination of these specific cues is that users employ many cues to arrive at a specific conclusion. Here, I propose that the possible manifestation of the available cues is limited to the respective platforms' technical and design characteristics. For example, when initially displaying a message, most common platforms only provide limited information about the source, which is often limited to a profile picture and a user handle. Likewise, other than traditional blogs, primary text-based

social media platforms often only provide a limited number of characters, thus limiting the amount of conveyable information in one post on the message level (Smith, 2015). In the same vein, these platforms also provide additional and contextual cues that are distinct from social media platforms, namely qualitative and quantitative community-based responses (see Lee et al., 2022; Metzger & Flanagin, 2015; Wang et al., 2023). In short, the number of cues available to recipients when assessing trustworthiness and credibility is finite. While the possibility of users independently seeking further information and verifying the content of serendipitously presented sources cannot be discounted, this framework concerns the initial moment before such a step is taken, if it is even taken.

Grounded on these considerations, I will categorise the cues of interest based on two key characteristics. The first characteristic concerns the reference point of the cues available to recipients encountering a scientist on social media. These include cues about the sender (a scientist), the message, and the context. Second, I will differentiate the cues according to whether they represent the unique characteristics of scientists and their communication to better understand how the two types of cues affect perceived trustworthiness. The rationale behind this approach is to examine the extent to which the impression of trustworthiness is coupled with the presence and use of those unique cues. Table 1 illustrates an overview of my proposed categorisation. In the following, I will outline how and why the cues in each category may contribute to the perceived trustworthiness of scientists and the credibility of the information they provide.

Table 1
Classification of Cues

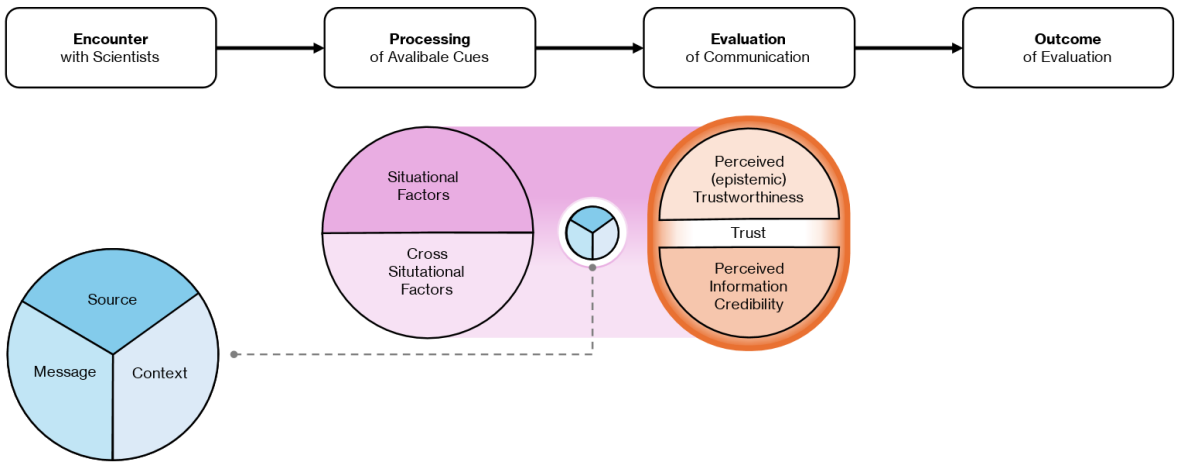
	Distinctive to Scientists' Communication	Not Distinctive to Scientists' Communication
Sender	Academic Title/Affiliation	Gender Familiarity, Reputation
Message	Use of Scientific Evidence Use of Scientific Jargon	Use of Anecdotal Evidence Expression of Opinion
Context	Community-based Endorsement/Rejection	

Figure 5 provides an updated overview of the proposed framework, which visualises the assumptions made by now. My premise is that all available cues to the recipients on social media will be evaluated based on a set of boundary conditions (see Figure 5, pink/purple) outlined in the previous section. These cues available to recipients when

encountering scientists on social media are illustrated in blue tones in Figure 5. As they are processed according to the specified boundary conditions, they are inserted between the second and third steps of the visualisation. Following Figure 3 (see section 2.1.5), the evaluation of trust in the encountered scientists encompasses their perceived trustworthiness and information credibility, visualised in orange in Figure 5. I consider the cues available during encounters with scientists to be external stimuli for a recipient. Therefore, considering the lens model (Brunswik, 1956), these cues are indicators or proxies for the actual trustworthiness of scientists and the credibility of their information.

Figure 5

Overview of the Proposed Framework updated by available Cues, Processing, and Evaluation of Cues



3.3.1 Sender Cues

I define sender-related cues as characteristics and attributes of the information provider that assist the recipients in assessing their trustworthiness and are stable across multiple potential encounters. These include any form of identification visible to the outside recipient who encounters a directly communicating scientist on social media, potentially indicating their status as a trustworthy source of information. Additionally, I differentiate between cues that are (if not misused) distinctive to scientists and those which can apply to any personified information source on social media.

3.3.1.1 Not Distinctive to Scientists' Communication

There are a multitude of sender-related cues, which are non-exclusive direct communication by scientists that recipients can utilise to assess their trustworthiness on a sender-related level. However, I argue that a few cues are decisive for scientists' evaluation as those are linked to a person's expertise, integrity, and benevolence perceptions. Again, those are the impressions a sender needs to create to be perceived as epistemic trustworthy (Hendriks et al., 2015). Concerning the sender-related cues, I will focus on the examples of the scientists' presumed gender, as well as the sender's familiarity and reputation.

3.3.1.1.1 Gender

Gender plays a significant role in the perception of scientists, which can influence their trustworthiness in the recipients' eyes. As previous research indicates, gender stereotypes can affect the perceived quality of scientific work despite the absence of objective differences in the work itself (Knobloch-Westerwick et al., 2013). This underrepresentation of women in science is historically rooted and described in the Matilda Effect (Rossiter, 1993), where women were found to be less cited than men (Knobloch-Westerwick & Glynn, 2013). While the effect of women being underrepresented has been recently replicated in some disciplines (Chatterjee & Werner, 2021; Dworkin et al., 2020), some research suggests no significant gender differences in citations in multiple disciplines (Andersen & Nielsen, 2018). Moreover, research indicates an increase in female-led articles over the last 20 years despite a general underrepresentation (Martínez-Rosales et al., 2021).

Despite the softening of this underrepresentation of women in specific scientific fields, the media coverage, on the dominant contact point with the science of the public (Reif & Guenther, 2021), still underrepresents female scientists or portrays them as less favourable. To elucidate, media reports surrounding the COVID-19 pandemic mostly showed male scientists and experts. This aligns with the prevailing (popular) media representations of scientists as male (Cave et al., 2023; Weingart et al., 2003). In instances where female scientists are featured in the media, their status as experts is less central compared to personal, and thus apparently irrelevant, details (Chimba & Kitzinger, 2010), which causes the reinforcement of stereotypes and broadens differences based on gender (Carli et al., 2016; Kitzinger et al., 2008). Stereotypes correspond to fixed ideas and assumptions about a group or person, just like scientists. It can be seen that scientists (influenced by the media) are often viewed as "smart, hard-working, eccentric, workaholic men" (Tintori & Palomba, 2017).

The extent to which the equation of science with men is deeply entrenched can be observed in studies that ask children to draw scientists. In these studies, children commonly portray scientists as men (e.g., Ferguson & Lezotte, 2020). However, the COVID-19 pandemic seems to have contributed to changing this image. While some children still depict scientists as men, several others – especially girls – showed more diverse science ideas, including drawings of both sexes (Quílez-Cervero et al., 2021). How deeply these

stereotypes are rooted is also evident in adults, who are more likely to attribute the profession of a scientist to pictures of men rather than women (Banchefsky et al., 2016).

Moreover, implicit stereotypes still exist even in a society where it is common for women to be scientists (Miller et al., 2015). These findings underline a mismatch between stereotypes concerning females and science (Carli et al., 2016; Nosek et al., 2007). However, these stereotypes, more specifically the fulfilment of those, determine how a person is evaluated and how one will generally react to said person (Cuddy et al., 2011). As described within the role congruency theory, a mismatch between the role or stereotype assigned to a person based on a social group and the observed characteristics of this person causes a less favourable evaluation (Eagly & Karau, 2002).

Further research suggests a change in this less favourable evaluation of females in science, highlighting no gender differences concerning scientists' trustworthiness (e.g., Reif et al., 2020) or female scientists being evaluated as more beneficial than men (e.g., Kim et al., 2024). For example, a recent study showed that male and female scientists' perceptions of epistemic trustworthy sources do not differ significantly for Twitter users in the US (Kim et al., 2024). The observed gender-based differences in trustworthiness, regardless of being in favour of female or male scientists, indicate that social media users use the anticipated gender of scientists to assess trustworthiness. Additionally, recipients rely on stereotypes and implicit beliefs when assessing unknown persons (Cao & Banaji, 2016), which is important to keep in mind for the evaluation of serendipitously encountered scientists online. As a result, I argue that, although not exclusive to scientists, their gender should influence their trustworthiness assessment since it is rooted in the expectations set towards scientists and their communication.

3.3.1.2 Familiarity

The next cue, linked to evaluating scientists' trustworthiness, is the recipient's familiarity with them. In the context of direct communicators, the influence of familiarity on trust can be primarily explained by two related perspectives: a) recognition and reputation, as well as b) repetition.

3.3.1.2.1 Familiarity through Recognition and Reputation

Familiarity with the sender of a message, and, in this case, a scientist, is critical in trusting them. To elucidate, trusting involves taking a risk (e.g., Bhattacharya et al., 1998). To trust a scientist and accept said risk, a recipient needs to have either the slightest sense of familiarity grounding on prior experience with the scientist or no negative experiences (Alarcon et al., 2016; Luhmann, 1979; Wallace et al., 2003). I argue that familiarity best captures foundation through recognition and the corresponding reputation attached to a sender. For scientists, this familiarity can be established through direct communication via social media channels or their general (media) visibility. Thus, a scientist's familiarity and level of media visibility are inseparably linked to their reputation and the image they create and are portrayed with (see Metzger & Flanagin, 2015). In other words, familiarity enables

recipients to assess the trustworthiness and what to expect from publicly communicating scientists or an entity in general (Lucassen & Schraagen, 2012; McKnight et al., 1998). When speaking about reputation, I refer to the level of societal admiration for a specific person or organisation (Sanz-Menéndez & Cruz-Castro, 2019). Nevertheless, it should be noted that the feeling of familiarity should be established before a conscious recognition of a scientist (see Montoya et al., 2017).

Previous research supports the idea of familiarity benefiting trust with and without acknowledging a source's reputation. For example, Alarcon and colleagues (2016) examined the resolution of moral dilemmas in which participants were required to determine whether to engage in cooperative behaviour. The findings demonstrated that the perceived trustworthiness between the partners increased over time. Further, their findings showed that individuals with whom the participants were more familiar were rated as more trustworthy, which led them to exhibit a greater propensity to engage in cooperative behaviour compared to those with whom they were less familiar. Notably, previous experience was more influential than participants' generic propensity to trust (Alarcon et al., 2016). Similarly, Gefen (2000) tested the effects of familiarity in e-commerce. Here, familiarity is understood as the "*understanding* of *current* actions [...] while trust deals with *beliefs* about the *future* actions […]" (Gefen, 2000, p. 727). In line with Luhmann's (1979) assumptions on trust, the concept of familiarity was shown to be a predictor of trust independent of the propensity to trust. While trust and familiarity differed, both affected the users' behavioural aspects of purchasing (Gefen, 2000). Further, Fan and Lederman (2018) scrutinised how trust in online health communities emerges. In their model of trust formation, they illustrated that familiarity positively affected cognitive and affective trust in the online community members, which in turn led to a higher likelihood of adopting information. Here, they defined familiarity as an insight into others' future actions based on previous encounters. Another investigation on cancer-related posts on Facebook revealed that people put more trust in government and health organisations based on their positive reputation and familiarity (Trivedi et al., 2020). Overall, familiarity with a source determines whether it is trusted (or not) based on (positive) past experiences (Lucassen & Schraagen, 2012).

Familiarity grounded on acknowledging a source's reputation was also identified to serve as a robust heuristic when evaluating the credibility of information. Metzger and Flanagin (2013) argue that this heuristic is either "rooted in more basic heuristic principles of favouring recognised alternatives over less familiar ones" (Metzger & Flanagin, 2013, p. 214) and, thus, the recognition of a source or likelihood of adhering to the source's recognised authority. The evaluation of content based on the positive reputation of a source is a strategy employed irrespective of one's earlier ability to value information. For example, Ou and Ho (2024) showed that both laypersons and experts evaluate the credibility of information on novel food based on the (positive) reputation of the associated academic (and media) organisations and persons such as reputable scientists. However, an objective

evaluation cannot resolve whether a favourable reputation of the source is employed to assess the veracity of information. Instead, it is contingent upon the subjective perception of the source's positive reputation (Flanagin & Metzger, 2011), which in turn can be linked to the perceived competence of an author (Nauroth et al., 2017).

Therefore, I argue that familiarity (through recognition and reputation) can be equated with the positive expectations linked to trust (e.g., Gefen, 2000). In line with this assumption, familiarity should influence a recipient's perceived epistemic trustworthiness in every dimension: expertise, integrity, and benevolence. Bearing in mind the dynamic nature of trust, the impression of integrity and benevolence should develop and diverge over time (Mayer et al., 1995) and strengthen with growing familiarity (Alarcon et al., 2016).

3.3.1.2.2 Familiarity through Repetition

Next to a scientist's recognition and reputation, there is another approach that can be used to demonstrate how familiarity with a source affects the scientist's perceived trustworthiness. This approach refers to the concept of familiarity achieved through repetition, which can also be linked to a scientist's level of media presence. To elucidate, before the conscious recognition of a stimulus, repeated exposure to it may cause a favourable evaluation of a stimulus based on familiarity with a stimulus (Montoya et al., 2017). For instance, recent evidence suggests that repeatedly seen messages and information are perceived as more credible, believable, and trustworthy (Nadarevic et al., 2020; Pennycook et al., 2018; Pennycook & Rand, 2020; Stump et al., 2022), which can be explained, among factors, by the "truth effect". It is one of several well-known phenomena, such as the mere exposure effect, which promises positive outcomes through repetition (Montoya et al., 2017). Nevertheless, it is essential to note that evaluating a claim or message is different from evaluating a person. However, a similar mechanism may explain a comparably favourable outcome based on repetition or multiple exposures.

Regarding the evaluation of persons, Moreland and Beach (1992) tested whether the evaluation of a person increased with repeatedly seeing them. They found that participants in their study rated women as increasingly familiar and attractive (including intelligence, honesty, and sincerity) with increasing exposure. The more often the participants met them in person, the more favourable their overall evaluations were. Notably, despite the beneficial evaluation based on repeated exposure, most participants did not recall any persons explicitly. This circumstance is, according to the authors, an indication of solid exposure effects. A study by Bocian et al. (2018) shows that exposure to a person increases if participants like this repeatedly show the person and that repeated exposure benefits moral judgments. However, while morality, conceptually similar to the dimension of integrity in epistemic trustworthiness, increased alongside exposure, competence ratings did not increase directly. The authors emphasise that the liking effect based on repeated exposures might "overspill" competence ratings but should also be investigated by future research (Bocian et al., 2018). Another examination by Smith and colleagues (2006) further illustrates that repeated exposure influences the application of stereotypes and expectations

set towards a scientist. Two experiments showed that more familiar faces (i.e., repeatedly presented) increase participants' inclination to judge the shown persons based on stereotypes. The authors concluded that familiarity is linked to non-elaborate processing when asked to evaluate a person. This finding highlights that repetition is highly linked to the cognitive process of how repetition influences the recipients' judgments and, as a consequence, their evaluation of trustworthiness. In line with these findings, I argue that repeated exposure to a scientist or science communicator will increase the likelihood of evaluating them beneficially in terms of their epistemic trustworthiness.

In the case of familiarity through repetition, the foundations of this evaluation converge on a common determinant: Processing fluency, which refers to the "subjective *feelings* of difficulty or ease while processing information" (Shulman et al., 2020, p. 581). The premise is that the positive sentiments associated with easy or fluent processing also positively influence the evaluated stimulus and related ones (e.g., Oppenheimer, 2008). For example, authors of texts that are easily read and, thus, more fluently processed are rated as more intelligent (Alter & Oppenheimer, 2009). Similarly, listening to speakers with high (compared to low) audio quality also increases the evaluation of the talk and the speaker's trustworthiness (Newman & Schwarz, 2018). Moreover, fluency perceptions can not only increase the positive effect towards a stimulus. However, they can also amplify and strengthen both positive and negative evaluations through repeated exposure (e.g., Landwehr & Eckmann, 2020).

Overall, I argue that familiarity is a central element in trusting scientists, as it can reduce uncertainty and what to expect from another person. On the one hand, familiarity through recognition and reputation may reflect what one can expect from said scientists based on past impressions or cause a favourable stereotypical impression of them. On the other hand, repetition-based familiarity grounds a different cognitive mechanism. While familiarity through recognition and reputation is based on a conscious process and subsequently attached expectations, familiarity through recognition is based on the unconscious adaptation of fluency as metacognitive cues. Although I argue that both types of familiarity are distinct in their underlying mechanisms, I also want to emphasise that they are highly intertwined as they share the exact cause of multiple exposures. Therefore, making a clear and sharp distinction between the two is impossible, as they are interdependent due to their common cause, mainly since recognition and mere exposure are highly linked (Newell & Shanks, 2007). Their distinction is, nevertheless, necessary to scrutinise the different mechanisms through which familiarity may work and to classify its influences on scientists' perceived trustworthiness.

3.3.1.3 Cues Distinctive to Scientists'

Beyond the cues of gender and familiarity, essential for assessing epistemic trustworthiness but not unique to scientists, two primary indicators distinguish scientists: their academic credentials, such as academic titles and affiliations.

In general, scientists are considered highly trustworthy (see WiD, 2022, 2023, 2024). The high level trust in scientists is also reflected in experimental studies, which demonstrate that scientists are seen as more trustworthy than other professions like V(Hendriks et al., 2023; König & Breves, 2021), religious leaders (Hoogeveen et al., 2022), or laypersons (Lin & Spence, 2018; Thon & Jucks, 2017; Winter & Krämer, 2014).

In the context of this dissertation, I argue that this high level of trustworthiness results from recipients relying on the reputation or authority heuristic as soon as they can identify a scientist as such (Metzger & Flanagin, 2013; Sundar, 2008). This linkage can be traced back to the fact that people have learnt to rely on certain people or groups depending on the situation and to orientate themselves on their knowledge, i.e., their epistemic authority (Kruglanski et al., 2005, 2018). I assume scientists fit the role of orientation figures for knowledge and knowledge gain for (most) recipients. A principal factor contributing to this elevated level of trust and categorisation as epistemic authorities is the considerable expertise accredited to scientists, which is primarily attributed to professional credentials and experience rather than to personal traits like interpersonal warmth or benevolence alone (Bromme et al., 2022; Fiske & Dupree, 2014; Seyd et al., 2024). For example, previous research shows that when senders present their academic credentials alongside detailed background information about their expertise in a specific domain, it significantly enhances their perceived trustworthiness compared to persons with no matching credentials or signs of expertise (Thon & Jucks, 2017). Another study showed that when comparing tweets about health, experts from reputable organisations were consequentially perceived as higher in credibility and trustworthiness than peers or strangers on Twitter (Lin & Spence, 2018).

Other than the cues discussed in the section above, which are universal and can apply to multiple senders on social media, only a few cues are available to identify a sender as a scientist. In other words, distinct cues for scientists can help recipients identify scientists without prior knowledge and familiarity. Previous research has also relied on precise cues to portray a sender as an expert. However, those sender-related cues are limited on social media. Most research focusing on such cues has examined general indicators like displaying a PhD or a diploma (Winter & Krämer, 2014), having an affiliation with a reputable organisation (König & Breves, 2021; Lin & Spence, 2018; Trivedi et al., 2020) or empathising research experiences (Bigham et al., 2019). However, explicit studies isolating and analysing these individual cues are scarce. Existing studies comparing scientists with other information sources often address these cues implicitly rather than focusing directly on them.

I claim that despite those two, there are no other available cues to directly identify a sender as a scientist that do not require some interference and can be available to a social media user when the sender communicates publicly on social media. Following this idea, I argue that for scientists to be perceived as trustworthy, they must be identified as one. Thus, to be perceived as potentially trustworthy scientists, they must refer to at least one of these

cues (reference to title or affiliation), given that the recipient is unfamiliar with them. These indicators should enable recipients to assess the sender, increasing their trustworthiness (e.g., Metzger & Flanagin, 2013). Without a justifying cue, scientists should not be identified as such. They should not be perceived as trustworthy sources when addressing the public. Based on the idea that scientists are generally considered more trustworthy than other sources (e.g., Hendriks et al., 2023; Hoogeveen et al., 2022; König & Breves, 2021) given their high epistemic authority (Haas, 2023), I also argue that cues unique to scientists will be more effective in increasing trustworthiness perceptions than other cues – particularly those cues related to the sender. In this light, it is also essential to recognise that scientists do not possess absolute authority over the concepts of trust or trustworthy information. However, they benefit from the established standards and controls that are integral to the scientific process and the scientific system as a whole (Fage-Butler et al., 2022).

3.3.2 Message Cues

In this section, I will discuss the cues available to social media users to assess the epistemic trustworthiness of directly communicating with scientists concerning the messages. These cues encompass all information conveyed through written (or potentially verbal) communication. Consequently, they may vary in their representation across different contexts, contingent upon the recipient's evaluation. Again, I will differentiate between cues that are unique to scientists and those that are not.

3.3.2.1 Not Distinctive to Scientists' Communication

Concerning message characteristics that are not unique to scientists but should still be influencing the recipients' evaluation on the message level, all bound to the content of the message. For now, I will focus on two examples of these message-related cues: the opinion expressed in a message and the argumentation style.

3.3.2.1.1 Expression of Opinion and Message Valence

The message valance plays a decisive role in the judgements and reactions of the scientists communicating them. With the term message valance, I refer to the interpretation of the position expressed in the message by the recipients. In other words, if the message aligns, or does not align, with the recipients' attitudes.

While I will discuss the specific role of attitudes in the evaluation of scientists' epistemic trustworthiness in an upcoming section, I will now illustrate why the message valence (i.e., the alignment with the recipients' attitudes) is an essential factor in determining the trustworthiness of scientists since it can serve as a heuristic for their evaluation (Metzger & Flanagin, 2013). I assume that the trustworthiness of communicating scientists directly relates to the perception of their messages since the latter is a direct consequence of trust (see section 2.1.5 for more details on the proposed relationship between credibility and trustworthiness). For now, I will illustrate why and how message

valence serves as a crucial cue for recipients in evaluating a scientist's trustworthiness based on confirmation bias and attitude alignment.

To elucidate, attitudes are known to determine the evaluation of the content, such as content aligning with one's attitude will be selected more frequently, i.e., selective exposure, thus resulting in a conformation bias (Knobloch-Westerwick et al., 2020) with attitude-consistent content being evaluated more favourably (e.g., Meppelink et al., 2019; Metzger et al., 2020; Van Strien et al., 2016) and processed more fluently (Frauhammer & Neubaum, 2023). A recipient's willingness to confirm their views and beliefs is so persistent when exposed to scientific or medical matters (Knobloch-Westerwick et al., 2015; Meppelink et al., 2019), and this persists even if the information comes from questionable sources (e.g., Johnson et al., 2020; Wischnewski et al., 2022). Concerning the impact of confirming tendencies, Van Strien et al. (2016) tested the effects of attitude strength on the evaluation of science blogs. Their results show that those blogs containing attitude-consistent content were rated more credible than those with non-consistent content, which was more pronounced for those with stronger attitudes. Edgerly and Vraga (2019) evaluated if familiarity with a source, the presence of a platform-based verification, and the alignment with one's views affected the credibility of a source and its message. Their results revealed that alignment was the most crucial factor for a favourable evaluation. Similarly, Bashkirova and Krpan (2024) showed that psychologists were more likely to trust an AI system and accept its recommendation when it is confirmed rather than questioned their prior diagnosis assessment. In other words, if the participants' opinions were confirmed rather than challenged, they were more willing to trust the source.

Those studies all point to the role of the perceived message valence and, more precisely, the alignment with one's attitude in favourably evaluating a source and related trusting intentions. Therefore, the messages' valence is a crucial cue for the epistemic trustworthiness of scientists online. Although not exclusively unique to the communication of scientists themselves, the use of massage valence and the alignment with the recipients' attitude should "overspill" the evaluation of the scientist as it is closely interlinked with the evaluation of message credibility.

3.3.2.1.2 Argumentation Style: The Use of Anecdotal Evidence

The next message-related cue I will address is the argumentation style, more specifically, the use of anecdotal evidence. Other than scientific evidence (see section 3.3.2.2.1), anecdotal evidence, also known as narrative evidence, does not follow the same rigorous standards and adherence to specific methods to support a claim (Allen & Preiss, 1997; Dahlstrom, 2014). Thus, anyone can use and produce this type of evidence in argumentation, as it does not require applying scientific knowledge or methods. Therefore, it is not (scientifically) validated (Flemming et al., 2017). Nevertheless, anecdotal evidence refers to the subjective reporting of individuals' instances, experiences, or stories (Moore & Stilgoe, 2009; Zebregs et al., 2015). Overall, the fundamental premise of anecdotal evidence is using singular experiences to infer broader conclusions (Dahlstrom, 2014). Previous

research suggests that abstract, stand-alone information is less effective in affecting recipients than stories from supposedly real people talking about their experiences (De Wit et al., 2008). An explanatory approach can be found in exemplification theory, which suggests that recipients conclude one instance or exemplar and extrapolate this to a larger scale. This is attributed to the ease with which anecdotal and narrative information can be processed, which is reinforced by the vividness of the examples (compared to statistics and data; Bigsby et al., 2019; Zillmann, 1999, 2002, 2006).

Further, this vividness can additionally increase processing fluency, making it more likely to persuade recipients (Bullock et al., 2021). I assume that the associated increased processing fluency due to said vividness is used as a metacognitive cue to increase the credibility of scientists' messages on the one hand. On the other hand, it is used equally to assess their trustworthiness. As a result, the argumentation style, in this case, using anecdotal evidence, can be a relevant cue for recipients. The effect of exemplification and narratives also becomes evident when considering how users conclude scientific issues. For example, a study by Hinnant et al. (2016) illustrates the impact of evidence in user comments. The authors argue that comments containing anecdotal evidence cause a greater risk perception of climate change and higher perceived credibility of the article, regardless of the original article's (dis)approval. This example demonstrates that anecdotal evidence not only enhances credibility perceptions in scientific discussions but also increases the credibility of the communicating scientists by facilitating cognitive processing and acting as metacognitive cues.

However, the use of anecdotal evidence by scientists may also be seen as a norm violation since it deviates from the expectation that scientists should communicate "scientific", leading to a potential decrease in trustworthiness (Metzger et al., 2010; Metzger & Flanagin, 2015). Other expectations may include functioning as providers of solid, accurate, and scientific (e.g., Falchetti et al., 2007; Maier et al., 2016), which contradicts the nature of anecdotal evidence. According to Burgoon's (1993, 2015) expectancy violation theory (EVT), recipients will judge a scientist based on a particular set of social norms. A deviation from a norm, or an expectation based on such a norm, draws attention to the scientist and their subsequent evaluation as either positive or negative. For example, Bullock and Hubner (2020) tested the effects of expectancy violations in political campaigns. Not only did informal communication constitute a violation, but it also reduced a political candidate's credibility and support for them. This study demonstrates how expectation breaches affect communicators' assessments. This phenomenon is likely to manifest in a similar manner when evaluating scientists' trustworthiness.

Either way, I argue that social media users will judge scientists' perceived trustworthiness based on their argumentation style. In the case of anecdotal evidence, the vividness and fluency of anecdotes should either be transferred to the perceived trustworthiness of a scientist or decrease a scientist's perceived trustworthiness due to an

expectancy violation. Within the next section, I will also outline the opposite approach, addressing the use of scientific evidence.

3.3.2.2 Distinctive to Scientists' Communication

In this section, I will elaborate on the cues distinctive to scientists' communication. Specifically, I will outline how the argumentation style using scientific evidence can influence scientists' perceived trustworthiness (compared to presenting arguments underlined by anecdotal evidence). In the same vein, I will introduce scientific jargon as a cue unique to scientists and their communication and how it can, just like scientific evidence, influence the perceived epistemic trustworthiness by signalling "scientificness."

3.3.2.2.1 Argumentation Style: The Use of Scientific Evidence

Other than anecdotal or narrative evidence, scientific evidence, in the broadest sense, covers all forms of evidence that represent an approximation of objectivity. It includes all evidence based on a large amount of replicable data and statistics that are thus representative and generalisable (Allen & Preiss, 1997; Flemming et al., 2017; Hoeken, 2001). Whereas anecdotal evidence is used to draw inferences from one situation and generalise them to many cases, scientific evidence describes many cases and deduces them to one subject (Dahlstrom, 2014). Scientific evidence can counter anecdotal evidence because, according to the definition above, it lacks the classical form of narrative and exemplary character. This circumstance may lead recipients to experience reduced processing fluency and, consequently, a reduction in perceptions of trustworthiness.

However, the assumption that scientific evidence has a distinct and potentially beneficial impact from anecdotal evidence again depends on the impression of "scientificness" conveyed by the communication and the style of argumentation adopted. Scientists and their communication may adhere to standards and expectations other than those of journalistic intermediaries, which a large body of research concerning the effects of different evidence types is based on. Because scientists are considered highly trustworthy sources with high epistemic authority (e.g., Haas, 2023), they might be subjects of different and higher standards compared to journalists. Based on the perspective and assumption that scientists must leave a "scientific" impression to be considered trustworthy, avoiding an expectancy violation and the associated negative consequences, scientists' perceived trustworthiness may be enhanced by using scientific evidence (see sections 3.3.2.1.2 and 4.2.3).

In this vein, using scientific evidence might be most beneficial for the perception of a scientist's perceived expertise and integrity by highlighting their ability, but also willingness, to assess and provide complex scientific information first-hand. Therefore, scientific evidence can be used as an essential indicator to assess the trustworthiness of scientists on social media.

3.3.2.2.2 Scientific Jargon

The next message-related cue that is unique to scientists' communication is the use of scientific jargon, which is present in scientists' academic and non-academic writing (Baram-Tsabari et al., 2020; Rakedzon et al., 2017; Wen & Yi, 2023). I argue that, albeit not recommended to use when addressing the public (Bullock et al., 2019; Burns et al., 2003; Goldstein et al., 2020), scientific jargon and the use of technical terms serve as cues for recipients to assess the trustworthiness of a scientist online. The underlying premise is that using a specific language and structure is a critical element in identifying scientific writing (Thomm & Bromme, 2012) and, therefore, can help laypersons identify a scientist as such.

The surrounding literature demonstrates the potential benefits of jargon for scientists' perceived trustworthiness. For instance, Weisberg et al. (2008) examined the effects of different explanations on neuroscientific information. They found that explanations with jargon were more satisfying than explanations in plain language for laypeople. They argued that laypersons without any solid understanding of the matter used jargon to judge the "scientificness" of content, which then caused a favourable evaluation, although its actual quality was rather low. Similarly, referring to science can also increase the credibility of advertisements (Van Mulken & Hornikx, 2011). Information with a science-related background is perceived as more credible than information provided by a corporation (Haas & Unkel, 2017). Another study by Haard et al. (2004) showed that using scientific jargon in advertisements increased the persuasiveness of therapeutic claims, again indicating that trust is applied based on the "scientificness" of content. However, referring to experts and other prolific but vague references did not affect changes in persuasiveness, highlighting that jargon is indeed a key element in evaluating and justifying a source's scientificness. These studies demonstrate how using jargon to refer to science, which I argue is most efficiently implemented by using scientific jargon, benefits a positive evaluation of scientists. This positive evaluation, again (see section 3.3.1.2), grounds the application of expectations and stereotypes about science to the communicator. So, suppose a communicator creates the impression of being a scientist (for example, by speaking like one). In that case, they will more likely create the impression of an epistemically trustworthy source.

Nevertheless, jargon may also have contradictory effects. If jargon reduces the processing fluency of presented information, it could serve as a meta-cognitive cue, causing a decrease in trustworthiness or – at least – providing some contraindication for trusting a communicator. Studies have outlined this potential by showing that the presence of scientific jargon impedes a recipient's processing fluency. In doing so, it caused greater resistance to the presented information, comparatively less support for the claim, and, in the end, reduced credibility (Bullock et al., 2019; Shulman et al., 2021). However, if the motivation to process decreases with the situational importance, then the willingness to overcome the obstacle of lower processing fluency decreases correspondingly (Shulman et al., 2021). Other studies show that jargon indicates "scientificness" and, consequently,

increases the credibility of posts and the perceived trustworthiness of communicators (Jonas et al., 2024; Thomm & Bromme, 2012). Perceived expertise in particular seems to benefit from the use of scientific jargon. For example, Zimmermann and Jucks (2018) showed that while high jargon use increases expertise perceptions, it decreases the perceived integrity and benevolence of experts compared to those who use less jargon in their posts. Hence, it is reasonable to assume that jargon can be perceived as a sign of expertise and scholarship. However, jargon and complex language do not necessarily contribute to rating experts as more proficient (Taddicken et al., 2020).

In general, most previous studies strongly indicate that the use of jargon can enhance the perception of trustworthiness among scientists, as it underscores the "scientific nature" of the content and potentially matches expectations set towards scientists. Consequently, it can be inferred that scientific jargon serves as a crucial indicator for social media users to gauge the epistemic trustworthiness of scientists in an online context.

3.3.3 Context Cues

In this section, I will present an overview of the cues available to recipients to assess the trustworthiness of directly communicating scientists that are based on the distinct features of social media platforms, i.e., context cues. In specific, I will focus on are community-based endorsements and rejections. Since those context cues are specific to social media platforms and to the senders, I do not differentiate between cues unique to scientists and cues not unique to scientists. All cues in this category have the following characteristics in common: They are dynamic and unstable across time as users can actively influence them, and the respective scientists cannot significantly influence them. In this dissertation, I will differentiate between quantitative cues, such as the number of likes or other endorsements regarding a post, and qualitative cues, which refer to comments surrounding a post. The premise of why quantitative and qualitative cues are essential for recipients' evaluation of scientists' epistemic trustworthiness is that recipients include the judgements of others on their own. In this way, recipients can find "truth" in either adapting to the masses' evaluation to save cognitive resources thus, relying on the communal warranting of others (qualitative cues: e.g., Metzger & Flanagin, 2015; Wang et al., 2023), or interfering from one comment to as a testimony of public opinion (Lee et al., 2022).

3.3.3.1 Quantitative Cues

Quantitative cues refer to any metric on a social media platform to indicate the endorsement or appreciation of content generated by the users of a platform. Consequently, these cues provide a numerical representation of others' endorsements. For example, these can be the number of likes or shares. I argue that those quantitative cues may serve as an indicator for recipients to make estimations of scientists' perceived epistemic trustworthiness by signalling general public approval and support (e.g., Sundar, 2008). Based on the assumption that the message's credibility can also be used as an indicator of trustworthiness (see section 2.1.5), I now focus on studies that demonstrate the impact of

quantitative endorsement cues on content evaluation. In this vein, scholars have argued that recipients rely on the so-called endorsement or bandwagon heuristic to judge the credibility of online content (e.g., Metzger & Flanagin, 2013; Sundar, 2008). The presence of quantitative endorsement cues can also alter recipients' likelihood of examining and questioning the content with which they are confronted. In particular, the influence of likes as a form of quantitative cues has become particularly popular in recent years in investigating and identifying false information and fake news. For example, Luo et al. (2022) investigated how social endorsements influence the credibility ratings of science, health, and politics headlines, as well as the likelihood of identifying false and correct content. They found that quantitative endorsement cues increased the credibility assessment of those cues but only for scientific information. This circumstance points to the uniqueness of scientific information as others' endorsement appears to be more influential compared to other topics – presumably due to the inherent complexity of scientific information and the increased need to rely on others to evaluate its reliability and, thus, trust (e.g., Baram-Tsabari & Schejter, 2019; Bromme & Gierth, 2021). Other studies on less complex but not polarised issues also support the notion that a high amount of endorsement cues benefits the evaluation of content, which aligns with the general assumption of the endorsement heuristic (Jin et al., 2023).

While previous research has already shown that endorsement cues can signal social desirability and credibility of messages (e.g., Chen et al., 2022; Shin et al., 2022; Turcotte et al., 2015), it also should be noted that there are a handful of studies showing that quantitative cues exert a small or no influence on credibility perceptions. Further, the effect of quantitative cues often varies depending on different situational factors, such as the discussed topic (see Wang et al., 2023 for meta-analysis). This is specifically evident when topics with a cooperative high potential for strong prior options are examined, such as politics or health (e.g., Borah & Xiao, 2018; Luo et al., 2022; Winter et al., 2015). Based on the research presented so far, I assume that quantitative evidence plays a vital role in assessing the epistemic trustworthiness of scientists on social media. They provide an accessible representation of public approval. Thus, they should be considered by recipients to assess the trustworthiness of scientists on social media.

3.3.3.2 Qualitative Cues

Other than quantitative cues, qualitative cues, such as user comments, are textual representations of expressing user feedback at the content level. Qualitative cues have a higher information content as they can transport insights to the creator's thoughts, impressions of something, and, ultimately, the rejection or approval of the original content.

As with anecdotal evidence, qualitative comments can illustrate the beliefs of others. However, one of the key distinctions is that users employ comments to obtain a categorisation of public opinion (Eilders & Porten-Cheé, 2022; Lee, 2012; Winter & Krämer, 2016; Zerback & Fawzi, 2017), which is not anticipated in this format with anecdotal evidence as a message-related cue. The substantial influence of qualitative cues is

evident in previous research, which suggests a more substantial impact on the recipients than quantitative cues. Jucks and Thon (2017) tested whether expert or social validation regarding online health information is perceived as more trustworthy. Their results showed that both quality and quantity cues affected a sender's trustworthiness and source credibility. However, qualitative cues slightly overshadowed the quantitative cues in terms of the benevolence and integrity of the information sources. In another study, Lee et al. (2022) compared qualitative and quantitative cues. They found that qualitative ones have been shown to exert more potent effects on recipients' attitudes towards genetically modified food, as it was perceived to align with public opinion.

Beyond appearing more influential than quantitative cues, qualitative cues such as comments can also transport a higher information value than simple (missing) endorsement or rejection. Here, research on negativity and incivility stands out and underlines the effects comments can have on the perceived trustworthiness of online scientists' communication. Anderson et al. (2014) showed that uncivil comments lead to higher risk perception for those with lower support for the discussed technology. The scholars argued that readers judge the content based on their prior attitude toward the topic while utilising the comments' valence to form their risk assessment. The assumption of the negative emotional valence of the uncivil discussions' comment section is also shown in further research. For example, uncivil comments cause a lower perceived quality of news articles (Prochazka et al., 2018) and more significant bias in an initial post (Anderson et al., 2018). Comments that criticise the content of an article lead users to perceive it as less credible than those with comments that support its claims (Naab et al., 2020). Specifically, negative comments can have detrimental effects as they can reduce the content's credibility (Waddell, 2020), increase the perceived bias (Anderson et al., 2018), and make them less convincing. In contrast, positive comments appear to exert no such effects (Winter et al., 2015). When turning towards the perceived epistemic trustworthiness of scientists, Gierth and Bromme (2020) examined how comments critiquing the scientists' communicated research in multiple ways affected recipients' evaluation of them. The study revealed that recipients' assessment of the scientists was reduced to align with the critical comments.

In conclusion, both quantitative and qualitative cues can serve as crucial community-based reference points that have the potential to shape the perceived epistemic trustworthiness of scientists on social media. While quantitative cues, such as likes, provide a numerical measure of endorsement, qualitative cues, such as comments, offer qualitative insights.

3.3.4 Interim Summary: Assessing Epistemic Trustworthiness from the Available Cues

This section aimed to identify the cues available to recipients when assessing the perceived trustworthiness of scientists engaging with the public via social media. As outlined in Table 1, I have categorised these cues into sender-related, message-related, and context-related. Further, these cues can be unique or not unique to scientists as well as their

communication, and they may vary in their stability across multiple encounters. Despite differing points of reference, certain commonalities emerge regarding the mechanisms by which these cues operate. These mechanisms are based on publicly established norms, images, stereotypes, and the expectations associated with scientists, as well as whether these expectations are met or unmet (see EVT). These norms and expectations are closely tied to identifying specific characteristics of "scientificness" and their heuristic representation. Additionally, these cues share the potential for enhanced evaluation through increased processing fluency. It is important to note that interaction effects between these cues are likely, as they will not appear or be evaluated in isolation (e.g., Sundar, 2008; Sundar et al., 2019). I will explore specific examples of these interactions within the theoretical sections of the empirical contributions.

In line with the IMOT (Mayer et al., 1995) to the cues available to recipients for evaluating scientists' epistemic trustworthiness online, I conclude that despite the diversity of cues and their mechanisms of influence, all cues impact the sub-dimensions of the perceived epistemic trustworthiness – namely, expertise, integrity, and benevolence – as they are all equally relevant for forming the impression of a scientist worth trusting (Hendriks et al., 2015; Mayer et al., 1995). Against this background, the extent to which epistemic trustworthiness is attributed to a source is contingent upon its evaluation by the recipient, who must rely on various strategies, such as heuristics, to legitimate the trust itself (Origgi, 2012). From the perspective of the lens model (Brunswik, 1956), recipients who encounter scientists on social media and are presented with a situation in which they evaluate the epistemic trustworthiness of the scientist in question will form their impression based on the available cues, which will, in turn, inform their respective interpretation of the scientist's level of expertise, integrity, and benevolence. The interpretations presented herein are contingent upon how the cues are processed, which I will discuss in the next section.

3.4 Repercussions and Implications of Scientists' Perceived Trustworthiness

Having provided an overview of the cues that can be used to assess the perceived trustworthiness of scientists communicating directly in social media (see section 3.3), the way and the circumstances under which these indicators are assessed (see section 3.2), this section will examine the implications and associated consequences of the perceived trustworthiness for scientists on social media. At the centre of this consideration is the question of how trust in scientists increases their credibility and shapes recipients' (subjective) knowledge and attitudes.

As I stated in the beginning (see section 2.1.5), I argue that the perceived information credibility and the perceived trustworthiness of a scientist online are highly related concepts, each having the potential to influence the other. While trust and perceived trustworthiness relate to an at least situational relationship with a scientist where the

recipient is dependent on the factual correctness of the information they provide (Bromme & Gierth, 2021; Origgi, 2012), credibility pertains to the believability of the message itself (Metzger et al., 2003; Tseng & Fogg, 1999). Thus, the perceived credibility of information and the message is critical for assessing the trust placed in a scientist, as it reflects the recipient's belief about a scientist's perceived ability to convey believable information and their subsequent willingness to accept the vulnerability of believing their information (e.g., Wilholt, 2013). Therefore, I see credibility as an intermediate consequence of trust in the source of information on a conceptual level, which is nevertheless tied to evaluating the scientists' communication in general. In this vein, I also argue that credibility is a repercussion of trust in a scientist, which builds the foundation for further implication. In the following two sections, I will elaborate on those.

3.4.1 Updates as Implications

Each interaction and evaluation of a scientist's communication is not an isolated event, but rather a continuous process that continuously updates perceptions about the scientists' trustworthiness, including their expertise, integrity, and benevolence. This process serves as the foundation for subsequent situations that require trust (Mayer et al., 1995; Schoorman et al., 2007). Thus, encounters refine the beliefs about a scientist. I argue that these cognitive updates based on the encounters with science are not only reflected in the updated beliefs about science communicators online (e.g., Dietz, 2011; Six & Latusek, 2023), which is highly linked to their perceived familiarity (see section 3.3.1.2), but also with updates of their domain-specific knowledge and potentially their attitudes on the discussed issues.

As previously discussed, the classical dual-process models of persuasion (HSM & ELM; see section 3.2) and the unimodel (Kruglanski & Thompson, 1999) suggest that individuals update or form their attitudes following a thorough or superficial processing of the available cues. The same should hold for a) the expectation, or belief, that the outcome of a trusting situation with a directly communicating scientist online will be positive and b) a recipient's (subjective) knowledge, which potentially operates in similar manners as subjective knowledge, can be considered an attitude-like structure (see Kruglanski, 1990). At this point, I would like to stress once again that the perceived credibility of the information and the scientists' trustworthiness are the pivotal points from which the positive updates proceed. Further, I want to emphasise the parallelism between the attitude change according to those models and the perceived trustworthiness of directly communicating with scientists and the credibility of their information. Both can be referred to as the expectation or belief that the outcome of a trusting situation with a directly communicating scientist online will be positive. The latter concerns the attitude towards the communicated content, that is, what the scientist says. As indicated in section 3.1.1, encounters with scientists in social media can directly impact recipients' impressions of scientific topics and knowledge (e.g., Anderson et al., 2021; Light et al, 2022; Meier, 2024).

Overall, each encounter with a scientist online should cause a looping update in which trust (but also distrust) in the scientist is established (Dietz, 2011; Six & Latusek, 2023), as well as attitudes are formed or strengthened depending on the relevance and depth of processing the available cue (Kruglanski, 1990; Kruglanski & Thompson, 1999). In short, every encounter with a scientist online should affect the recipients' cognitions, at least to a certain extent.

3.4.2 Actions as Consequences

The trust placed in scientists should not only affect cognition; it should also be reflected in recipients' actions. To explain, within the IMOT, Mayer and colleagues (1995) argue that the perceived trustworthiness of a trustee will increase one's likelihood of taking risks in a relationship, which goes beyond one's willingness to be susceptible to someone else, or, in other words, to trust someone. In this case of trust in science and scientists, this acceptance of vulnerability is mainly considered as the willingness to trust the information scientists provide (e.g., Hendriks et al., 2016; Wilholt, 2013). However, to fully exert trust, one must also engage in trusting behaviours and act upon said risk (Mayer et al., 1995). For this reason, the actions a social media user is willing to take based on the perceived level of a scientist's trustworthiness need to be considered. The interplay between perceived credibility, trustworthiness, and cognitive updates is central to understanding how recipients interact with scientific content online. Moving from cognitive processes to observable actions, it is essential to consider how trust manifests in specific behaviours that reinforce the credibility and influence of scientists on social media.

Previous research shows that trust in science, and thus the potential (epistemic) trustworthiness, is linked to a multitude of actions, or at least behavioural intentions (see Colquitt et al., 2007). For instance, trust in science is linked to behaviour following scientific recommendations on more significant societal issues, such as the acceptance of and adherence to protective measures during the COVID-19 pandemic (Bicchieri et al., 2021; Dohle et al., 2020; Hromatko et al., 2021; Plohl & Musil, 2021) or the acceptance of anthropogenic climate change along with engaging in climate-friendly behaviours (Bogert et al., 2024; Cologna & Siegrist, 2020).

Despite the engagement in behaviours reflecting trust in science and scientists on a socio-scientific level, I argue that the connection between behaviours that reflect trust in scientists can also be more direct, on a lower level of effort, and bounded to the affordances of social media. I assume that in the context of direct communication with scientists on social media, participation in online dialogue indicates trust in science. This assumption is supported by research findings, which suggest that people engage with social media content that they find credible, as well as with sources that they trust. For instance, if the content is seen as accurate, those messages are more likely to be shared on social media (e.g., Pennycook et al., 2020; Yaqub et al., 2020), just as content from highly reputable and trustworthy sources (Xu et al., 2018).

Furthermore, I argue that engaging in public discourse on social media with a higher level of involvement, such as sharing or commenting, and, thus, actively shaping the dialogue (Taddicken & Krämer, 2021) reflects a trust-indicating behaviour by making oneself susceptible to others' (negative) feedback online. Recipients who publicly engage with scientists may face the uncertainty of being rejected or attracting on a social level by either the scientists they address on social media, by their peers, or by strangers. The fear of being rejected or attacked online can cause recipients to stay silent online rather than be vocal and visible (Neubaum & Krämer, 2018). Secondly, the act of publicly sharing or commenting on content demonstrates a willingness to align oneself with and self-presentation (Johnson & Ranzini, 2018; Swani & Labrecque, 2020), just like to potentially impress others (Khan, 2017; Lee & Ma, 2012), which also implies a high level of trust in the source as, again, it may backfire.

By participating in a dialogue with a directly communicating scientist online, recipients alter and shape the environment in which others perceive the communication by said scientist. For example, influencing perceptions through comments (see the nasty effect: Anderson et al., 2014) can substantially impact other recipients' further evaluation of a communicator's messages and perceived trustworthiness. Thus, engaging with a scientist on social media indicates trust and, in addition, potentially affects how other users encounter a scientist's online communication. Thereby, it creates a feedback loop.

3.4.3 Interim Summary: Consequences and Implications of Trust in and Perceived Trustworthiness of Scientists

In summary, each encounter with any form or shape of a directly communicating scientist on social media influences the image of science in society by giving individual users reasons to build positive or negative expectations towards science and its representations. The trust placed in scientists based on their perceived trustworthiness and the perceived credibility of their information influences the outcome of an evaluation. I argue that the evaluative outcome of each encounter with a scientist online primarily affects the cognitive domain by updating (subjective) knowledge and attitudes (regarding a discussed topic and the beliefs about the communicating scientist) and the behavioural domain. Here, the consequence of a scientist's perceived trustworthiness is taking specific actions and, thus, accepting a vulnerability. In the next section, I will summarise the complete framework.

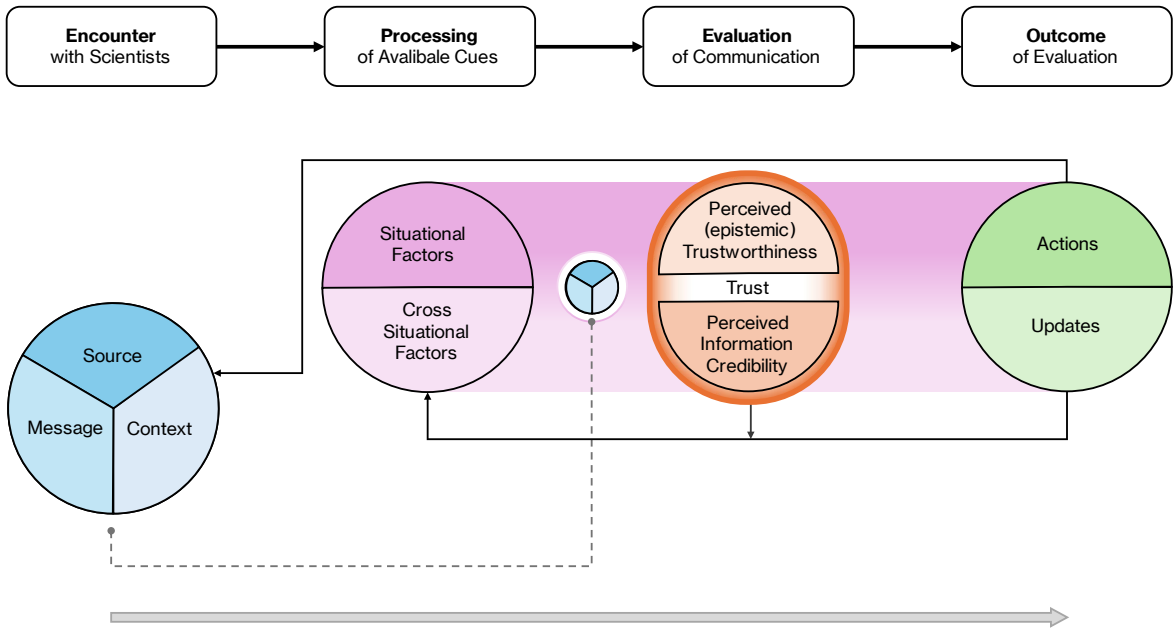
3.5 Summary & Overview: Description of Proposed Framework

This section briefly outlines the proposed framework within which scientists perceive (epistemic) trustworthiness to arise when directly addressing the public via social media. I have divided this process into four stages as follows: 1) encounters with scientists and exposure to cues; 2) the associated boundary conditions of evaluation; 3) the individual mechanisms of subsequent evaluation of these cues leading to an evaluation of the

communication by perceiving scientists as a trustworthy source; and 4) the consequences of this evaluation (see Figure 6 for the final overview of the proposed framework, including the outcomes of the evaluation). Before outlining the empirical approach to assess this framework and other subordinate questions in the following section, I will describe my framework's final cornerstones and assumptions of situational epistemic trustworthiness of directly communicating scientists.

Figure 6

Final Overview of the Proposed Framework



Each encounter with scientists on social media represents an opportunity to foster trust in scientists (see Huber et al., 2019; Reif & Guenther, 2021). Users can gain personal insights and assess the perceived trustworthiness of scientists, which can contribute to developing a positive perception of scientists and their work (see Collins et al., 2016; Jarreau et al., 2019). In light of the pervasive spread of misinformation on social media (e.g., Suarez-Lledo & Alvarez-Galvez, 2021; Wang et al., 2019; Yang et al., 2021), users are challenged to identify reliable sources of information and distinguish between those who disseminate such sources and those who do not (Baram-Tsabari & Schejter, 2019; Bromme & Gierth, 2021; Weingart & Guenther, 2016). However, the cues available to social media users for directly verifying the source and confirming the veracity of information are frequently constrained by the specific characteristics of the platform (see Smith, 2015). At

the same time, these platforms provide additional community-based information, which can alter the perception of information (e.g., Anderson et al., 2014; Luo et al., 2022; Wang et al., 2023).

To gain insight into the processes through which recipients determine the perceived trustworthiness of scientists, as well as the potential effects and consequences that go along with this evaluation, it is essential to comprehend the mechanisms by which information is processed on social media and the criteria upon which judgments are based. To conceptualise this situation, I propose that every encounter with a scientist online is unique to the degree that recipients are faced with the decision that the scientist in question is trustworthy and will provide credible information.

In this sense, I assume that processing the available cues resulting from the encounters and linked to the respective platform takes a singular processing route (see unimodel: Kruglanski et al., 2006; Kruglanski & Thompson, 1999). Under this premise, all cues should be equally capable of influencing the perception of a scientist and their scientist's communication. Further, the cues should function as indicators, or evidence, of a scientist's actual trustworthiness (see lens model: Brunswik, 1956; Wolf, 2005 and lay epistemic theory: Kruglanski, 1990; Kruglanski et al., 2018). This evaluation is subject to different boundary conditions, which influence the process by which the cues lead to a particular impression. Specifically, I distinguish between situational and cross-situational factors. The cross-situational factors are flexible, state-like influences, such as the individuals' motivation at the time of the encounter (see section 3.2.3). In contrast, I expect situational factors to always influence the scientists' evaluation and subsequent beliefs in the same way across potentially multiple encounters. These include the need for cognition, attitudes toward a particular topic being discussed, or even the scientists themselves (see section 3.2.2). In line with the unimodel, I argue that combining all these factors determines the weight with which the cues present in an encounter are evaluated and how deeply the corresponding processing can be and is. The fundamental theoretical assumption here is that more thorough processing leads to a more lasting and stronger influence that is strongly anchored in the subsequent course of events than only superficially processed information (e.g., Chaiken, 1980; Kruglanski & Thompson, 1999; Petty & Cacioppo, 1986).

In light of the premises mentioned above, I posit that the cues unique to scientists and their communication have a powerful influence on trustworthiness ratings. However, more generic cues, which are a fixed and integral part of any source evaluation on social media, should also influence the perceived trustworthiness of scientists and the credibility of their messages. To categorise these cues systematically, I have divided them into three distinct levels of reference: sender, message, and context. While sender cues remain constant across multiple encounters, message and context cues may differ and change from encounter to encounter. This circumstance raises the question of which cues are particularly effective in assessing the trustworthiness of directly communicating scientists (see section 3.3).

It is also important to note that each cue has the potential to influence trustworthiness perceptions and information credibility assessments in different ways. However, I assume that norms, stereotypes, and expectations associated with the scientific community, or the perception of what it means to be "scientific," are significant factors in this process (see section 3.3.4). In particular, all cues should be capable of simultaneously influencing the three sub-dimensions of the perceived epistemic trustworthiness (expertise, integrity and benevolence) since they are equally relevant to the trustworthiness (Colquitt et al., 2007; Hendriks et al., 2015; Mayer et al., 1995).

Depending on the impression of trustworthiness that these cues convey, situational encounters with scientists should impact the recipients' cognitions, such as knowledge (e.g., Anderson et al., 2021; Meier, 2024). Thus, based on the evaluation of trustworthiness, encounters with scientists should lead to a reinforcement or change in attitudes towards a topic, the respective scientist, and even science itself. This is based on the premise that general trust in science is a multidimensional dimension that influences each other (Reif & Guenther, 2021). In addition to cognitive updates, I assume that a scientist's perception is also reflected in the credibility of their information, as well as potentially in actions that indicate trust. I suppose these are mainly related to public online engagement on social media and the direct communication of scientists (see section 3.4.3). For each encounter with a scientist communicating directly online, I expect this process to be the same and shape trustworthiness perceptions over time (e.g., Mayer et al., 1995).

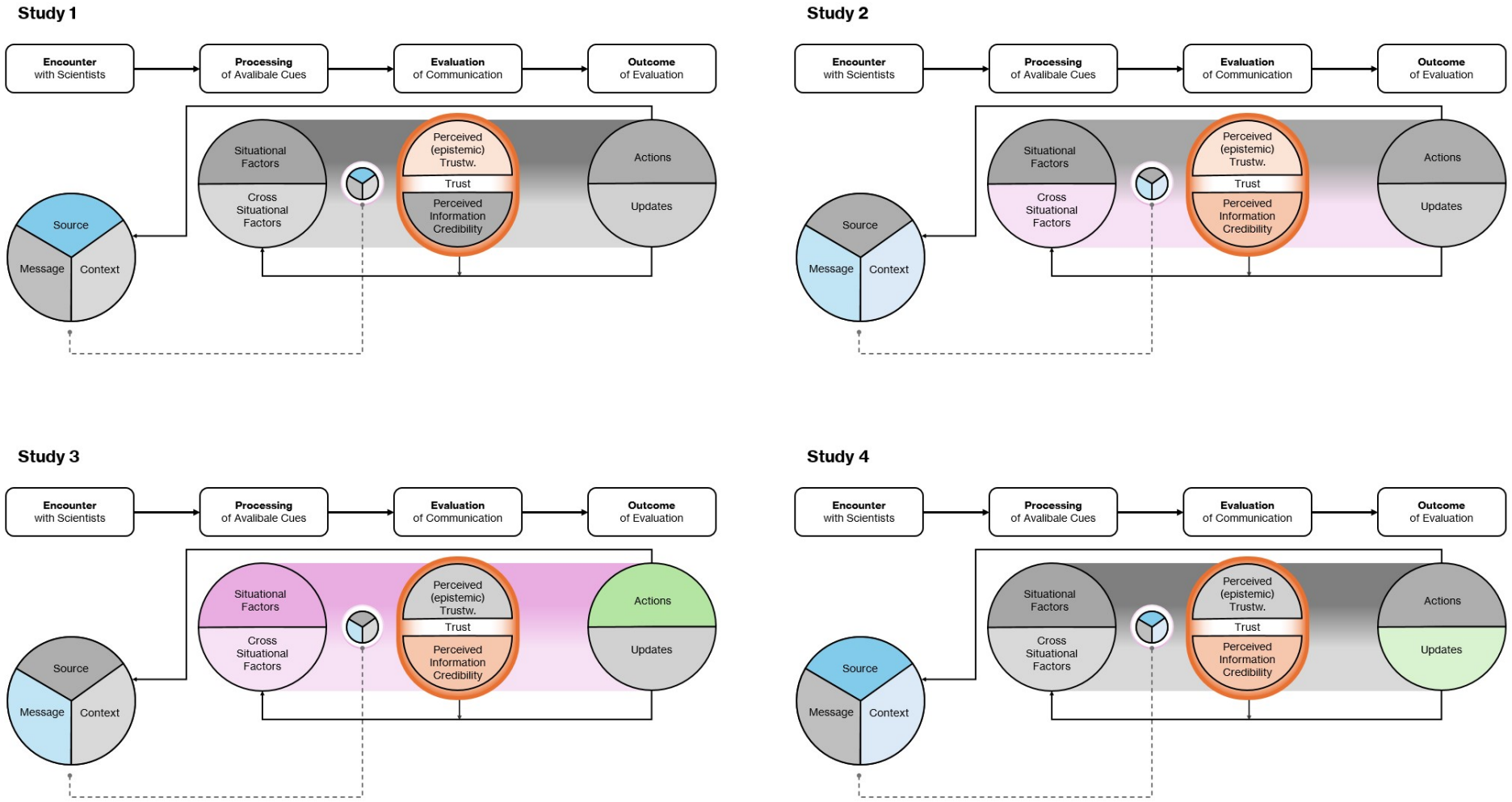
Chapter 4. Empirical Approach

In this section, I will examine scientists' perceived trustworthiness and the credibility of their messages within my proposed framework by presenting four experimental studies. All four experimental studies concern science communication on social media, yet three concentrate on directly communicating with scientists. The fourth study will be used to extend the framework's validity for non-personified science communication. Figure 7 provides an overview of the scrutinised elements, which describe the relations between a) the cues available to users on the sender, message, and context level, b) the situational and cross-situational boundary conditions, and c) the assumed outcomes for each experimental study.

I will outline the individual contributions and their relationship to the conceptual framework for each study. Then, I will provide additional literature tailored to the specific study's context, outline the methodological approach along with the results, and discuss them within the experimental setup. Afterwards, I will discuss each study's results in the context of the proposed framework and introduce linkages to the other experimental studies presented in this dissertation.

Figure 7

Overview of Experimental Studies



4.1 Experimental Study 1: Examining the Impact of Visibility in Media (i.e. Familiarity), Gender, and Academic Title on Scientists' Perceived Trustworthiness

In the first empirical study, I will outline the role of sender-related cues for scientists who directly address the public. Thus, I will address how senders, or sources, are identified as scientists and how cues unique to a scientist interfere with cues not unique to them. Regarding cues that are not distinctive to scientists, I will focus on perceived familiarity based on a scientist's previous visibility in the media and their gender. For the cues unique to scientists, I will focus on the presence of an academic title, which may help recipients identify scientists as such. In this vein, I will examine the interaction effects of both cues to gain more insight into the relations between these cues.

The central issue is to what extent the familiarity with the scientists (irrespective of the underlying mechanism, see section 3.3.1.2) influences the incorporation of specific cues (such as a presumed "scientificness" based on vague academic qualifications) in the evaluation of a scientist's perceived trustworthiness. In other words, do recipients rely on their assessment of an individual, or do they rely more on superficial and generic cues? If the latter is evident, are cues unique to scientists more influential than cues not distinct to scientists?

4.1.1 Familiarity

As discussed in the section on familiarity, I argue that perceived familiarity of a scientist, either via repetition or via recognition and reputation, influences their perceived trustworthiness when they address the public on social media. Both familiarity via recognition and reputation, as well as repetition, can evolve through visibility in media. In the German media, several scientists were remarkably visible during the COVID-19 pandemic, appearing on talk shows, podcasts, and news reports. While some scientists were consulted as experts by the media (Leidecker-Sandmann et al., 2022), others communicated directly with the public using social media or used both channels of communication (see Szczuka et al., 2024). Interestingly, those with higher visibility in the media were even met with a "personality cult" and reached a celebrity-like status as a side effect of the pandemic (Joubert et al., 2023; Wormer, 2020). In short, I assume that this high visibility in the media increases recipients' trust in those scientists, given that familiarity with another person is argued to form the basis of what can be expected from that person (Luhmann, 1979). It is mandatory for trusting scientists, as trust is closely linked to the vulnerability of accepting false information (e.g., Hendriks et al., 2016). This perceived familiarity, which should be established through high media visibility, should shape a recipient's impression of a scientist with each encounter online because they may (unconsciously) prefer a familiar scientist over an unfamiliar one (Metzger & Flanagin, 2013; see section 3.3.1.2 for further information on the rationale).

Therefore, it can be expected that the previous visibility in media increases the perception of scientists' epistemic trustworthiness. Visibility, public reputation, and the (repeated) selection as an expert in public media should enhance perceived expertise, integrity, and benevolence. Consequently, a high level of visibility for a sender should lead to a higher level of trust and a more favourable impression. From this, the following hypothesis can be derived:

H1: A highly visible sender will be rated as more epistemically trustworthy than a non-visible sender.

4.1.2 Scientists' Gender

While various scientists were present in the media during the COVID-19 pandemic, the majority were male, which is broadly consistent with the predominant portrayal of science and scientists as male in (popular) media in the past (Cave et al., 2023; Weingart et al., 2003). If female scientists are presented in the media, the focus often lies on personal details rather than their status as experts (Chimba & Kitzinger, 2010). This image in the media may reinforce the stereotypes about scientists that females do not appear to conform to (Carli et al., 2016). As discussed in section 3.3.1.1, the potential (mis-)match between being a scientist and presenting as a female might also affect their perceived trustworthiness.

This notion is supported by research on the public perception of scientists who communicate directly with their audience, which indicates a negative attitude towards women in science. For example, comments on the YouTube videos of female STEM science communicators contained more criticism than on videos by men. These comments were generally more negative. Moreover, TED talks given by men were rated more favourably than those given by women (Rosenbusch et al., 2021). Further, research on the comparative perceived trustworthiness of men and women is limited, especially regarding science communication. While some studies suggest that males are perceived as more credible than females in general (Armstrong & McAdams, 2009; Flanagin & Metzger, 2003), recent studies have produced conflicting results in terms of the credibility assessment of online news commenters, with commenters with female names rated as higher in source credibility than those with male names (Bhandari et al., 2021) and scientists posting selfies, especially women, being evaluated as warmer and more trustworthy (Jarreau et al., 2019). It has been reported that female scientists are perceived as more credible, indicating a shift in stereotypical gender roles within the scientific community (Bigham et al., 2019; Jarreau et al., 2019), and this shift may have been reinforced by the presence of female scientists in the media during the COVID-19 pandemic. Due to the limited number of studies on the epistemic trustworthiness of male and female scientists and the limited sample sizes, the following question is open to testing:

RQ1: Does a sender's gender influence their perceived epistemic trustworthiness?

4.1.3 Academic Title

Highlighting a sender's expertise is crucial in promoting trust. As discussed in the section addressing the sender-related cue, laypersons can use an academic title or references indicating a scientific affiliation to build trust. Indeed, presenting one's credentials has been shown to increase the perceived trustworthiness of senders when combined with background information about their domain-specific expertise (Thon & Jucks, 2017). Expertise can be conveyed through various means, such as training in a specific domain (Winter & Krämer, 2014), organisational reputation (e.g., Lin & Spence, 2018), or highlighting research experience (Bigham et al., 2019). This raises the question of whether completed academic training alone is sufficient for a recipient to judge a sender as trustworthy or whether additional background information, such as a reputable affiliation or other instances of clearly labelled expertise, is necessary. An academic title alone does not necessarily indicate domain-specific expertise or provide information about the sender's integrity or benevolence. However, scientists are generally considered to be trustworthy, particularly in light of the COVID-19 pandemic (WiD, 2020, 2023), and this overall high level of trust seems to exists despite possible scepticism about scientists' work (Hendriks et al., 2016). As stated above, trust in the sender depends on their perceived level of expertise, integrity, and benevolence. Therefore, it needs to be investigated whether indicating one's scientific expertise by presenting an academic title also implies benevolence towards society and high integrity. Accordingly, it can be hypothesised that:

H2: A sender with an academic title will be rated as more epistemically trustworthy than a sender without an academic title.

4.1.4 Combination of Visibility, Gender, and Academic Title

When evaluating whom to trust, various cues can guide one's judgment (Kruglanski & Thompson, 1999). Therefore, these cues do not appear in separation and cannot be considered independently. Since media depictions of female scientists are less likely to emphasise their status as experts (Chimba & Kitzinger, 2010), it can be expected that an interaction between a scientist's gender and the presence of an academic title will be a cue for expertise. Moreover, it can be assumed that recipients aim to conserve cognitive resources during processing (Kruglanski & Thompson, 1999), meaning that familiarity might influence their evaluation by potentially increasing the likelihood of relying on stereotypes or previous encounters to evaluate the sender's epistemic trustworthiness (Garcia-Marques & Mackie, 2007; Smith et al., 2006). For example, an academic title indicating an academic profession may reinforce gender stereotypes, leading to a more favourable evaluation of male (compared to female) scientists, or vice versa. A similar phenomenon was observed in a study by Nadler et al. (2013), in which students rated familiar male professors as more competent than familiar female professors. However, the study also found that unfamiliar female professors were rated more competent than

unfamiliar male professors, indicating that familiarity may contribute to a negative bias towards women in science and the application of corresponding stereotypes.

In addition to gender stereotypes, stereotyped evaluations of a sender may also be triggered by academic titles, media visibility, and familiarity. Therefore, this study aims to determine the essential factors for communicating science and building trust with the audience. Specifically, the bidirectional interactions that these cues elicit are of interest here. The need to better understand the impact of familiarity on the evaluation of scientists and how familiarity is related to media-generated images of female scientists leads to the following research question:

RQ2: How do a sender's gender, visibility in media, and the presence of an academic title interact in terms of epistemic trustworthiness?

4.1.5 Methods

To test the hypotheses and address the research questions, I conducted an online study with a 2 (academic title: visible, not visible; between-subjects) x 2 (gender: female, male; within-subjects) x 2 (media visibility: yes, no; within-subjects) mixed-subjects design. The stimulus material, additional information on the measures, sampling rationale, and statistical analysis can be accessed here: https://osf.io/hq7w8/?view_only=ac8b8b81fa19432eaf20558052d14d0b

4.1.5.1 Sample

A total of 384 complete datasets were collected in August 2022 using the German panel provider Respondi. A balanced sample was chosen, with an even gender distribution of German participants aged 18 years or older. Participants who failed to correctly answer the instructed response items (n = 55), those who indicated that they did not complete the survey attentively, meaning that their data were not trustworthy (n = 8), and those who diverged strongly in terms of completion time (n = 12) were excluded for the analysis. Thus, a total of 306 datasets were included in the analysis. Of these 306 participants, 156 identified as female and 150 identified as male, and the average age was 43.28 years (SD = 13.47). Concerning educational level, 18% had a Bachelor's degree as their highest educational attainment, 23% had a Master's or equivalent degree, 26% had university entrance-level qualifications, 24% had an intermediate school-leaving certificate, and 9% had a lower-secondary school-leaving certificate.

4.1.5.2 Measures and Materials

4.1.5.2.1 Epistemic Trustworthiness

The senders' perceived trustworthiness was measured using the *Muenster Epistemic Trustworthiness Inventory (METI)* (Hendricks et al., 2015). The METI consists of the three subscales expertise (six items, e.g., "intelligent – unintelligent"), M = 5.26, SD = 1.05, Cronbach's α = .968, integrity (four items, e.g., "fair – unfair"), M = 5.00, SD = 1.41, Cronbach's α = .948, and benevolence (four items, e.g., "moral – immoral"), M = 4.70, SD

= 1.06, Cronbach's α = .943. Items are rated on a semantic differential scale ranging from 1 to 7.

4.1.5.2.2 Familiarity through Media Exposure

In addition to manipulating the presentation of pretested (non-)visible scientists (see 'Stimulus Material' for more details), familiarity through media exposure was measured using eight self-developed items (shown in Table 2), which were rated on a Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree". On average, senders who were previously classified as visible, *M* = 3.70, *SD* = 1.48, Cronbach's α = .942, were rated as higher in familiarity than those classified as non-visible, *M* = 1.54, *SD* = 0.88, Cronbach's α = .927.

4.1.5.2.3 Valence of Perceived Media Coverage

Participants rated how often they had previously seen positive or negative media coverage of the senders on a scale ranging from 0 = "never" to 6 = "exclusively". The majority reported having seen neither positive (63%) nor negative (69%) media coverage of the senders. Furthermore, 19% reported having seen positive media coverage "rarely" or "sometimes", and 24% reported having seen negative media coverage "rarely" or "sometimes". Only a minority of the participants reported having seen positive media coverage (18%) and negative media coverage (7%) "often" to "exclusively".

4.1.5.2.4 Information Credibility

To determine whether the assessment of trust was influenced by the content of the presented messages or by the communicating scientists, I measured the credibility of the messages separately. Therefore, participants were asked whether they perceived the posts' content as believable, factual, credible, and trustworthy on a Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree". On average, the messages presented by the scientists were perceived as relatively credible, *M* = 4.54, *SD* = 1.19, Cronbach's α = .974.

4.1.5.2.5 General Trust in Scientists

McCright et al.'s (2013) General Trust in Scientists Index was used to control for participants' general disposition to trust science when assessing their responses. For this purpose, participants rated four items on a bipolar scale ranging from 1 = "completely distrust" to 6 = "completely trust", *M* = 4.44, *SD* = 1.14, Cronbach's α = .920. For instance, participants were asked whether they trusted scientists, in general, to "advise government officials on policy."

4.1.5.2.6 COVID-19-Related Measures

As this study's material deals with COVID-19 and presents visible scientists, it is crucial to gain an understanding of participants' attitudes towards the virus and the corresponding pandemic, more precisely, whether participants doubted the (scientific) consensus regarding COVID-19 itself. Thus, four items were added, e.g. "A vaccination against COVID-19 is useless.", *M* = 1.99, *SD* = 1.16, Cronbach's α = .795, with high values

Table 2

Items to Measure Perceived Familiarity through Media Exposure

German (original)	English (translated)	M	SD	Eigenvalue
[Name einfügen] kenne ich bereits seit einiger Zeit.	I have known [insert name] for some time.	2.34	2.11	0.937
[Name einfügen] ist mit aus Zeitung und Fernsehen bekannt.	[insert name] is familiar to me from newspapers and television.	2.68	2.40	0.948
[Name einfügen] ist mir völlig fremd. *	[insert name] is completely foreign to me. *	3.09	2.62	0.888
[Name einfügen] ist mir bekannt.	[insert name] is familiar to me.	2.63	2.34	0.963
[Name einfügen] habe ich schon mehrfach in meinem Leben gesehen.	I have already seen [insert name] several times in my life.	2.19	2.01	0.883
[Name einfügen] habe ich noch nie zuvor gesehen. *	I have never seen [insert name] before. *	3.33	2.76	0.842
[Name einfügen] habe ich bereits in den sozialen Medien (Twitter, Facebook, etc.) gesehen.	I have already seen [insert name] on social media (Twitter, Facebook, etc.).	1.90	1.80	0.731
[Name einfügen] erscheint mir vertraut.	[insert name] seems familiar to me.	2.82	2.18	0.844
		2.62	2.01	

Note. * = reversed items. Data was transformed into a long format. Since each participant (N = 306) rated four persons, 1,224 data rows were available for the exploratory factor analysis (EFA) after transforming the data. A principal component analysis with varimax rotation was conducted to confirm the assumed one-factor solution for the familiarity measurement, KMO = .963, χ^2 (28) = 11562.858, $p < .001$. The scree plot and a parallel analysis support the one-factor structure, with Eigenvalues above 1, which explains 77.68 % of the total variance. Overall, the internal consistency is high (Cronbach's α = .957).

indicating a rejection of scientific consensus. Those items were measured on a 7-point Likert scale ranging from 1 = “strongly disagree” to 7 = “strongly agree”.

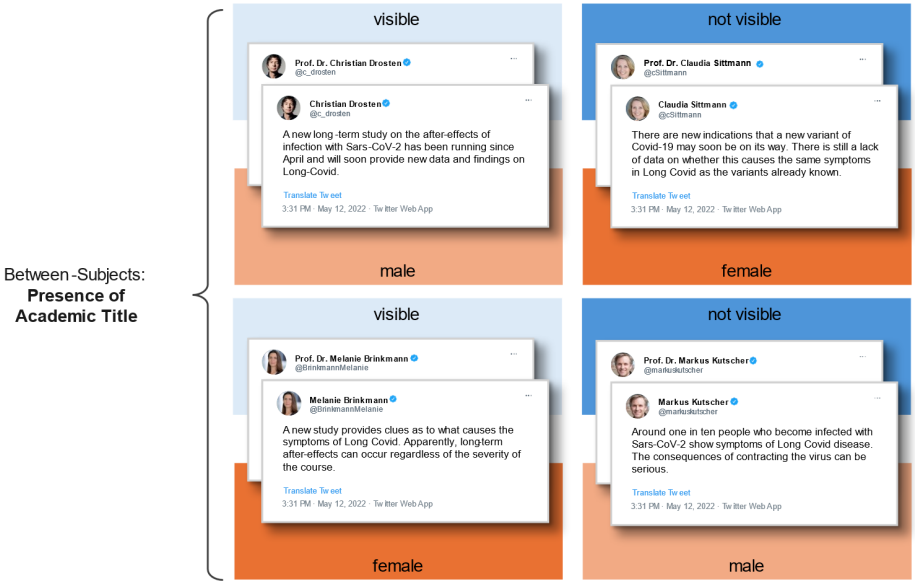
Participants were also asked if they felt uncertain and wanted information about the new variant of COVID-19 that was beginning to spread at the time of data collection, as uncertainty is believed to increase the reliance on expert knowledge. For this purpose, I used three additional items, e.g. “The new COVID-19 variant unsettles me.”, which participants also rated on a 7-point Likert scale. Overall, the participants appeared uncertain regarding their need for further information on COVID-19, $M = 3.04$, $SD = 1.33$, Cronbach’s $\alpha = .814$.

4.1.5.3 Stimulus Material

The stimulus material was pretested with 32 participants (age: $M = 29.3$, $SD = 10.2$), of whom 18 (56%) identified as female and 14 (44%) as male. Each participant viewed a selection of 16 individuals, complete with a photograph and full name. Eight German-speaking scientists who actively tweeted about COVID-19 had a significant number of Twitter followers and had made multiple appearances in news media and on talk shows. They were selected as representatives of scientists with a high media presence. To represent non-visible scientists, eight artificially generated faces with fictitious first and last names (see Figure 8) were presented. The stimulus material depicted individuals with neutral to friendly facial expressions and without any accessories, such as jewellery or glasses, facing the camera directly. In the pretest, participants were asked to rate the familiarity of these

Figure 8

Visualisation of Experimental Design with Example Posts



individuals using eight items developed for the study, such as “I have seen [name] multiple times in my life” and “[name] seems familiar to me” (see Table 2) Based on this information, I selected four visible and four non-visible individuals, with two female and male persons each for the main study. To enhance the generalisability of the results, I presented one male and one female person for each condition, with one scientist being classified as visible and the other not. Additionally, participants in the pre-study rated their interest in various COVID-19-related topics. The majority rated the spread of new variants of the virus as the most exciting topic, so this topic was chosen for the content of the material in the main study.

4.1.5.4 Procedure

After providing the instructions, demographic information from the participants was collected, and they were randomly assigned to one of two experimental conditions. In each condition, four tweets from four different scientists, either all with an academic title or all without an academic title (i.e., Prof. Dr., between-subjects factor), were successively presented. Participants first viewed a fictitious post about COVID-19. They were then asked to answer a question about the post’s content to ensure they had read it and subsequently to rate its credibility. Each item was presented alongside a picture of the sender and their name, and participants were asked to rate the epistemic trustworthiness of the respective sender. This process was repeated four times, with participants thus rating four different scientists (see Figure 8 for visualisation). Following this, participants were asked to indicate their level of trust in scientists, their beliefs about the scientific consensus on COVID-19, and their perceived uncertainty regarding the new variant of COVID-19 that was spreading at the time of data collection[1]. After completing the study, participants were asked whether they had participated attentively and were subsequently debriefed.

4.1.6 Results

4.1.6.1 Analysis Plan

First, I conducted an ANOVA to assess differences in participants’ perceived familiarity with the scientists based on their visibility in the German media during the COVID-19 pandemic. The analysis revealed a significant difference between senders in terms of the “visible male” conditions, $F(3, 302) = 21.52$, $p < .001$, with the first male scientist receiving an average familiarity rating of $M = 5.63$, $SD = 1.07$ and the second receiving an average rating of $M = 4.12$, $SD = 2.07$. Other scientists’ perceived familiarity did not differ significantly in terms of their visibility in the media. For this reason, and due to the relatively low perceived familiarity of the scientists, it was necessary to deviate from the preregistered analysis: Instead of comparing visible scientists with non-visible scientists,

[1] Further constructs were collected that are not part of this investigation.

I used the participants' self-reported familiarity with the scientists to circumvent the issue that some participants were unfamiliar with the visible scientists while a few reported being familiar with the non-visible scientists. As such, performing the preregistered analysis was impossible; instead, a multilevel analysis (MLA) was conducted to account for the available data, considering the variation within and between the different groups.

The variables on the within-subjects level (gender and familiarity) were treated on level 1 since they are nested within the participants and grouped according to the presence/absence of an academic title (level 2). The data were transformed into long format to conduct the analyses, and I used the lme4 package in R (Bates et al., 2009). To account for the design, random slopes were chosen for familiarity and senders' gender, reflecting the initial within-person factors (Barr, 2013; Bell et al., 2019). Furthermore, the dependent variables and familiarity scores were centred within the participants. The visibility of the academic title and the gender of the senders were included as uncentred predictors (Finch et al., 2014; Nezlek, 2012).

Given the changed analysis plan due to the data, the statistical power was calculated a posteriori to determine the smallest effect that could be detected with a sample size of N = 1,224 data points[2], an alpha level of .05, and a power of .90. Thus, the smallest effect that can be reliably detected is r = | .09 |.

4.1.6.2 Data Analyses

I conducted an individual MLA for each dependent variable (perceived expertise, integrity, and benevolence), describing the epistemic trustworthiness of the senders. The results of each analysis are presented in Table 3. As outlined above, the results refer to participants' reported familiarity with the senders rather than the manipulated visibility in media.

The first hypothesis posited that senders with high media visibility would be rated as more epistemically trustworthy than non-visible senders. The MLA revealed that perceived expertise, b = 0.32, p < .001, and integrity, b = 0.20, p < .001, increased with increasing familiarity with the sender. However, the perceived benevolence decreased with increasing familiarity, b = - 0.17, p < .001. As a result, H1 was praised for perceived expertise and integrity, but not for benevolence.

The following assumption was made: senders with an academic title would be rated as more epistemically trustworthy than senders without an academic title. The results indicated that the presence of an academic title led to an increase in the perceived expertise of the senders, b = 0.09, p = .018. However, no effect emerged for perceived integrity, b = 0.06, p = .149, or benevolence, b = 0.02, p = .689. Thus, H2 was confirmed for perceived expertise, but not for integrity and benevolence.

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[2] To calculate the MLA, the data was transformed into long format. As there were four measurements at the within-subjects level for each of the participants, the available data points increase from N = 306 to N = 1,224.

Table 3

Results of Multilevel Analysis with Unstandardised Coefficients

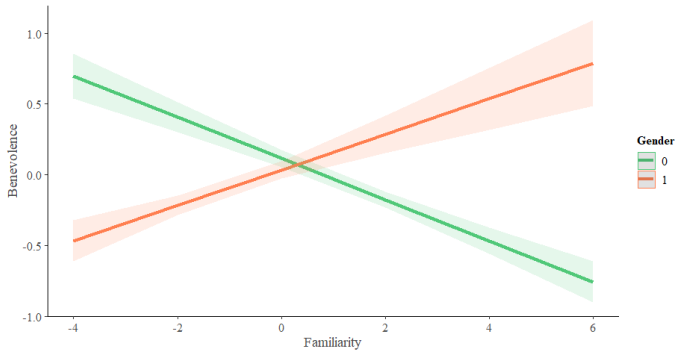
Predictors	Expertise				Integrity				Benevolence			
	b	*SE*	*t*	*p*	*b*	*SE*	*t*	*p*	*b*	*SE*	*t*	*p*
(Intercept)	-0.10	0.03	-3.54	**< .001**	-0.10	0.03	-3.33	**.001**	0.10	0.04	2.35	**.019**
Familiarity	0.32	0.02	13.15	**< .001**	0.20	0.03	7.72	**< .001**	-0.17	0.02	-8.60	**< .001**
Gender	0.20	0.04	4.80	**< .001**	0.21	0.05	3.95	**< .001**	-0.05	0.08	-0.67	.502
Title	0.09	0.04	2.37	**.018**	0.06	0.04	1.44	.149	0.02	0.06	0.40	.689
Familiarity × Gender	0.01	0.02	0.34	.737	0.01	0.02	0.75	.456	0.27	0.02	12.33	**< .001**
Familiarity × Title	-0.11	0.03	-3.28	**.001**	-0.07	0.04	-1.98	**.048**	0.05	0.03	1.90	.058
Gender × Title	-0.19	0.06	-3.21	**.001**	-0.12	0.07	-1.67	.095	-0.06	0.11	-0.55	.584
Random Effects												
σ^2	0.21				0.14				0.26			
τ_{00}	0.00 $_{id}$				0.06 $_{id}$				0.16 $_{id}$			
τ_{11}	0.06 $_{id.familiarity}$				0.08 $_{id.familiarity}$				0.03 $_{id.familiarity}$			
	0.00 $_{id.gender}$				0.24 $_{id.gender}$				0.57 $_{id.gender}$			
ρ_{01}					-0.12				-0.92			
					-1.0				-1.0			
Marginal R^2	0.504				0.386				0.192			
Deviance	1960.270				1865.785				2213.058			
AIC	2026.948				1932.276				2278.672			
Log-likelihood	-999.474				-952.138				-1125.336			

Note. Dependent variables and familiarity based on media exposure centred within persons (= id), N = 1,224)

Concerning the question of whether the senders' gender influenced their epistemic trustworthiness (RQ1), the MLA revealed a significant impact of gender on the senders' perceived expertise, $b = 0.20$, $p < .001$, and integrity, $b = 0.21$, $p < .001$, in favour of females. The senders' gender did not affect their perceived benevolence, $b = -0.05$, $p = .502$. Finally, I investigated the interaction between the senders' gender, academic title, and previous media visibility (i.e. perceived familiarity) regarding their epistemic trustworthiness (RQ2). The analysis revealed no significant interaction between familiarity and the senders' gender regarding their perceived expertise and integrity. However, a significant interaction effect of familiarity and gender on perceived benevolence emerged, $b = 0.27$, $p < .001$. As Figure 9 illustrates, females were rated as more benevolent with increasing familiarity, while the opposite was the case for males.

Figure 9

Interaction Effect of Gender and Familiarity in Predicting Senders' Perceived Benevolence

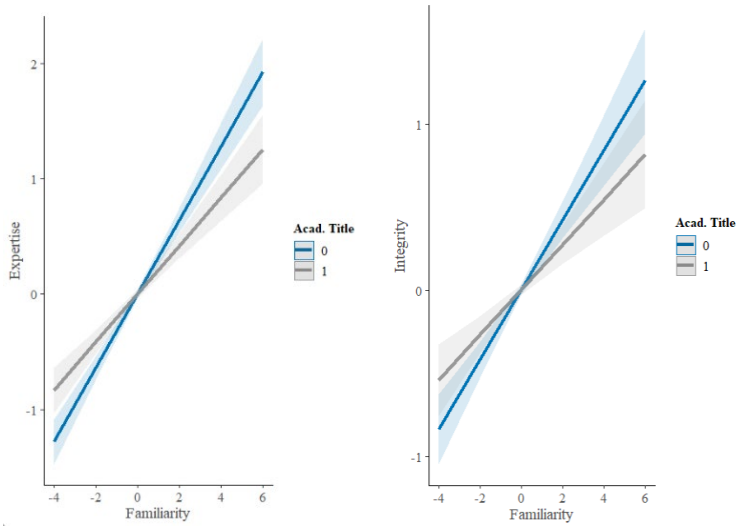


Note. Males coded as 0, females coded as 1.

The MLA further revealed a significant interaction between familiarity and the presence of an academic title concerning the senders' perceived expertise, $b = -0.11$, $p < .001$. While academic titles increased the perceived expertise of unfamiliar senders, they decreased the perceived expertise of familiar senders (see Figure 10, left). A similar pattern of findings emerged for the perceived integrity of senders: Familiarity with a scientist reduced the perceived integrity when an academic title was present but increased it when no academic title was present, $b = -0.07$, $p = .048$ (see Figure 10, right). There was no interaction between familiarity and the presence of an academic title regarding perceived benevolence, $b = 0.05$, $p = .058$. Finally, the MLA demonstrated a significant interaction between the senders' gender and the presence of an academic title in predicting perceived expertise, $b = -0.19$, $p = .001$. As shown in Figure 11, an academic title increased perceived expertise for males but decreased perceived expertise for females.

Figure 10

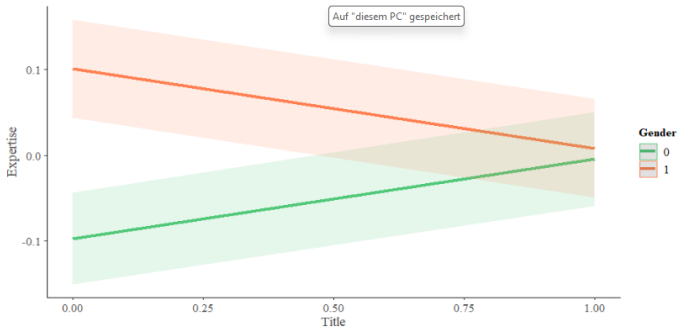
Interaction Effect of the Presence of an Academic Title and Familiarity in Predicting Senders' Perceived Expertise (left) and Integrity (right)



Note. Academic title not present coded as 0; academic title present coded as 1.

Figure 11

Interaction Effect of Gender and Presence of an Academic Title in Predicting Senders' Perceived Expertise



Note. Males coded as 0, females coded as 1. Academic title not present coded as 0; academic title present coded as 1.

4.1.7 Discussion of Empirical Results

The present study aimed to examine the effect of scientists' visibility in the media, gender, and academic title on evaluating their epistemic trustworthiness when communicating on social media. I further assessed how combining these factors influences senders' epistemic trustworthiness, as I expected all information to be evaluated simultaneously (Kruglanski & Thompson, 1999).

4.1.7.1 Familiarity

The first hypothesis proposed that familiar senders would be perceived as more epistemically trustworthy than non-familiar senders. As anticipated, the results revealed that perceived expertise and integrity increased with the perceived familiarity of the sender. This finding underlines previous research suggesting that, first, integrity serves as a supplementary attribute to trustworthiness, as users cannot assess the necessary expertise without sufficient knowledge about the respective domain (Hendriks et al., 2015), and, second, that integrity and benevolence need time to diverge from each other (Mayer et al., 1995; Schoorman et al., 2007), as a differing impact of familiarity on benevolence and integrity was found. Interestingly, the analysis revealed that the perceived benevolence of the sender decreased with higher familiarity. This finding raises questions about how a scientist's previous media presence affects the public's perception of their benevolence and how the media portrays them. A previous study found that the scientists in German media during the COVID-19 pandemic were reputable experts (Leidecker-Sandmann et al., 2022). However, whether and how their motives were communicated to the public is unclear. A possible explanation is that the public lacked sufficient information about the scientists' motivations for sharing their knowledge, only presenting them as sources of pandemic-related information. Therefore, further investigation is needed to examine the impact of scientists' public appearances and whether cues regarding their benevolence and, beyond this, their expertise were provided.

Moreover, the findings suggest that the pre-validation and selection of experts in traditional media provide a strong foundation for independently evaluating their trustworthiness in social networks. Although the posts shown in the present study were designed to present information about COVID-19 neutrally and were rated as showing relatively high levels of credibility, familiarity had the most substantial impact on trustworthiness. It is worth noting that the visible scientists chosen for this study were also active on social media and had a substantial number of followers reaching beyond the scientific community. However, this further highlights the impact of visibility on evaluating the trustworthiness of scientists who communicate directly, indicating that recipients tend to have greater trust in senders with whom they have previous experience, at least in terms of expertise and integrity. Although I cannot definitively state that these effects are solely based on the senders' overall visibility, it is worth noting that perceived familiarity appears to be a striking contributing factor.

Additionally, a small proportion of participants also rated non-visible senders as familiar, suggesting that the perception of trustworthiness can be influenced by factors beyond conscious exposure (Bornstein & D'agostino, 1992; Smith et al., 2006). At this point, it should be emphasised that the stimuli used comprised AI-generated faces with fictitious names; thus, participants rated the trustworthiness of non-existent persons based on their feelings of having seen the depicted persons before.

4.1.7.2 Senders' Gender

The question was also posed as to whether the senders' gender influenced the epistemic trustworthiness based on the previous media portrayals of scientists as male (Carli et al., 2016; Ferguson & Lezotte, 2020; Nosek et al., 2007) and on biases in favour of male scientists (e.g., Banchefsky et al., 2016; Knobloch-Westerwick et al., 2013). However, the analysis did not reveal any evidence to support these tendencies reported in the literature, as no differences in perceived benevolence between male and female senders emerged. Furthermore, participants in the present study perceived female senders as showing higher expertise and integrity than male senders. These findings partially correspond to previous research indicating that when asked directly about scientists' trust and assumed competence, respondents evaluate female scientists more favourably than male scientists (Jarreau et al., 2019). Following role congruency theory (Eagly & Karau, 2002), it might be assumed that the discipline of science is nowadays perceived as less exclusively male, and this perception may have been influenced by the COVID-19 pandemic and the increased presence of female scientists during this time (Quílez-Cervero et al., 2021).

Concerning the senders' gender and media visibility, which were alternated on a within-person level, the analysis revealed that female senders were perceived as more benevolent with increased familiarity. In contrast, the opposite pattern was observed for male senders. On the other hand, when senders were not rated as familiar, females were rated as less benevolent compared to males, indicating that familiarity with a sender might override gender-stereotypical expectations. Nevertheless, future research needs to investigate this pattern in more depth and focus on the communication of scientists' motives in public media.

4.1.7.3 Academic Title

Emphasising one's reputation and experience is known to increase trustworthiness (e.g., Thon and Jucks, 2017; Winter & Krämer, 2014). Partially aligned with expectations, the results illustrated that presenting an academic title in a user handle on social media increases a sender's perceived expertise. However, the analysis did not show any effect of academic title on the senders' perceived integrity and benevolence. These findings indicate that providing cues to "scientificness" – such as an academic title – can be beneficial for scientists to increase their trustworthiness on the level of expertise. However, there are no further indications from the findings that such cues increase perceptions of scientists' domain-specific knowledge and competence.

Moreover, presenting a scientific title does not necessarily influence whether a scientist will be perceived as sincere or responsible, suggesting that scientists rely solely on their status as experts to be considered reasonably trustworthy. Since epistemic trustworthiness extends beyond expertise and covers an individual's benevolence and integrity (Hendriks et al., 2015, 2016; Mayer et al., 1995), communicating scientists must highlight all three components further.

Interestingly, no interaction effect between the scientists' gender and the presence of an academic title in the user's handling of their perceived benevolence and integrity was present. However, the interaction between gender and the presence of an academic title significantly affected perceived expertise. While no gender difference can be seen if an academic title is present, female senders were rated as more competent than males with an academic title. This lack of gap between female and male scientists indicates a change in stereotypical gender roles, which previously did not link women with science (Banchefsky et al., 2016; Knobloch-Westerwick et al., 2013).

Furthermore, the results showed that, specifically for unfamiliar senders, cues to academic expertise as indicators of specialist knowledge and competence increased scientists' perceived expertise and integrity. However, with increasing familiarity, this effect reversed, such that familiar senders did not benefit from providing a cue regarding their expertise and received lower ratings on expertise and integrity. There was no interaction effect between the presentation of an academic title and the perceived benevolence of the sender, indicating that perceiving a sender to have high moral and ethical standards is linked solely to one's previous encounters with this sender. Although these findings might appear surprising at first glance, they correspond to previous research on the epistemic trustworthiness of scientists, as existing studies presumably presented non-visible or fictitious experts for their stimuli (e.g., Nadarevic et al., 2020). However, it should be emphasised that the effect on integrity is below the threshold of a meaningfully interpretable effect size and needs to be evaluated in further research.

While the assumption that familiarity or high visibility translates to greater trust in scientists holds promise for science communicators active on social media, it also presents a potential pitfall. Actors with dubious motives can exploit this dynamic by misrepresenting themselves as experts with unearned academic titles. Although the effects are comparatively small, an academic title seems at least partly a free pass to imply expertise and trustworthiness, regardless of any justification of actual expertise and competence. This circumstance underscores the danger of unwarranted confidence in science, leading to the acceptance of misinformation (O'Brien et al., 2021).

4.1.7.4 Limitations and Future Research

Regarding the study design, the focus on the within-person variance raises concerns about serial effects. As visible and non-visible senders were consecutively presented, it cannot be ruled out that the non-visible senders might have been equated with the visible senders in terms of trustworthiness due to the context. Consequently, participants might

have trusted the non-visible senders by default, and if they recognised the visible senders as real scientists, they might have presumed that the non-visible senders were real scientists. Nevertheless, in the condition without an academic title, participants were given no indication (i.e. in the instructions) that the senders were supposed to be scientists, and no other type of information was provided.

In this vein, the content of the presented posts should also be viewed critically. Although all of the posts addressed a new variant of COVID-19, which was still largely unknown at the time of data collection, it is unclear whether this topic was still of interest to the participants. Moreover, since epistemic trust builds on reliance on others' knowledge, it is unclear whether the participants needed to trust due to the topic. Most participants stated that they were not very unsettled by the COVID-19 pandemic. Whether a survey conducted at the beginning of the pandemic, when scientists were in greater demand, would have produced the same results remains open.

Some limitations on the sample should also be noted - specifically, the sample comprised German participants with a relatively high level of education. As the participants in this study largely agreed with the scientific consensus on COVID-19, further research should examine other topics with a different potential for controversy.

While the present study offers insights into how scientists' presentations on social media affect their trustworthiness depending on gender and media visibility, future research should delve deeper into these topics. In particular, there is a need to isolate the specific effects at play to distinguish between the effects caused by the scientists' reputation in the media, combined with the recipients' attitude towards visible scientists and the effects based on the feeling of familiarity and increased processing fluency.

4.1.7.5 Conclusion

Scientists must communicate transparently to provide laypersons with scientific information. Referring to one's scientific expertise can be especially beneficial for unknown science communicators and scientists. Therefore, scientists who engage in science communication on social media should highlight their expertise and increase their visibility for their target audience, for instance, by posting regularly. Additionally, the results suggest that gender-based stereotyping of science as a male domain can be reduced if scientists display their academic titles. Nevertheless, it is essential to emphasise that the higher expertise ratings of female senders compared to male senders disappeared when senders displayed their academic titles, suggesting that male scientists might benefit more from such references to their expertise than their female colleagues and that female scientists might consider renouncing references to their expertise in their user handles. Finally, I recommend that in the context of public communication, scientists should endeavour to actively communicate their benevolence and ethical behaviour in addition to their expertise, as the current evidence suggests that these factors are not associated with scientists by default. While scientists are generally considered trustworthy, the present findings demonstrate that

ostensibly simple profile elements like the user handle and picture can significantly influence the perceived trustworthiness of scientists on social media.

4.1.8 Discussion within the Framework

This experiment aimed to ascertain the impact of diverse sender-related cues on perceived trustworthiness and elucidate their interrelationships. Concerning the primary inquiry concerning the genesis of trustworthiness in direct communication between scientists, the following observations merit mention:

First, because of the found effect sizes, the perceived familiarity of a scientist appears to be the most influential predictor for the perception of trustworthiness in the first experimental study. Specifically, visible scientists benefit from their perceived familiarity in terms of perceived trustworthiness compared to non-visible scientists, particularly in terms of their assigned expertise and integrity. Interestingly, the perception of their benevolence is diminished. Further, it should be emphasised that although this study was not a multiple-wave longitudinal examination, it nevertheless was able to support that benevolence and integrity diverge over time (Mayer et al., 1995; Schoorman et al., 2007).

Second, this study revealed interesting interaction effects concerning recipients relying either on their prior encounters with a directly communicating scientist or, instead, on cues available to them in the respective encounter on social media (which are unique vs. not unique to scientists). Presenting an academic title, which is a unique cue for scientists, resulted in a less beneficial evaluation in terms of expertise and integrity for familiar scientists compared to unfamiliar scientists. Furthermore, gender, i.e., a cue not unique to scientists, increased the perceived benevolence for unfamiliar females compared to familiar ones. The interaction effect, which indicates that unfamiliar male scientists are perceived as more benevolent than female scientists, suggests a devaluation of unknown female scientists along stereotypical lines. In this context, I am referring to the assumption that a discrepancy between the expectations associated with scientists and those associated with women results in a negative bias (see section 3.3.1.1.1 for further information on gender and role congruency; Eagly & Karau, 2002). Unless altered by perceived familiarity, this bias negatively assesses female scientists' assumed benevolence. To contextualise this further, benevolence does not explicitly refer to interpersonal warmth but reflects the scientists' perceived level of morality and responsibility (Hendriks et al., 2015; Mayer et al., 1995).

The current experimental study also provides a new context to reflect on the presented content analysis (see Biermann et al., 2024). The initial set of scientists whose communication was analysed (see section 3.1.2) were all visible figures, potentially known to the public. They were also representatives of the highly visible researchers in the media in this experimental study. Although not empirically verified, the following can be interpreted from the overlap of the visible scientists analysed: If the assumption that public engagement reflects a trust-based behaviour (see section 3.4.3) is valid, then this specific group of visible scientists may have benefitted from their familiarity through recognition

and reputation (see section 3.3.1.2). The hypothetical assumption points to a potentially correlative relationship, suggesting that the use of scientific evidence is related to engagement in its function as a trust indicator. I assume that this relationship is, at best, correlative because it is impossible to suggest a causal relationship without evidence of an experimental approach.

Nevertheless, this interpretation demonstrates a similarity to the results of the first experiment, in which the perceived familiarity of a scientist was identified as a significant predictor of perceived trustworthiness. Thus, it may be hypothesised that using scientific evidence is beneficial regarding trust-indicating behaviour, such as engagement (for example, commenting). This scenario raises the question of whether unknown scientists without such reach could benefit from using scientific evidence. In other words, is the assumption that scientific evidence (i.e. a message cue) has a positive effect on the impression of the trustworthiness of scientists communicating directly on social media valid?

4.2 Experimental Study 2: Differential Effects of (Negative) User Comments and Types of Evidence on Scientists' Perceived Trustworthiness and the Credibility of Their Messages

After sketching out the first study's results on the sender-related cues and establishing how they relate to perceived trustworthiness, I will now focus on message- and context-related cues. The second study, unlike the first, focuses on unfamiliar scientists. However, the main goal is to explore how message-related cues, in particular using different evidence types in postings, affect a scientist's trustworthiness in more depth (see sections 3.3.2.1.2 and 3.3.2.2.2). Further, the upcoming study explores the function of qualitative context cues (see section 3.3.3.2) and how they interact with the message cues. I will introduce the need for cognition and the participants' prior attitudes to address the boundary conditions of a recipient's processing when encountering a scientist online. I will also examine the perceived message credibility of scientists' posts on social media platforms to demonstrate the level of trust that recipients are presumably willing to give scientists and communication efforts (see section 2.1.5).

As demonstrated during the COVID-19 pandemic, scientists indeed engage in public discourse online beyond the scientific community, sharing information with the public and facilitating public engagement with science (e.g., Kouper, 2010; Stylinski et al., 2018). However, communicating directly with the public can be challenging for scientists, as they are not always welcome in these online debates and face negative feedback or even online harassment (Nölleke et al., 2023; Royan et al., 2023). Scientists cannot control the individuals' public reactions to their message when they engage with them on social media. However, they can ensure that their message is presented in a carefully considered manner,

for example, by selecting which type of evidence they use to support a claim. Although previous research has focused on the differential effects of evidence types in professional and traditional communication outlets, such as newspapers (Hoeken, 2001; Wojcieszak & Kim, 2016), there is a scarcity of studies examining the influence of evidence in dynamic social media environments and – more importantly – when a scientist directly communicates the evidence. Thus, this study tests the differential effect of scientific evidence (an approximation of objectivity based on replicable data and analyses; Dahlstrom, 2014) and anecdotal evidence (relying on individual experiences; Moore & Stilgoe, 2009).

The unique nature of scientific evidence contributes to the distinctive role of the scientist, who can provide and evaluate it firsthand, unlike individuals who may lack the requisite training, such as laypeople, politicians, or journalists. Based on expectation violation theory, it remains to be tested whether using anecdotal versus scientific evidence affects scientific experts' trustworthiness and their messages' credibility based on expectations that might be linked to their public communication. Scientists are expected to provide accurate and scientific information (e.g., Falchetti et al., 2007; Maier et al., 2016). However, when using anecdotal evidence, they deviate from this expectation. A violation like this can cause a shift of attention towards the communicator's characteristics, which can be both positive and negative and will be evaluated accordingly (see expectation violation theory (EVT): Burgoon, 1993). In this vein, science communicators may either benefit from the unexpected use of vivid anecdotal evidence (see exemplification theory: Zillmann, 1999, 2006) or may weaken their trustworthiness by arguing "unscientifically", thus violating norms and expectations (Metzger et al., 2010).

In addition to the choice scientists can make about framing their messages, their impact depends on the responses they elicit. It has been consistently demonstrated that comments influence how the original message is perceived (e.g., Lee & Jang, 2010; Winter et al., 2015). This raises the question of whether this effect can be applied in a context that is not primarily opinion-based, such as science communication. In particular, the mechanisms by which negative comments can influence the evaluation of a science communicator, which relies on attributions of trustworthiness and credibility, require further investigation. While factual criticism of scientists on social media can reduce their trustworthiness (e.g., Gierth & Bromme, 2020), social media debates are often characterised by intense emotion rather than objectivity (Nemes & Kiss, 2021; Oyebode et al., 2021), highlighting the need to examine how negative - particularly negative and emotionalised - comments can distort the trustworthiness of scientists and the credibility of the information they disseminate online. Given that content expressing negative emotions spreads more rapidly on social media than content expressing positive emotions (R. Fan et al., 2014; Stieglitz & Dang-Xuan, 2013) and posts displaying anger attract more visual attention (Kohout et al., 2023), this study examines the impact of different types of negative comments, both factual and emotional, on discussions about science communicators who directly address the public on social media.

Grounded on the lay epistemic theory and the unimodel, the boundary conditions of scientists' aspired impact are examined based on their evidence use and a possible distortion through public reactions, as multiple cues can affect a scientist's public perception (Kruglanski, 1990; Kruglanski & Thompson, 1999). For this study, I specifically refer to epistemic trustworthiness, meaning recipients will trust a scientist to provide reliable information and knowledge, which hinges on their perception of having high expertise, integrity, and benevolence (see section 2.1.4). Given that these three characteristics are equally relevant to the perception of epistemic trustworthiness (Hendriks et al., 2015), they should be similarly inclined to the influence of evidence and comments.

Again, understanding how impressions are formed is crucial to understanding scientific experts' public perceptions and statements. In the lay process of gaining knowledge, assumptions about a topic are tested and verified depending on the individual's beliefs, subsequent evaluation of the relevant evidence, and individual abilities (see lay epistemic theory (LET): Kruglanski, 1990; and Kruglanski & Thompson, 1999). According to LET, all information about the message and the communicators is equal in its ability to contribute to an evaluation (Kruglanski et al., 2006, 2010). Hence, both the content of a post (i.e., arguments like the evidence type) and contextual information (i.e., cues like comments) should affect the evaluation of a communicator and their statements (Kruglanski & Thompson, 1999) as a piece of information never stands alone and is evaluated within its context (Sundar, 2008; Sundar et al., 2019). Given the potentially strong influence of different types of evidence (e.g., Xu, 2022) and users' comments in discussing scientific issues (e.g., Winter & Krämer, 2016), the recipient should consider all available information to form a judgement.

4.2.1 Message Cues: Anecdotal vs Scientific Evidence

As outlined in section 3.3.2.1.2, *anecdotal evidence* (also known as narrative evidence) is defined as any evidence that does not follow a strict methodology (Allen & Preiss, 1997; Dahlstrom, 2014) and relies on subjectivity and individual experiences to support a claim (Moore & Stilgoe, 2009). Anecdotal evidence draws inferences or exemplars, while scientific evidence adheres to higher standards (Dahlstrom, 2014), representing an approximation of objectivity based on replicable and representative data and statistics(Allen & Preiss, 1997; Hoeken, 2001). Previous research suggests that anecdotal evidence, which relies on narrations, may be easier to comprehend than hypothetical instances due to the vividness of concrete examples (see exemplification theory; Zillmann, 1999, 2006). Although the difference in the persuasive effect of scientific versus anecdotal evidence appears to be minor, anecdotal evidence often influences behavioural intentions more, especially in health-related decisions (see for meta-analyses: Freling et al., 2020; Xu, 2022; Zebregs et al., 2015). For instance, recipients are less likely to verify medical (mis)information that contains anecdotal evidence due to reduced cognitive effort and increased fluency that is associated with its vividness as opposed to statistical evidence

(Dudley et al., 2023; Marsh & Yang, 2018; Zhao & Tsang, 2023). Concerning science communication, Knobloch-Westerwick et al. (2015) investigated the effect of the type of evidence in an online magazine and demonstrated no differences between the evidence types presented.

Nevertheless, it is arguable that the theoretical mechanisms might differ if the evidence is presented directly by a scientist rather than by an intermediate source, such as a blog. Laypeople may perceive anecdotal evidence presented by scientists themselves as more credible than scientific evidence, mainly as scientists have high epistemic authority (Haas, 2023). Based on the premise that recipients use multiple cues, such as the communicator's epistemic authority and communication style (Kruglanski et al., 2006, 2010), it can be argued that scientists and their messages should still benefit from anecdotal evidence as it may create an expectancy violation, drawing attention to the communicators' properties (Burgoon, 1993). As narrations and reporting personal perspectives can benefit scientists' perceived authenticity (Saffran et al., 2020), which is closely linked to the perceived determinants of integrity and benevolence of their epistemic trustworthiness (Hendricks et al., 2015), this violation might be interpreted favourably. By combining the fluency and vividness of anecdotal evidence (e.g., Marsh & Yang, 2018) with their epistemic authority, scientists should benefit from both strengths, thereby improving their overall trustworthiness and message credibility. Therefore, the following hypotheses are up for testing:

H3a: Posts containing anecdotal evidence will be rated more credible compared to posts containing scientific evidence.

H3b: Scientists who use anecdotal evidence in their posts will be rated as more trustworthy compared to scientists who use scientific evidence in their posts.

4.2.2 Qualitative Context Cues: Negative and Emotionalised Comments

When science communicators directly address the public, they automatically expose themselves to the public's reactions and comments. If recipients read those comments, they can influence their evaluation of them and their messages. Specifically, negative comments can have detrimental effects as they can reduce the content's credibility (Naab et al., 2020; Waddell, 2020), increase the perceived bias (Anderson et al., 2018), and make them less convincing. In contrast, positive comments appear to exert no such effects (Winter et al., 2015). The unifying determinant is the bias of attention and processing capacities towards a negative stimulus instead of a positive one (Baumeister et al., 2001). However, comments on social media are often more than just opposing. As emotions are known to impact online discussions (e.g., Fan et al., 2014; Stieglitz & Dang-Xuan, 2013), this study differentiates between two types of negative comments: factual and emotional expressions, which go beyond mere rejection of the content in the sense of negative valence. To capture this emotional negativity, this study specifically focus on anger since it can increase the depth of processing (Nabi, 2002) but also draws more visual attention to comments (other than

negative emotions such as fear), which is even more pronounced for recipients who can allocate more cognitive resources (Kohout et al., 2023).

In general, the expression of emotions is known to influence recipients' impressions through emotional contagion, which refers to the (unconscious) adaptation of others' emotional states (Hatfield et al., 1993; Kramer et al., 2014) and integration of these states into their evaluation of content (Hasford et al., 2015). Consequently, others' emotions can play a significant role in the evaluation of content, especially in cases of less profound processing (see EASI-model: Van Kleef, 2009; Van Kleef et al., 2010), and thus, influence recipients' impressions and attitudes (Van Kleef et al., 2015). I expect that recipients adapt to the displayed negative emotions in a comment (in this case, anger) and use them as a guide when evaluating the content. Consequently, negative-emotional comments should significantly impact recipients' evaluations more, given their characteristically attention-grabbing nature compared to solely negative yet factual comments. Therefore, the following hypothesis is proposed:

H4a: The negative effect of negative-factual comments on message credibility will be greater than the effect of neutral comments but smaller than the effect of negative-emotional comments.

Following the lay epistemic theory, an expert's epistemic authority and the associated trust in them can substitute the need for stand-alone evidence (Kruglanski et al., 2006, 2010). Given that all types of information are equally assessed when evaluating a message on social media (Kruglanski & Thompson, 1999), negative comments should undermine trust in the communicating experts. Previous research indicates that user comments factually questioning a scientist's motivations or the complexity of their research decrease trust in the sender by challenging their researchers' core values (Gierth & Bromme, 2020). However, it is unclear whether negative comments expressing emotions like anger have comparable effects to factually formulated rejection. Drawing on the previously described effects of negative comments, both factual and emotional comments should reduce the trustworthiness of the communicating expert. Accordingly, it can be assumed that factual-negative comments, without emotional expression, generally harm the trustworthiness of the communicators. Additionally, it can be assumed that negative-emotional comments reflecting anger increase the effects of negativity through emotional contagion and direct attention towards the comment. Therefore, the following hypothesis can be derived:

H4b: The negative effect of negative-factual comments on the communicators' trustworthiness will be greater than the effect of neutral comments but smaller than the effect of negative-emotional comments.

4.2.3 Interaction of Evidence Types and (Negative) Comments

Given that recipients consider multiple cues when evaluating whom and whose messages to trust (Kruglanski et al., 2006, 2010), I will now address possible interactions.

Regarding the main effect of the type of evidence, science communicators should benefit from anecdotal evidence by creating a positive expectancy violation (see EVT: Burgoon, 1993, 2015). While still benefiting from their epistemic authority, they can benefit from the vividness of the anecdotes by tailoring their message to the audience, emphasising their benevolence. However, recipients should interpret this violation of expectations as negative if negative comments accompany the contributions, as these serve as additional information for the evaluation (e.g., Winter et al., 2015). In particular, the effect of negative comments should have an even more substantial impact when they are reinforced by emotional valence adjustment (Van Kleef, 2009; Van Kleef et al., 2015). In this light, recipients who view anger just like those who feel anger should also engage in a more thorough evaluation and monitor the source more closely (Nabi, 2002). With the negativity expressed in the comments, the negative effects should grow. In this scenario, the use of scientific evidence should be more beneficial, as recipients would fall back on trusting science communicators as authoritative figures who communicate in line with this expectation, causing them to perceive the messages as more credible. Following the same pattern, recipients should also perceive communicators using scientific evidence as more trustworthy, with increasingly negative and emotional comments. This ends in deriving the subsequent hypotheses for testing:

H5a: Posts containing anecdotal evidence will be rated less credible if the comments are negative-factual compared to neutral comments and more credible compared to negative-emotional comments.

H5b: Posts containing scientific evidence will be rated more credible if the comments are negative-factual compared to neutral comments and less compared to negative-emotional comments.

H6a: Scientists of posts containing anecdotal evidence will be rated less trustworthy if the comments are negative-factual compared to neutral comments and more credible compared to negative-emotional comments.

H6b: Scientists of posts containing scientific evidence will be rated more trustworthy if the comments are negative-factual compared to neutral comments and less compared to negative-emotional comments.

4.2.4 Cross-Situational Boundary Condition: Need for Cognition and Prior Attitudes

Two covariates are included to investigate their potential effects: the recipients' attitude and need for cognition (NFC). Since a preference for attitude-consistent information can also be found in the realm of science communication (Gierth & Bromme, 2020), five items that were used to assess participants' prior attitudes towards COVID-19 and the post-COVID-19 condition in general were presented to the participants at the beginning of the study. The recipients' cognitive style is expected to influence the processing of evidence types and comments, like their prior attitudes. Therefore, in the upcoming analyses, the recipients' NFC, which refers to an individual's inclination towards deliberate cognitive

processing and reflection (Cacioppo et al., 1996), will be included. For example, individuals with low NFC levels are more likely to be influenced by anecdotal evidence if it aligns with their prior attitudes (Hinnant et al., 2016) and are also more easily persuaded by arguments relevant to the discussion compared to subjective comments (Winter & Krämer, 2016).

4.2.5 Methods

An online experiment was conducted to investigate the effects of evidence types and comments on the perception of scientific experts. The experiment followed a 2 (evidence type: scientific vs. anecdotal) x 3 (comments: neutral, negative-factual, negative-emotional) between-subjects design. The stimulus material, information about the pretest conducted to assess the perceived emotional valences and level of anger in the comments, additional information on the measurements, and data can be accessed at the OSF: https://osf.io/d8kea/?view_only=162a6c6b354b4ba895782a5f36245f69

4.2.5.1 Sample

A total of 360 German participants were recruited for this study in the summer of 2022. Four manipulation checks and one attention check were carried out to ensure data quality. The manipulation check assessed whether participants read the instructions and materials carefully. A total of n = 59 participants failed at least one check, leaving a total sample of $N = 301$. The age of the participants ranged from 18 to 80 years, $M = 30.0$, $SD = 10.5$. 54% of participants identified as female, and 1% identified as nonbinary or preferred not to provide information on their gender. Approximately 7% of participants had completed secondary school, while 35% completed higher education with a university entrance qualification. 33% of participants reported having a bachelor's degree and 21% a master's degree. The remaining 2% of participants hold a PhD, and 2% did not indicate their highest level of education.

4.2.5.2 Procedure

Demographic information was collected from participants after informing them of the study's purpose and how their data would be used. Participants were then asked to indicate their general attitudes towards COVID-19. Subsequently, they were randomly assigned to one of six experimental groups, where each participant saw three X/Twitter profiles of experts, each displaying one post about a different aspect of the post-COVID-19 condition, with one comment each. All comments were from the same experimental condition to which the participant was assigned. After reviewing each profile, participants were asked to rate the posts' credibility and the experts' trustworthiness. They were also asked to identify the post's topic to confirm that they had read the content. Finally, the study measured the participants' NFC and their attitudes towards the post-COVID-19 condition (i.e., "Long Covid" (WHO, 2022b)) were measured.

4.2.5.3 Materials and Measures

The stimulus material comprised three Twitter profiles, each featuring tweets from fictional experts discussing a different aspect of the post-COVID-19 condition: duration, symptoms, and diagnosis. The profiles displayed the experts' profile pictures with a landscape or building as a background banner. The biographies briefly mentioned their expertise (e.g., "Virologist; Scientist at #CharitéVirology"). To account for possible effects, the number of followers was balanced across all three fictional accounts. The experimentally manipulated tweet contained anecdotal or scientific evidence and was displayed below the biography. The anecdotes referred to a patient, friend, or family member. In contrast, the scientific evidence consistently references and describes study results or analyses.

One comment was displayed under each tweet. The neutral comments did not address the content of the tweets but rather the discourse surrounding COVID-19 in general (e.g., "COVID-19 must remain a topic of discussion"). The negative-factual comments disagreed with the tweet's content (e.g., "I don't believe that COVID-19 has long-term consequences. A large proportion of people probably just tend to misinterpret common everyday symptoms."). Negative-emotional comments included not only the rejection of the content but also emotional language in the form of anger (e.g., "What a mess! You really cannot take all this seriously anymore!! NOBODY can tell me that COVID-19 really lasts that long! In the end, every little cold is over-interpreted!"). The comment authors were given fictional names and profile pictures.

4.2.5.4 Messages' Credibility

A scale by Appelman and Sundar (2016) was adapted to measure the messages' credibility. Participants were asked to indicate how accurately, authentically, credibly, correctly, and reliably they rated each post on a scale from 1 (= describes the content not well) to 7 (= describes the content well). Overall, the content was rated relatively credible, $M = 5.35$, $SD = 1.12$, Cronbach's $\alpha = .96$, McDonald's $\omega = .92$.

4.2.5.5 Senders' Trustworthiness

The perceived trustworthiness of the experts was measured using the METI by asking participants to rate the senders on 14 semantic differential word pairs ranging on a scale from 1 to 7 (Hendriks et al., 2015). The measure consists of the three dimensions: expertise (e.g., "professional – unprofessional"), $M = 6.03$, $SD = 0.82$, Cronbach's $\alpha = .96$, McDonald's $\omega = .94$, integrity (e.g., "just – unjust"), $M = 5.59$, $SD = 0.89$, Cronbach's $\alpha = .95$, McDonald's $\omega = .90$, and benevolence (e.g., "considerate – inconsiderate"), $M = 5.67$, $SD = 0.89$, Cronbach's $\alpha = .95$, McDonald's $\omega = .91$.

4.2.5.6 Covariates

4.2.5.6.1 Need for Cognition.

Participants' NFC was assessed using the German short version of the NFC scale by Beißert et al. (2015). The four items (e.g., "I would prefer complex to simple problems.") were measured on a scale from 1 (= "completely disagree") to 7 (= "completely agree"), M = 4.77, SD = 1.05, Cronbach's α = .69, McDonald's ω = .70.

4.2.5.6.2 Attitude Measures.

Five items were included at the beginning of the study to address the participants' prior attitudes towards COVID-19 and the post-COVID-19 condition in general. For instance, they were asked if they took the risk of long-term consequences of COVID-19 seriously. The answers were assessed on a scale ranging from 1 (= "completely disagree") to 7 (= "completely agree"), M = 5.07, SD = 1.30, Cronbach's α = .88, McDonald's ω = .89.

4.2.6 Results

4.2.6.1 Analysis Plan

To test the hypotheses, a general linear model (GLM) was conducted for each dependent variable, i.e., the credibility of the posts and the senders' trustworthiness, which consists of perceived expertise, integrity, and benevolence. The model included separate factors for the evidence types (scientific, anecdotal), comments (neutral, negative-factual, negative-emotional), and participants' general prior attitudes towards COVID-19 and NFC as covariates. The models, fixed effect parameter estimates, and post-hoc comparisons for each dependent variable are reported in the results.

4.2.6.2 Credibility of the Posts

The overall effect of the model with credibility as the dependent variable was significant, $F(7, 293) = 10.02$, $p < .001$. It was predicted that anecdotal evidence would make the post seem more credible than scientific evidence (H3a), which was not supported by the analysis (see Table 4). Although a significant main effect was found, $F(1, 301) = 5.15$, $p = .024$, it favoured scientific evidence, β = .239, p =.024. On average, posts containing scientific evidence were rated more credible, M = 5.47, SD = 1.11, than those containing anecdotal evidence, M = 5.25, SD = 1.13. Thus, H3a must be rejected. H4a predicts a negative main effect of comments if credibility decreases from neutral to negative-factual and negative-emotional comments, which was not supported, $F(2, 301) = 0.32$, $p = .730$.

Table 4

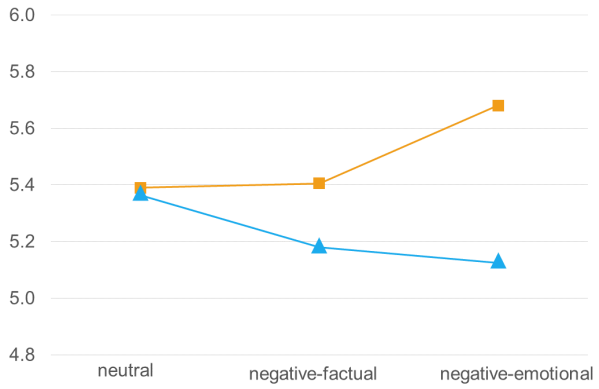
Results of GLM for the Effect of Evidence Type and Comments on the Perceived Credibility

	Credibility						
	df	*F*	*p*	η^2	$\eta^2 p$	β	*p*
Comment	2	.32	.730	.002	.002		
negative-factual vs neutral						-.075	.558
negative-emotional vs neutral						.023	.858
Evidence	1	5.15	.024	.014	.017		
scientific vs anecdotal						.239	.024
NFC	1	.60	.438	.002	.002	-.041	.438
Prior Attitude	1	57.72	< .001	.159	.165	.402	<.001
Comment × Evidence	2	1.71	.184	.009	.012		
negative-factual vs neutral × scientific vs anecdotal						.178	.429
negative-emotional vs neutral × scientific vs anecdotal						-.040	.068

Next, it was assumed that posts containing anecdotal evidence with negative-factual and neutral comments are rated more credible than those with negative-emotional comments (H5a). Additionally, it was assumed that posts containing scientific evidence with negative-emotional comments are rated more credible than those with neutral comments (H5b). The analysis shows no significant interaction effect between the evidence and comment type, $F(2, 301) = 1.71$, $p = .184$. Since the effects of negative comments are of particular interest to this study, a follow-up post hoc test was conducted to test the hypotheses. There were big differences between posts with scientific evidence and negative emotional comments, $M = 5.70$, $SD = 1.14$, and posts with anecdotal evidence and negative emotional comments, $M = 5.09$, $SD = 1.32$, $t(293) = - 2.707$, $p = .007$. Posts containing anecdotal evidence with negative-factual comments, $M = 5.16$, $SD = 1.04$, significantly differ from posts containing scientific evidence with negative-emotional comments, $t(293) = -2.414$, $p = .016$ (see Figure 12). As no differences were found between the evidence types based on the comments, H5a and H5b cannot be confirmed.

Figure 12

Credibility of the Messages for the Use of Scientific Evidence (orange, rectangle) and Anecdotal Evidence (blue, triangle)



4.2.6.3 Trustworthiness of the Sender

To address the remaining hypotheses, I conducted GLMs to investigate the communicators' perceptions based on the use of evidence (H3b), the influence of comments (H4b), and their interactions (H6a, H6b) on the three sub-dimensions of epistemic trustworthiness (expertise, integrity, benevolence). The results for each subdimension of epistemic trustworthiness are presented in Table 5. No significant main effects of evidence type or comments on the perceived trustworthiness of the communicators were found[3]. Therefore, H3b and H3b must be rejected as neither comment nor evidence type affected the communicators' perceived trustworthiness. However, the recipients' prior attitudes were a significant predictor for each subdimension of epistemic trustworthiness. Participants rated the communicators higher in expertise, $\beta = .373$, $p < .001$, integrity, $\beta = .363$, $p < .001$, and benevolence, $\beta = .410$, $p < .001$, when they initially perceived COVID-19 as a severe and threatening condition.

H6a assumed that communicators of posts containing anecdotal evidence would be rated less trustworthy if the comments were negative-factual compared to neutral comments and more credible compared to negative-emotional comments, and H6b assumed the opposite pattern for scientific evidence. The GLM showed no significant interaction between comment and evidence type for the perceived expertise of the communicators, $F(2, 301) = 2.00$, $p = .136$. However, there was an interaction between scientific and anecdotal evidence for negative-emotional and neutral comments, $\beta = .523$, $p = .047$. Anecdotal

[3] A table showing the results is available at: https://osf.io/d8kea/?view_only=4a6d1dd842c547bb8c9ace1628510cb3

evidence accompanied negative-emotional comments resulted in a lower rating of communicators' perceived expertise, $M = 5.85$, $SD = 1.03$, compared to scientific evidence, $M = 6.24$, $SD = 0.73$, SE = 0.153, $t(293) = -2.34$, $p = .020$ (see Figure 13, left).

The remaining differences were not significant. For these reasons, it is not possible to fully support H6a and H6b. The main differences in the communicators' trustworthiness were found to favour scientific evidence (compared to anecdotal) for negative-emotional (compared to neutral) comments.

Concerning the communicators' perceived integrity, a significant interaction effect between comments and evidence type can be observed, $F(2, 301) = 3.99$, $p = .020$. Again, an interaction between scientific and anecdotal evidence for negative-emotional and neutral comments emerged, $\beta = .737$, $p = .005$. For posts with negative-emotional comments, the perceived integrity of the communicators was lower when they used anecdotal evidence, $M = 5.43$, $SD = 0.95$, compared to scientific evidence, $M = 5.80$, $SD = 0.91$, SE = 0.164, $t(293) = -2.075$, $p = .039$. Further, if communicators utilised scientific evidence in their posts, their integrity was rated even higher when the comments were negative-emotional, $M = 5.80$, $SD = 0.91$, compared to neutral comments, $M = 5.40$, $SD = 0.88$, SE = 0.168, $t(293) = -2.00$, $p = .046$ (see Figure 13, right). Regarding the communicators' perceived benevolence, no significant interaction effect emerges between the comment and evidence type, $F(2, 301) = 2.62$, $p = .075$. However, an effect of neutral versus negative-emotional comments and between the evidence types, like what was found for the communicators' perceived expertise and integrity, is present, $\beta = .586$, $p = .023$. The post hoc comparisons showed no significant difference in perceived benevolence, unlike the other two dimensions.

Figure 13

Perceived Expertise (left) and Perceived Integrity (right) of the Communicators for the Use of Scientific Evidence (orange, rectangle) and Anecdotal Evidence (blue, triangle)

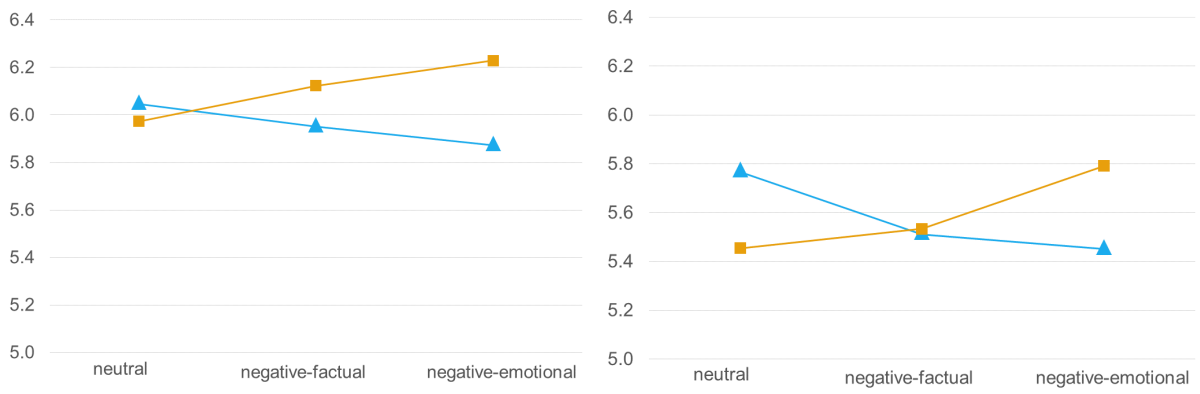


Table 5
Results of GLM for the Effect of Evidence Type and Comments on the Perceived Epistemic Trustworthiness

	Expertise						Integrity					Benevolence				
	df	*F*	*p*	η^2	β	*p*	*F*	*p*	η^2	β	*p*	*F*	*p*	η^2	β	*p*
Comment	2	.08	.925	.0			.43	.648	.002			.22	.802	.001		
negative-factual vs neutral					.033	.801				-.10	.444				-.085	.508
negative-emotional vs neutral					.051	.698				.011	.933				-.034	.770
Evidence	1	2.98	.086	.008			.03	.862	.0			.0	.993	.0		
scientific vs anecdotal					.185	.086				.019	.862				.001	.993
NFC	1	.16	.688	.0	-.022	.688	.25	.615	.001	-.027	.615	.51	.475	.001	-.038	.475
Prior Attitude	1	48.07	< .001	.137	.373	<.001	45.81	< .001	.130	.363	<.001	60.21	< .001	.165	.410	<.001
Comment × Evidence	2	2.01	.136	.011			3.99	.020	.023			2.62	.075	.014		
negative-factual vs neutral × scientific vs anecdotal					.298	.258				.379	.149				.253	.328
negative-emotional vs neutral × scientific vs anecdotal					.523	.047				.737	.005				.586	.023

4.2.7 Discussion of Empirical Results

When science communicators turn to the public and use their specific expertise to address socio-scientific issues, they enter uncertain territory because it is not clear how the public will react. Especially with topics of high social relevance, such as the COVID-19 pandemic and its consequences, the discourse is often marked by (negative) emotions. Thus, this study investigated whether science communicators may benefit from using a particular type of evidence. The results demonstrate that the type of evidence used positively impacts the credibility of the messages and trust in the communicators. Contrary to initial assumptions, anecdotal evidence is not perceived as more credible than scientific evidence (e.g., Hinnant et al., 2016). This finding suggests that science communicators should prioritise evidence-based communication, as anecdotes may provoke a negative expectancy violation and decrease credibility (Metzger et al., 2010). This finding differs from previous research on non-personal or journalistic media posts (Hoeken, 2001; Wojcieszak & Kim, 2016), highlighting the unique position of scientists providing information directly from their personal social media accounts and how evidence types are perceived in different contexts.

Moreover, the impact of negative comments also reveals essential distinctions. Based on previous research, it was assumed that negative comments would determine the evaluation outcome (e.g., Winter et al., 2015), which is reinforced by emotions (Van Kleef et al., 2015). Contrasting to previous studies examining the harmful effects of negative comments (e.g., Naab et al., 2020; Winter et al., 2015), this study did not show such effects of comments on their own. Although explicitly targeting science communicators' motives or work can harm their trustworthiness (Gierth & Bromme, 2020), the results suggest that plain and emotional negativity in comments cannot. This finding further underlines that general negativity might be less challenging for science communicators and their messages than expected. It highlights the boundary conditions for biases grounded in negativity (Baumeister et al., 2001).

The current findings further emphasise the need for a nuanced approach to assessing negativity online. The findings indicate that the impact of negative comments depends on the type of evidence presented. It was previously proposed that science communicators and their messages should, just like other communicators, benefit from relying on anecdotal evidence due to its vividness and easier processing (e.g., Marsh & Yang, 2018), provided that no contraindication is present. As discussed above, science communicators did not benefit from the use of anecdotal evidence, even when the comments were neutral. Arguing along the same lines, posts with scientific evidence were expected to be perceived as more beneficial when viewing negative comments, as they did not break any potential expectations towards their communication. Although the analysis revealed no significant effects, there was evidence of this type of interaction for perceived communicator integrity and a similar, though less pronounced and consistent, pattern for message credibility and perceived expertise, supporting this assumption.

Concerning communicators' integrity, the results indicated that they were perceived as more sincere and honest when they shared anecdotes, but only when the comments were neutral, consistent with research on authenticity in science communication (Saffran et al., 2020). However, the perceived integrity was lower when scientific evidence was combined with neutral comments. Conversely, this pattern is reversed when the comments are negative. Communicators who rely on scientific evidence are rated higher regarding integrity. In this context, when comments express negativity and emotionality, recipients may react with resistance and thus reject the appeal of anecdotal evidence. The strong effect of participants' prior attitudes, which reflected the perception of COVID-19 and the post-COVID-19 condition as serious threats - as expressed in the stimuli used - further supports an additional explanation, as reactance occurs when negative reactions in the comments contradict one's attitude (Kim et al., 2021; Lu & Liang, 2023).

In terms of communicators' perceived expertise and message credibility, a less pronounced picture of this pattern is evident, as there was no difference between the evaluations based on the evidence type when presented with neutral comments. However, the analyses showed that with comments expressing more prevalent emotions (i.e. anger) and negativity, recipients rated messages and senders of posts containing scientific evidence as more beneficial. Simultaneously, the presence of negative comments weakened the credibility of posts and the expertise of senders containing anecdotal evidence. From the perspective of the EVT (Burgoon, 1993, 2015), using anecdotal evidence caused a negative expectancy violation and, thus, a comparably less beneficial evaluation due to a deviation from the anticipated use of scientific evidence. As anecdotal evidence does not meet the rigorous standards typically expected of scientific evidence (Dahlstrom, 2014), this violation may have ultimately undermined the perceived message's credibility and the communicators' perceived expertise, particularly in the presence of negative comments.

Interestingly, communicators' perceived benevolence was not affected by the type of evidence and comments present. Although the negative-emotional comments had the potential to do so, communicators' perceptions of benevolence remained largely unaffected and at a relatively high level. This finding suggests that benevolence may either be a stable trait of science communicators that negative comments cannot quickly damage or that negative comments must specifically affect the communicators themselves to do so (Gierth & Bromme, 2020), as the negativity did not carry over to perceptions of benevolence.

Lastly, the results underline that the previous attitude towards a topic is more important regarding the communicators' evaluation in general than the surrounding discourse and evidence type used. The findings indicate that recipients' prior attitudes influence their evaluation of online content and subsequent opinion formation (Gierth & Bromme, 2020). Additionally, it is important to note that prior attitudes towards the COVID-19 topic consistently emerged as a significant predictor of the post-COVID-19 state. This example emphasises the significance of broad mechanisms, such as confirmation

bias (Knobloch-Westerwick et al., 2015), in shaping the perception of science communication on social media to promote an informed society.

4.2.7.1 Limitations and Future Research

The main limitation of the present study is the limited generalisability of the findings, as the investigation was limited to the post-COVID-19 condition. Despite the different aspects (diagnosis, duration, symptoms) considered in the material, further research on the impact of evidence and comments should examine other issues, ideally with varying degrees of surrounding controversy and potential for negativity. This is of utmost importance given the unexpected beneficial effect of scientific over anecdotal evidence, which contradicts prior research. Therefore, further research should focus on the different types and forms of evidence used in scientific discourse. This should include an examination of the relative merits of different types of evidence, such as qualitative, quantitative, or theoretically based evidence. Changing the topic and type of evidence analysed would also allow a more robust examination and replication of the fine-grained differences, particularly given the minor differences found in the post-hoc analyses for perceived credibility.

Similarly, while this study provides initial insights into the differential effects of negative-factual and negative-emotional comments on evaluating science communicators online, it is essential to note that the investigation was limited to a single emotional state: anger. Therefore, future research should investigate other emotions (e.g., fear) which play a pivotal role in situations where trust in scientific expertise is paramount, such as during crises, and can also influence information processing in other ways than anger appears to do (e.g., Nabi, 2002). Furthermore, given that emotional contagion on social media may be less prevalent for negative emotions than positive ones (Gutierrez et al., 2022), future research should also examine how positive emotions in comments may influence expectation violations and evaluations of science communicators.

Further, although participants' NFC was included, the situational capabilities and goals of the participants were not explicitly considered. Kruglanski and Thompson (1999) argue that while all information is equally important in evaluating a persuasive message, it is weighted according to the individual's capabilities, as other theoretical considerations argue. A more comprehensive understanding of the processing conditions can be achieved by considering individual motivation and goals, such as the pursuit of accurate information (e.g., Chaiken et al., 1996).

4.2.7.2 Conclusion

In today's media environment, scientists can communicate their findings directly to the public, bypassing the traditional intermediary role of the journalist. This shift in communication dynamics presents both opportunities and risks, emphasising the importance of carefully planned science communication. Against the background of lay epistemic theory and expectancy violation theory, the results of this study show that scientific

evidence can increase the credibility of messages and protect science communicators against a decrease in trustworthiness, mainly when negative emotions characterise online discussions. In particular, when anecdotal evidence was used, negativity had a detrimental effect on the perception of expertise and integrity was affected by the detrimental effects of negativity. For this reason, I recommend that scientists rely on scientific evidence when engaging in (emotionalised) debates on social media to avoid taking harm from those comments and maintain credibility in communicating with the public. Nevertheless, the impact of simple negative comments appears to be less pronounced in science communication than in other, more opinion-based domains. Finally, this study has demonstrated that the well-researched effects observed in traditional media cannot be directly transferred to scientists who engage with the public on social media.

4.2.8 Discussion within the Framework

With the second experimental study in this dissertation, I aimed to investigate the role of message and context-related cues in social media users' online assessment of scientists' trustworthiness and their messages' credibility. In detail, I was first interested in exploring the differences between message cues that are unique vs not unique to scientists and their communication, naming the use of scientific vs anecdotal evidence. As indicated by this dissertation's previously outlined content analysis (see Biermann et al., 2024; section 3.1.2), the second experimental study only partially supports the notion that scientific evidence increases trust in a scientist who directly addresses the public on social media. To elucidate, while the perceived message credibility benefited from scientific evidence, none of the three subdimensions of the perceived epistemic trustworthiness (expertise, integrity, and benevolence) was independent of the context cues.

Concerning the argument about the role of message credibility as an almost indispensable consequence of trust (see section 2.1.5), these results point to two possible interpretations: either the discrepancy indicates a gap between trustworthiness and trust, or the context cues that are always present in the expertise influence the assessment of trustworthiness. However, given the high ratings of epistemic trustworthiness, the second possibility is certainly more plausible than the first. Thus, I interpret the results in the context of the framework presented as follows: Assuming that, following the results of the first experimental study, the unfamiliar scientists in this second study were presented with full references to academic qualifications and affiliations, it stands to reason that this manipulation at the sender level led to a consistently high perceived trustworthiness rating and ceiling effects. Thus, manipulating the types of evidence at the message level seems to affect only the evaluation of the messages, not that of the sender. This circumstance indicates that the evaluation appears to be parallel with message-related cues that preliminarily influence the evaluation at the message level.

Further interpreting the main effects from the perspective of the unimodel means that sender cues were only relevant for the sender evaluation, and message cues were only

relevant for the message evaluation. Following the analysis of the qualitative context cues (i.e., the different types of comments present) and the discovered interaction effects with the type of evidence, it seems that context cues are an additive part of the trustworthiness assessment but only under certain conditions. To be more precise, only in situations where the comments express emotional negativity do the message-related cues exert an influence on both the perception of trustworthiness and credibility. In the current case, the mere presence of context cues was not enough to affect the evaluation of a scientist's communication, but the manifestation and the degree of negativity expressed in them did. This points to the respective role of arguments within an evaluative process. In light of the unimodel (e.g., Bohner et al., 2008; Kruglanski & Thompson, 1999), the context cues "became" relevant by introducing a certain degree of an argumentative quality through the provided negativity to the recipients, not by solely providing context with information about the potential public opinion (e.g., Lee, 2012; Zerback & Fawzi, 2017). Bearing their large effect sizes introduced by the emotional-negative comments in mind, this circumstance also appears to facilitate a more thorough reflection of the materials presented to the recipients, which is potentially induced by the violation of expectations set towards communicators in professional settings, such as the scientist here (see EVT: Bullock & Hubner, 2020; Burgoon, 2015). In general, however, it can be stated that the reference to science, and thus the presumed scientific character of communication, has a favourable impact on the assessment of the evaluation of a directly communicating scientist's posts.

To summarise, the following can be said about evaluating the cues: The second experimental study demonstrates a parallelism between the cues and the respective evaluation. Specifically, it was found that sender cues influence the sender's evaluation. In contrast, message cues influence how the message is evaluated. It also shows that this only applies under the given circumstances, provided no relevant counter-indicators, such as attention-grabbing (i.e., negative) context cues, exist. If so, unique message cues for scientists contribute to the overall impression of trust when scientists directly address the public online and make themselves vulnerable to comments. Circling back to the proposed framework, this study also aimed to examine the role of boundary conditions. It shows that the need for cognition (a stable cross-situational boundary condition) did not affect the processing of the available information, which deviates from prior research on one's inclination to invest effort in thinking (Hinnant et al., 2016). Instead, the prior attitude towards the topic as a potentially flexible cross-situational boundary condition did.

Given the strong predictive power of prior attitudes, I will further investigate the role of attitudes as characteristics of the recipients and their relationship with message cues by systematically varying the valence expressed in scientists' posts for the following empirical study. Furthermore, I will examine combinations of cross-situational factors combined with situational factors as boundary conditions in more detail concerning the evaluation of scientists' communication.

4.3 Experimental Study 3: Investigation of Boundary Conditions and the Recipients' Reactions to Scientists' Posts

In light of the findings from the first two experimental studies, I will attempt to ascertain how influential message cues are in creating a perception of trust. I will do so by further varying the message cues that are unique vs not unique to scientists' communication. Specifically, I will again compare two manifestations of a "scientific" vs "unscientific" message. However, instead of manipulating the use of evidence, I will manipulate the use of jargon to investigate further if "scientificness" promotes trust in a scientist, which was indicated by the first two experimental studies (see sections 4.1 and 4.2). Additionally, I will introduce the valence of a message. This cue is not unique to scientists and is an attempt to contextualise the roles of different boundary conditions further within my proposed framework (see section 3.2.1).

In this vein, I will examine how they relate to the evaluation of scientists' communication and recipients' behavioural intention to engage with the scientists' posts. As outlined in section 3.4.2, I assume that public engagement with a scientist online can be considered an indicator of trust in said scientist. This will allow me to address the dissertation's overarching question and introduce the potential consequences of trust in a directly communicating scientist on social media. Furthermore, I will contextualise the findings of the presented content analysis and address the opinion expressed in a message as a cue paralleling the use of evidence. In doing so, I will also further investigate how message cues that are not unique to scientists (i.e., the valence expressed in the post) and cues that are unique to scientists and their communication (i.e., the use of scientific jargon) affect recipients' evaluation and engagement intentions.

To be more precise, the third experimental study of this dissertation investigates the reactions to statements expressed by scientists, intending to elucidate the factors that drive the effectiveness of scientific communication in terms of its dissemination. How influential posts become crucially depends upon the public reception, particularly on likes, shares, and comments (e.g., Gisler et al., 2017). These reactions not only imply an increase in the possible reach of scientists' posts but also influence users' subsequent evaluations of the posts positively and negatively (see section 3.3.3.2). For this study, liking, sharing, and commenting, which reflect varying degrees of involvement in the discourse (Taddicken & Krämer, 2021), will represent the trust-indicating actions of interest. Concerning the message cues, which are unique to scientists, this study focuses on scientific jargon since scientists frequently use jargon and technical terms, such as "virulence" or "heterogeneity", when attempting to communicate with the general public (Rakedzon et al., 2017) - even though this is usually not recommended (e.g., Bullock et al., 2019). To gain insight into the development of public dissemination of science content on social media, it is necessary to examine whether laypeople understand scientists' social media posts, particularly given the

potential use of scientific jargon. In addition to how scientists formulate a message, the valence of the message, i.e., whether it expresses a position in favour of or against a specific topic, will be part of the study. Given that phenomena such as confirmation bias lead to a preference for information that aligns with one's attitudes (e.g., Knobloch-Westerwick et al., 2020; see section 3.2.3.1.1. for further information on attitudes), the alignment between the valence of the message and the user's prior attitude towards a specific topic may be a significant factor in determining credibility perceptions of and, thus, engagement with scientists' posts.

Situational factors that influence how recipients process content must also be considered when identifying why recipients on social media are willing to interact with specific content while neglecting others. A crucial variable here is the recipients' situational motivation (see section 3.2.2.), which may influence their credibility assessment and intention to engage with scientists' social media posts (e.g., Winter et al., 2016). Based on the heuristic-systematic model (Chaiken et al. 1996), two motivations are considered here. First, accuracy motivation is linked to the goal of finding accurate and objective information, which causes users to invest time in effortful information processing. Second, defence motivation, driven by the desire to uphold and validate one's beliefs and attitudes, can result in individuals not only seeking information that aligns with their attitudes but also disregarding not-aligning information (Chaiken et al., 1996). Furthermore, I will focus on users' need for cognition and general trust in scientists, which both have been shown to influence content evaluation (e.g., Jonas et al., 2024; Knobloch-Westerwick et al., 2020). Although I utilise the HSM as a framework for selecting situational factors, I still assume that all information available to the users has equal potential to influence a recipient's evaluation of a scientist's communication on social media (see section 3.2.1).

4.3.1 Situational Motivation in User Engagement with Scientists' Social Media Postings

To gain a deeper understanding of the factors influencing the decision to engage with specific science-related posts, the users' current motivation needs to be considered. To expand the remarks on situational factors in section 3.2.2, accuracy motivation is determined by the aim to find objectively correct information (Chaiken et al., 1996). Following the motive of achieving an accurate decision outcome, users should show a preference for what they believe is accurate. For example, users are more likely to identify false or dubious information when reminded to do so, affecting their likelihood of sharing news (e.g., Pennycook et al., 2020). In contrast, the goal underlying defence motivation is to reinforce and protect one's beliefs and opinions. Thus, a high level of defence motivation, thus, causes individuals to seek information that confirms existing views rather than precise information. This inclination may result in a directional bias in information processing, whereby individuals favour - and then potentially engage with - information that aligns with their values and attitudes (Chaiken et al., 1996). Consequently, the first hypothesis of the

third experimental study assumes that these recipients will engage with scientists' posts that match their situational goal of either finding accurate or self-confirmation content:

H7.1: Users' motivation predicts the engagement with the content.

Despite the recipients' situational motivation presumably shaping if and how they engage with content online, the overall message assessment must be considered, particularly concerning those seeking accurate information. Therefore, the perceived credibility of content should play a pivotal role in determining user engagement. Previous research has shown that users are more inclined to interact with content perceived as truthful or credible. For instance, the perceived truthfulness of a message appears to have a more significant effect on the distribution of content than social cues like the number of likes or authority cues of the message's source (Buchanan, 2020). If the content is seen as accurate, it is more likely to be shared on social media (Pennycook et al., 2020).

Further, research on (fake) news showed that the perceived credibility of content increases the likelihood of sharing content (Kluck et al., 2019; Petit et al., 2021). However, the perceived credibility of information is also heavily influenced by the resources users allocate to it (Metzger, 2007). Since these capacities of information processing should be determined by the individual's motivation (e.g., Chen et al., 1999), the following hypothesis is posed:

H7.2: The relationship between the users' motivation and engagement with the content is mediated by the content's perceived credibility.

4.3.2 The Role of Attitudes in Credibility Perceptions and Engagement

Based on the assumption that the individual's motivation is decisive for the degree to which users engage with the content, the question of how individual attitudes influence content perception and evaluation is raised. While motivations and the corresponding goals are situational factors driving content reception, attitudes are more persistent and influenced by personal beliefs. In contrast to motivations, which determine the cognitive capacities allocated to processing information, attitudes determine evaluation, i.e., the tendency to reject or accept something (Hart et al., 2009).

Overall, recipients tend to exhibit a strong preference for content that aligns with their previous views. For instance, when asked to select polarised or balanced news articles, participants preferred articles that matched their views over balanced or opposing ones (Winter et al., 2016). This phenomenon of choosing content that aligns with preexisting attitudes, more frequently known as selective exposure, can be found across multiple domains (e.g., Knobloch-Westerwick et al., 2015; Meppelink et al., 2019) and demonstrates said preferences for attitude-consistent content. Since the goal of choosing content that is consistent with one's attitude has now been shown to drive users to select attitude-consistent content, preferably, the following hypothesis for users who encounter scientists' posts on social media concerning the match between users' attitudes and the messages' valence can be derived:

H8.1: The attitude-consistency with the posts predicts the users' intention to engage with the content by liking and sharing.

The selection of content is not the only area where this cognitive bias is not limited to the selection of content. The credibility evaluation also demonstrates the confirmation bias regarding alignment with attitude-consistent content. For instance, Van Strien et al. (2016) demonstrated that strong, but also weak, prior attitudes led to increased credibility of attitude-consistent websites. The tendency for attitude-consistent information to be evaluated as more credible and favourable manifests in related research (e.g., Meppelink et al., 2019; Metzger et al., 2020). From this, it can be concluded that the alignment of content with previous attitudes affects credibility and influences engagement with the post via credibility, as explained in the section on motivation. Consequently, the following two hypotheses are proposed:

H8.2: Attitude consistency predicts the perceived credibility of the post.

H8.3: The relationship between the attitude consistency with the post and engagement with the content is mediated by the content's perceived credibility.

4.3.2.1 *Interaction of Motivations and Attitudes*

As previously outlined, empirical evidence indicates that both the initial attitude and the individual motivation of the recipient influence the way content is evaluated. It can be expected that both will interact with one another since the tendency to select attitude constituent information is associated with both accuracy and defence motivation. Particularly, defence motivation should enhance confirmation bias with greater attitude strength and should be reduced with high-quality information and relevance, which are both associated with accuracy motivation (Hart et al., 2009). Consequently, the next hypothesis reads as follows:

H8.4: The relationship between the users' motivation and the contents' perceived credibility is moderated by the users' attitude consistency.

In relation to this, accuracy-motivated users should show a stronger preference for information provided by scientists to obtain highly accurate information. However, defence-motivated users should only do so for information aligning with their views. Here, specifically, defence-motivated participants should also be less inclined to endorse scientists' posts, given their tendency to seek confirming information. Consequently, they may be less likely to engage with information that challenges their beliefs. Hence, the next hypothesis reads as follows:

H8.4.1: Defence-motivated users are less likely to engage with a post by liking and sharing (compared to accuracy-motivated users and those in the control group).

4.3.3 Message Cues Unique to Scientists' Communication: Influence of Jargon on Credibility and the Intention to Engage

To scrutinise why recipients on social media engage with scientists' posts, it is necessary to consider personal variables (i.e., motivation and attitude) and the attributes of

the message itself. In the context of science-related messages, one crucial construct is the language used. Although "scientific language" and jargon are central components of scientific writing (Thomm & Bromme, 2012), it is often problematic for laypersons to comprehend jargon, which can negatively affect the credibility of the content (Bullock et al., 2019; Shulman et al., 2021). While avoiding jargon is beneficial for the contents' evaluation, it is vital to strike a balance, as using overly simplified language may result in misunderstandings (Rice & Giles, 2017). When texts are difficult to understand, readers often seek more straightforward explanations from experts. However, this can lead readers to underestimate the complexity of a subject and cause them to rely on their knowledge instead of verifying information with experts (e.g., Scharrer et al., 2012, 2017, 2021). These findings suggest that the presence of jargon could either prompt individuals to seek expert advice or, conversely, prevent them from engaging with the content at all. Since research on jargon is scarce, the next research question asks:

RQ3: Does scientific jargon in a post encourage or discourage engagement?

Given the jargon's potential to influence users' intentions to like, share, and comment on content, it can be assumed that credibility mediates this connection. Some research suggests that jargon hinders users' processing fluency, leading to greater resistance to the presented information, comparatively less support, and reduced credibility (Bullock et al., 2019; Shulman et al., 2021). However, other research suggests a more nuanced perspective of jargon, where it seems to function as an indicator of credibility. For instance, experts' use of jargon can boost credibility and perceived expertise in health forums (Zimmermann & Jucks, 2018) and increase the persuasiveness of therapeutic claims (Haard et al., 2004). Similarly, compared to more accessible texts, scientific writing was found to increase the trustworthiness of the authors and the content (Jonas et al., 2024; Thomm & Bromme, 2012). Therefore, it can be expected that if jargon influences engagement with content, it should not only affect the users' intention to engage with a post but also be mediated by the posts' credibility. This consideration leads to the following hypothesis:

H9.1: The presence of jargon in a post and engagement with the content are mediated by the content's perceived credibility.

Given that providing explanations is insufficient to combat the potential negative effects of jargon (Shulman et al., 2020), content needs to be understood for it to be perceived as credible. This consideration leads to the following hypothesis:

H9.2: The relationship between the use of jargon in a post and the perceived credibility is mediated by the users' understanding of the post.

4.3.4 Moderating Factors in Credibility Perceptions

Building upon the previous discussion on users' credibility assessments in engaging with scientists' posts online, two additional moderating factors, which reflect the cross-situational factors, need to be introduced: Users' need for cognition (NFC) and their general trust in scientists. Concerning the presumed effect of motivation on the content's perceived

credibility, users with a high NFC, a tendency reflecting the enjoyment of effortful thinking (Cacioppo & Petty, 1982), may tend to evaluate content more closely, particularly in accuracy motivation. For instance, higher levels of NFC were found to be associated with the selection of two-sided messages (Winter & Krämer, 2012). However, higher levels of NFC were also associated with an increased selection of attitude-consistent information (Knobloch-Westerwick et al., 2020), which aligns with self-confirming tendencies associated with defence motivation. Additionally, the recipients' general trust in scientists will be included to ascertain whether recipients are more or less likely to accept scientists' information uncritically, given that trust can serve as a heuristic to facilitate decision-making (Lewicki & Brinsfield, 2011). Individuals with a high level of trust in scientists may be more inclined to perceive content presented by scientists as more credible, which should amplify the effect of accuracy and defence motivation. Accordingly, the following can be hypothesised:

H10.1: The relationship between the users' motivation and the contents' perceived credibility is moderated by the users' (a) NFC and (b) trust in science.

In this vein, higher levels of NFC may also interact with the presence of scientific jargon. As with the effects anticipated regarding the respective motivations, it can be expected that users with higher levels of NFC will react differently to jargon in scientists' posts. Those who are more willing to perform effortful thinking when confronted with jargon should experience lesser impairments by jargon due to a decrease in processing fluency (e.g., Shulman et al., 2021).

Furthermore, the presence of scientific jargon may enhance the credibility ratings of those who trust scientists, as the "scientificness" of the content may serve as a heuristic cue for evaluating the content (Jonas et al., 2024). This tendency should be even more pronounced for those with high trust in scientists. Accordingly, the last hypothesis of this study reads:

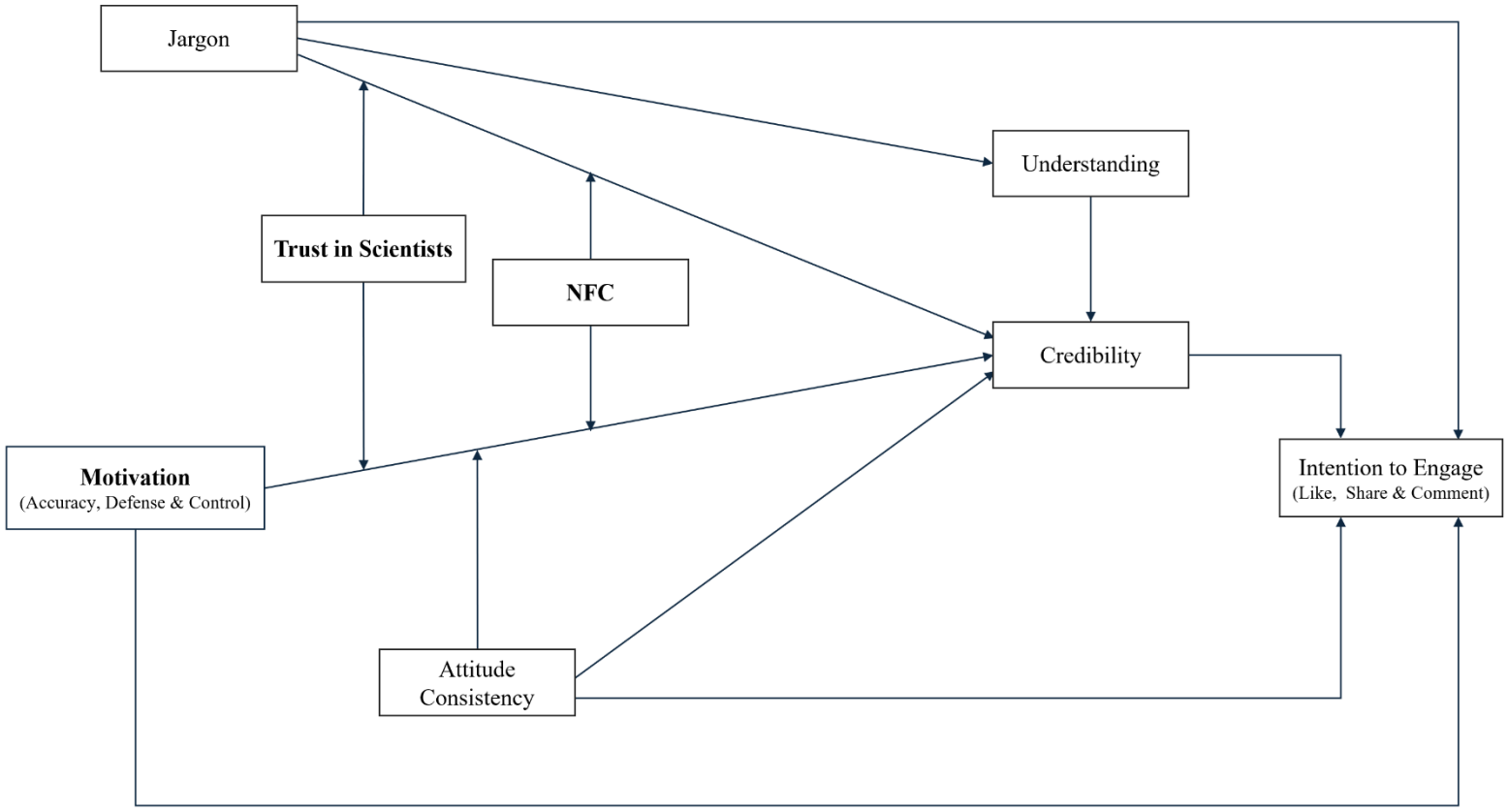
H10.2: The relationship between the presence of jargon in a post and the contents' perceived credibility is moderated by the users' (a) NFC and (b) trust in science.

4.3.4.1 Proposed Conceptual Model

The objective of this study is to gain insight into the mechanisms that influence user credibility assessment of scientists' messages, their engagement with the posts, the examination of message cues, and the overarching role of boundary conditions in their processing, which is illustrated in the following conceptual model reflecting the hypotheses (see Figure 14).

Figure 14

Proposed Conceptual Model



Note. Intention to engage covers the intention to like, share, and comment; Manipulated motivation, trust in scientists and NFC (bold) are on the between-person level.

4.3.5 Methods

Using a preregistered (https://osf.io/4ctwg/?view_only=4164405bb07a42a7826c2bac51e10dfe) 3 (between-subjects, prompted motivation: accuracy, defence, control) x 2 (within-subjects, jargon: present, not present) x 2 (within-subjects, posts' valence: positive, negative) mixed subjects-design the influence of scientific jargon and its impact on the willingness to engage (like, share, comment) with scientists' posts and its credibility assessment is explored. The materials, anonymised data, analysis code, and additional information are available in OSF: https://osf.io/39w85/?view_only=7569a89bcecb42dbb7f816eaa51021f0. [4]

4.3.5.1 Stimulus Materials

The stimuli consisted of posts by different fictitious scientists, each commenting on one of four topics pertinent to the subsequent processing of the COVID-19 pandemic: a) the role of science during the pandemic, b) the need for further research on the COVID-19 virus, c) the origin of the COVID-19 virus, and d) the adequacy of protective measures during the pandemic. At the time of data collection (January - February 2024), these topics were still publicly discussed. To reflect the first within-subject factors, the valence of two of the four posts was positive (supporting statement), and two posts were negative (opposing statement).

Additionally, the presence of scientific jargon was manipulated within the posts. Two of the four posts contained five to seven technical terms and academic jargon referring to the COVID-19 pandemic, such as "zoonosis" or "mRNA vaccines". These terms were chosen based on several glossaries concerning COVID-19 communication provided by public media institutions. In contrast, in the non-jargon condition, the two posts adopted more uncomplicated and accessible language by replacing jargon with everyday expressions. For example, the phrase "viral dispersion" in the jargon condition was replaced with "spread of the virus" in the non-jargon condition (see Figure 15 for an example).

4.3.5.2 Experimental Manipulation of Motivation

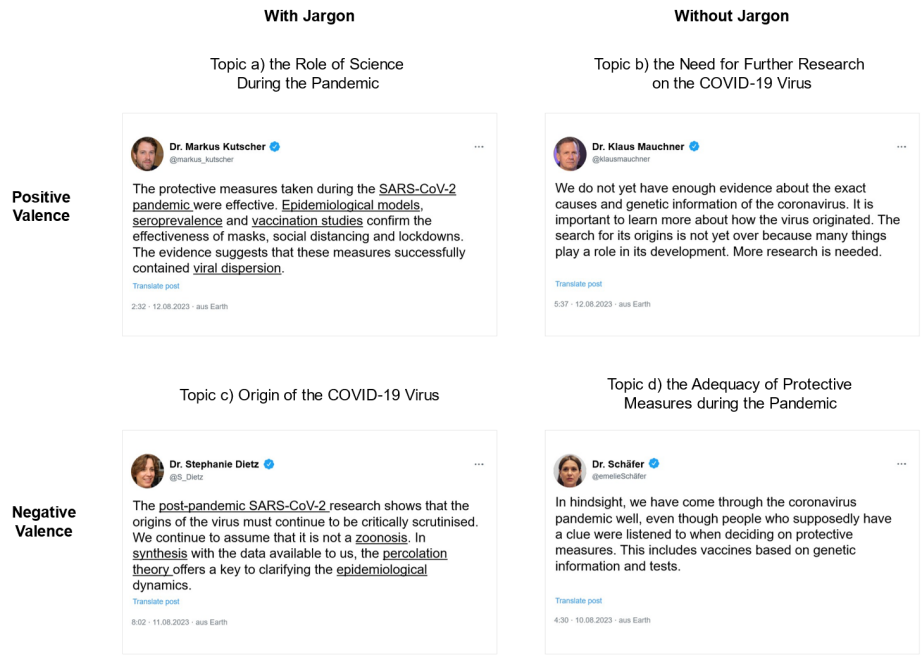
As part of the experimental manipulation, the participants were informed that they would be redirected to a chat with another participant where they should discuss the posts presented in this study. Participants in the accuracy group were instructed to identify the most accurate information possible, and the research goal was to understand how people search for accurate information and use it in discussions. Participants in the defence group were instructed to present their viewpoints in the most convincing manner possible. They

[4] Two additional research questions were preregistered but are not included in this examination since they did not yield meaningful insights to better understand the mechanisms of interest. The corresponding analyses can be found in OSF.

were further told that the research interest was to examine how individuals identify arguments to discuss with others and defend their perspectives. To enhance the impact of the manipulation, participants were also informed that the five individuals who presented the most accurate information or their viewpoint most effectively would receive a voucher, respectively. The participants in the control group were instructed to read the posts. Further, they were told that the research interest focused on examining how people discuss science on social media and determining whether platform X suits science communication.

Figure 15

Implementation of the 3 (between-subjects: motivation) x 2 (within-subjects: jargon) x 2 (within-subjects: posts' valence) mixed design with exemplary stimuli



Note. Jargon was not underlined in the experiment.

4.3.5.3 Procedure

First, participants were informed of the survey's purpose and the intended use of their data. Following consent, demographic data were collected, and participants were asked to complete questionnaires about their NFC and general trust in scientists. This was followed by a questionnaire on their attitudes toward various positions in dealing with the COVID-19 pandemic. Subsequently, the participants were randomly assigned to one of three experimental groups to induce their respective motivations. Each group was informed

that they would view a series of posts by scientists about COVID-19 and were instructed to read them carefully. Following that, all participants viewed a post and were asked to rate it in terms of credibility, understanding of the content, and intention to interact with it. This process was repeated four times in a randomised order. Participants rated four posts addressing topics related to the COVID-19 pandemic, which corresponded to previously posed questions addressing their attitudes. Of these four posts, two contained either scientific jargon or none, and two presented either a pro or con stance on the selected COVID-19-related topics. After rating the posts, participants were asked to answer items designed to measure motivation strength and the general reasons for engaging with social media posts. Finally, the participants were debriefed and informed of the rationale behind the experimental manipulation. They were given the option to enter a prize draw for vouchers independently of the experimental manipulation and their previous answers.

4.3.5.4 Measures

If not stated otherwise, all items were measured on a 7-point scale ranging from 1 = "strongly disagree" to 7 = "strongly agree".

4.3.5.4.1 Motivation Strength

A measure used by Winter et al. (2016) was adapted to fit the scenario presented in the current study to measure the strength of participants' accuracy and defence motivation. A total of eight items were used to measure accuracy motivation. For example, participants were asked how important it was to "make an accurate judgement" and "find all relevant information" when reading the posts, $M = 5.30$, $SD = 0.92$, Cronbach's $\alpha = .834$. Seven items were used to measure defence motivation. These included, for example, the extent to which it was important for participants to "find arguments to support your opinion" and "prepare for a possible counterargument" when reading the posts, $M = 4.53$, $SD = 1.21$, Cronbach's $\alpha = .878$.

4.3.5.4.2 Previous Attitudes & Attitude Consistency

To measure the participants' prior attitudes, they were asked to indicate their agreement to four statements that address the content of the posts (see Materials) on a 6-point scale ranging from 1 = "strongly disagree" to 6 = "strongly agree". For instance, to assess their prior attitude concerning the topic "origin of the COVID-19 virus", they were asked to indicate whether they agreed with the following statement: "The COVID-19 pandemic was caused by viruses being transmitted from animals to humans." (see Table 6).

Based on the measures for prior attitudes, I calculated a score to reflect the participants' attitude consistency with each post: Messages were coded +1 for positive valence and -1 for negative valence. The existing attitude questions, which were initially on a 1-6 scale, were adjusted. The scores for 1-3 were changed to -3, -2, and -1, while those for 4-6 were changed to +1, +2, and +3. Finally, each message score was multiplied by the participant's recorded score for the attitude strength. A positive result indicates an attitude-

consistent post (aligned with prior beliefs), while a negative result indicates an attitude-inconsistent post (not aligned).

Table 6
Means and Standard Deviation of Attitudes

Topic	Item
Research in decision-making	Scientific research has played an essential role in decision-making during the COVID-19 pandemic.
Need for further research	It is necessary to conduct further research on the origin of COVID-19.
Origin of the virus	The COVID-19 pandemic was caused by viruses being transmitted from animals to humans.
Appropriateness of measure	In general, protective measures to contain the COVID-19 pandemic were appropriate.

4.3.5.4.3 Perceived Credibility

Participants were asked to indicate whether they believed the post was "credible," "factual", "truthful", and "scientific". To address the perceived credibility of the posts, I calculated a score using the perceived factualness, truthfulness, and credibility, $M = 4.39$, $SD = 1.56$, Cronbach's $\alpha = .918$.

4.3.5.4.4 Understanding

To measure the participants' understanding, they were asked to indicate their agreement with the following statement: "I fully understood the content of the post." $M = 5.99$, $SD = 1.38$.

4.3.5.4.5 Engagement

To address participants' intention to engage with a post, they were asked to indicate their likelihood of liking, sharing, and commenting on the seen post on a scale ranging from 1 = "very unlikely" to 7 = "very likely". Overall, participants were likelier to like a post, M = 2.67, SD = 1.96, compared to sharing, M = 1.88, SD = 1.40, or commenting, M = 1.96, SD = 1.42.

In addition to asking the participants how likely they would engage with the posts presented in the experiment, they were also asked to provide general reasons for each type of engagement. A set of 11 potential reasons to engage (e.g. "to express praise or appreciation for the content" or "discuss the content of the post with others") and a text field

to include further options were presented to the participants. The descriptive results are available at OSF.

4.3.5.4.6 Need for Cognition

A short version of the NFC scale by Beißert et al. (2015) with four items (e.g., "Simply knowing the answer rather than understanding the reasons for the answers to a problem is fine with me."), was used to measure this cross-situational factor, $M = 4.51$, $SD = 1.06$, Cronbach's $\alpha = .683$.

4.3.5.4.7 General Trust in Scientists

Participants' general trust in scientists was measured using the four items rated on a bipolar scale from 1 = "completely distrust" to 7 = "completely trust". For example, these items covered their belief that participants (dis-)trust scientists to "create knowledge that is unbiased and accurate" (McCright et al., 2013), $M = 5.22$, $SD = 0.92$, Cronbach's $\alpha = .768$.

4.3.5.5 Sample

To determine the sample size, I conducted a power analysis using the R package 'pwr' (Champely et al., 2018). Given the expectation of small effect sizes, the aim was to detect effects of at least .12 at the between-subjects level with an alpha level of .05 and a power of at least .90. This analysis indicated a required sample size of 725 participants. This sample size can be expected to detect effects as small as .06 at the within-subjects level, maintaining the same alpha level and power.

Participants were recruited via the panel provider Prolific. The requirements for participation were that the participant be at least 18 years old, use social media platforms, and be fluent in German. Overall, 775 datasets were collected, and participants who failed to correctly answer attention check items ("to show that you are participating attentively, please select the value two", $n = 49$) were excluded. The remaining sample comprises $N = 726$ participants aged 18 to 71, $M = 28.02$, $SD = 5.93$. Of those, 50% of the participants identified as female, 49% as male, and 1% as non-binary. Most participants had university entrance-level qualifications (35%), 30% had a Bachelor's degree, 24% had a Master's or equivalent degree, and 11% had an intermediate school-leaving certificate or lower educational qualification.

4.3.6 Results

4.3.6.1 Manipulation Check

To ascertain whether the respective strengths of accuracy and defence motivation differ between the three experimental groups, two ANOVAs were calculated. No significant differences were observed regarding the motivation strength for accuracy, $F(1, 724) = 0.23$, $p = .629$, and defence motivation, $F(1, 724) = 1.53$, $p = .215$, between the groups. However, the strength of motivation corresponds with the group assignment (see Table 7).

Table 7
Means and Standard Deviation of Motivation Strength in the Respective Experimental Groups

		Strength of Accuracy Motivation		Strength of Defence Motivation	
Exp. Group	*n*	*M*	*SD*	*M*	*SD*
Accuracy	242	5.32	0.93	4.51	1.25
Defence	242	5.29	0.92	4.70	1.22
Control	242	5.28	0.90	4.37	1.15

4.3.6.2 Analysis Plan

Given the unsuccessful experimental manipulation, deviating from the preregistered analysis plan regarding this independent variable was necessary. Guided by the theoretical assumptions that accuracy and defensive motivations can co-occur (Chaiken et al., 1996), the best choice was to directly enter the measured strength of accuracy and defensive motivations in the analysis rather than comparing the experimental groups.

To analyse the available data while accounting for the within-person variances, I ran multilevel structural equation models (SEM) using R (version 4.2.1) and the 'lavaan'-package (version 0.6-17; Rosseel et al., 2017) with maximum-likelihood estimation. I specified the models (Figure 1) on level 1, where participants' data points are clustered within the individual subjects. Given the manipulation check and the decision to analyse individual motivation strength within the participants rather than comparing groups, I choose to define only the covariances on level 2. Further, I calculated interactions to address the proposed moderations. I included indirect and total effects according to the hypotheses in the model specification.

4.3.6.3 Analyses

Since the primary interest of this study is to examine the different types of engagement, I conducted three individual SEMs – one for each type of intention to engage (like, share, and comment) with the content. Descriptive values and zero-order correlations of the included variables are shown in Table 8.

First, the model, including the participants' intention to like a post based on the assumptions in the literature review, was tested, which revealed an acceptable fit, χ^2 (24) =

229.82, $p < .001$, χ^2 /df = 9.58, CFI = .995, TLI = .990, RMSEA = .054 (90% CI: .054, .048), SRMR = .036. I then examined the modification indices to confirm an appropriate model and test for any missing links. Based on those, I decided to add one path that connected the understanding of the post and the intention to like it. Since there is nothing to oppose this addition at a theoretical level, I have decided to accept this change as it increases the model fit, χ^2 (23) = 154.73, $p < .001$, χ^2 /df = 6.72, CFI = .997, TLI = .993, RMSEA = .044 (90% CI: .038, .051), SRMR = .033. The SEM, including the adjustments and standardised coefficients, is visualised in Figure 16.

Next, the model, including the participants' intention to share a post, was tested, which also revealed a good fit, χ^2 (24) = 188.37, $p < .000$, χ^2 /df = 7.84, CFI = .996, TLI = .991, RMSEA = .049 (90% CI: .042, .055), SRMR = .035. Again, I included one path from understanding the post to intending to share based on the modification indices. This modification increased the model fit, χ^2 (23) = 155.12, $p < .000$, χ^2 /df = 6.74 , CFI = .997, TLI = .993, RMSEA = .044 (90% CI: .038, .051), SRMR = .033 (see Figure 17).

Lastly, the model was analysed, including the participants' intention to comment on a post. This model fit is acceptable, χ^2 (24) = 195.11, $p < .000$, χ^2 /df = 8.13, CFI = .995, TLI = .991, RMSEA = .050 (90% CI: .043, .056), SRMR = .039, but was slightly increased by including a path form understanding to the intention to comment on a post like in the other model, χ^2 (23) = 156.23, $p < .000$, χ^2 /df = 6.79, CFI = .996, TLI = .993, RMSEA = .045 (90% CI: .038, .051), SRMR = .037 (see Figure 18).

4.3.6.4 Hypothesis Testing

The hypotheses are evaluated based on the models described above. Given the overlap in relationships across the three models, I will only present the coefficients from the model, including the intention to like, if the type of engagement is not part of the respective hypotheses. Information on the coefficients covering the intention to share and comment is available in Figures 17 and 18. This decision is based on the minimal differences observed in coefficients between models, depending on the engagement variable entered.

4.3.6.4.1 Influence of Motivation on the Intention to Engage

H7.1 stated that the users' motivation predicts engagement with the content. Concerning accuracy motivation, the analysis does not directly affect the intention to like, $\beta = .02$, $p = .412$, to share, $\beta = .01$, $p = .840$, and to comment, $\beta = .05$, $p = .367$. However, defence motivation predicts the intention to like, $\beta = 0.11$, $p < .001$, the intention to share, $\beta = .16$, $p < .001$, and to comment on the post, $\beta = .18$, $p < .001$. Therefore, H7.1 was supported for defence motivation but not for accuracy motivation.

Following this, H7.1.1 proposed that defence-motivated users are less likely to engage with a post by liking and sharing (compared to accuracy-motivated users and those in the control group). The analysis shows that measured accuracy motivation does not affect the intention to engage with the content, but defence motivation does. Thus, H7.1.1 (in their adjusted forms for measured motivation) needs to be rejected.

Table 8

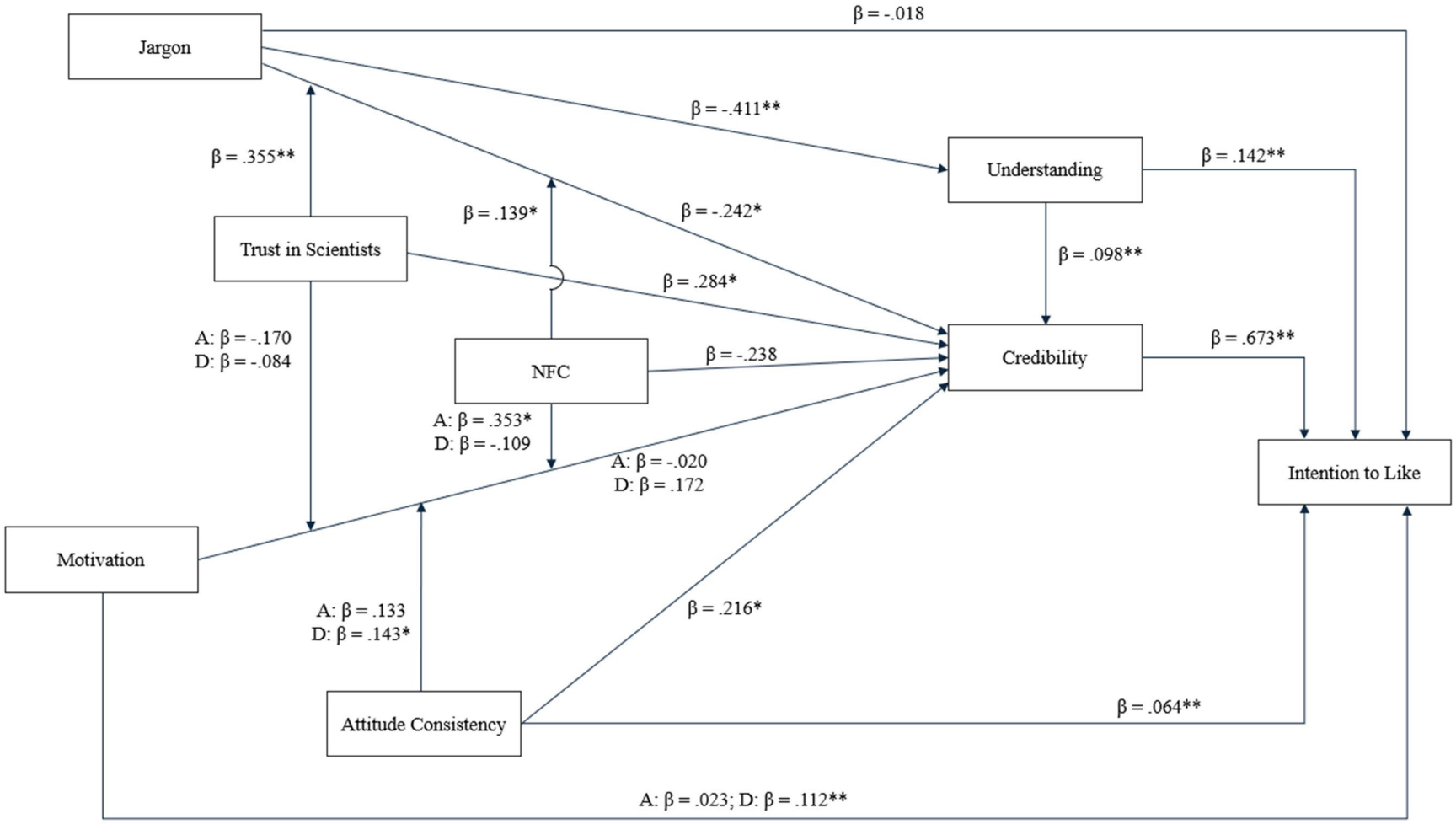
Means, Standard Deviations, and Pearson Correlations

		M	*SD*	1	2	3	4	5	6	7	8	9
1	Intention to Like	2.67	1.96									
2	Intention to Share	1.88	1.40	.72**								
3	Intention to Comment	1.96	1.42	.36**	.53**							
4	Accuracy Motivation	5.40	.94	.14**	.12**	.12**						
5	Defence Motivation	4.53	1.21	.15**	.16**	.16**	.46**					
6	Understanding of Post	5.99	1.38	.20**	.14**	.15**	.12**	.06**				
7	Presence of Jargon	.00	1.0	.05**	.05**	.01	.00	.00	-.37**			
8	Attitude Consistency	.00	4.91	.36**	.24**	.03	.01	.00	.14**	-0.01		
9	Trust in Scientists	5.22	.92	.07**	.06**	.01	.14**	.06**	.05**	.00	.00	
10	Need for Cognition	4.51	1.06	.00	.02	.10**	.09**	-0.01	.08**	.00	.00	.10**

Note. * indicates $p < .05$. ** indicates $p < .01$.

Figure 16

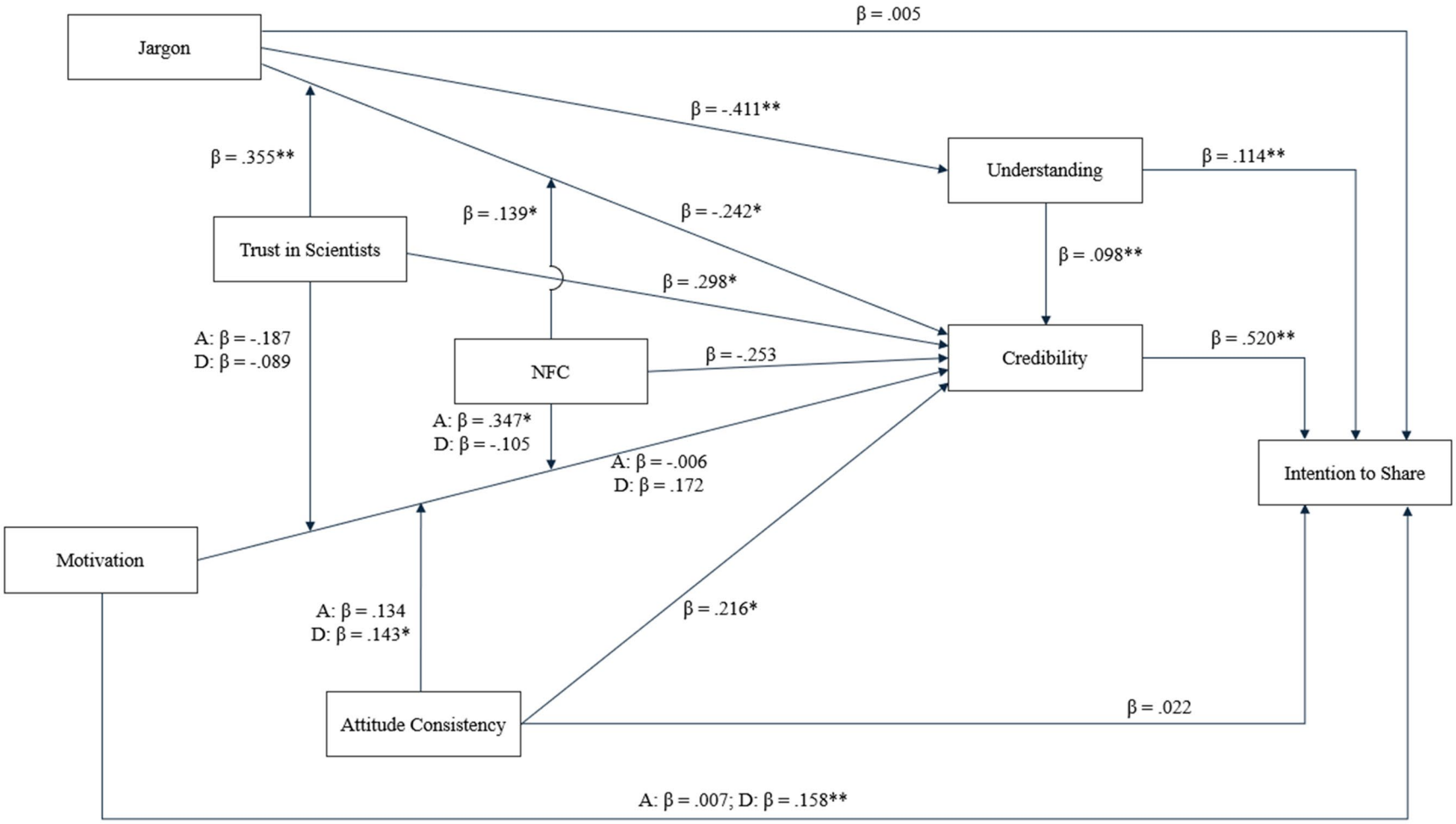
SEM including the Intention to Like a Post with Standardised Coefficients



Note. * indicates $p < .05$, ** indicates $p < .001$, A = Accuracy motivation, D = Defence motivation

Figure 17

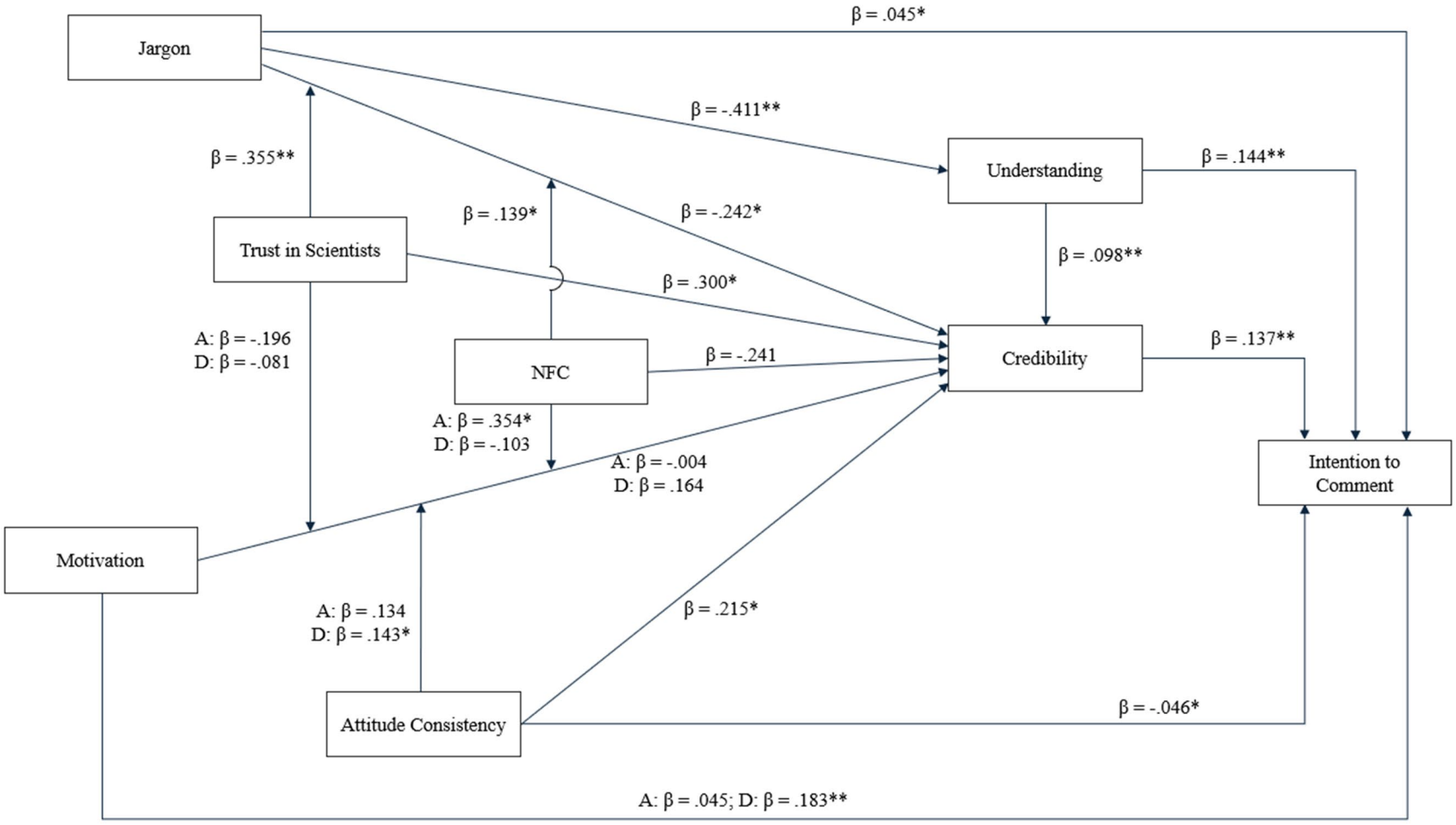
SEM including the Intention to Share a Post with Standardised Coefficients



Note. * indicates $p < .05$, ** indicates $p < .001$, A = Accuracy motivation, D = Defence motivation

Figure 18

SEM including the Intention to Comment on a Post with Standardised Coefficients



Note. * indicates $p < .05$ **, indicates $p < .001$, A = Accuracy motivation, D = Defence motivation

Next, it was assumed that the relationship between the users' motivation and the contents' perceived credibility is moderated by attitude consistency (H8.4), NFC (H10.1a), and trust in scientists (H10.1b). For this reason, I will first report on the direct effects of attitude consistency, NFC, and trust in scientists on the perceived credibility as well as those of the respective motivation. As previously stated, I report the standardised coefficients based on the SEM, including the intention to like a post. Please refer to Figures 17 and 18 or the supplementary material in the OSF for the coefficients concerning the model, including the intention to share and comment.

No direct effect of accuracy motivation, $\beta = -.02$, $p = .895$, and defence motivation, $\beta = .17$, $p = .301$, on the perceived credibility can be found. While trust in scientists, $\beta = .28$, $p = .007$, and attitude consistency, $\beta = .22$, $p = .019$, had a significant effect on the perceived credibility of a post, NFC did not, $\beta = -.24$, $p = .053$. Further, the analysis shows that the relationship between participants' accuracy motivation and the perceived credibility of the post was neither moderated by attitude consistency, $\beta = .13$, $p = .197$, nor trust in scientists, $\beta = -.17$, $p = .353$. However, a significant moderation effect of the NFC emerges, $\beta = .35$, $p = .030$. Participants with higher levels of NFC, coupled with higher levels of accuracy motivation, perceived the posts as more credible. As a result, H10.1b can be partially supported in terms of accuracy motivation. Next, I report the results for defence motivation. Attitude consistency moderated the relationship between defence motivation and credibility, $\beta = .14$, $p = .035$. Further, neither a moderation effect of NFC, $\beta = -.11$, $p = .403$, nor trust in scientists, $\beta = -.08$, $p = .630$, can be found. Thus, H4.1a can be used to support defence motivation.

H7.2 assumed that the content's perceived credibility mediates the relationship between the users' motivation and engagement with the content. As reported above (H8.4/H10.1), neither the accuracy nor the defence motivation directly influences the posts' perceived credibility. However, the analysis shows that the perceived credibility of a post predicts the intention to like, $\beta = .67$, $p < .001$, share, $\beta = .52$, $p < .001$, and comment, $\beta = .14$, $p < .001$. Regarding the participants' intention to like a post, neither an indirect, $\beta = -.01$, $p = .895$, nor a total effect, $\beta = .01$, $p = .922$, of accuracy motivation over credibility to the intention to like a post can be found. This holds also true for the intention to share, $\beta_{indirect} = -.00$, $p = .970$, $\beta_{total} = .00$, $p = .961$, and to comment, $\beta_{indirect} = -.00$, $p = .980$, $\beta_{total} = .04$, $p = .410$.

Concerning the defence motivation and the intention to like a post, the analysis shows that the indirect effect is not significant, $\beta = .12$, $p = .302$, but the total effect is $\beta = .23$, $p = .048$. Similarly, no indirect effect of the perceived credibility can be found for the intention to share a post, $\beta = .09$, $p = .302$. However, a total effect can be found, $\beta = .25$, $p = .008$. The same pattern also holds for the intention to comment on a post. No indirect effect of the perceived credibility appears, $\beta = .02$, $p = .334$. However, the total effect is significant, $\beta = .21$, $p < .001$. Since no mediating effects can be found, H7.2 cannot be confirmed for accuracy and defence motivation for any of the three engagement types.

4.3.6.4.2 Influence of Attitude Consistency on the Intention to Engage

Now, I will report the results for the influence of attitude consistency on the intention to engage with a post. H8.1 proposed that attitude consistency with a post will predict the intention to engage with the content by liking and sharing. The analysis supports this assumption for the intention to like a post, β = .06, $p < .001$, but not for the intention to share a post, β = .02, $p = .230$. Thus, H8.1 can only be partially confirmed. Moreover, a significant negative effect of attitude consistency on the intention to comment on a post can be found, β = -.05, $p = .033$. While the effect is below the threshold for meaningfully detectable effects, it still signals that while posts in line with one's attitude appear to be liked more, they also seem to be commented on less.

Further, it was expected that attitude consistency predicts the perceived credibility of the post (H8.2), which is supported by the data, β = .21, $p = .019$. Subsequently, the effect of the relationship between the attitude consistency with the post and engagement with the content is mediated by the posts' perceived credibility, which was assumed (H8.3). As reported above (H7.2), the analysis showed that perceived credibility predicts the intention to engage with a post. For the intention to like a post, the analysis also reveals a significant indirect effect of credibility and attitude valence on the intention to like, β = .15, $p = .019$, and a significant total effect, β = .21, $p = .001$. A similar pattern holds for the intention to share a post where the indirect effect is significant, β = .11, $p = .020$, and the total effect is β = .13, $p = .008$. Moreover, the analysis shows a significant indirect effect, β = .03, $p = .031$, but no significant total effect, β = -.02, $p = .464$, for the intention to comment. Therefore, H8.2 can be supported for liking and sharing. However, the effects of commenting are below the threshold of meaningful, interpretable effects.

4.3.6.4.3 Influence of Jargon on the Intention to Engage and Credibility

Further, it was up for question if the presence of scientific jargon would encourage or discourage the intention to engage with a post (RQ3). The analysis reveals that jargon does not influence the intention to like, β = -.02, $p = .216$, or share, β = .01, $p = .790$, a post. However, it slightly increases the intention to comment on a post, β = .05, $p = .032$.

Next, it was assumed that the effect of jargon on the posts' perceived credibility is moderated by users' NFC (H10.2a) and trust in scientists (H4.2b). First, the analysis shows that jargon decreases the perceived credibility, β = -.24, $p = .022$. As reported above (H8.4/H10.1), NFC and trust in scientists directly influence perceived credibility. Further, the analysis reveals a significant moderating effect of NFC, β = .14, $p = .040$. While NFC alone reduces the posts' perceived credibility, it increases the credibility in the presence of jargon. Regarding trust in scientists, there was a moderating effect on the relationship between the use of jargon and how credible the posts were seen to be, β =.36, $p < .001$, with trust in scientists making the positive effect of jargon stronger. Therefore, H9.4a and b can be confirmed.

Continuing, it was stated that the relationship between the presence of jargon and engagement with the content is mediated by perceived credibility (H9.1). The presence of

jargon decreases credibility (see H10.2), while credibility increases the intention to engage with a post (H7.2). Further, the analysis shows that jargon does not directly influence the intention to like or share a post but appears to increase the intention to comment (RQ3). For the intention to like a post, a significant negative indirect effect, β = -.16, p = .022, and a significant negative total effect, β = -.181, p = .013, can be found. Regarding the intention to share, the analysis also shows a significant negative indirect effect, β = -.13, p = .022, and a total effect, β = -.12, p = .038. The indirect effect of jargon and credibility on the intention to comment is also negative and significant, β = -.03, p = .034. However, the total effect is not significant, β = .01, p = .664. These findings indicate that credibility mediates the effect between the presence of jargon and the intention to engage with jargon, decreasing credibility and, thus, engagement. Therefore, H9.1 can be partially confirmed since the direct and indirect effects found for the intention comment are below the smallest effect reliably detectable given the current sample size.

The last hypothesis stated that the relationship between the presence of jargon and the perceived credibility is mediated by the users' understanding of the post (H9.2). While jargon reduces the credibility of a post (H10.2), it also reduces the understanding of a post, β = -.41, p < .001. Furthermore, understanding the post increases the perceived credibility, β = .10, p < .001. The observed indirect effect of jargon and understanding on the perceived credibility is significant, β = -.04, p < .011, but not meaningful due to its small effect size. Further, the total effect is significant, β = -.28, p = .007. Nevertheless, the proposed mediation in H9.2 cannot be confirmed since the indirect effect falls below the threshold for reliably detectable effects. An overview of the supported and rejected hypotheses is available in Table 9.

4.3.7 Discussions of Empirical Results

The successful dissemination and public perception of scientists' content on social media depends on user engagement. Therefore, this study examined the factors influencing user intention to like, share, and comment on scientists' posts by exploring users' motivation**,** their alignment with the content, and the presence of scientific jargon. Regarding one of the overarching results, this study aligns with previous research (e.g., Kluck et al., 2019) by demonstrating that credibility was the most influential factor in predicting the intention to engage with a scientist's post in the current setting. Specifically, the results show that the lower the effort to participate in the dialogue, the greater the effect of the perceived credibility.

4.3.7.1 Impact of Motivation

The current results demonstrate that users' level of defence motivation predicted all surveyed forms of engagement. Mainly, defence motivation had the most significant effect on commenting, deemed the most effortful form of participation in a dialogue (Taddicken & Krämer, 2021). This finding provides novel insights into the development of active dialogue between scientists and the public, which is essential for modern science communication.

Table 9

Overview of Supported and Rejected Hypotheses

No.	Hypotheses/Research Question	Findings
H7.1	The users' motivation predicts engagement with the content.	Rejected for accuracy motivation Supported for defence motivation
H7.2	The relationship between the users' motivation and engagement with the content is mediated by the content's perceived credibility.	Rejected for accuracy and defence motivation for all types of engagement
H8.1	The attitude consistency with the posts predicts the users' intention to engage with the content by liking and sharing.	Supported for liking Rejected for sharing
H8.2	Attitude consistency predicts the perceived credibility of the post.	Supported
H8.3	The relationship between the attitude consistency with the post and engagement with the content is mediated by the content's perceived credibility.	Supported for all types of engagement, but below meaningful interpretable effect size for commenting
H8.4	The relationship between the users' motivation and the content' perceived credibility is moderated by the users' attitude consistency.	Rejected for accuracy motivation Supported for defence motivation
H8.4.1	Defence-motivated users are less likely to engage with a post by liking and sharing (compared to accuracy-motivated users and those in the control group).	Rejected
RQ3	Does scientific jargon in a post encourage or discourage engagement?	Discouragement for liking and sharing encouragement for commenting, but below meaningful interpretable effect size
H9.1	The presence of jargon in a post and engagement with the content is mediated by the content's perceived credibility.	Supported for all types of engagement, but below meaningful interpretable effect size for commenting
H9.2	The relationship between the use of jargon in a post and the perceived credibility is mediated by the users' understanding of the post.	Supported but below meaningful interpretable effect size
H10.1a	The relationship between the users' motivation and the contents' perceived credibility is moderated by the users' NFC.	Supported for accuracy motivation Rejected for defence motivation
H10.1b	The relationship between the users' motivation and the contents' perceived credibility is moderated by the users' trust in science.	Rejected for accuracy and defence motivation
H10.2a	The relationship between the presence of jargon in a post and the contents' perceived credibility is moderated by the users' NFC.	Supported
H10.2b	The relationship between the presence of jargon in a post and the contents' perceived credibility is moderated by the users' trust in science.	Supported

Further, it highlights that recipients' goal to reinforce and protect their attitude is linked to a mere preference in the selection of content and extends to actively producing content, shaping the public dialogue. This suggests that recipients not only process information following their goals, as posited by Chaiken et al. (e.g., 1996), but also extend to their behavioural intentions. Notably, this effect manifested for those who were not instructed to defend themselves. Interestingly, defence motivation alone did not affect the content's perceived credibility, which indicates that the desire to protect one's views does not per se influence how content is evaluated. Content has to align with one's views to be perceived as credible, which supports prior research suggesting that credibility perceptions may be more relevant in evaluation patterns of information than, for instance, the avoidance of cognitive dissonance (Metzger et al., 2020).

While accuracy motivation was expected to predict users' credibility evaluations and their intention to engage with scientists' content, the results indicate otherwise. This finding can be explained in two ways. Firstly, interacting with content may not necessarily align with users' goals of seeking accurate information. In other words, accuracy motivation did not affect the intention to respond to a post. Thus, it may simply not influence engagement with scientific information in online dialogues. Secondly, the absence of an effect could stem from the experimental setup, where participants were instructed to exchange information with others. This could have conflated accuracy motivation with defence motivation. Those with high accuracy motivation may still be driven by a motive to defend their views, leading to higher confirmation bias (Winter et al., 2016), which fits the notion of co-occurring motives in processing information (Chaiken et al., 1996). This assumption can also explain the strong effects of defence motivation on engagement intentions. The first explanation appears more fitting since no interaction effect between the motivations and contents' valence was found.

However, analysis shows that NFC moderated the relationship between accuracy but not defence, motivation, and perceived credibility. Furthermore, neither motivation had a direct effect on the credibility evaluation. Recipients who enjoyed thinking and simultaneously had the goal of finding accurate information were more likely to rate scientists' content as credible. Although the effect was not significant, those with a higher level of defence motivation and a high NFC tended to rate credibility lower. This finding suggests that cognitive tendencies, such as the NFC, may play a more consistent role in evaluating content than motivational states alone, contrary to previous conceptions (Chaiken et al., 1996).

4.3.7.2 Impact of Attitude Consistency

The results yield evidence for a direct positive effect of attitude consistency on credibility, which aligns with previous research (e.g., Metzger et al., 2020; Van Strien et al., 2016). Moreover, it can be observed that attitude consistency increases the intention to like content but reduces the intention to comment. However, the impact of commenting falls below a confidently interpretable threshold. Additionally, no direct influence of attitude

consistency on the intention to share content was found, thus contradicting previous findings (e.g., Wischnewski et al., 2022). This inconsistency may arise from the context of the study, which focuses on users' intention to engage with scientists' posts.

In contrast, previous studies examined sharing behaviour in political contexts. However, the analysis shows a moderating effect of credibility on the effect of attitude consistency on intention to like, share, and comment. In other words, only attitude-consistent content that is also seen as credible is more likely to be engaged with. Again, this finding provides further evidence for the notion that credibility is not only a central factor in information selection (Metzger et al., 2020) but also extends to information dissemination and participation in the dialogue. The mediation further indicates that the impact of confirmation biases may be less pronounced in scientific contexts, where there is less scope for individual opinion compared to political issues. When users evaluate scientists' posts, who are often regarded as more trustworthy than political actors (Bromme et al., 2022), they may tend to cautiously reflect on the content before responding. In this study, participants were more likely to like content that aligned with their beliefs. However, they were less likely to comment, suggesting they engaged in more cognitive elaboration.

4.3.7.3 Impact of Jargon

Concerning the research question of whether jargon encourages or discourages engagement with a post, the analysis shows that jargon only influences the intention to comment. Neither the recipients' intention to like nor share a post was affected by jargon. This finding indicates that jargon may encourage engagement with scientists' posts, thereby providing an entry point for public engagement. However, the effect size was below the meaningful interpretable threshold. Thus, further research should investigate this relationship in more depth.

Nevertheless, the current results still stress that jargon needs to be used cautiously: Posts containing jargon were less understood by recipients, which caused a direct and indirect decrease in credibility. This finding aligns with previous research suggesting that jargon can impede readers' processing fluency and, thus, cause a decrease in credibility (Bullock et al., 2019; Shulman et al., 2021). Although it may appear obvious, only when a post is well-understood will recipients engage with it. Hence, science communicators need to consider potential readers and avoid jargon to foster public engagement and reach a wider audience.

Interestingly, the negative effect of jargon on the perceived credibility of the post is reversed for those who reported to trust scientists. Therefore, this finding exhibits that jargon can serve as a heuristic for evaluating a source's trustworthiness (e.g., Jonas et al., 2024; Thomm & Bromme, 2012). It further appears to support the concept of trust as an evaluative heuristic (Lewicki & Brinsfield, 2011), which implies a presumption of credibility specifically for scientists. Furthermore, the analysis supports that the negative effects of jargon on credibility are also reduced for recipients with higher levels of NFC. This result parallels previous research, which also noted the negative effects of jargon on

urgent and significant situations (Shulman et al., 2021). Given this, it appears that context and individual inclinations toward cognitive engagement influence the impact of jargon.

4.3.7.4 Limitations and Future Research

The first limitation demanding attention is the unsuccessful experimental manipulation, which caused a deviation from the preregistered plan and, therefore, used the measured motivation strength and revealed a co-occurrence of multiple motives, as discussed in the literature (Chaiken et al., 1996; Chen et al., 1999). Consequently, future research should account for multiple motives in evaluating information online and develop and validate a measure to (quickly) capture motivational states. Another limitation of this study is the chosen topic, which may have elicited the deviation of results from previous research. Therefore, future research should use different postings and focus on multiple topics. To further strengthen the generalisability of the results, future research should also consider different platforms that offer different types of content regarding subjects and formats. Next, further research should consider including participants' level of impression motivation (S. Chen et al., 1996, 1999), as motivated reasoning and identity cues may also influence the engagement with science communicators online (Hart & Nisbet, 2012).

4.3.7.5 Conclusion

This study provides an empirically tested model of the factors affecting public engagement with scientists on social media. The findings demonstrate that credibility is the most influential factor in user engagement and, subsequently, the dissemination of scientific content on social media. Participants were more strongly inclined to engage with content perceived as credible than with attitude-consistent content. Although the motivation to defend one's view directly predicted the users' engagement intention overall, it only increased the credibility perceptions for attitude-consistent content but not on its own. Similarly, seeking accurate information increased credibility perceptions, but only for those high in NFC. However, it had no direct effect on either credibility or engagement intentions. Lastly, the analysis showed that using scientific jargon is a double-edged sword, as it can drastically decrease understanding, credibility, and the intention to engage. On the other hand, it can also serve as a credibility-boosting heuristic for those who trust scientists, and it may encourage a dialogue between scientists and the public.

Based on these results, communicators should keep their audiences in mind when posting since individual characteristics, such as the level of NFC and trust in scientists, can influence how the audience perceives their messages. Furthermore, those considering discussing controversial topics online should note that defence-motivated users are likelier to engage with the content than accuracy-motivated ones.

4.3.8 Discussion within the Framework

Concerning the overarching proposed framework, the aim of the third experimental study was preliminary to examine two objectives: Firstly, to further examine the effects the

message cues on the evaluation of scientists' messages online – precisely, their credibility, as I posit that it is a direct consequence of trust in a scientist (see section 2.1.5). Regarding the message cues, I was specifically interested in assessing the assumption indicated by the contributions discussed beforehand, which points to the strong effects of cues unique to scientists. Secondly, its purpose was to scrutinise how the different boundary conditions for a recipient's processing of the available cues and the relations of the (cross-)situational factors. For further context, this third study, again, focused on scientists who addressed the public on social media but only on message cues. Also, like the second experimental study, it focused on message cues that are unique vs not unique to scientists' communication, but provided a different angle as it included other cues.

Addressing the first aim, the third experimental study also supports the notion that the presumed scientific character of a message has a favourable impact on the assessment of communication by scientists, but only to a certain degree. Here, including the boundary conditions provides a particularly crucial perspective to understand how specifically the cues unique to scientists' communication transmit the perception of trust. As the study indicates, scientific jargon (i.e., a message cue unique to scientists) in a scientist's post is only rated as more credible and, thus, more likely to be engaged with if the respective recipient trusts scientists in general. This finding further contextualises the role of trust in science as a cross-situational and, thus, disposition-like state. The result supports the assumption I proposed for the current framework: trust can be seen as an attitude-like state. Additionally, it shows parallels to heuristics (see Lewicki & Brinsfield, 2011) in determining how recipients bridge potential gaps in knowledge and understanding by accepting their vulnerability towards a scientist (see section 2.1.4). It can thus be posited that the cross-situational factor of the general tendency to trust scientists has a pronounced impact on the process of trust application, as it appears to counterbalance the adverse effects that scientific jargon would otherwise exert. Given that the situational motivation to strive for accurate information did not interact with a recipient's general propensity to trust scientists, it is up for question whether trust indeed serves the same function as a heuristic or if this type of trust is a disposition reflecting the inclination to expect positive outcomes from encounters with scientists.

Regarding the cross-situational tendency to enjoy thinking (NFC), jargon also benefited the perceived credibility, which indicates that both positively influence the evaluation of communication with unique properties to scientists. This notion is also evident in prior research indicating that higher levels of NFC are inclined to place more trust in experts (Bakker et al., 2013). Interestingly, NFC did not significantly interact with the situational defence motivation as users who were motivated to select self-confirming information did and had higher NFC levels showed no signs of credibility reduction based on these boundary conditions, which appears to contradict prior research (Knobloch-Westerwick et al., 2020). However, it also underlines that those who enjoy thinking are potentially less impaired by a decrease in processing fluency through scientific jargon

(Schulman et al., 2021). Like in the second experimental study, NFC had no direct effect on independently evaluating a scientist's communication. This circumstance shows that a recipient's cognitive style is a boundary condition of the processing of scientists' communication, specifically regarding cues unique to scientists, as the third experimental study underscores.

Additionally, this study highlights that, in particular, the directional situational defence motivation affected all types of engagement with the posts presented by unfamiliar scientists. Nevertheless, it must be emphasised that the message cue of valence exerted more significant effects on the perceived credibility yet more negligible effects on the intention to engage with the content. Within the context of my proposed framework, this circumstance indicates that the boundary conditions are more influential for evaluating the cues compared to the trust-indicating behaviours, i.e. the intention to engage publicly with content.

In light of the lens model (Brunswik, 1956), the results of the third experimental study also demonstrate that the cues available to recipients on social media can be viewed as intermediaries for trust indicators but also that the proposed boundary conditions shape the "lens" through with they are viewed (see section 3.2.1). All the examined (cross-) situational factors influenced the evaluation of a scientist's communication. Although the effects differed based on the stimuli presented to the participants, cross-situational factors were particularly influential in determining the recipients' evaluation, given the situational motivations.

At this point, I want to emphasise that within my proposed framework, both credibility and engagement can be seen as approximations of trust (see sections 3.4.1 and 3.4.2). Based on the current analysis, message-related credibility also appears to have a direct link to engagement. It can, therefore, be seen as a foundation for showing trust-indicating behaviour. This notion partially supports my assumption that deviates from the content analysis presented in this dissertation (see Biermann et al. 2024) that public engagement with science is linked to (message) cues that are unique to scientists and their communication, as the presence of jargon only partially predicted engagement. However, as examined in the content analysis, it only affected the recipients' intention to engage. This further contextualises the results. Given the relatively small and, therefore, not reliably interpretable effect size, the presence of jargon had an impact on the recipients' intention to comment. In detail and bearing the results of the first experimental study in mind, the visible scientists seemed to benefit from their perceived familiarity when engaging with their posts, including message cues unique to scientists and their communication (i.e., scientific evidence).

To ascertain whether perceived familiarity functions in a sender-related manner, I will reexamine this concept from the first experimental study and provide further contextualisation. In particular, I will examine the cues that are not unique to scientists, their communication, and the extent to which non-personalised senders who also communicate scientific content benefit as much as scientists. This circumstance prompts the question of

whether the clear scientific relevance of the information source has a positive effect on recipients' evaluations or the scientific nature of the content itself. As seen in the second experimental study, I will also address contextual cues but focus on quantitative rather than qualitative cues to gain further insights into the influence of community-based endorsements rather than rejections. Additionally, I will provide another perspective on the results of the third experimental study, which demonstrated that cross-situational factors (i.e., attitudes) significantly influence the evaluation of content communicated online by scientists. This raises the question of whether this is an exclusive characteristic of belief-driven attitudes, whether it can also be applied to knowledge in its various forms, and to what extent these are influenced by exposure to scientific information.

4.4 Experimental Study 4: Investigating Context and Sender Cues on the Perceived Credibility of Science Communication Videos and Recipients' Knowledge

In the fourth and last experimental study, I will transfer and assess the proposed framework in the context of science communication, with no directly personified scientists but science communication channels. In this regard, I will focus on sender-related cues in conjunction with context-related cues and examine their impact on (subjective) knowledge change and perceived credibility, which I argue indicates trust in the sender (see section 2.5.1). Furthermore, this study will deviate from the previous studies as it will investigate dynamic video-based content rather than text-based communication, such as preliminary data seen on platforms like Twitter/X, to further examine the soundness of my proposed framework.

The rationale behind this choice is that scrolling through unlimited short-format videos has recently gained immense popularity on platforms like TikTok, Instagram Reels, and YouTube Shorts. Since primarily younger persons use social media as their core source of receiving information and news (Newman et al., 2023), the question about how users rate the credibility of content on these platforms is of the highest importance, given the rise of misinformation about socio-scientific issues like vaccines or global warming. Notably, social media content that is incidentally consumed by the users (i.e., without actively searching for it) has been theorised to contribute to users feeling knowledgeable rather than contributing to factual knowledge, thus creating so-called knowledge overconfidence (Schäfer, 2020; Yamamoto & Yang, 2022). Accordingly, this study differentiates between users' factual knowledge about a topic (i.e., objective knowledge) and their confidence in possessing accurate knowledge (i.e., subjective knowledge; Brucks, 1985) to investigate how subjective knowledge confidence is related to credibility judgements (see section 3.2.3.1.2 for further information). Understanding the impact of short-format videos on social media on objective and subjective knowledge is critical since they are differently associated with believing either accurate or false scientific information. Specifically, a tendency to

overestimate one's knowledge is associated with rejecting scientific information. In contrast, a realistic knowledge assessment and underestimating one's knowledge are related to accepting scientific information as is (Light et al., 2022).

Consequently, objective and subjective knowledge may affect the videos' further dissemination and influence users' overall belief in the scientific information presented. Knowledge confidence is crucial for determining information interpretation and subsequent evaluation (Light et al., 2022; Park & Lessig, 1981; Schäfer, 2020). Therefore, this study also aims to analyse the relationship between recipients' knowledge confidence and credibility evaluations of short-format science videos.

Since viewers of short-format videos see an ever-growing amount of content in a very short time, they are likely to rely on superficial processing to save cognitive capacities (Sundar, 2008). Specifically, the recommendation algorithm of TikTok prioritises content based on user interests and properties of the video rather than solely on the creators one follows on the "For You"-page (TikTok, 2020). As a result, users encounter a diverse range of content serendipitously, even from channels they do not follow or are previously aware of. This raises the question of whether familiarity with the source and its reputation affect the video's credibility since they are assumed to serve as a heuristic in determining the credibility of content online (Metzger & Flanagin, 2013). Hence, the aim is to test if this holds for short-format videos presenting science. Mainly, when a source is unfamiliar, users may rely on other credibility indicators to evaluate the content, such as community-based endorsement ratings, i.e. the number of likes for a video (Metzger & Flanagin, 2013; Sundar, 2008). Thus, the present study investigates the role of two influential elements in credibility judgments and knowledge acquisition: Quantitative endorsement cues and the source's reputation and recognition. In this study, the sources' reputation is defined as 1) the degree to which a channel is perceived positively and 2) the degree to which a channel is previously familiar to and recognised by a recipient. Those cues, which recipients rely on when evaluating information online (Metzger et al., 2010), should be relevant because the endorsement of others, along with the reputation, serve as easily accessible cues besides one's prior knowledge confidence when processing large amounts of information.

4.4.1 Endorsing Quantitative Context Cues

In evaluating the credibility of information disseminated online, individuals frequently employ cognitive shortcuts, such as relying on others' judgments. This phenomenon is known as an endorsement or bandwagon heuristic (e.g., Metzger & Flanagin, 2013; Sundar, 2008) and is further discussed in section 5.2.6 of this dissertation. Several studies support the notion that endorsement cues, such as the number of likes, lead to favourable evaluations of content across multiple domains and platforms. For example, Jin et al. (2023) showed that deep fake videos are rated as more credible if the source has more followers and if the video has a high number of views and likes. Another study by Jucks and Thon (2017) shows that highly endorsed posts in medical forums are rated more

credible than posts with no endorsement and are similar in credibility to information provided by experts.

Further, Luo et al. (2022) tested the effects of social endorsement on the credibility ratings of headlines on science, health, and politics. Their study found that higher credibility ratings were associated with a high (compared to low) number of likes. However, this effect was observed for headlines dealing with science and health, not for those addressing politics. This finding blends into prior research, which showed no effect of endorsement cues. Here, it is arguable that those studies have not found any effects of endorsement cues due to the presented polarising or opinionated nature of the examined content. Examples include content such as the legalisation of drugs (Winter et al., 2015), gain/loss frames on health issues (Borah & Xiao, 2018), or politics (Luo et al., 2022). Therefore, it can be expected that endorsing quantitative context cues should also positively affect the credibility of short-format videos, as observed on other text-based platforms examined in the previously discussed studies. This assumption leads to the following hypothesis:

H11: Participants who see short videos with a high number of likes will rate them as more credible than short videos with a low number of likes.

4.4.2 Familiarity: Reputation and Recognition

In addition to the potential beneficial evaluation based on endorsing quantitative context cues, which evaluates the reception of short-format videos by other viewers, the reputation of the video source also serves as an additional aid in the credibility evaluation of the content. According to Metzger and Flanagin (2013), recipients may prefer familiar sources over unfamiliar ones and those recognised as having high authority and status. Rather than examining content closely, people use their prior knowledge about the source as a proxy for the content's actual credibility (Metzger et al., 2010; Ou & Ho, 2024), which should be based on previous encounters with the source. A positive reputation can foster trust in the source and the information (e.g., McKnight et al., 2002; Metzger, 2006; Metzger & Flanagin, 2013). Previous research underscores that recipients trust highly reputable sources, such as experts or scientists, more than laypersons and rate them higher in credibility (Borah & Xiao, 2018; Flanagin et al., 2020; Winter & Krämer, 2014). Accordingly, and based on the further explanations in section 3.3.1.2, recipients who are familiar with a channel and think it has a positive public image should be more likely to believe the content without further verification, which should be visible in ratings of higher credibility. Therefore, the next hypothesis reads as follows:

H12: Participants who ascribe a high reputation to a channel will rate the short videos as more credible.

4.4.3 Boundary Conditions Between Quantitative Endorsement and Familiarity

Since people use multiple types of information to evaluate the credibility of online content at the same time (Sundar, 2008), it can be assumed that both the quantitative

endorsement of a short video and the familiarity via the reputation of the source together influence users' credibility assessments, as indicated by prior research. Two studies conducted by Winter and Krämer (2014) show that both the source's reputation and community-generated endorsement cues increased the credibility ratings of news headlines. However, they noted that others' endorsements may be a supplementary heuristic to the source's reputation when unclear. In this vein, Lin and colleagues (2016) found that if no further indication of other endorsements (by retweeting) was present, expert sources were rated the most competent. As argued by the authors, the reputation heuristic again seems to be more influential than the endorsement heuristic.

Similarly, Borah and Xiao (2018) found that, although quantitative endorsement cues had no direct effect, they increased the credibility perception of a reputable source. Oeusoonthornwattana and Shanks (2010) demonstrated that recognising a brand increases its chances of being chosen by a participant, but only if additional positive attributes are highlighted. Consequently, they discussed that recognition needs to be supplemented by further information.

Given that the same principle applies to content on social media, the source's reputation should interact with endorsement cues since those indicate favourable judgements already made by others. Regarding the interaction of endorsement and reputation, it can be expected that if recipients have no previous encounters with or information about a source to assess its reputation correctly, the number of likes (i.e., the endorsement heuristic) will guide their evaluation and lead to higher credibility ratings. These considerations lead to the following hypothesis:

H13: The effect of the number of likes on the short videos' credibility rating will be greater for low reputable sources than for high reputable sources.

4.4.4 Boundary Conditions between Knowledge Confidence and Cues Available to the Users

In the relationship between knowledge and credibility assessment for short-format videos on social media, it is mandatory to differentiate between subjective and objective knowledge. Again, objective knowledge refers to the factual level of knowledge one has "stored in memory" (Brucks, 1985, p. 2). On the other hand, subjective knowledge is the perceived level of knowledge one believes to have and the confidence in the correctness of that knowledge (Brucks, 1985; Park & Lessig, 1981).

It can be supposed that confidence in one's knowledge is the boundary condition for the reliance on heuristic cues since the perception and evaluation of content are often intricately tied to an individual's prior knowledge of a given topic (Chaiken & Ledgerwood, 2012; Hilligoss & Rieh, 2008). For instance, Ou and Ho (2024) found that laypersons and experts use cues like the source's reputation to judge the credibility of information on novel food. However, unlike experts, laypersons specifically reported relying on endorsement cues. This suggests that those with presumably lower levels of knowledge are likely to

utilise heuristic cues when evaluating information. The notion is also supported by Luo et al. (2022), who found that participants were less successful in correctly identifying fake science news than false political or health news. They also observed that false headlines with more significant endorsements were more likely to be identified as such than those with fewer endorsements. In contrast, for actual headlines, the opposite was true. According to the authors, political information may be easier to evaluate due to more frequent encounters with political (compared to scientific) information (Luo et al., 2022). Hence, participants' subjective knowledge of politics might have been more extensive than their subjective knowledge of science. Thus, these studies highlight the role of prior knowledge in the likelihood of evaluating information heuristically if knowledge is low (Chaiken & Ledgerwood, 2012) - or, as in the current case, felt to be low, i.e. having low subjective knowledge confidence. Therefore, if someone is not confident in their knowledge, they should be more likely to rely on heuristic cues, such as endorsement indicators or reputable sources, when evaluating the credibility of content. Hence, the next hypothesis states:

H14: For participants who are confident in their knowledge (before watching the video), the influence of a) the ascribed reputation of the source and b) the number of likes on credibility will be lower compared to participants who are less confident in their knowledge.

4.4.5 Changes in Knowledge Confidence

Content presented on short-format video platforms can challenge views and behaviours by presenting the unexpected, leading recipients to rethink their previous standpoints (Molem et al., 2024). Since subjective knowledge appears vital for holding strong attitudes (Schäfer, 2020), it can be assumed that subjective knowledge operates through cognitive mechanisms as attitudes in shaping recipients' perception and evaluation of content, which should also affect subsequent changes in knowledge confidence. To extend the considerations made in section 3.2.3.1.2, just as prior beliefs can drive a confirmation bias in favour of attitude-consistent information (Lescarret et al., 2024; Meppelink et al., 2019), one's level of confidence in having correct knowledge may similarly influence their evaluation of content, paralleling how prior attitudes strongly determine credibility perceptions (Zhou & Shen, 2022).

Hence, if people are overconfident in their knowledge, which means that they possess objectively false knowledge but are sure to possess accurate knowledge, they might reject objectively correct scientific information (Light et al., 2022) - similar to research on the confirmation bias (e.g., Zhou & Shen, 2022). However, when people realistically assess (e.g., because they acknowledge not knowing something for sure) or even underestimate their knowledge level, the content of a short-format video should enhance confidence in one's objective knowledge. In other words, if what one believes to be true is reflected in the video, this should further amplify their confidence. Therefore, it can be expected that a

change in knowledge will only occur if the content is perceived as credible. Hence, knowledge change should be positively related, which leads to the final hypothesis:

H15: The higher the positive change in a) objective and b) subjective knowledge, the more credible participants rated the short video.

4.4.6 Methods

To assess the hypotheses proposed beforehand, an online study with a between-subjects 2 (number of likes: high vs low) x 2 (familiarity: high vs low) design was conducted. Information on the preregistration, anonymised data, analysis code, and supplementary information is available at the OSF: https://osf.io/swkp7/?view_only=ed3caae510da4187943b662183ed5bd6.

4.4.6.1 Sample

I used the' pwr' package in R to define the required sample (Champely et al., 2018). Given a minimum power of 0.90 and an alpha level of 0.05, the goal was to recruit at least N = 163 participants to detect a minimal effect size of r = 0.25. Ultimately, a total sample of N = 247 participants was recruited in May 2024. The participation was voluntary and without compensation. Due to incomplete data or incorrect answers to the control questions, n = 47 participants were excluded from the analysis, leaving a final sample of N = 200 participants. This sample size allows the detection of meaningful and interpretable effects of r = 0.22.

Out of the final N = 200 participants, 142 persons identified as female (71 %). The participants' age ranged from 18 to 84 years, M = 30.1, SD = 12.6. Most held either a high school diploma (34.3%) or a bachelor's degree (41.8%). The remaining respondents held an intermediate school leaving certificate (8.0%), master's degree (7.0%), doctoral degree (2.5%), diploma (2.5%), and elementary and secondary school certificate or lower (2.0%). Finally, 2% of the sample members did not provide information on their educational status. Most participants were university students (60.2%), followed by employees (29.9%).

4.4.6.2 Materials

Participants were exposed for the first time to a short video covering one of four subjects. The material was presented using a generic mock-up, similar to the most common short-format video providers. Experimental manipulation involved manipulating the number of followers of short videos and the potential familiarity of the source. Each participant randomly viewed a short video with either a high (> 15,000) or a low (< 100) number of likes (see Seo et al., 2019; Winter & Krämer, 2016).

Four German YouTube channels with significant differences in reach and a focus on science communication were chosen to introduce variance in the source's attributed familiarity and reputation. The channels in the group classified as unfamiliar were *StiftungGesundheitswissen* [foundation for health knowledge] (20k followers) and *Kenhub* (47k followers). The channels classified as familiar were *Simpleclub* (238k followers) and *Quarks* (789k followers). The number of followers corresponds to June 2024. All videos

discussed different functions of the human body (immune system, wound healing, respiration, and bloodstream) and showed comic-like visualisations with a voiceover.

4.4.6.3 Measures

4.4.6.3.1 Perceived Video Credibility

The credibility of short-form video content was evaluated using a seven-point Likert scale adapted for German by Appelman and Sundar (2016). Participants were asked to rate the content's accuracy, authenticity, and believability, $M = 5.74$, $SD = 1.13$, Cronbach's $\alpha = .85$.

4.4.6.3.2 Perceived Familiarity

To measure the reputation of the social media channels, participants were asked to indicate their familiarity with the channel ('I am familiar with [channel name]'), $M = 2.76$, $SD = 2.13$, and whether they believe the channel has a positive reputation ('I think [channel name] has a good reputation), $M = 3.80$, $SD = 1.62$, on a 7-point scale ranging from - 3 = "completely disagree" to 3 = "completely agree".

4.4.6.3.3 Subjective and Objective Knowledge

Knowledge was assessed using two bipolar items per topic. The items contained only factual statements discussed in the videos, such as "Many parasites and bacteria are destroyed in the stomach by gastric acid." Participants were asked to indicate how confident they were about the correctness of these statements on a 6-point scale ranging from -3 = "definitely false" to 3 = "definitely true". Participants rated the same set of items before and after exposure to the video. The following metrics can be derived from this measurement: First, the subjective knowledge: The more participants thought their answer was "definitely" correct, the more subjective knowledge (i.e., knowledge confidence) they had. Second, participants' answers on the bipolar scale were used to extract their objective knowledge. Positive values indicate correct objective knowledge, and negative values represent incorrect objective knowledge. Although all participants answered eight items, only the knowledge confidence score corresponding to the video they saw was used.

4.4.6.3.4 Media Usage

The participants' usage frequency of social media was then measured with a self-developed three-item scale, where they indicated how often they use social media in general, $M = 4.72$, $SD = 0.76$, to obtain specific information, $M = 3.96$, $SD = 1.04$, and to gain scientific knowledge, $M = 3.12$, $SD = 1.19$. The answer options consisted of ranks on a 5-point scale ranging from 1 = "never' to 5 = 'daily".

4.4.6.4 Procedure

Firstly, all participants gave informed consent to participate in the study. Subsequently, demographic data and social media usage habits were collected. Afterwards, participants were asked to evaluate the reputation of each social media channel (see Section Materials). Then, participants were asked to indicate their knowledge and confidence in it.

A test video was added to the survey to determine whether the participants were able to watch videos without technical issues. Participants who had no technical difficulties watching the test videos continued to watch a short video from one of the four YouTube channels. As a result of the experimental manipulation, each participant was randomly assigned to one of the eight videos (one out of four videos with either a low or high number of likes). Control questions about the content of the video had to be answered afterwards to test the participants' attention during the video. Additionally, participants were asked to specify the name of the channel of the short video and whether they had watched it before.

Following this, items regarding the credibility of the video content were gathered. Finally, participants were asked to indicate their confidence in their knowledge using the same items. After confirming attentive participation and usable data, participants were debriefed.

4.4.7 Results

To test the hypotheses, I calculated a moderated regression analysis according to the proposed research model using R (version 4.2.1) and the lme4-package (Bates et al., 2009).

4.4.7.1 Hypothesis Testing

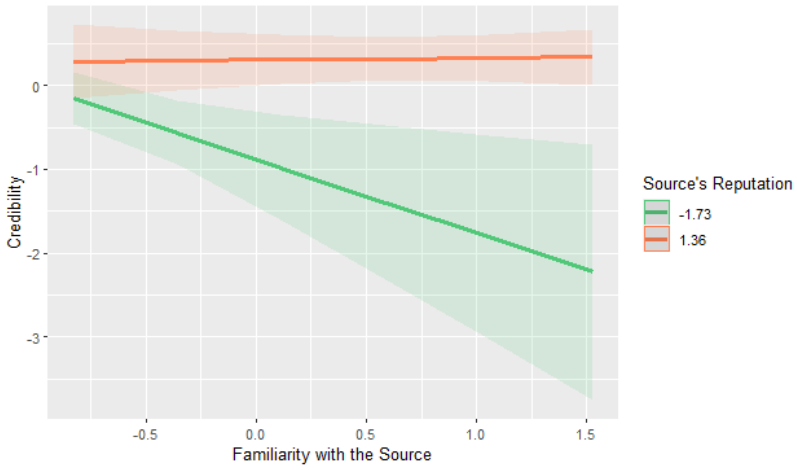
The participants' perceived familiarity with the channel, assessing the channel's reputation, the prior knowledge confidence, and corresponding interaction terms, were entered as independent variables to assess the proposed mediations. The perceived credibility was selected as the dependent variable. Because of the various scales used, the data were scaled before the analysis. The proposed model predicted the perceived credibility of the videos, $F(10, 189) = 1.93$, $p = .044$.

H11 stated that videos with a high number of likes would be rated higher in credibility than those with fewer likes. The data did not support the hypothesis, $\beta = -.017$, $p = .813$ and had to be rejected.

Next, participants who ascribed a high reputation to a channel were expected to rate the short videos as more credible (H12). The analysis included this variable since reputation was also expected to cover familiarity with a channel. The results show that participants' familiarity with the sender and the ascribed positive reputation affected the video's credibility. At the same time, familiarity with the channel decreased credibility, $\beta = -.377$, $p = .010$, and a positive reputation increased credibility, $\beta = .383$, $p = .002$. Furthermore, an interaction effect where a positive reputation outweighs the initial negative effect of familiarity appears, $\beta = .294$, $p = .022$. Thus, H12 is not rejected. As illustrated in Figure 19, the perceived credibility of the content decreases with increasing familiarity with the source when the reputation of the source is evaluated as less favourable.

Figure 19

Interaction of Source Familiarity and Positive Reputation on the Perceived Credibility



As expressed in H13, it was assumed that the effect of the number of likes on the short videos' credibility rating would be greater for low - reputable sources than for high - reputable sources. The data did not support this assumption since the analysis did not reveal a moderating effect of either the positive reputation, β = .165, p = .115, or the familiarity, β = -.083, p = .426, on the relationship between the number of likes and the perceived credibility of the video. Thus, H13 cannot be confirmed.

According to H14a, the impact of reputation on perceived credibility will be lower for participants who are less confident in their knowledge. Participants' subjective knowledge confidence neither influenced the effect of familiarity with the channel, β = .074, p = .479, nor the effect of a positive reputation, β = -.133, p = .188. H14b predicted that the number of likes would have a lower effect on perceived credibility for participants who were less confident in their knowledge. Again, knowledge did not affect the relationship between the number of likes and credibility, β = .004, p = .951. Therefore, H14 needs to be rejected. However, the analysis shows that the subjective knowledge confidence predicts the perceived credibility of the videos directly, β = .148, p = .039. This indicates that participants who were more confident in their knowledge (and objectively correct) were likelier to rate the video as more credible.

Lastly, it was expected that the higher the positive change in a) objective and b) subjective knowledge, the more credible a video would be rated. To test this assumption, the first step was to check if the knowledge confidence changed after watching the video (H15). While most of the participants who watched the video had objectively correct knowledge confidence before watching it, M = 1.11, SD = 1.32, it significantly increased after watching it, M = 2.37, SD = 0.97, t(365.77) = -10.88, p < .001.

After confirming the positive change in knowledge confidence, a score was built to reflect the changes in the respective knowledge. The first score reflected whether

participants' knowledge remained objectively correct/incorrect after watching the video (= 0; n = 140), changed from objectively correct to incorrect knowledge (= -1; n = 7), or changed from objectively incorrect to correct knowledge (= 1; n = 53). The credibility of the video did not correlate with whether participants' objective knowledge changed or remained unchanged, r = -.07, p = .293.

For the relative change in subjective knowledge confidence, the knowledge confidence before watching the video was subtracted from the knowledge confidence after watching the video. Since it was initially measured on a 6-point scale (see section 4.4.6.3) and the observed changes ranged from -3 to 5.5, M = 1.26, SD = 1.53. For n = 150 participants, a positive change in subjective knowledge confidence can be observed, indicating that those participants became more confident in factual correctness. Further, the analysis revealed a negative change for n = 19, and no change in knowledge confidence for n = 31 participants. However, this change was unrelated to the perceived credibility, r = .02, p = .740. Thus, H15 needs to be rejected.

4.4.7.2 Exploratory Analysis

To further understand how the evaluation of the videos affects the perceived knowledge, I conducted a mediation analysis in addition to the preregistered analyses reported above. No direct effect of the knowledge confidence before watching the video on the knowledge confidence after watching emerged, β = .083, p = .225. Further, knowledge confidence before watching the video predicted credibility, β = .184, p = .015, and credibility predicted the subjective knowledge after watching the video, β = .302, p < .001. Further, the analysis shows that the indirect effect of the subjective knowledge confidence before watching the video on the subjective knowledge confidence after watching over credibility is significant, β = .06, p = .036, indicating a total mediation.

4.4.8 Discussion of Empirical Results

While short-format videos have become nearly ubiquitous on most social media platforms, it remains unclear if and to what degree recipients rely on heuristics and specific cues to evaluate the credibility of those videos and how their knowledge confidence changes. This study investigated the extent to which users rely on community-based quantitative endorsement cues (number of likes) and channels' familiarity via reputation alongside recognition of the source on the perceived credibility of the video.

4.4.8.1 Credibility Indicators of Short-Format Videos

It was hypothesised that a high number of likes would increase the credibility of the presented short-format video because users of short-format video platforms typically encounter much content quickly. Thus, they may use mental shortcuts to save cognitive resources (see Sundar, 2008). However, quantitative endorsement cues did not influence the perceived credibility, which leads to rejecting this assumption. Since participants in this study only saw one video, the setting might not have reflected the same psychological

processes users undergo when using social media. Another possible explanation for the absence of the effect of the number of likes might be the stimulus material used in this study. There has been little research on endorsement cues in short-format videos on social media platforms. Therefore, the current findings suggest that the reliance on heuristic cues varies depending on the medium delivering the information (Sundar, 2008). For instance, Lee et al. (2010) found that motion media, which includes short-format videos, generally increase credibility. Since the videos presented in this study were rated highly credible overall, this effect may have also emerged here, thus diminishing the potential need for additional content verification based on others' endorsements to evaluate credibility. Likes of social media postings are an indication of support for the content and, hence, might have less impact on the evaluation of the content than other cues, for instance, qualitative context cues such as the comments which can be positive and negative (see Experimental Study 2/ section 4.2 for information on negative comments).

In contrast to endorsement, familiarity via reputation recognition was significantly associated with the perceived credibility of the videos. The results partially corroborate prior research on the reputation heuristic (Metzger et al., 2010; Ou & Ho, 2024), as the anticipated increase in credibility due to the source's positive reputation was evident in the analysis. However, an unexpected decrease in credibility was still associated with familiarity via source recognition. This suggests that the impression of a positive reputation and perceived recognition of a source are highly linked, and that those variables need to be studied in combination. Remarkably, the interaction effect highlights that the perception of a source's good reputation plays a more crucial role in content evaluation than knowledge of the source's actual reputation or expertise. Although the data did not demonstrate the predicted positive effect, the observed negative effect aligns with the underlying assumption of the reputation heuristic (Metzger & Flanagin, 2013). Specifically, the negative effect of familiarity via recognition was only evident when the source was not perceived as reputable.

Additionally, it was postulated that the impact of the number of likes on the credibility rating of the short-format videos would be more influential for low-reputable sources than for high-reputable sources. However, the data did not support this hypothesis. The participants had low confidence in their knowledge before watching the video, which should theoretically lead them to rely more on heuristic information processing. However, the current data do not directly support this notion and thus contradict prior research, which demonstrated that in evaluating new food information, laypersons – that is, individuals with comparatively low prior knowledge – tend to rely more on endorsement cues (Luo et al., 2022; Ou & Ho, 2024). This observation indicates that one's subjective knowledge does not affect the inclusion of endorsement heuristics in credibility evaluations.

Furthermore, the direct effect of knowledge confidence on the perceived credibility of the video is supported. This direct but not mediating effect appears to contradict the common assumption that the level of knowledge determines whether information is processed heuristically or systematically at first (Chaiken & Ledgerwood, 2012). Instead,

the evidence indicates that subjective knowledge influences processing rather than objective knowledge (Park & Lessig, 1981).

4.4.8.2 The Role of Subjective Knowledge in Credibility Evaluations

Despite the absence of evidence for the proposed mediating effect of knowledge on credibility evaluation, the results indicated that subjective knowledge confidence was associated with increased perceived credibility of the videos. Consequently, an exploratory mediation analysis was conducted to further examine the role of knowledge in credibility evaluations. This analysis demonstrated that perceived credibility mediated the relationship between knowledge confidence before and after watching the short-format video. In particular, participants who were more confident in their factually correct knowledge were also more likely to rate videos as credible. This circumstance caused them to be even more confident after watching the video.

Given that this measurement concerns knowledge confidence, the results indicate that one's assessment of their objectively held knowledge is based on psychological mechanisms similar to attitudes (Light et al., 2022). To elucidate, individuals seek out, favour, and rate more credible content that reinforces their previous attitudes (e.g., Meppelink et al., 2019; Zhou & Shen, 2022). It could be assumed that this also applies to their perceived knowledge. Nevertheless, the impact of subjective knowledge confidence is below the smallest meaningful interpretable effect size, which is why this finding needs to be interpreted with caution. The same holds true for the exploratory follow-up mediation that was conducted.

4.4.8.3 Changes in Subjective and Objective Knowledge

Our last assumption addressed the potential changes in subjective and objective knowledge. It was expected that a higher positive change in objective and subjective knowledge would be related to participants rating the video as more credible, which was not supported by the analysis. Thus, whether a change in factual or subjective knowledge happens depends on the recipients' credibility perceptions.

However, the study demonstrated that participants exhibited increased objective and subjective knowledge after viewing the videos. Additionally, a recent study found that people who regularly interact with accurate science content on social media have more factual knowledge about science and more faith in their own objective understanding (Meier, 2024). Consequently, the findings challenge the assumption that social media science content leads to overconfidence in knowledge (Schäfer, 2020). Indeed, science content on social media leads to a "healthy" confidence, that is, to the realistic assessment of one's level of knowledge (see Meier, 2024).

4.4.8.4 Limitations and Future Research

As previously discussed, all presented videos were rated as highly credible. This may be attributed to the dynamic nature of the videos, which differs from the static news articles that have been the focus of much prior research. Consequently, further research

should investigate the impact of the medium through which information is conveyed and whether the impact of heuristic cues depends on it.

Given the limited sample size, it is essential to exercise caution when interpreting the results. While most discussed effects were above the smallest meaningful detectable effect size, it is crucial to emphasise the role of knowledge. Nevertheless, the study posited that the results provide a robust basis for further research to examine the impact of short-format videos on the subjective and objective knowledge of scientific issues. As a result, this highlights the urge for future research to investigate this relationship further by employing diverse topics and varying the type of content presented.

Another shortcoming of this study, which may limit the results' interpretation, is how the material was presented to the participants. Short-format video platforms' content is almost exclusively presented as a conscious stream of videos. However, participants in this study only saw one video. Hence, future studies should consider testing the effects in the said stream of videos, which is closer to how users consume short-format videos on social media platforms.

4.4.8.5 Conclusion

This study proves that users of short-format video platforms do not judge their credibility based on endorsement cues. Instead, the results imply that users of short-format video platforms are more likely to evaluate credibility based on their prior knowledge, confidence and the overall impression of the source as being reputable, albeit not knowing it. Regarding the influence of objective and subjective knowledge, this study demonstrated that watching videos with scientific content can positively impact confidence in this area. This finding highlights the potential for short-format videos to communicate science and provide information to make informed decisions shaping daily life. Altogether, this study yields some significant novel findings about how users of short-format videos evaluate the videos' credibility, learn from such videos, and become more confident in their objective knowledge.

4.4.9 Discussion within the Framework

The fourth experimental study aimed to investigate further sender-related and context-related cues and their influence on changes in knowledge and perceived credibility (as an indicator of trust) and to further explore the role of knowledge as a cross-situational boundary condition for processing said cues.

In this vein, I expanded the results of the second experimental study, focusing on quantitative context cues compared to qualitative cues. Against the background of the proposed framework, I discussed that qualitative context cues can have an additive character if they have a certain argumentative quality, for example, by introducing negative emotions to examine the scientists and their messages on social media. Like qualitative cues, context cues, such as the number of likes on posts, are assumed to set a guideline for a recipient's evaluation by signalling a quantified public approval (e.g., Sundar, 2008). However, the

results of the fourth experimental study did not support this notion. While this blends into prior research suggesting that the effects of endorsement cues are limited (e.g., Borah & Xiao, 2018; Luo et al., 2022), it also provides evidence that context cues appear to need substantial value (i.e., potentially raise concerns such as in the second study). Recipients instead rely on their own assessment rather than on multiple others. To clarify, the results of the fourth experimental study highlighted that recipients did not consider the sender or context-based cue, as their subjective knowledge confidence predicted the perceived credibility of the short-format science videos they saw.

At this point, I would like to mention the unexpected pattern regarding the perceived familiarity via reputation and recognition of the source. While familiarity decreased the perceived credibility, a positive perceived reputation increased the perceived credibility of the video, which even outweighs the negative effects of familiarity. Accordingly, the results of the first experimental study, which demonstrated a significant positive relationship between general familiarity and perceived trustworthiness of scientists, can be explained as follows:

The novel findings underscore the necessity for a nuanced examination of the influence of reputation and familiarity. The impact of a sender's familiarity is markedly contingent upon the perception of the source as positive or negative, which suggests that negative preconceptions exert a considerably more pronounced effect than positive ones. This phenomenon can be attributed, at least in part, to a negativity bias (Baumeister et al., 2001), parallel to the results of the second experimental study. However, other than in the second study, the negativity had its source within the sender's perception and not in the contextual cues. At this point, it is crucial to recognise that both studies exclusively presented factual information. Thus, those findings point to the potentially pivoting role of negativity in the evolution of scientists and their communication.

Moreover, the results show that non-personalised sources, such as the video channels examined in the fourth experimental study, overall, also seem to benefit from the perceived familiarity, which indicates that not only scientists but also other sources of scientific information online benefit from the perceived familiarity and particularly a positive reputation. At this point, I want to emphasise that the perceived familiarity with the source outweighed the effects of a negative reputation.

Further examination of the boundary conditions and the potential effects of science communication on social media platforms reveals that both objective and subjective knowledge increased after watching the videos, regardless of the perceived credibility. Although a more critical analysis is required to establish whether the impact of attitudes on the evaluation of scientific content is exclusive to belief-driven dispositions or whether it can also be applied to disparate forms of knowledge, this study still provides a first step by showing that not all conventionally examined cues are as influential as expected. In terms of the proposed framework, the fourth study nevertheless supports updating the cross-situational boundary conditions induced by direct contact with scientists. Finally, the study

showed that the framework also allows the contextualisation of both dynamic-video-based content and text-based science communication.

After outlining the four experimental studies and connecting them to my proposed framework for assessing scientists' perceived situational trustworthiness, I will provide a brief overview of the results of the four experimental studies.

Chapter 5. General Discussion

In the previous chapters, I classified the concept of trust (in comparison to distrust; Chapter 2), described online encounters with scientists and what communication by scientists looks like (Chapter 2), presented a framework for categorising the situational assessment of scientists' trustworthiness and its repercussions (Chapter 3), and conducted four experimental studies aiming to understand said assessment (Chapter 4). In this final chapter, I will discuss the overall findings. In detail, I will outline and discuss my general findings guided by the proposed framework and derive their theoretical implications based on the studies conducted. Additionally, I will summarise recommendations for scientists who directly address the public on social media and science communicators in general. Before outlining the concluding remarks, I will also discuss the limitations of this work and derive directions for future research.

Here, I adopt the same considerations for the general assessment of trust and distrust (see section 2.1.3). To make precise statements about the respective object of trust, it is first necessary to set the limits to the relevant reference points. Consequently, I must emphasise that the primary focus of my proposed framework is on evaluating individual scientists (i.e. persons and not science as an organisation or system) and their communication. Even though the basic assumption can also be applied to non-personal science communication, as the experimental study four shows, the focus is on scientists as individuals addressing the public with any barrier or other form of gatekeeping.

5.1 Discussion of Empirical Findings

Within this dissertation, I specifically attempted to investigate how the impression of trustworthy scientists is formed based on the specific cues available to social media users. Further, I aimed to clarify whether those must be unique to scientists or whether these cues are generic for social media. Then, I aimed to scrutinise the effects of boundary conditions in evaluating senders (scientists) on social media and examine how these relate to the messages put forward. My last goal was to research the influence of direct contact with scientists on social media users in terms of potential cognitive updates and behaviours. For context, my process of answering these questions was guided by the following assumptions: In situations where social media users directly encounter scientists' communication, without any journalist filter or layperson-friendly editing of information, it can be incidental or

intentional/selective. However, in both scenarios, recipients are faced with the challenge of identifying if the source can be trusted or if accepting this information bears the potential risk of integrating false information into one's knowledge. Hence, social media users must differentiate between those who post what is likely true and those who post what is likely false or potentially harmful based on the small amount of information (i.e., cues) available.

As outlined in the second step of my proposed framework, I argued that in these encounters, certain boundary conditions determine how these cues are integrated into one's evaluative process. These conditions can be divided into cross-situational (i.e. trait-like) and situational (i.e. state-like) factors. Given these prerequisites, recipients will use the available cues to evaluate scientists' perceived trustworthiness, just as they will evaluate the credibility of their messages. I expected this evaluation's outcome to lead to updates of cross-situational factors, such as knowledge or attitudes, or a set of behaviours, such as public engagement with scientists' posts. Per the aforementioned illustrated process (see Figure 6, page 56), I have made the following discoveries in this dissertation, extending previous research as outlined in the following sections.

5.1.1 Encountering Scientists on Social Media: Evaluation of Cues Available to Users

When recipients encounter posts by scientists on social media, they can utilise a limited number of cues to assess the trustworthiness of scientists. These can relate directly to the sender, the message, and the context, i.e. user-generated cues such as qualitative or quantitative feedback on social media. Further, I divide the message and sender-related cues into two categories: cues unique to scientists and their communication or generic cues. Against the background of the lens model (Brunswik, 1956, 2023), I also assume that recipients use these available and directly observable cues to assess the perceived trustworthiness of scientists. Based on this trustworthiness assessment, recipients should determine whether to place trust in the sender. To reiterate, this trust refers to accepting the risk of accepting false information, thus making oneself vulnerable (see section 2.2.1). I discovered the following regarding the cues that precede the underlying judgment:

5.1.1.1 Sender Cues

As part of this dissertation, I examined various cues that recipients can use to assess the trustworthiness of a source (in other literature also referred to as source credibility, see section 2.5.1). The first empirical study lays the foundation for the following considerations: I specifically focused on the sender-related cues and examined what cues it takes for a source to be perceived as (epistemically) trustworthy.

As predicted, the presence of an academic title alone, without further contextualising information like an affiliation or reference to domain-specific proficiency, led to increased perceptions of expertise, broadly in line with previous research (e.g., Thon & Jucks, 2017; Winter & Krämer, 2014). However, there was no significant effect on the other two sub-dimensions of epistemic trustworthiness: integrity and benevolence. This finding contrasts with previous research suggesting that people portrayed as scientists are also rated higher in

all three subdimensions of epistemic trustworthiness than other authority figures, such as politicians (e.g., Hendriks et al., 2023; König & Breves, 2021). Nonetheless, a source's perceived expertise is still an indicator of trustworthiness, although all three subdimensions are theoretically relevant and distinguishable perceptions causing trust (Hendriks et al., 2015; Schoorman et al., 1996).

At this point, I would like to draw on two explanatory approaches. First, unlike the studies mentioned so far and those described in section 3.3.1.1.3, I have compared scientists with other (presumable) scientists and not with other authoritative figures or groups, which can explain this deviation. Secondly, I have included perceived familiarity. Considering the findings of the fourth study on the perceived credibility of short videos in science communication, this emphasises how perceived familiarity combined with the impression of a positive, but also negative, reputation affects trustworthiness. They indicate that other impressions, beyond mere expertise, can also strongly influence how experts are perceived and what influence existing assumptions can have. Thus, these results demonstrate and connect the general links between familiarity and trust. In line with previous research, the results demonstrate that familiarity with the source has a positive impact on trust, which can lead to the acceptance of information and further potential risk-taking (e.g., Alarcon et al., 2016; Fan & Lederman, 2018; Lucassen & Schraagen, 2012) – all the more so when it comes to the direct communication of scientists.

This insight complements and extends research, acknowledging other factors that contribute to trust in science. It shows that solely relying on academic credentials is sufficient to create an impression of expertise, but not enough to be perceived as a source who is also high in integrity and benevolence. However, it has the potential to do so. I based this assumption on the interaction effects between perceived familiarity and the presence of a title and gender in the first experimental study. The first of these two effects showed that unfamiliar individuals benefited from the presence of an academic title in terms of their perceived integrity, which increased slightly. However, the perceived benevolence was independent of the respective factors, and no significant differences emerged. Since the differences were relatively small and the interaction effect barely reached significance, it still indicates the same beneficial effect of an academic title, which needs to be investigated in more depth by further research. Particularly given how subtle the experimental manipulation was, these results point to an interesting effect of referring to science (i.e. relying on cues unique to scientists and their communication) and thus one's potential epistemic authority. Accordingly, this finding further indicates a potential application of stereotypes to an unfamiliar (presumed) scientist (Cao & Banaji, 2016) and underscores the potential danger of misplacing trust. For example, using academic credentials is unprotected on social media platforms, which could lead recipients to place trust in questionable sources and, thus, accept false information (see O'Brien et al., 2021).

At this point, I would also like to mention the results of the fourth experimental study regarding the perceived familiarity and reputation of the source of a short-format

science communication video as sender-related cues. In instances where a negative or non-positive reputation is held, the perception of familiarity mitigates the adverse effects of a negative perceived reputation on credibility. Conversely, a positive reputation serves to offset this negativity. Thus, the result also underlines the function of distrust in the form of the expectation of negative consequences due to the prior assumption of a negative reputation (see section 2.1.2). In the context under analysis, these negative consequences correspond to the potential integration of false information.

Continuing with the senders' gender, which was also examined in the first experimental study, the results showed that unfamiliar female scientists were perceived as significantly less benevolent than men. However, the opposite was true for familiar male scientists. As mentioned in section 3.3.1.2, I assume that perceived familiarity is a highly influential determinant of the perception of trustworthiness, which is characterised by the impression of reputation (see Experimental Study 4/section 4.4). This circumstance may have caused the interaction effect for familiar scientists. Regarding the role congruence theory (Eagly & Karau, 2002), I demonstrated that in no significant instance, women were rated less positively than men, as no differences in disregarding females emerged other than those previously addressed. Indeed, females without a visible academic title were rated higher in expertise than males – a difference that disappeared in the presence of one. While this finding shows that female communicators are presumably viewed as more knowledgeable information sources online, it raises the question of why women with academic qualifications were rated lower in expertise than those without. However, it should be stressed that in the latter case, they were rated the same as men. In other words, while males benefited from the presence of an academic title, females did not. One possible explanation is that the media predominantly selected and displayed male scientists as experts (during the COVID-19 pandemic) (see Hubner, 2023; Joubert et al., 2023), thus balancing out negative preconceptions. Overall, the results demonstrate that the perceptions of women talking about science online per se are not significantly worse than those of men. In terms of gender, it can generally be said that, at least at the expertise level, the widespread negative gender bias against women in science (Knobloch-Westerwick et al., 2013; Miller et al., 2015) seems to be dissolving, which is also consistent with recent research findings (e.g., Kim et al., 2024; Quílez-Cervero et al., 2021).

In conclusion, the perceived familiarity of the source emerges as the most influential factor in perceived trustworthiness and its indicators. In particular, cues that are theoretically unique to scientists and their communication support this favourable perception. This pattern is also reflected in the findings on message-related cues, which I will discuss in more detail in the next section.

5.1.1.2 Message Cues

On the premise, and before the considerations from the previous section on the influences of sender-related cues on the perceived trustworthiness of directly communicating scientists and the credibility of their messages, I will now discuss the results

I found on message cues. Concerning the message cues, I initially differentiated between those unique to scientists' communication and those not. In detail, I chose three types of cues: the message valence as a universal message cue that can still affect recipients' evaluation of its source and the content, which I will discuss in a later section. Second, the type of language employed (i.e., scientific jargon) and third, the argumentation style (i.e., scientific evidence).

Concerning the message of the cue of valence, meaning the position expressed by a scientist's statements, the results of the third experimental study showed that recipients prefer posts that align with their preexisting attitudes. The consistency of the messages in terms of recipients' attitudes is evident at the level of the message credibility, which I consider to be an indicator of trust in the respective scientists (see section 2.1.5). The same pattern was also evident in the results of the second experimental study, in which the recipients' general prior attitude towards COVID-19 was identified as a strongly significant predictor of the perceived credibility of the messages, as well as the perceived trustworthiness of the directly communicating scientists. The results of the current studies thus align with previous research from other areas, which suggests that attitude-consistent content is rated more credibly (e.g., Meppelink et al., 2019; Van Strien et al., 2016). The results demonstrate that the effects of credibility triggered by the message cues of valence are pronounced in scientific contexts, particularly concerning the confirmation bias. This circumstance can be attributed to the variation in effect strength observed in the second and third experimental studies. In both cases, the preconception and matching of the content with the recipients' attitudes dominated the evaluation of the content. This interpretation has a direct impact on the roles scientists who communicate directly can take on social media. Since recipients seem to favour content whose valence matches their attitudes, critical scientific findings that do not agree with prevailing opinions appear to receive less attention and reach, limiting scientists' ability to be perceived as objective communicators of knowledge.

In light of the considerations mentioned above, the concept of public engagement and the corresponding results should be subjected to critical scrutiny. For context, the influence of message valence in the third experimental study was minimal and on the borderline for a meaningful interpretation. While attitude consistency increases the intention to like content, it simultaneously reduces the intention to comment. In contrast to studies conducted in political contexts (e.g., Weeks et al., 2017; Wischnewski et al., 2022), the message cue of valence did not lead to a clearly increased willingness to share content. These results suggest that recipients in online discussions surrounding scientists and their communication may perceive content as less relevant or critical to the social and digital environment, leading to a lower likelihood of sharing it in their social network.

Beyond the message cues that are not unique to scientists and their communication, I now want to continue discussing the message cues that are unique to them. As stated in the beginning (see section 2.1.5), message credibility and the sender's trustworthiness are

highly intertwined concepts. While they refer to the evaluation of different reference objects with credibility reflecting the message evaluation and trustworthiness reflecting the sender evaluation, they both still mirror the evaluation of a scientist's overall communication. In this vein, I see credibility as an indirect reflection of a scientist's trustworthiness, as only a trustworthy scientist should be able to provide credible information. In light of this assumption and combined with the findings of the first and fourth experimental studies on the sender cues, I further argue that the second and third experimental studies on message cues also point to the idea that "scientificness" benefits trust.

At the highest level, all the results share the commonality that as soon as a cue points to the domain of science, it triggers the application of stereotypes around science or a science-based heuristic; if it looks scientific, then trust is warranted - so it is appropriate to take a potential risk, such as relying on potentially false information. Of course, this is subject to certain boundary conditions and depends on the scenario. Nevertheless, it fits the results of previous research that support the assumption that message-related lexical cues, like scientific jargon, serve as a cue to trustworthiness (Jonas et al., 2024). The rationale is that people have learned whom to turn to for guidance and knowledge, i.e., who an epistemic authority is (Kruglanski et al., 2005, 2018). This includes not only individuals but also groups, like scientists. Then, this learning is used to assess and guide their judgements (e.g., Metzger & Flanagin, 2013; Sundar, 2008). This idea can be seen in diverse ways in the different studies.

Regarding the message-related cues, I showed that this is not only based on heuristic cues, such as jargon (see Experimental Study 3), but also on supposed argumentative content features (see Experimental Study 2). As discussed in section 4.2.7, I showed within the second experimental study that specifically scientific (compared to anecdotal) evidence used by scientists positively impacts the credibility of the messages, but only benefits trust in the communicators under certain circumstances. To elucidate, only if contraindications from the context (i.e. user comments) appear will recipients broaden the cues they include in their evaluation. From the opposing perspective, this also shows that expectation violations (see Burgoon, 2015) and inconsistencies, such as the use of anecdotal rather than scientific evidence in their public communication, can have a negative impact on the perception of scientists' perceived trustworthiness who communicate directly as well as their messages' credibility.

Nonetheless, the idea of scientists uniformly benefiting from expressing and emphasising their connection to science may not always hold, as the third study on the message cues indicates. The results showed that scientists' posts containing scientific jargon were rated less credible than those without jargon. Nevertheless, the additional variables included in the surveyed model can explain this circumstance and provide further insights into a potential "science-based" heuristic function. The negative effects of jargon were diminished in three cases: 1) if recipients enjoyed thinking (i.e., reported high levels of NFC), 2) if they tended to trust scientists in general, and 3) if they understood the posts'

content despite the use of jargon. As a result, these findings indicate that recipients only seem to rely on said presumed heuristic if they, in principle, are able to decide to believe the content. Further, this supports the idea that trust in scientists is a type of "informed trust" (Bromme, 2020). In other words, recipients use their existing knowledge of the subject and the role of scientists to assess the credibility of the contributions, thereby taking a potential risk. The results of the fourth experimental study also support this idea. Here, recipients also relied on their impression of the source to judge credibility and their subjective knowledge rather than on quantitative contextual cues.

In closing, it can be stated that the message-related cues that are unique to scientists also have a favourable impact on the perception of scientists and their communication in a manner analogous to the effect observed with the sender-related cues. Furthermore, the experimental studies demonstrate that although the evaluation of messages and senders occurs simultaneously following the lens model, this parallelism is disrupted by specific contextual cues, which I will address in the next section regarding the recipients' assessment. In other words, message cues extend beyond evaluating a scientist's post (see section 4.2.8). At this point, it is also important to highlight the methodological strengths of the first three experimental studies. Firstly, the studies compare all scientists, which allows for specific statements about the impact of the particular cues within the group of scientists as communicators. Furthermore, using an experimental within-subjects design coupled with appropriate centring and modelling techniques in the first and third studies enables the systematic identification and comparison of potential effects within individuals, accounting for the individual variances triggered by the cues.

In summary, the studies' findings show that two crucial factors influence the perceived trustworthiness of scientists and the credibility of their communication on the message-level: the message's expressed valence and the degree to which the messages incorporate references to science, or any science-related cues.

5.1.1.3 Context Cues

As outlined in section 3.3.3, I differentiated between quantitative and qualitative context cues within my proposed framework, which guides this dissertation. I argued that those cues are vital for recipients' evaluation of scientists' trustworthiness and the credibility of their messages since previous research indicates that recipients use the community-based warranting of others, which are distinctive structural features of social media platforms (e.g., Metzger & Flanagin, 2015; Wang et al., 2023).

To a partial surprise, both qualitative and quantitative context cues exerted fewer effects than initially expected in both studies that included context cues. No significant main effect emerged, neither for the perceived credibility of the content presented to the participants nor the perceived trustworthiness of the scientists, in the fourth experimental study, where I examined the effects of the sources' perceived familiarity and reputation in combination with the quantitative endorsement cues, precisely the number of likes on a short-format video. The context cues were largely ineffective in causing differences

between the experimental groups. I initially expected recipients to include these cues in their judgements because scientific information is less polarising than political information, which should have inclined them to cross-verify the presented information via the number of likes, i.e. the public's endorsement (Luo et al., 2022). However, this effect did not appear as recipients were more likely to incorporate their subjective knowledge and the sender's cues into consideration for the evaluation. This finding again resonates with the source primacy effect, which posits that an expert source will outweigh other cues, such as aggregated endorsement cues (Sundar et al., 2007; Wang et al., 2023). In this vein, additional cues will only supplement credibility perceptions if their source is of lower quality (see Sundar et al., 2007).

Further support for context cues serving as supplementary information can be found in the surveyed interaction effects discovered in the second experimental study on the differential effects of negative user comments and scientists' evidence use. Since the sources in this study were in line with the findings of the first experimental study and presented as highly trustworthy scientific experts, recipients must have inferred message credibility and trustworthiness perceptions based on the evidence used. As I stated in the discussion section corresponding to the study (see section 4.2.7), when negative comments (qualitative context cues) were present, especially those expressing strong emotions such as anger (implying high relevance), messages and scientists using scientific evidence were rated more credible and expert. In contrast, negative comments weakened the credibility of messages and the perceived expertise of broadcasters using anecdotal evidence. In other words, the use of anecdotal evidence led to a negative expectancy violation (see EVT: Burgoon 1993, 2015), which increased attention to the expectancy breach because it did not meet the high standards of scientific evidence (e.g., Dahlstrom, 2014) and scientists fulfilling their expected role as providers of valid information (Falchetti et al., 2007; Maier et al., 2016). This deviation from expected scientific rigour undermined the message's credibility and the communicator's perceived expertise, but only in the case of negative comments. The result is not a primacy but a deferral of the source, with context cues seemingly serving as moderating factors that shift the recipients' attention and, thus, their evaluation patterns.

To close the section on the influence of context cues on the assessment of scientists' perceived trustworthiness and their messages' credibility when directly addressing the public online, I would like to emphasise one last commonality between the second and fourth experimental studies: Both studies suggest that context cues alone are not always sufficient to influence evaluations; they must carry significant or argumentative weight to affect the perception of credibility or trustworthiness to become a cue relevant for the evaluative process in the sense of the unimodel (see Kruglanski & Thompson, 1999). Therefore, based on the results, they seem to have little predictive power in the sense of allowing recipients to estimate the perceived trustworthiness of a scientist based on the

available information they encounter surrounding scientists' online communication, at the level of the main effects (see lens model: Brunswik, 1956).

5.1.2 Boundary Conditions for the Evaluation of Available Cues

After discussing the evaluation of scientists and their messages based on the cues available to users when they encounter them on social media, I will describe and discuss the effects I have discovered in this dissertation concerning the boundary conditions for processing these cues. As in the initial description of the framework, I assume that the evaluation of the cues depends on situational (i.e., state-like) and cross-situational (i.e., trait-like) factors. To this end, I analysed examples of these groups in three of the four experimental studies, which cover the need for cognition (NFC), different motivations (directional vs non-directional), subjective and objective knowledge, attitudes, and the propensity to trust scientists. The following section will present a detailed account of the findings on the abovementioned factors, as well as an analysis of the interrelationships between them. The fundamental premise of this inquiry is that within the context of the lens model (Brunswik, 1956), which posits a mapping from the environment to perception via cues as a "lens" between those two spaces, cross-situational and situational factors exert a bending influence on this metaphorical lens. This, in turn, determines how the cues facilitate the transmission of the evaluation.

5.1.2.1 Situational Factors

To investigate this assumption, I examined how situational motivation, one of the potential situational factors (see section 3.2.2), influences the evaluation of message cues. In particular, I examined how the valence expressed in a scientist's post affects its evaluation regarding credibility and recipients' engagement intention based on the recipients' motivation and the fit with recipients' prior attitudes towards the topic discussed in the third experimental study.

Concerning the motivations, I surveyed how recipients evaluate scientists' communication in the presence and potential co-occurrence of directional (i.e., defence) and non-directional (i.e. accuracy) motivations. The third study's results showed that the impact of different motivational goals did not directly affect the credibility evaluation of scientists' posts. Since I argued that credibility ratings, like engagement intentions, are a direct repercussion or consequence of trust in the sender of information (see section 2.1.5), this finding indicates that situational motivations per se have a limited impact on a recipient's specific evaluative credibility assessment. This interpretation contrasts with previous research suggesting, for example, that recipients view content more critically when they are asked to do so (e.g., Pennycook et al., 2020). One explanation for the fact that situational motivation did not profoundly impact credibility judgments could be that the sources were clearly presented as scientists and not supposed journalists or anonymous sources. Even if I can only make a speculative assumption based on the available data, the presumed trust bias of scientists seems to override situational goals and lead to a potentially less critical (or less

thorough) processing, even if recipients were instructed to do so. Therefore, it seems convincing that situational motivations had only minor influences when asked to evaluate the information provided by directly communicating scientists.

However, the results also showed a direct influence of a recipient's situational motivation on the intention to engage with the content, but only for recipients with high defence motivation, who were more likely to like, share, and comment on a post by a scientist. Thus, this finding suggests that recipients' situational motivation affects behavioural intentions linked to the respective goals but not the preceding evaluative process. Since there was also no mediating effect of either motivation via credibility on the intention to engage with the presented content, this again underlines the implicit separation of content evaluation and behavioural intentions. In other words, situational motivation seems to influence behavioural intentions that may indicate trust (see section 3.4.2), but not content evaluation per se. Instead of situational factors, more stable cross-situational factors, such as general trust in scientists, influence how recipients evaluate the content on the first level (see section 5.1.2.2).

Although only a theoretical approximation, the second experimental study, in which I examined how emotions may influence the evaluation of scientists and their communication, also allows me to draw a similar conclusion. To clarify, I assumed that particularly negative and emotionalised comments would cause emotional contagion and subsequently influence recipients' impressions and attitudes concerning scientists' communication (Van Kleef et al., 2015) by (unconsciously) adapting the commenters' expressed emotional states (Hatfield et al., 1993; Kramer et al., 2014) and the further integration of those emotional states into the recipients' evaluation of content (Hasford et al., 2015). In this vein, the results of the second experimental study showed that while the presence of negative-emotionalised comments interacted with the type of evidence used by the scientists and, thus, could potentially reflect emotional contagion in the evaluation, the effects caused by the cross-situational factors of prior attitudes were still significantly more influential for the evaluation. Again, these findings indicate that situational motivations seem to play a subordinate or supporting role in cross-situational factors. Nevertheless, their current findings still point to considering the respective situational boundary conditions, as they can still strongly influence the recipients' perceptions of scientists and their communication.

In sum, the presented results emphasise the importance of considering and understanding the respective situational factors when recipients encounter scientists online, since these context-dependent judgments may have a lasting impact on the image of the specifically evaluated scientists and science overall. Accordingly, dynamic and context-dependent influences in the perception of the trustworthiness of scientists who address the public should not be underestimated but need to be considered.

5.1.2.2 Cross-Situational Factors

Concerning the role of cross-situational factors, I want to begin by outlining the other results of the third experimental study since they support the previously made assumption that cross-situational factors appear more influential than situational factors. Prior considerations suggest that motivations and respective goals do not entail different levels of intensive processing, as both can potentially alter evaluations (Molden et al., 2021), which is not refuted by the current results. Instead, the results rather provide evidence suggesting that cross-situational factors determine the extent to which these motivations will guide content evaluation. In other words, the influence of states is different based on a recipient's traits. However, cross-situational factors are still more influential than situational factors in how recipients react to content presented by scientists.

When considering the post-valence as a message cue, different cross-situational factors emerged as more influential than other situational factors for evaluating the content. This notion becomes particularly clear in two instances within the third experimental study. Firstly, it became evident in the interaction effect of accuracy, motivation and NFC, as it showed that those who enjoyed thinking would do so if prompted to - this combination then caused a significant increase in the perception of credibility. Secondly, attitude-consistent posts were rated significantly more credible than attitude-inconsistent posts, which reflects the impact of attitudes as a cross-situational factor. Moreover, defence motivation was only influential for the perceived credibility when the content was consistent with the attitude.

Nevertheless, the unmoderated effect of attitude consistency was still stronger. The strong influence of attitudes as a cross-situational boundary condition was also present in the second experimental study on the influence of evidence use and user-generated comments. Despite not explicitly instructing participants to defend their prior view, participants' prior attitudes towards the topic emerge as the strongest predictor for the trustworthiness assessment of the scientists and their messages. These findings seamlessly blend into prior research on the confirmation bias, where recipients circumvent attitude-challenging content to avoid cognitive dissonance (see Festinger, 1957; Metzger et al., 2020) and, in consequence, view such opposing content as less credible (e.g., Edgerly & Vraga, 2019; Meppelink et al., 2019; Metzger et al., 2020; Van Strien et al., 2016).

Continuing with further cross-sectional boundary conditions, the fourth experimental study, in which I focused on both the recipients' subjective and objective knowledge, aligns with these findings. As outlined beforehand (see sections 3.2.3.1.2 and 4.4.5), I assumed that a recipient's subjective knowledge confidence would similarly influence the recipient's credibility evaluation. Indeed, the analysis showed that one's confidence in their subjective knowledge influenced credibility perceptions, just like (strong) prior attitudes would do (e.g., Light et al., 2022; Schäfer, 2020). This finding aligns with previous research highlighting that the (perceived) knowledge in a domain influences how information will be assessed (Lucassen & Schraagen, 2011; Metzger, 2007). Further, the results illustrate that subjective knowledge influences processing rather than objective knowledge (Park &

Lessig, 1981), emphasising how important it is to distinguish between those two constructs in further research.

Under the premise that perceiving content as credible can be seen as an indicator of trust in a scientist, this finding on subjective knowledge confidence is of particular interest. Trust can be seen as a mechanism for reducing uncertainties, and within science communication, this often entails accepting false information. This circumstance raises the question of whether trust in directly communicating with scientists is still necessary if recipients rely on their knowledge when evaluating information online to assess the content they see. The answer, like the question, can also be found in the fourth experimental study. While the context cues did not influence recipients' evaluations, they still relied more heavily on the source to judge the credibility of the short-format videos presented to them. Given that watching the video further increased their belief in their knowledge, it indicates a positive reinforcement due to the presented science content. Irrespective of possible adverse overconfidence effects (see Light et al., 2022) that could be triggered by the encounter with science or science-like short-format videos in social media, the fourth and third experimental studies demonstrate how intensely flexible cross-situation factors influence the evaluation of science communication online.

Moving on, I will discuss the general trust in scientists, which I classify as a flexible but cross-situational factor (see section 3.2.3.2.2). In short, if one's tendency to trust scientists is seen as a disposition (Fage-Butler et al., 2022), it should exert the same influence on information processing as traits in general should. Thus, it should also promote a less thorough and superficial processing of available information. In other words, one's general tendency to trust scientists should become a "default heuristic" applicable across multiple encounters with scientists. I assume that in the context of scientists communicating directly on social media, the *specific* propensity to trust scientists plays a more significant role than the general tendency to trust. This assumption is confirmed, at least in light of the results of the third experimental study, which shows the direct and indirect positive influence of the trait of trusting scientists. As already described in the section on message cues, general trust in science reduces the adverse effects of jargon. The study thus suggests that trust in scientists acts as a heuristic filter, making recipients more receptive to messages from scientists. At this point, I would like to emphasise a limitation of this interpretation against the background of the available data; as explained in section 3.2.3.2.2, the choice of the specific propensity to trust scientists is primarily of theoretical nature and no empirical comparison between the general and the specific propensity to trust (scientists) is part of this dissertation. However, this circumstance does not diminish the results' significance but highlights the need for further research to test and empirically verify the assumptions concerning the propensity deviations in more depth.

Beyond a recipient's cross-situational trust in scientists, I also examined the role of recipients' NFC, which I investigated in the second and third experimental studies as another example of the stable cross-situational boundary conditions for evaluating

scientists' communication on social media. Unexpectedly, it did not influence the perceived epistemic trustworthiness of the directly communicating scientists or the credibility of their messages in the second experimental study. Furthermore, in the third experimental study, the effect of NFC on evaluating scientists' communication was contingent upon the presence of other factors. Considering these findings, it can be concluded that NFC has a limited influence on evaluating scientists' communication, which is based on the following matter: The influence of NFC depends on a certain level of cognitive demand, which can be caused by the presence of scientific jargon, for example, as in the third study. Conversely, the second study on evaluating the different types of evidence was arguably less cognitively demanding, as the stimulus material was written in plain language. Hence, NFC may only exert an influence on the recipients' evaluation of scientists and their communication if the presented stimuli demand higher cognitive effort.

Further, the suitability of the NFC as a self-report for investigating science communication issues can be questioned since it reflects a tendency and not a recipient's cognitive ability, which recipients tend to overestimate (see Pennycook et al., 2017). Thus, when it comes to the actual ability to critically examine content and go beyond a heuristic evaluation of content triggered by science-based cues, other ability-related variables may help gain a deeper understanding of the recipients' evaluative process and the role of cross-situational factors.

In essence, cross-situational factors were pivotal determinants of evaluating scientists and their communication. These factors, such as general trust in science or recipients' prior attitudes, significantly influenced the evaluation process. Given the previously introduced lens metaphor, cross-situational factors can be understood as constant bends or inclinations of said perceptual lens, which characterise the assessment of scientists and their statements. Situational factors, on the other hand, serve to either accentuate or distort this perspective in the short term without affecting the lens's fundamental orientation. The results demonstrate the significant influence of stable, cross-situational factors on assessing the information presented by scientists and the scientists themselves.

5.1.3 Repercussions of Trust

In this section, I will discuss the last stage of my proposed conceptual framework, namely, the repercussions of trust placed in scientists and their communication online. To reiterate, in the beginning, I outlined that credibility can be seen as a repercussion of trust, which is based on the perceived trustworthiness of a scientist (see section 2.1.5). Furthermore, I describe two outcomes of trust and a scientist's perceived trustworthiness, respectively. The first for them is updates in terms of domain-specific knowledge, attitudes of the recipients regarding the topics discussed, and the recipients' beliefs regarding the encountered scientist's trustworthiness. As a result of the latter, trust in the encountered scientist and science with its multidimensional character (e.g., Reif & Guenther, 2021). The second are actions, which result from trusting a scientist and the information they provide.

5.1.3.1 Updates of Cognitive Representations

Concerning the first matter, the first and fourth experimental studies support the idea that beliefs about a scientist's trustworthiness will be updated and subsequently be used as a starting point for an encounter with a scientist where trust is required (Mayer et al., 1995; Schoorman et al., 2007). In particular, the first experimental study focused on the perceived familiarity of a source in terms of its perceived epistemic trustworthiness perceptions. Although the measures only captured one assessment, the results still indicated a divergence between the presented scientists' perceived integrity and benevolence. Thus, this finding supports the theoretical notion that both variables diverge over time and that trustworthiness perceptions are presumably formed based on previous encounters (Mayer et al., 1995; Schoorman et al., 2007), as evidenced by the differences between familiar and unfamiliar sources. Similarly, the fourth experimental study supports these considerations, as the perceived familiarity and reputation of the science communication channel affected the perceived credibility of the presented video, which I consider a consequence of trust in the sender on the message level. Recipients, indeed, used their prior assessment of the source to evaluate the content. This circumstance also underlines the notion of previous encounters as a basis for upcoming evaluations of trust assessments. However, unlike the first experimental study, the effects were primarily negative, which extends these considerations from perceived trust to distrust. As outlined at the beginning of this dissertation (see section 2.1), distrust extends beyond the mere absence of trust and can still function as a mechanism to reduce uncertainties. As none of the experimental studies in this dissertation were conducted with a multi-wave design, I, unfortunately, cannot draw any empirically based conclusions about the idea of refinement of beliefs about a scientist based on multiple encounters (Dietz, 2011; Six & Latusek, 2023). However, they seem to be highly plausible, given the current results, but still need to be verified in future studies.

Beyond the updates regarding trustworthiness beliefs based on encounters with scientists online, I also found evidence concerning updates of a recipient's knowledge and attitudes. The results of the second and third experimental studies showed the significant influence prior attitudes have on a recipient's evaluation of scientists' communication online. Thus, both indicate strong patterns of confirming, and thus reinforcing, attitudes in recipients. This circumstance leads me to posit that these will (or would have) influenced recipients' attitudes after exposure to the stimulus used, if so, only slightly. This thought is supported by the results of the fourth experimental study, as recipients' subjective knowledge confidence directly influenced the perceived credibility of the short-format videos. However, the analysed changes in knowledge are of greater significance in assessing if and how encounters with science online can affect a recipient's cognitive structures. As outlined in section 3.2.3.1.1, I expected knowledge and beliefs to operate based on similar mechanisms in assessing scientists and their communication. Indeed, the same confirming pattern evidenced by a recipient's prior attitudes also appeared regarding their subjective

knowledge confidence (see Light et al., 2022) as it directly influenced their credibility assessment.

Furthermore, these self-confirming patterns appeared regarding their subjective and objective knowledge changes. Both increased after watching the video, which blended into prior research, indicating that encounters with correct scientific information benefit a healthy level of knowledge and confidence in it (see Meier, 2024). In this vein, the current results extend the research on incidental exposure to scientific and political information on social media, which shows that exposure to online information – even if encountered incidentally – exerts learning effects (e.g., Anderson et al., 2021; Nanz & Matthes, 2020). Although this is only reflected experimentally in the fourth study, it confirms my conceptual framework's assumption that encounters trigger a loop that can influence cognitive representations in the long term.

Overall, the findings indicate that interactions with science and scientists shape the assessment of trustworthiness, categorisation, and verification of existing cognitive representations. In other words, multiple encounters with science or specific scientists strengthen recipients' assumptions regarding the communicators and their individual beliefs.

5.1.3.2 Trust Indicating Actions

Beyond updates of a set of cognitions, I also initially proposed that specifically higher levels of trust will lead to actions and behaviours of the recipients. In this dissertation, I examined actions in two instances. Those actions cover publicly visible engagement with scientists' posts on social media. To reiterate, I posited that actions based on the perceived information credibility are indicators of trust in the source and scientist, respectively. The idea behind this assumption is explained in section 3.4.2; every action taken based on what a scientist says is the same as accepting vulnerability and specific risk, which reflects trust by definition (see section 2.1.1). Notably, the results of the third experimental study support this notion by showing that credibility emerged as the most influential factor in participants' engagement intentions. Again, I view credibility as a direct result of trust in the source (see section 2.5.1). While I argued that, particularly public participation in dialogue could be associated with the risk of being socially rejected instead of staying silent (see Neubaum & Krämer, 2018), this explanation still needs to be interpreted with a certain degree of caution. This caution is preliminary, based on the studied scenario, just like evident in all experimental studies in this dissertation, are hypothetical and isolated instances. As I have not studied actual behavioural data in a realistic setting, the assessment of behavioural intention still leaves the question of transferability to a real-life setting.

It is critical to emphasise that situational defence motivation also impacted all forms of engagement, even if the effect sizes were remarkably smaller than those caused by the perceived credibility. In particular, the messages' valence had a more significant influence on credibility than willingness to engage. This circumstance can be interpreted to mean that trust, which leads to engagement, is not only determined by the credibility of a scientist's

messages (i.e. a consequence of trust), but also by additive personal motivations. In detail, the personal motivation to focus on accurate information has no effect on engagement. Crucially, however, the goal of defending one's position did.

Furthermore, I initially specified that trust-indicating and trust-based actions would cause a feedback loop in which recipients' behaviour reflected their willingness to be vulnerable and act upon potential risks (Dietz, 2011; Six & Latusek, 2023). As described in section 3.1.2, the results of the presented content analysis (see Biermann et al., 2024) underline this notion because recipients were more likely to respond to scientists' posts which included scientific evidence. Based on the considerations in the discussion (see section 3.1.2.1), this use of scientific evidence may have increased trust perceptions and, thus, the chance of public engagement, i.e., trust-indicating behaviour. Although not experimentally verified, this interpretation still suggests a "loop of trust." Independent of this interpretation, these results, like the results from the third experimental study, clearly show that trust in a scientist's communication benefits engagement (intentions). Hence, it influences the environment in which other social media users experience and perceive said communication. In other words, it manipulates the context cues that other recipients may use to evaluate a scientist and their messages.

5.2 Theoretical Implications

After reiterating and discussing the empirical findings of this dissertation, I will now discuss the theoretical implications and contributions made. This dissertation does not refer to a single unified theoretical model or specific theory for further development. Instead, several models are brought together to elucidate the perceived trustworthiness of scientists who engage with the public on social media and the consequences of such direct contact. Hence, I will now outline the individual contributions of my work to existing theoretical approaches from which I have drawn.

5.2.1 Heuristics: Science vs Trust

As the first theoretical contribution to my dissertation, I aim to categorise my statements and results on heuristics, as this work has led to two critical implications. Firstly, I have argued that trust itself is a heuristic (Lewicki & Brinsfield, 2011). Secondly, I have also demonstrated that the reference to science, or what I term "scientificness", can be considered a universal cue triggering a heuristic for positive trust and credibility evaluations (see section 5.1.1.2). Nevertheless, it is first necessary to acknowledge that these two perspectives converge in a unifying manner. This matter is explained as follows:

Lewicki and Brinsfield (2011) conceptualised trust as a heuristic based on its function of serving as a shortcut in decision-making. The argument is that once trust (or distrust) is justified, trust will continue to serve as a prefabricated (or heuristic) judgement if no instance contradicts this once-made judgement. This assumption first requires a sense of familiarity (Alarcon et al., 2016; Luhmann, 1979) – as supported by experimental studies

one and four. Further, this perspective on trust fits the idea of trust as a feedback loop stretching over multiple encounters with one source, where (un)breached expectations of interaction will transfer to the following situation and develop over time (Dietz, 2011; Six & Latusek, 2023). Lewicki and Brinsfield (2011) conclude that trust is highly connected to other common heuristics. For example, they explain that the availability heuristic (choosing what is common and known) connects to trust in the sense of recalling (positive) outcomes of previous trusting situations, leading to an increased certainty that said outcome is positive. All with the overarching goal of saving cognitive resources. Evidence that trust plays a similar role can be seen, for example, in the third experimental study, where general trust in scientists compensated for the adverse effects and lack of understanding of the scientific jargon used. This finding supports the notion of recipients saving cognitive resources by utilising trust as a heuristic (Lewicki & Brinsfield, 2011). In this manner, recipients effectively circumvent the supposed reduction in processing fluency of content by cognitively demanding jargon (e.g., Shulman et al., 2021). While this is a conceptual and functional perspective on trust, it still connects to the notion of "scientificness" being a heuristic cue implied earlier.

The confirmation of this functional assumption of trust as a heuristic was demonstrated across the studies. Once more, the jargon example can be employed, as it illustrates that general trust in scientists as reliable information providers mitigates the adverse effects of scientific jargon. Furthermore, as evidenced in the first experimental study, the presence of "scientific" cues increases the evaluation of trustworthiness when there is a leap of faith in the communicator. Thus, the findings indicate that science-related cues trigger a beneficial evaluation of communication efforts, which extend beyond lexical representations, such as scientific jargon (e.g., Jonas et al., 2024; Thomm & Bromme, 2012). In addition to these lexical representations, these "scientific" cues extend up to sender cues, such as academic credentials (see Experimental Study 1), and other message-level cues, such as using different evidence types (see Experimental Study 2). This finding can be pinned down to previous acceptance of science and scientists' epistemic authority in general (Kruglanski et al., 2005, 2018).

Further evidence for this claim can also be found in the third experimental study, where I examined the situational processing motivation for the available cues. To elucidate, general trust in scientists did not moderate the effect of accuracy motivation on the posts' credibility evaluation. If a participant said their goal was to find accurate information, which is thought to require more effortful processing (see sections 3.2.3 and 4.3.1), they were presumably less likely to rely on their trust as a heuristic or save cognitive resources (Bellur & Sundar, 2014; Sundar, 2008). It is important to note that the available studies do not provide evidence that these heuristics were actually used by recipients when evaluating the stimulus material. However, they suggest that rather superficial or heuristic-driven processing is being employed.

In conclusion, once communication contains cues unique to scientists that are recognised as such, recipients should be highly inclined to save cognitive effort and trust based on their previous acceptance of science. It should be noted that this argument only applies to individuals who tend to trust scientists in general. This pattern should be reversed from the perspective of distrust, which is to say, negative rather than positive expectations towards science. The general propensity to trust scientists remains the decisive variable for interpreting these cues, aligning with my initially outlined position that trust and distrust always need to have a specific reference point (see section 2.1.3).

Those with a negative propensity towards science will negatively interpret the cues. Conversely, those with a positive propensity will positively interpret the cues. Nevertheless, differences in trust and distrust can still occur with increased relevance and, thus, deeper involvement with the information in question. To illustrate, an individual may place trust in the methods and expertise of a specific scientist, yet simultaneously exhibit distrust regarding their motives and the interpretation of the results. As previously indicated, this should only be the case if the propensity-dependent linkage from science to a heuristic-driven evaluation is not employed beforehand.

In addition, the current results also allow for further categorisation of related heuristic judgments, as proposed by Metzger and Flanagin (2013), to scrutinise the strategies users employ in evaluating web credibility. They propose that the reputation (or name recognition) heuristic is a subset of the authority heuristic. As discussed in section 5.1.1, I assume that who to view as an epistemic authority is learned and diversifies over time (Kruglanski et al., 2005, 2018). Although I cannot certainly state whether this classification should be rejected or confirmed based on the present studies, the results of the fourth experimental study suggest that recognising a source and the presumed reputation have different but robust effects on evaluating science communication online. The results of the first experimental study addressing familiarity also support this assumption. The interaction found between perceived familiarity and the presence of an academic title (i.e. a cue to the sender's epistemic authority), in which scientists perceived as familiar with an academic title were rated as less trustworthy than those without an academic title (and the opposite effect for unfamiliar scientists), suggests that perceived familiarity (i.e., name recognition) exerts more influential effects than the authority cue of academic credentials. This idea also fits in with the interpretation that known (even if not consciously recognised) persons tend to be assessed and evaluated according to stereotypes or preconceived notions (Smith et al., 2006). Although the empirical study did not explicitly examine heuristic cues, it nevertheless provides evidence that recognition can indeed be considered a subset of the authority heuristic (Metzger & Flanagin, 2013).

In essence, it can be posited that trust in scientists can function like a cognitive shortcut that positively influences evaluating scientists in the absence of a breach of trust.

5.2.2 Online Norm Violation

In addition to my abovementioned contributions regarding confidence and heuristics, I would like to present a further perspective on the expectancy violation theory (EVT) proposed by Burgoon (1978, 1993, 2015). The theory was initially developed to explain reactions to social norm violations in (nonverbal) communication settings. In particular, it addressed violations of personal space. For the derivation and categorisation of the second experimental study, I was primarily guided by two core aspects of this theory. Firstly, expectations influence behaviour and impressions of a social situation. Secondly, expectation breaches draw attention to the characteristics of the person making the expectation, which can be interpreted positively or negatively. Whether the violation is viewed as positive or negative depends on the type of violation and the communicator.

In this vein, the second experimental study demonstrated that the way scientists utilise evidence (scientific vs anecdotal) only influenced credibility and trustworthiness perceptions in the presence of negative user comments. Here, I argue that the presence of negative-emotional comments, such as anger, resulted in lower ratings of credibility and expertise for messages containing anecdotal evidence. This is because these negative comments draw attention and cognitive capacities to the expectation violation that occurs when scientists fail to provide scientific information. On the other hand, the same attention caused by negative-emotionalised comments and presumably high cognitive effort invested in evaluating the content caused posts with scientific evidence to be perceived as more beneficial. In light of the unimodel, the interpretation can be viewed as a shift in the individual's relevance (Chun et al., 2002; Kruglanski & Thompson, 1999). However, more importantly, it emphasises that specifically negative emotionalised comments, as contextual cues, trigger a more in-depth processing of the available cues. In the context of EVT, it can be said that violations not only have to be triggered by the combination of expected and observed behaviour but can also be triggered by third parties in social media, where this possibility exists. It remains uncertain whether the use of anecdotal evidence was perceived as a violation of norms by the recipients. However, this seems highly plausible given that previous research indicates that the public expects scientists to communicate valid scientific information (see Falchetti et al., 2007; Maier et al., 2016).

Against this background, the question arises about how the lack of scientific jargon in the third experimental study represents a potential violation of norms or a breach of expectations regarding scientists' communication. To respond to this question, it is necessary to concentrate on the effect of scientific jargon. As the absence of jargon and the perceived understanding of the content were found to have a beneficial effect on credibility, it can be assumed that this must have constituted a positive rather than a negative norm violation (if it was present in the first place) further fostering the need to rely on trust in the communicator. However, this assumption remains speculative since the corresponding meditation effect is below the meaningful interpretable effect size. Nevertheless, these

findings still show parallels to the online norm violation based on the EVT and emphasise the need to bear the roles and expectations towards communicators online in mind.

5.2.3 Limits of the Source Primacy Effect

In addition, the results of the second experimental study also help to contextualise the source primacy effect further. Sundar and colleagues (2007) describe the source primary effect as follows: secondary cues are only relevant in assessing a message's credibility if the quality of the message is deemed inadequate and low. In the second experimental study, it can be observed that there were no differences in the trustworthiness evaluation of the sender for neutral comments. However, differences in the message evaluation were recorded. This initially suggests a parallelism between evaluating the sender and message cues. Message cues affect the message evaluation, while sender cues only affect the sender evaluation.

At a second level, including negative emotional comments appears to transfer the message's content to both the sender and message evaluations. Therefore, if there is reason to believe that the sender's quality is being questioned, the content features will be more likely to be subjected to critical scrutiny. Consequently, the results of the second experimental study indicate a limitation of the source primacy effect, given that, irrespective of the type of evidence, the sources were always scientists with high epistemic authority. However, according to the source primacy effect, the type of evidence should not affect how scientists evaluate communication. Against this background, the source primacy effect seems limited to specific situations where no negative and contradictory information is available to the recipients. The reasoning is that the comments have changed according to the respective experimental conditions, but not the message itself.

In conclusion, the results imply that the evaluation mechanisms for the sender and message initially operate independently of each other but are linked by attention-grabbing contextual cues (e.g. negative-emotional comments).

5.2.4 Interferences with the Sources' Familiarity

The following theoretical implication addresses the role of a recipient's perceived familiarity with the source when researching trust. Even without actively seeking out scientists on social media, individuals may encounter them incidentally, which can still impact them (see section 3.1.1). Particularly in cases where individuals encounter scientists without seeking direct contact or searching for them to gain information on social media, there is a need for an initial entry point to assess the trustworthiness of the scientist and the information being conveyed (e.g., Luhmann, 1979; Mayer et al., 1995). This circumstance makes it unavoidable to consider if a recipient is (or feels) familiar with the scientist (see section 3.3.1.2). Hence, I argue that when addressing trust on social media, it must be explicitly considered to incorporate the perceived familiarity of a source (i.e., a specific communicating scientist). As evidenced in the first and fourth experimental studies, perceived familiarity is a highly influential predictor of perceived trustworthiness and

credibility. At this point, I would like to emphasise again that even an unfamiliar sender can evoke a feeling of familiarity (see section 4.1.7.1). Thus, it can be assumed that existing impressions will influence the extent to which recipients will place trust in a source.

In consequence, at least some degree of familiarity must be considered. This also facilitates avoiding "experimental isolation" when implementing the findings. When researching trust, familiarity must be considered because it can negate the impact of other cues or interact with them. Considering the specific research question and the corresponding design, familiarity should be considered a possible predictor or moderator variable.

5.2.5 Reliance on Source, Self, and Community

This dissertation's following theoretical implication addresses the effects of recipients' confidence in their subjective knowledge. I expected subjective knowledge confidence, i.e. what one feels to know (Brucks, 1985), to influence individuals' perceptions of scientists' trustworthiness and the credibility of their messages. The rationale behind this assumption is that subjective knowledge affects which cues recipients rely on when evaluating the information presented to them (e.g., Brand-Gruwel et al., 2017; Lucassen et al., 2013).

Against this background, the results of the fourth experimental study provide further insights into the role of subjective knowledge in evaluating information in social media. In the respective study, recipients had three potential sources of information and cues to assess whether the presented short-format video was credible, respectively. They covered quantitative endorsement cues, their perception of the source (i.e., perceived familiarity via recognition and reputation), and prior knowledge of the respective issue. Since specifically science-related knowledge often requires expert knowledge to assess (Bromme & Gierth, 2021), the recipient should have been more likely to rely on other external sources to verify their content evaluation. The results, however, clearly showed that specifically endorsement cues had no impact on the evaluation. In this vein, the fact that knowledge confidence had a direct and not a mediating effect is essential to emphasise. This circumstance suggests that recipients may not find the quantitative community-based note reliable and convincing enough to assess the content's reliability. Thus, the current results regarding the endorsement heuristic seem to be embedded in previous research, suggesting that quantitative ratings have no effect. Therefore, it can be concluded that, as with potentially polarising issues or whether recipients are quite confident in their position, community opinions have little influence on recipients and their evaluations (see Borah & Xiao, 2018; Winter et al., 2015). Instead of accumulated public responses, recipients' evaluations were influenced by the perception of the source and their knowledge confidence. Based on the respective effect sizes, the source's influence seems more remarkable than the influence of knowledge confidence. Thus, the results indicate that recipients rely more on their impression of the source than on their knowledge. This notion is also evident in the first experimental study, where the perceived familiarity exerted the strongest effects on the

perceived trustworthiness of the communicator. At this point, I would like to emphasise that the effect of familiarity on the perceived expertise was nearly three times larger than the effect of an academic title, which indicates that recipients judge content based on what they know and what they know about the sources.

At first glance, these findings contradict the results of the third experimental study, where I examined the effects of understanding on the perceived credibility of scientists' postings. To reiterate, the credibility was reduced if the posts contained scientific jargon. In parallel, jargon reduces the understanding of the content, resulting in reduced credibility. These two poles of scientific jargon's role suggest that perceived understanding must be the key explanatory variable. Further, a recipient's general trust in scientists caused higher effects than the recipient's semantical understanding of the post, which mirrors the results of the fourth experimental study. Once individuals can rely on their judgment, the necessity to trust scientists diminishes. In parallel, the benefits of emphasising "scientificness" may also be reduced. This notion is also reflected in the findings of the fourth experiment (see section 5.2.6). In other words, if recipients were able to understand the technical terms used, which, in conclusion, indicates confidence in their knowledge, the adverse effects on credibility diminished.

Although the fourth and third studies did not measure the same construct, they both indicate that credibility is crucially dependent on the source and (to a presumably lower extent) the recipients' domain-specific knowledge, with both elements having varying importance depending on the circumstances.

5.2.6 The Public's Engagement with Scientists' Information Online

Moreover, the findings presented in this dissertation also have implications for public engagement with information provided by scientists. As public engagement is not a theory in itself, it is not possible to make a theoretical contribution here. However, it is possible to provide a categorisation that can be used as a guide for future developments in this field.

The first implication that should be considered for research on science communication online can also be derived from the preceding content analysis (see section 3.1.2; Biermann et al., 2024). Here, the results showed that scientists per se utilise scientific evidence in their social media communications, a practice that laypeople seldom engage in. This finding underscores the role of scientists in providing well-received scientific information. As a result, scientists serve as crucial intermediaries for scientific information on social media, a role that laypeople are unable or unwilling to fulfil in dialogues surrounding science. This circumstance reflects the imbalance between laypersons and scientists in terms of understanding specific scientific knowledge (see O'Doherty, 2022; Schäfer, 2016). In this vein, the results show an asymmetry in disseminating first-hand evidence on social media, with scientists taking the lead in providing evidence-based information. This finding may not be surprising, but it requires further investigation and consideration of the online dialogues between scientific experts and lay audiences.

In light of these findings, there is an apparent necessity to identify the specific mechanisms that either facilitate or impede public engagement with scientific content. In the third experimental study, I conducted a detailed investigation into these specific mechanisms. This section further aims to contextualise the results of recipient engagement with scientists' communication in the context of confirmation bias and selective exposure patterns. While these two have been extensively researched in political communication – specifically with a US-centric and bipartisan focus (e.g., Metzger et al., 2020; Shin & Thorson, 2017) – far less research has focused on their role in discussing scientific issues and the subsequent behavioural intentions to engage with the content rather than select it. Interestingly, the results of the third experimental study showed that while credibility perceptions were highly influential, particularly for content that aligned with the recipient's attitudes, this influence was not observed across all three levels of engagement. To clarify, only marginal and direct effects occurred, which suggests that although personal opinions shape credibility judgements, this alignment does not automatically result in higher public engagement.

The perceived credibility mediated the relationship between attitude consistency and engagement, though the effects were only marginal. This result indicates that while credibility is a factor in engagement, attitude alignment is minimal in influencing public engagement with scientists online. These findings differ from research on political information, where attitude consistency, selective exposure, and sharing are connected (Johnson et al., 2020; Shin & Thorson, 2017; Weeks et al., 2017). Therefore, the current results highlight a gap between selecting and actively engaging with science-related content, which requires further investigation. While the selection of content may align with attitudes (Knobloch-Westerwick et al., 2015), the question arises whether science communication needs to be more targeted to effectively engage lay audiences. The lack of a meaningful effect of attitude consistency on engagement could be attributed to the fact that the expression of values and beliefs drives online engagement with political information (Johnson et al., 2020; Shin & Thorson, 2017), whereas science might not. Potentially, science (or the topics examined in the third experimental study) was perceived as generally irrelevant by the participants, or participants were generally less likely to engage with scientists' communication online, as the means for engagement in the study overall were relatively low. Irrespective of the reasons, it is evident that the processes involved in scientific and political communication do not exert a similar effect.

Beyond outlining political and science communication differences regarding recipients' credibility evaluations, I also explored the mechanisms underlying public engagement with scientists' communication. In particular, I examined accuracy and defence motivations, which should, theoretically, influence the processing and interpretation of available cues in different ways (see section 4.3.1). Surprisingly, neither directly influenced the credibility evaluation of the content. This finding suggests that neither directional nor non-directional goals influence the evaluative process of mapping available cues to content

credibility. The results suggest that situational motives, combined with individual factors, influence how people assess the credibility of content based on available cues. For example, the credibility attribution of content was only affected when people liked to think (high NFC) and were simultaneously motivated to find the correct information.

This finding, therefore, prompts the question of whether there are, in fact, two distinct routes for the processing and evaluation of content (see HSM: Chaiken & Ledgerwood, 2012 or ELM: Petty & Cacioppo, 1986). Suppose a process involves superficial or deep processing with corresponding (non-)directional motives. In that case, it should be at least partially reflected in the data. However, since this was not observed**,** it seems more appropriate to assume a single route (e.g., Erb & Kruglanski, 2005). This assumption is also supported by the fact that the cross-situational factors had a more substantial influence than the motives alone. For example, this idea aligns with research suggesting that confirmation bias is more pronounced in individuals motivated by accuracy goals (Winter et al., 2016). Rather than distinct processing routes, individual dispositions seem to play a more significant role in evaluating content.

Similarly, attitude-consistent content is rated more credible than when these recipients are also motivated by the goal of defining their attitudes. At this point, I would like to emphasise that, specifically, defence motivation affected the intention to engage with the content but not the credibility assessment. Further, no mediating effect of credibility for the relationship between engagement and the different types of motivations (accuracy vs defence) was examined. Thus, this directional motivation might not solely change content evaluation per se but might be linked to the content selection before recipients are willing to engage with it (see Winter et al., 2016).

The observed differences in behavioural intentions, based on distinct motivational factors, do not necessarily support a dual processing model. Instead, they suggest an intermediate step between evaluation and behaviour, influenced by directional but not non-directional motivation. This notion is further supported by the finding that the relationship between the users' motivation and engagement with the content is not mediated by the content's perceived credibility. Whether recipients were willing to engage was only weakly related to the attitude consistency of the post and more strongly linked to perceived credibility and the goal of defending one's views.

In summary, these results support the assumption that different forms of engagement reflect different levels of involvement (Ariel & Avidar, 2015; Taddicken & Krämer, 2021; Xu et al., 2018). Although it cannot be determined with certainty from this study whether substantial or minimal cognitive effort was exerted, given that motivation was the sole proxy, the study demonstrates that the stronger the directional motivation to defend, the greater the likelihood of effortful (i.e., commenting) participation in the dialogue. Thus, this study provides empirical evidence supporting this classification.

In closing, the results contribute to the understanding of directly communicating scientists as information brokers and how recipients react to them in fulfilling this role. In

this regard, the findings of this dissertation illustrate the necessity to examine scientists' communication on social media as a distinct domain, yielding disparate outcomes compared to other purportedly comparable communicators. Additionally, as previously discussed in section 5.1.2, situational variables exert less influence on the dissemination of information when it is conveyed directly by scientists.

5.3 Practical Implications for Scientists and Science Communicators

Besides the theoretical contributions, this dissertation also provides practical implications in the form of evidence-based recommendations for scientists who directly address the public on social media and science communicators:

Throughout this dissertation, it became apparent that both sender-related cues (Experimental Study 1) and message-related cues (Experimental Study 2 and 3; Content Analysis), which made the senders appear to be scientists, benefited their perceived epistemic trustworthiness, their messages' credibility, and their reach on social media. Therefore, I recommend that scientists emphasise that they are scientists when addressing the public. In other words: *Show that you are a scientist.*

However, simply presenting oneself as a scientist does not guarantee that one will be perceived as more trustworthy. As indicated by experimental study 1, referring to one's expertise by presenting academic credentials was insufficient to reach higher levels of integrity and benevolence. This circumstance emphasises the need for scientists to explicitly highlight that they are honest and adhere to ethical standards in their communication to create an impression that leads to a high level of epistemic trustworthiness. Therefore, I recommend that scientists attempt to do so, as it appears they cannot solely rely on their presumed perceived expertise. In other words: *Highlight that you are more than an expert.*

Furthermore, the studies in this dissertation (Experimental Study 2, 3, and 4) highlight that recipients' characteristics are boundary conditions to their processing of the available cues. These range from confirming tendencies-based attitudes over stable tendencies, like the recipients' need for cognition, to situational effects, such as recipients' abilities to decipher scientific jargon. Thus, I recommend considering the potential audience and the respective tailoring of scientists' messages. In other words: *Keep your audience in mind.*

In the same vein, recipients may not always receive scientists' communication efforts well due to a confirmation bias, limited abilities, or other factors (Experimental Study 2, 3, and 4), which will limit the effectiveness of science communication by default and call for other strategies. However, as shown in the second experimental study, scientists can prepare for negative online feedback to keep the upper hand over their messages' credibility and perceived trustworthiness. As shown, for instance, by the third experimental study, recipients are highly likely to keep believing (i.e. rate as credible) what matches their previous view – irrespective of whether a scientist says otherwise. So, scientists should always keep these limitations in mind. In other words: *Know your limits.*

Furthermore, depending on the topic and the circumstances, recipients may exhibit various degrees of scepticism and distrust towards scientists due to their lack of knowledge about the specifically communicating person (Theoretical Approach). However, this disadvantage can be counteracted by a high (or more than less) visibility on media channels, as a positive reputation and perceived familiarity are beneficial for trust and credibility perceptions as long as they are positive (Experimental Studies 1 and 4). Therefore, scientists should frequently communicate their research to the public or, in other words, *Step into the public spotlight.*

5.4 Overarching Limitations and Future Research Directions

To further contextualise the empirical and theoretical contributions within my dissertation, it is necessary to address the overarching limitations of the work. In this light, I will devise and present directions for future research.

The most prominent limitation of this work is the context in which most studies were conducted – the COVID-19 pandemic and its aftermath. Given the highly polarising nature of the topic of the (then ongoing) pandemic, the empirical results must be viewed and transferred with some degree of caution. To clarify, although similar mechanisms are likely to be at play in the study of other issues, the effects may be more or less exaggerated with varying degrees of polarisation and individual relevance. At the same time, data collection on the experiments took place after the critical phases of the pandemic, making it necessary to examine the results from a crisis communication perspective to evaluate the durability and applicability of the results in future pandemics or crises.

Above all, the findings presented in this dissertation could have a temporary persistence. While the COVID-19 pandemic, coupled with the significant changes in science communication due to the widespread use of social media, sparked public interest in science and elevated scientists to a prominent position, potentially enhancing the overall level of trust in science, there are already signs of fluctuation (e.g., Blümel & DZHW, 2024; WiD, 2023). Thus, other future events, crises, or even technological developments may continue to alter the public's perspectives on scientists positively and negatively and change the idea of who is considered a trustworthy source. This circumstance ultimately highlights the need for continuous research on science communication. Although specifically, the practical implications might not stand the test of time, the theoretical contributions should.

Furthermore, just like with any other empirical research, it is crucial to ensure that the results are replicated to enhance the findings' reliability. In order to discuss such other topics with a varying degree of urgency and polarisation, the recipients' prior knowledge of the respective topics must also be investigated. It is important to note, however, that the descriptive measures of the samples suggest that most individuals surveyed do not appear to hold attitudes that deviate from the scientific consensus.

This notion leads to the following overarching limitation, namely the selection of the sample: All participants, as well as the data set for the content analysis, came from German-

speaking countries, which are characterised by a relatively high level of trust in science compared to other regions (e.g., Algan et al., 2021; Machado et al., 2024). This implies the need for replication and comparison with other countries and regions to confirm the immutability of the results. It is, therefore, quite possible that participants in countries with a different status of scientists would react differently to the scenarios studied (see Rowland et al., 2022). Therefore, these differences in scientists' perceptions should substantially influence sender and message-related cues more than contextual cues and the boundary conditions studied. However, it is important to note that studies using within-subject measurements reduce any unexplained differences that might be caused by context. This supports the validity of the results and the conclusions that can be drawn from them.

In addition to the apparent need for long-term studies (especially regarding the concept of familiarity), selecting exemplary elements within the framework was a limitation that can be overcome by exploring other factors. Therefore, based on the results and the literature mentioned at the beginning, they include but are not limited to the following factors: The need for cognitive closure (Choi et al., 2008; Webster & Kruglanski, 1994), participants' cognitive reflection (Pennycook et al., 2017), the scientists' attractiveness (Ohanian, 1990), or other motivational goals and states like the impression motivation (Chen et al., 1996). For further research, it is also crucial to consider the general and non-topic-specific propensity to trust as a cross-situational factor and personality variable.

Furthermore, it would be beneficial to conduct additional research to explore the potential of other platforms. While the experimental studies and content analysis have provided valuable insights into text-based communication, expanding these investigations to encompass other forms of communication is necessary. Despite my attempts at short-format video within the fourth experimental study, there is still a lack of research in this domain. In this vein, I also want to note that all measures used in the experimental studies are self-reports, which means that biases, such as social desirability, cannot be ruled out. To obtain more reliable statements about the actual willingness of recipients to trust, it is, therefore, advisable to conduct replications with measurements beyond questionnaires. These can include implicit measurements, such as attitudes towards science (Schoor & Schütz, 2021), to assess a participant's propensity to trust scientists or include actual behavioural measures beyond mere intentions.

Moreover, it is also important to emphasise that my dissertation primarily refers to academic scientists, not industry scientists. While this emphasises the complexity of the domain, it also represents an explicit and not to be underestimated limitation of the interpretation and applicability of my results. Throughout this dissertation, I applied a rather normative perspective on the role and function of directly communicating scientists as information providers and, thus, trust in them (Bromme, 2020). Although this view resembles the deficit perspective on science communication, it is closer to the paradigm of public engagement with science since its focus is on the recipient's direct contact with scientists (Scheufele, 2014). While most parts of this dissertation concentrate on the

recipients' and social media users' perspectives on scientists' science communication efforts, further research should extend this perspective to bi-directional communication. To clarify, I examined the circumstances under which recipients are willing to engage with scientists online (see Experimental Study 3 and Content Analysis). However, how responses from scientists and actual dialogue potentially affect trust perceptions is still a matter for future research. This direct dialogue between scientists and laypersons appears promising regarding public engagement (e.g., Hara et al., 2019; Hubner & Bond, 2022).

A further limitation of this dissertation is that, despite the initial differentiation of trust and distrust in science, the experimental studies have primarily focused on trust rather than on distrust in science and scientists, which limits the transfer of the results into the domain of distrust in science. Further, distrust cannot be identified in the current experimental studies, although the measurements used were, in theory, capable of appropriately measuring both distrust and trust. To explain, under the viewpoint that distrust is more than the mere absence of trust and has its functional justification, I have employed scales according to the recommendation for measuring these two concepts derived from perspective 1b. Trust and distrust can be measured as two ends of a construct once they have a specific reference point. Since this instance of distrust has not emerged through the collected data, further research (with an informed view of the two constructs) must continue to explore these links and interrelationships between the available cues to recipients and the boundary conditions in terms of scientists perceived (dis-)trustworthiness and (non-)credibility of their information. For this purpose, the misinformation shared and communicated online by supposed and feigned scientists is particularly suitable.

At this point, I would like to stress that the stimulus materials used in the first three experimental studies were AI-generated individuals. With improving image and text generation technologies, these studies also demonstrate the need for reliable authentication measures, the importance of promoting media literacy, and – most crucial – the need for further research in the specific domain of science communication and (supposedly) scientists' online communication.

5.5 Conclusion

Motivated by the fact that several scientists from different disciplines addressed the public directly via social media during the COVID-19 pandemic, this dissertation aimed to gain insights into the perceived trustworthiness of scientists who engage directly with the public via social media and the subsequent repercussions. In sum, this dissertation and the four experimental studies that build its core contribute to the existing literature by shedding light on the specific perceptions of scientists' perceived trustworthiness and the credibility of their communication. In this light, they are allowing the following conclusions to be drawn from the proposed framework:

Regarding the question of how the impression of a trustworthy scientist is formed, this work demonstrated that the perceptions of directly communicating with scientists are

contingent upon the number of cues available. However, the nature of social media platforms constrains them. In the studies examined, references to science at both the sender and message levels positively impacted the assessment of perceived trustworthiness and message credibility. Further, the perceived familiarity with the source was also identified as an influential factor. Contextual cues specific to the characteristics of the platforms in question played a minor role. Concerning the boundary conditions that apply to evaluating senders (scientists) on social media, I showed that while situational factors, such as a recipient's specific (non-)directional motivation, can impact the interaction with content, cross-situational factors, such as prior attitudes or subjective knowledge, exert a more powerful influence on the processing and evaluation of scientists and their communication online. Regarding the influence of direct contact with scientists in social media on recipients, I showed that encounters with scientists can positively affect users' evaluation of the scientists in question and their confidence in factual knowledge and beliefs. While these self-confirming biases must be viewed with caution, given the reinforcement of potentially harmful information, they can also be highly beneficial in reinforcing positive impressions about science and scientists.

Furthermore, it is essential to acknowledge that some observed results deviate from the previously established patterns in related fields. Additionally, the interactions between different cues and factors demonstrate the need for a nuanced approach to understanding scientists' unfiltered communication on social media. The findings not only identify the factors contributing to the perception of scientists as trustworthy and their messages as credible but also offer practical implications for scientists to effectively communicate and manage their online presence. While this research addresses a critical gap in understanding how trust evaluations are formed on social media platforms, particularly in the absence of traditional gatekeepers, I am confident that scientists can continue to use social media platforms to create positive momentum. Going forward, it is imperative that scientists use social media strategically to maintain and increase their trustworthiness and public trust in science.

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