journalism and media

MDPI

Article

What Is Denialism? An Examination and Classification of Definitional Approaches and Relevant Actors

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Abstract: Nowadays, virtually all discussions of social relevance involve actors negating the scientific consensus and disrupting the public discourse with so-called alternative facts. So far, this phenomenon, referred to as denialism, has encompassed different meanings and definitions that vary depending on the field of application, thereby making correct usage difficult. This paper therefore aims to develop an understanding of denialism by examining how the existing interdisciplinary literature is defining the term. Using an integrative systematic literature analysis, the interdisciplinary field of research is examined. This allows not only for the derivation of a definition of denialism but also for the identification and categorisation of denialist actors and the discussion of potential coping strategies. Finally, the definition integrated in this paper describes denialism from a communication studies point of view as a phenomenon that is characterised by the use of certain rhetorical tactics, a systematic and targeted approach, and an underlying motivation.

Keywords: denialism; denialistic actors; science denial; fact resistance; systematic literature analysis

Citation: Godulla, Alexander, Daniel Seibert, and Tim Klute. 2024. What Is Denialism? An Examination and Classification of Definitional Approaches and Relevant Actors. *Journalism and Media* 5: 135–147. https://doi.org/10.3390/journalmedia5010010

Academic Editor: Andreu Casero-Ripollés

Received: 4 October 2023
Revised: 8 January 2024
Accepted: 23 January 2024
Published: 26 January 2024

1. Introduction

Virtually all socio-political topics under discussion today reveal attitudes and voices that deny the fact-based consensus. Common to all of these voices is that they downgrade scientific findings to opinions and insist on the alleged right to their own alternative facts. These characteristics were described and popularised by Hoofnagle and Hoofnagle (2007) as a manifestation of the social phenomenon of "denialism". Denialists "... aren't interested in truth, data, or informative discussion, they're interested in their world view" (Hoofnagle and Hoofnagle 2007, p. 2), believing this to form "a new and better truth" (Kahn-Harris 2018). Looking at the research on denialism, it becomes apparent that it is not only individuals or groups of citizens actively involved in denialist tactics, but also, for example, governments and political organisations (Björnberg et al. 2017). In this context, denialism seems to have been more relevant than ever since the 2016 U.S. presidential election and the emerging debate on fake news and the post-factual age in which the boundaries between real and fake are becoming increasingly blurred (Lewandowsky et al. 2016). For a long time, former U.S. President Donald Trump's anti-science policies strongly influenced world events by withdrawing the United States from environmental regulations and blocking scientific institutes from doing their work (Tollefson 2020).

In recent decades, several topics have received enormous attention from denialists and have been used to systematically sow confusion. Examples include historical events such as denial of the Holocaust and its linked aim of cleaning up the Nazis' reputation (Kahn-Harris 2018), but also current developments affected by economic and political measures such as the COVID-19 pandemic or climate change (Hoofnagle and Hoofnagle 2007). Considering the latter, denialists often refer to the Earth's climate changes over millions of years, thus "... cast[ing] doubt on the idea that humans are causing climate to change today" (Rosen 2021). While the effects of climate change tend to be rather broad and may be difficult for

some people to grasp, examples in anti-vaccine denialism may point to concrete negative consequences for individuals. These include the COVID-19 pandemic and debates around vaccination and mask denial and related conspiracy theories (Linß and Richter 2022). Another example was the denial of the MMR vaccine in a Somali-American community in Minnesota in 2017, based on the discredited theory that the vaccine could cause autism. This led to parents not vaccinating their children, which was followed by a childhood measles outbreak (Kahn-Harris 2018). These examples not only illustrate that denialism can cause harm on an individual and societal level, but also demonstrate the implications of this phenomenon for science and academic research. Denialism undermines the integrity of scientific, evidence-based knowledge and impedes progress in understanding and addressing problems relevant to society. It fuels an atmosphere of doubt and creates confusion in the acceptance of scientific consensus, and thus can complicate policy decisions and political actions.

While Hoofnagle and Hoofnagle (2007) popularised the term denialism, Diethelm and McKee (2009) established the foundation for denialism research by introducing it into academic discourse. Since then, the term has been further developed across disciplines (e.g., Björnberg et al. 2017; De Cruz 2020; Kalichman 2014), but still lacks a consensual definitional understanding. Instead, denialism is often used synonymously with denial in general or science denialism and studies so far have mostly focused on specific aspects of denialism, such as its underlying motives (McLintic 2019) or its effects on society, for example regarding anti-vaccine denialism and public health (Barraza et al. 2013).

The term denialism is multifaceted and seems to bear numerous different meanings and definitions, thus making it difficult to use properly. Therefore, this study aims to categorise and ultimately make useful the various definitions of the term by reviewing and discussing previous interdisciplinary publications. Firstly, this includes the development of an overview of the research field, including the consideration of topics such as research approaches conducted previously, relevant disciplines, and contributing scholars, and a description of the development of research over time as well as the predominant methodological approaches. Secondly, the overview serves as a basis to describe denialism, taking into account already existing definitions, and is intended to contribute to developing an updated, definitional understanding of the term. The following research question will be addressed:

RQ1. *How is denialism defined across disciplines and what might constitute a comprehensive definition of the term?*

Third, in order to develop recommendations for actions and to counter denialists' tactics, it is necessary to analyse the relevant actors and groups. Therefore, when examining the theoretical perspectives, this study also aims to identify and categorise denialist actors and groups. Accordingly, the second research question is:

RQ2. *Who are denialist actors and how can they be categorised?*

In the following section, the methodological approach of the literature review is explained in detail. Next, general results regarding the temporal development of the analysed publications on denialism as well as the underlying disciplines and subjects are presented. Subsequently, different approaches to the definition of denialism and differences regarding the terms denial and science denial are explained. In addition, the identified and categorised denialist actors are outlined. Finally, the results are discussed with regard to the development of a new definition of denialism and the development of strategies for action.

2. Methodological Approach

The literature review was conducted by searching three databases, (1) Web of Science (WoS), (2) EBSCOhost, and (3) Google Scholar, and took place on 1 June 2022. WoS was selected as a database because it has a broad range of literature from different journals

across hundreds of disciplines and supports systematic literature searches using search terms and keywords. Since WoS includes publishers such as Elsevier, Taylor & Francis, Springer, Sage, and Wiley, it was not necessary to conduct searches in these publishers' individual databases. Instead, EBSCO's Communication & Mass Media Complete database was additionally consulted to search communication studies journals and analyse the significance of the research subject to the field. In addition, the searches in these databases were expanded with queries in Google Scholar, which works on the principle of relevance and, as an extension, ensures that the literature search is as comprehensive as possible. Finally, additional publications were added to those already identified using cross checks concerning the citations and references of the identified articles.

After selecting suitable databases for the literature review, various keywords (e.g., "denialism", "denial", "science denial") were linked using Boolean operators and tested in the databases. Then, the abstracts and titles of the results were checked according to their relevance. "Denial" (as compared to "denialism") turned out to be too broad a term, producing thousands of irrelevant results. Thus, only the search term "science denial" was included as a basis for denial in the scientific domain. Additionally, the concept of "fact resistance" was included, as it produced several relevant results. Other related terms that were tested, such as "revisionism", "pseudoscience", or "pseudo experts", turned out to be irrelevant and were discarded. In addition, the German counterparts of the search terms, such as "Wissenschaftsleugnung," "Denialismus," and "Leugnismus", were tested. However, the German terms failed to produce relevant results and were thus discarded.

Consequently, the keywords (1) denialism, (2) science denial, and (3) fact resistance were used for the final search phrase. The terms were connected by the operator "OR", so that the search results contained one of the selected keywords, and for science denial and fact resistance, quotation marks were used to ensure that only studies with combinations of both words appeared. Further, the term science denial was adjusted using * signs to find various word combinations, such as "scientific denial". For Google Scholar, the term was applied without using these operators. Accordingly, the following search phrase was chosen for Web of Science and EBSCOhost: denialism OR "scien* deni*" OR "fact resistance".

Concerning the selection criteria, the results produced in the databases might originate from different fields of research but must adequately describe the phenomenon of denialism in order for it to be structured as a concept (RQ2). Thus, it is necessary that the phenomenon plays a central role in the text and is explained or defined in detail. Other related phenomena such as misinformation and fake news or discussions on denialism in the context of a specific topic (e.g., COVID-19, climate change, AIDS) might be included as long as denialism is considered as a central topic. Further, there was no restriction on the year of publication. The process of the data collection is shown in Figure 1.

The search in Web of Science led to 334 results, of which 223 remained after excluding irrelevant publication types (e.g., editorial materials, letters, book reviews, meeting abstracts, proceedings papers) and articles in languages other than German and English. In addition, titles and abstracts were screened and irrelevant results were removed, leaving 56 results in the preliminary sample. The search on EBSCOhost produced twelve results, of which two publications were relevant according to the second screening but had already appeared in the search on Web of Science and were therefore excluded. Since the Google Scholar search was based on relevant related keywords, it was limited to the first 10 pages. This resulted in 100 publications, of which 80 remained after screening by publication type and language. After excluding the irrelevant literature, 13 results remained that had not yet been found through the previous searches and thus were included in the preliminary sample. Next, a screening of all full texts was conducted. By searching the citations and references of the literature and cross-checking, six relevant publications were additionally added to the preliminary sample (n = 75). Through screening all articles, 25 publications turned out to be irrelevant based on the selection criteria and were therefore excluded. Ultimately, 50 publications remained in the final sample.

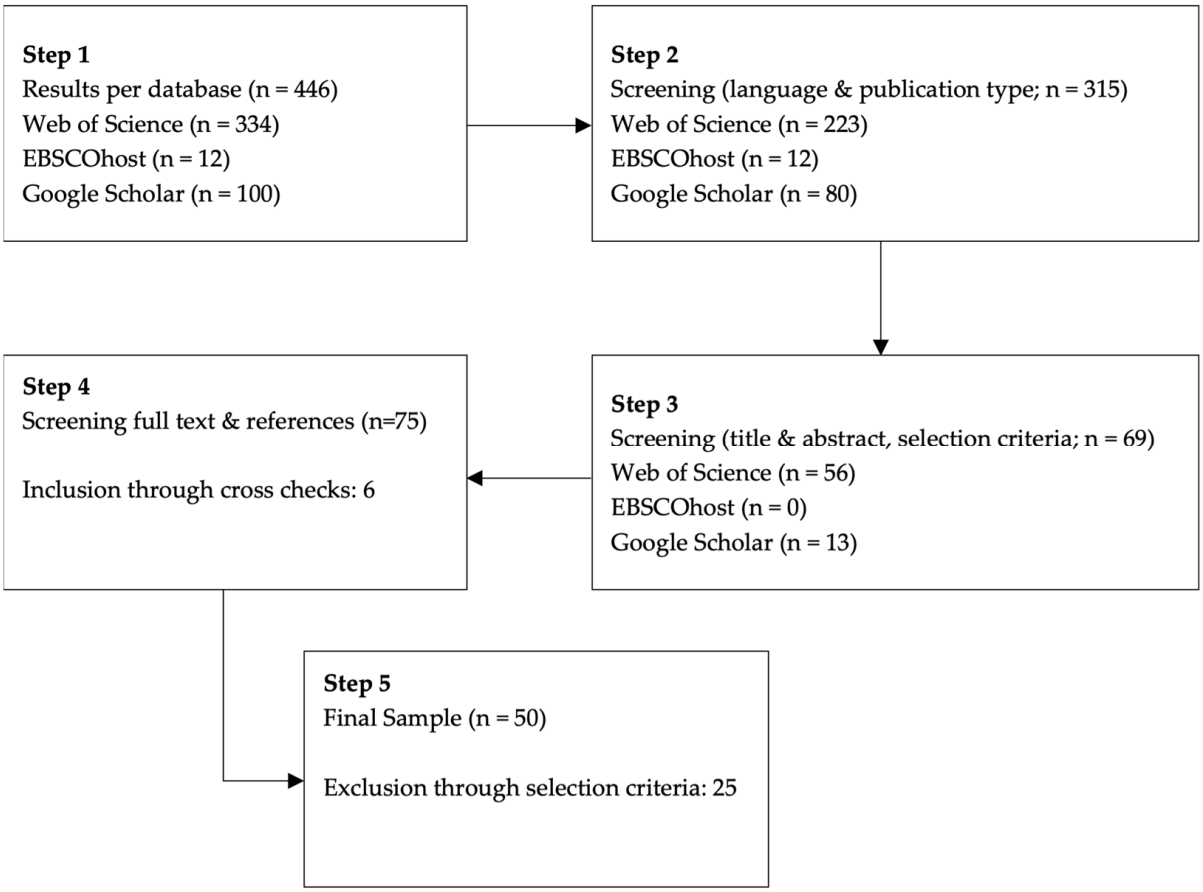

Figure 1. Overview of screening and inclusion of publications.

3. Results

3.1. Development and Disciplines of Publications on Denialism

Based on the years of publication, an increasing quantitative occurrence of contributions can be observed. The earliest publication by Hoofnagle and Hoofnagle (2007) laid the foundation for the theoretical examination of denialism. A jump in numbers is found in 2019, with nine publications, and the following years are at a similar level, with eight (2020) and nine (2021) texts (see Figure 2). By the date of the literature extraction (June 1) in 2022, two articles had been published.

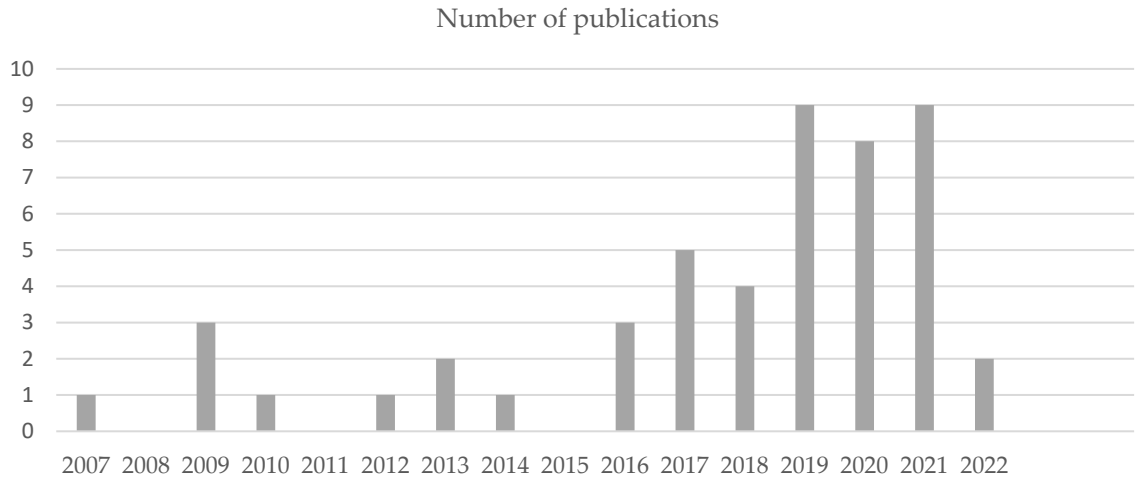

Figure 2. Number of publications per year.

Considering the disciplines of the publications, the literature review shows that ten different disciplines evaluated the concept of denialism (see Table 1). Research most frequently focused on denialism in the areas of philosophy, psychology, and medicine. Further, the subjects of most of these publications can be divided into five categories: climate and climate change (17), health (6), AIDS/HIV (4), COVID-19 (3), and non-COVID vaccinations (2). The remaining 19 texts deal with the phenomenon of denialism in a non-topic-specific way. Regarding the analytical approach of the articles, it was found that 34 explore the subject in a theoretical–conceptual way. The remaining sixteen articles are empirical studies, including nine quantitative and six qualitative papers and one mixed-methods approach.

Table 1. Number of publications per discipline.

Discipline	Publications
Philosophy	10
Psychology	10
Medicine	9
Environmental sciences	5
Communication studies	5
Sociology	3
Education studies	3
Natural sciences	2
Political sciences	1
Criminology	1
No discipline	1
Total	50

3.2. Definitions of Denialism and Distinction from Denial and Science Denial

The terms denial and denialism are not usually distinguished from each other in the literature. Either just one of the terms is used without excluding the other, or both are used synonymously. Further, modifications such as science denial or climate denial pose challenges for finding a general, interdisciplinary classification of terms, as they only refer to a specific field of study. Even in the context of denial in the field of climate science, further contextual understanding of how to use these terms is needed, as Björnberg et al. (2017) point out in their meta-study. So far, there is emerging debate on the distinction between scepticism and denial/denialism, while, for the most part, no distinction is made between denial and denialism. Therefore, an overview of the state of the debate as well as the different directions of use of denial or denialism are presented in the following section. An overview of denialism definitions can be found in Table 2.

Denialism. The first definition of denialism, which paves the way for further discussion on the topic, can be found on the blog of Hoofnagle and Hoofnagle (2007). Their definition has frequently been echoed after it was brought into the academic context by Diethelm and McKee (2009). Herein, the focus is on the rhetorical tactics or characteristic elements employed by denialists (Hoofnagle and Hoofnagle 2007):

1. Conspiracy. Almost every denialist argument enters into a conspiracy narrative in order to credibly explain why a consensus in science that has emerged through cooperation exists, and why people reject it;
2. Selectivity (cherry picking). The tactic of only citing those individual publications that support one's own ideas;
3. Fake experts. People who distinguish themselves by their credentials or titles instead of actual experience in the field and give arguments that are inconsistent with the literature and not accepted by "real" experts;
4. Impossible expectations (and moving goalposts). The tactic of constantly setting new expectations for scientists and findings that they cannot fulfil, such as a prediction that must be 100% correct;

5. Logical fallacies. Finally, there are a number of logical fallacies. For example, a counterargument is taken up in a slightly different way in order to invalidate it better, or false analogies describe a phenomenon in a way that is plausible for laymen.

Table 2. Overview of denialism definitions.

Publication	Definition
(De Cruz 2020, p. 441)	"Denialism is the systematic denial of facts and theories that enjoy a high degree of consensus among the scientific community."
(de Regt et al. 2019, p. 169)	"... denialism, an irrational cognitive process that leads to the refusal to accept an empirically verifiable reality."
(Hansson 2018, p. 1095)	"...science denialism, by which is meant an activity aimed at renouncing some well-justified assertion or theory in mainstream science."
(Hoofnagle and Hoofnagle 2007)	"Denialism is the employment of rhetorical tactics to give the appearance of argument or legitimate debate, when in actuality there is none."
(Kalichman 2014, p. 14)	"By definition, denialism is based on irrational and illogical thinking. ... Denialism is grounded in rhetorical tactics that are designed to give the appearance of a debate among experts, when in actuality there is none."
(Laking et al. 2009, p. 89)	"Denialism includes the use of rhetorical arguments, at times selective and influenced by economic interests beyond the science, inter alia, to give the impression of legitimate argument where there is none."
(Pérez-González 2019, p. 14)	"Science denialism consists in the systematical rejection of a claim on which scientific consensus exists."

These five tactics were picked up by Diethelm and McKee (2009) and expanded on a year later:

6. Manufacture of doubt. Any scientific disagreement (real or imagined) is taken as evidence that an entire topic is controversial (McKee and Diethelm 2010).

A number of publications in the literature review show high agreement regarding these six characteristics (e.g., Barraza et al. 2013; Björnberg et al. 2017; De Cruz 2020; de Regt et al. 2019; Hansson 2017; Kalichman 2014; Pérez-González 2019), with further tactics added by the authors:

7. Misinterpretation, for example, of collected data (Barraza et al. 2013, p. 319);
8. Single-study fallacy. Emphasising a study that stands alone and shows the correlation of certain phenomena (Kalichman 2014, p. 17f.);
9. Questioning the personal motives of scientists (Björnberg et al. 2017, p. 237);
10. Framing issues to be alleged threats against personal freedom and depicting mainstream science as emanating from certain philosophical or religious beliefs (Björnberg et al. 2017, p. 237);
11. Clinging to historical evidence that has long been disproven (Hansson 2017, p. 40).

Following the original understanding, firstly, denialism is defined primarily by rhetorical tactics (De Cruz 2020; Kalichman 2014). Second, the tactics are used in a concerted way to specifically discredit science and its findings (Diethelm and McKee 2009). This characteristic is echoed in the definitions in the literature: findings are purposefully rejected, in a systematic way, and denialists are systematically unwilling to change their perspective on the topic (McKee and Diethelm 2010), purposefully and methodically denying

facts and theories that enjoy a high degree of consensus (De Cruz 2020; Hansson 2018; Pérez-González 2019).

Moreover, the rhetorical tactics are used under the guidance of interests. The existence of a motivation for denial can be seen as a third characteristic and may be derived from emotional (Spence 2021) or "lucrative, emotional, ideological" viewpoints (Fasce and Picó 2019, p. 619), be influenced by economic interests (Laking et al. 2009), guided by hostility towards certain scientific evidence (Hansson 2017), or grounded in fear of not being able to continue a specific lifestyle if the evidence is acted on in terms of policies (Pérez-González 2019).

Denial. In defining denial, a distinction can be made between motivated and naive denial. Naive denial refers to denial that occurs due to ignorance of facts, while motivated denial occurs among those who actually have access to information and act against their better knowledge (Björnberg et al. 2017, p. 237). Similarly, active and passive denial differentiates between denialists' level of knowledge: knowingly acting against the evidence is considered an active denial event (Slater et al. 2020). While denialism refers to motivated, systematic action, denial can also imply an individually passive action. Rhetorical tactics and an active communication process leading to reception do not play a role in the current definitions of denial.

Science Denial. While denialism refers to scientific knowledge in many cases, other definitions also involve facts outside of academia. The less-used term science denialism might help to provide a more concrete definition here (Hansson 2018; Pérez-González 2019). In the meta-study of Björnberg et al. (2017), science denial is defined as the "unwillingness to believe in the existing scientific evidence" (p. 237). Other definitions go a step further in the direction of systematic action, as described above for denialism. Here, science denial is defined as the systematic rejection of empirical findings in order to avoid unwanted proof or conclusions (Darner 2019; Fackler 2021), or the rejection of a scientific consensus that is perceived as a danger (McLintic 2019). The communicative dissemination of doubt about valid data and results is also included occasionally (Björnberg et al. 2017). In this context, science denial does not reject science as a whole, but rather refers only to specific areas such as vaccinations (McLintic 2019).

3.3. Typology of Denialist Actors

The examined publications often refer to one or more groups of specific denialists. Table 3 presents an overview of all denialist actors mentioned. The classification of Björnberg et al. (2017) is used, which identifies numerous actors including the public, scientists, governments, industry, political and religious organisations, and the media. In addition, information on the actors and activities of the denial machine are classified.

First of all, when the denialist public or denialist laity are described in the articles, the characteristic of political orientation is frequently mentioned. On an individual level, large parts of the heterogeneous mass of denialists have the commonality of being right-of-centre on the spectrum of political sentiment. Correlations with susceptibility to science-denying countervailing voices are noted all the way on the spectrum to right-wing authoritarianism (Johnson 2021). The relationship between conservatism and denialism has been studied particularly with respect to Republican party supporters in the United States (Bugden 2022; Levy 2019; Lewandowsky 2021; McLintic 2019; Romero-Canyas et al. 2019; Rosenau 2012). Denial occurs very strongly in this group, a trend that can be attributed to the "rise of a starkly anti-science, conservative, and corporate political movement that began in the 1970s and '80s" (Bugden 2022, p. 34). Only 27% of Republicans acknowledge the fact that climate change is man-made, compared to 71% of Democrats who hold this view (McLintic 2019). Political orientation or ideology plays a greater role for Republicans, with increased knowledge about the environment not leading to higher climate concern among conservatives as it does with liberals (Romero-Canyas et al. 2019). Beyond political lines of differentiation, issue-based lay communities are examined, such as those run by AIDS denialists (Rykov et al. 2017) or vaccination opponents (Navin 2013).

Table 3. Overview of denialist actors retrieved from the literature review.

Type of Denialist Actors	Publications
The public and conservatives	(Bugden 2022; Johnson 2021; Levy 2019; Lewandowsky 2021; McLintic 2019; Navin 2013; Romero-Canyas et al. 2019; Rosenau 2012; Rykov et al. 2017)
Scientists and think tanks	(Björnberg et al. 2017; Bonds 2016; Fackler 2021; Cann and Raymond 2018; Johnson 2021; Lavik 2016)
Political and religious organisations	(Björnberg et al. 2017; Bonds 2016; Lewandowsky et al. 2016)
Governments	(Björnberg et al. 2017; Diethelm and McKee 2009; Jaspal and Nerlich 2022; Kenyon 2008)
Industry	(Aronowsky 2021; Barraza et al. 2013; Björnberg et al. 2017; Bonds 2016; Capewell and Lloyd-Williams 2018; de Regt et al. 2019; Diethelm and McKee 2009; Hoofnagle and Hoofnagle 2007; Laking et al. 2009; Lewandowsky et al. 2016; McKee and Diethelm 2010; McLintic 2019)
Media	(Björnberg et al. 2017)
Denial machine	(Barraza et al. 2013; Bonds 2016; Cagle and Herndl 2019; Cann and Raymond 2018; Johnson 2021; Slater et al. 2020)

Second, scientists and think tanks are mentioned as denialist actors. In this context, scientists that drift away from the scientific consensus (Björnberg et al. 2017), self-proclaimed experts in public discourse (Bonds 2016), educators (Fackler 2021), and think tanks in particular (Bonds 2016; Cann and Raymond 2018; Johnson 2021; Lavik 2016) provide problematic interference with science-based discussions through their statements and publications. Think tanks take on a special role as knowledge producers for the consensus-denying side.

The third group of actors includes organisations that are based on political or religious ideology. These organisations are considered to be financially well positioned to deny certain scientific findings and build alternative types of publications. In the U.S., these include, for example, the Heritage Foundation, the Heartland Institute, but also the Republican party and the Tea Party movement (Björnberg et al. 2017). Conservative foundations in particular (Bonds 2016) have capital that can be passed on to think tanks. A total of about USD one billion flows annually to foundations and think tanks of various ideological orientations (Lewandowsky et al. 2016).

Fourth, regarding denialist governments, the analysed literature focused on the anti-science governments of the U.S., South Africa, and Brazil. The former U.S. President Bush's administration's "war on science" (Björnberg et al. 2017, p. 237) focused on climate science, among other issues, and allowed conservative think tanks and corporate representatives to undermine climate policy (Björnberg et al. 2017). Donald Trump as U.S. "denier-in-chief" (Jaspal and Nerlich 2022, p. 759) and Jair Bolsonaro in Brazil have also been cited as denialist leaders in the context of several issues such as COVID-19 (Jaspal and Nerlich 2022). In addition, Thabo Mbeki and his policies have been in focus in the context of AIDS denialism in South Africa (Diethelm and McKee 2009; Kenyon 2008).

Fifth, industries that traditionally and currently produce science-denying information are frequently discussed in the literature examined. Either reference is made to specific industries or industry sectors or multinational companies (Capewell and Lloyd-Williams 2018; Diethelm and McKee 2009; Hoofnagle and Hoofnagle 2007) are held accountable for denialism. In this context, the example of the tobacco industry, which has a long history of attacking research linking smoking to cancer and other diseases, is mentioned in several publications (Barraza et al. 2013; Björnberg et al. 2017; de Regt et al. 2019; Diethelm and McKee 2009; Laking et al. 2009; McKee and Diethelm 2010; McLintic 2019). Further, concerning responsibility for global warming, the oil and gas (fossil fuel) industry, with companies such as Exxon-Mobil, is mentioned frequently (Aronowsky 2021; Björnberg et al.

2017; Bonds 2016; Diethelm and McKee 2009; Lewandowsky et al. 2016). Finally, denialism in other industries, such as the food and drink industry (fast food, alcohol, sugar), has been studied in relation to related health risks (Capewell and Lloyd-Williams 2018; McKee and Diethelm 2010), and denialism in the tanning industry and the link to skin cancer is also mentioned (de Regt et al. 2019).

Sixth, Björnberg et al. (2017) discuss the media—in particular outlets that appear to be conservative opinion-forming—and argues that a right-wing affiliation correlates particularly with the publication of denialism in articles.

Finally, if a number of these actors collude to deny scientific findings or to deliberately diffuse controversy, this is referred to as the denial machine (Cagle and Herndl 2019; Slater et al. 2020). As engines of science denial, for example, think tanks are funded by the fossil fuel or tobacco industries to stall or delay regulation (Cann and Raymond 2018; Slater et al. 2020). Seventy-two percent of publications doubting man-made climate change are from conservative think tanks (Johnson 2021). This has the effect of muddying the waters so that lay audiences are convinced that there is a balanced debate on the issue and that there is no scientific consensus. In consequence, social consensus is not formed either (Slater et al. 2020). Further, as part of the denial machine, astroturf organisations create the artificial equivalent of a social movement by pretending to be grassroots movements while being financed and controlled by corporate or political entities (Bonds 2016).

4. Discussion and Outlook

As the results of the literature review show, publications on denialism often originate from the fields of philosophy, psychology, and medicine and discuss the topic in particular in the context of climate and climate change, health, and vaccinations. The publications examined have shown that thus far, there has been general disagreement about the terms denialism, denial, and science denial: they are used synonymously, interpreted differently, and not classified or differentiated from each other. Our literature review helps to identify definitions of these terms and allow their relation to each other to be described. As a result, the foundation of an elaborated definition of denialism is established that can provide perspectives for research and practice.

In order to derive a definition for denialism, the existing definitional proposals used in the literature were split into their individual components in order to systematically synthesise them as a whole. Commonly, denialism was classified as the aim to create an alternative to consensus in the form of an artificially generated debate following three elementary features: first, denialists employ rhetorical tactics, discussed primarily with reference to conspiracies, selectivity (cherry picking), fake experts, impossible expectations, and logical fallacies. These tactics are expanded with six features: manufacture of doubt, misinterpretation, single-study fallacy, questioning scientists' personal motives, framing, and clinging to historical evidence that has been disproven. Second, denialism occurs systematically and purposefully, and therefore is not an oversight or a one-time occurrence on an individual level. Third, denialism stems from a motivation that can be expressed in different dimensions.

Taken together, while some studies describe denialism as a cognitive process and examine it from a psychology point of view (e.g., de Regt et al. 2019; Kalichman 2014), various previous definitions of the term pay attention to the message content and rhetorical tactics of denialist actors (e.g., Hoofnagle and Hoofnagle 2007; Laking et al. 2009). Following said tactics and their use by the identified denialist actors, we describe denialism as a communication phenomenon.

Finally, the examined literature often focused on discussions on denialism in scientific contexts (as the given examples demonstrated) and therefore pointed to the usage of the term in different areas. We understand science denialism as a subform of denialism and therefore propose a definition that can also be applied to different areas of denialism. Hence, regarding the research question (RQ1) of what can constitute a comprehensive definition of denialism, the following definition is arrived at:

> *Denialism is the motivated, systematic use of rhetorical tactics with the goal of creating the impression of legitimate debate where there is consensus based on reasoned facts and theories*.

In addition, we recommend using the following definition when examining denialism in scientific fields:

> *Science denialism is the motivated, systematic use of rhetorical tactics with the goal of creating the impression of legitimate debate about scientific topics where there is consensus based on reasoned facts and theories*.

Furthermore, denying actors were elaborated from the literature and allowed for the expansion of the categorisation of Björnberg et al. (2017). The typology of actors provides insights which can be further used to develop a precise stakeholder mapping that is appropriate for the respective thematic field of application. According to the second research question (RQ2) on who denialist actors are and how they can be categorised, the results of the literature review were presented following Björnberg et al. (2017). The relevant actors are conservative voices, denialist scholars and think tanks, political and religious groups, governments, industries, and the media. In addition, the so-called denial machine, as a concept that connects several groups of denialist actors with similar motivations, was added to the list.

Future research should focus on examining the communication of denialists, thus taking into account what topics the respective denialist actors address and which of the eleven identified rhetorical tactics they use most commonly. As a result, more effective strategies of action can be developed to counter these tactics. Strategies might include, for example, preventive educational measures, such as strengthening scientific literacy and knowledge in order to understand theories and processes and to be able to interpret statistical results (De Cruz 2020; Lavorgna and Myles 2021). These could help the public to reduce impossible expectations, notice when selective focus on publications (cherry picking) is used, realise the fallacy of focusing on a single study, and prevent misinterpretations. At the same time, a transparent and methodologically correct implementation of studies by the scientific community is needed to minimise room for misleading interpretation and to counteract denialists' rhetorical tactics (Lewandowsky et al. 2016).

In addition, action strategies such as rebuttal and rhetorical exchange can be applied to debunk conspiracy theories, fake experts, and single-study fallacies. Strategies might involve confronting denialists and debunking their argumentative structures and rhetorical tactics by providing evidence-based information and refuting individual arguments (Bugden 2022; McKee and Diethelm 2010; Schmid and Betsch 2019). This, for example, can also be applied to online forums, where barriers to joining the conversation are low and comment functions are available, thus creating the possibility of the emergence of multidimensional conversations, rewards for user engagement (e.g., gamification), the possibility to include external web links to evidence, and a function to search for keywords (Cagle and Herndl 2019). Gamified user engagement, for example, might reward Reddit users whose comments, in some way, alter a user's (original poster) opinion, even if it is just in the slightest way (tracked by a bot). The reward (e.g., a delta symbol, also tracked by a bot) is then displayed in comment threads and in a subforum showing the ranking of the earned deltas of individual users.

Finally, another possibility appears in the context of science communication and the optimisation of messages (Jaiswal et al. 2020). Designing interactive and realistic science communication (Björnberg et al. 2017), in combination with narratives and explanations and positive information, can help to point out spaces for action in order to react to existential problems such as climate change (Björnberg et al. 2017; McLintic 2019). Further, the optimisation of the intermediary is required: in many cases, an expert or testimonial is needed to convey messages credibly and effectively. When strategically addressing denialists, these should generally share the cultural and social identity of the concrete denialist actors and similar interests (McLintic 2019; Rosenau 2012). Since denial is an epistemically and socially

motivated phenomenon, particularly experts to whom the audience feels sympathy due to their identity play an important role (De Cruz 2020).

To summarise, this study aims to develop a common understanding of denialism for academic research and practice. In doing so, the identified and categorised rhetorical tactics and the developed definition of denialism serve as a basis to evolve appropriate strategic solutions and to apply standard measures of investigation. Conversely, in practice where there might be uncertainty about the existence of denialism, the characteristics and tactics identified in this literature review can be consulted and serve as guidance.

5. Limitations

Although the aim of this paper, i.e., to develop an understanding of the term denialism based on its definitions and categorisations in previous research, has been achieved, we acknowledge that our implementation comes with some limitations. By pursuing a systematic literature analysis approach with a relatively narrow focus (see keywords and exclusion criteria), we might have also excluded studies discussing concepts and influences related to denialism. Although our approach allowed us to derive a definition of the fundamental understanding of denialism, it might also have drawn a rather simple picture of how denialism is being examined in research. Therefore, as an alternative to this literature analysis, it would have also been possible to conceptualise denialism and define it by differentiating it from existing and related concepts and theories, or to develop an empirical paper investigating factors influencing denialism by, for example, implementing a representative online survey. Prior related research, for example, examined ideological (e.g., political ideology, conspiracy thinking), science-specific (knowledge, trust in scientists), as well as psychological factors (motivated reasoning, beliefs, rationalisations) in the context of issue-based rejection of science (Kerr and Wilson 2021; Rekker 2021; Washburn and Skitka 2018; Williams 2023) and hence might serve as a basis for developing a conceptual reflection on denialism in future research.

Author Contributions: Conceptualization, A.G., D.S. and T.K.; Methodology, A.G., D.S. and T.K.; Validation, T.K.; Formal analysis, T.K.; Data curation, D.S. Writing—original draft, D.S. and T.K.; Writing—review & editing, A.G.; Supervision, A.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: No new data were created or analyzed in this study. Data sharing is not applicable to this article.

Conflicts of Interest: The authors declare no conflicts of interest.

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