



**OMEDIA LITERACY**

OVERVIEW OF THE CHALLENGES AND OPPORTUNITIES OF MEDIA LITERACY POLICIES IN EUROPE

# Combating the Disinformation

# Crisis: A Systematic Literature Review

# W.P.1

# OMEDIALITERACY Partners

The OMEDIALITERACY project brings together four leading European universities who contribute their expertise in the fields of political and communication science and journalism studies.



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## **Authorship of report WP1**

**Ellen Droog, Ivar Vermeulen, and Dian van Huijste from Vrije Universiteit Amsterdam.**

The VU team was in charge of the section Systematic Literature Review on Media and Information Literacy interventions and effects.

**Beatriz Villarejo, Santiago Tejedor (Main Researcher), Cristina Pulido (researcher editor) and Albert Sarabia from Autonomous University of Barcelona.** UAB team was in charge of reviewing the report and update information with grey literature and scientific publications on MIL strategies and its impact.

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## **OMEDIA LITERACY TEAM**

**Universitat Autònoma de Barcelona:** Santiago Tejedor (Main Researcher), Cristina Pulido, Beatriz Villarejo-Carballido, Maria Jose Recoder, Albert Sarabia.

**Universidade Nova de Lisboa:** Cristina Ponte, Loli Campos, Andreia Vieira, Ana Filipa Joaquim, Rita Baptista

**Universität Wien:** Haja Boomgaarden, Jakob-Moritz Eberl, Sebastian Sherrah.

**Vrije Universiteit Amsterdam:** Ivar Vermeulen, Ellen Droog, Dian van Huijstee.

## Table of contents

<b>SUMMARY</b> .....	4
<b>KEY FINDINGS</b> .....	5
<b>GLOSSARY</b> .....	6
<b>1. Introduction</b> .....	8
1.1 Disinformation Effects.....	8
1.2 Media Literacy Interventions .....	11
1.3. Impact of Media Literacy .....	13
<b>2 Method</b> .....	14
<b>2.1. A systematic review about effects and media literacy interventions</b> .....	14
2.1.1 Database Search Procedure .....	14
2.1.2 Screening Procedure .....	14
2.1.3 Coding Procedure.....	15
<b>2.2. A complementary literature review on MIL strategies</b> .....	16
<b>2.3. A review of grey literature about disinformation and media Literacy</b> .....	17
<b>3. Results</b> .....	19
<b>3.1 Results of Systematic Literature review</b> .....	19
3.1.1 General Characteristics .....	19
3.1.2 Media Literacy Intervention Characteristics.....	20
3.1.3 Outcome Variables.....	27
3.1.4 Effects of Media Literacy Interventions on Outcome Variables .....	29
<b>3.2 Results of Literature review on Media Information Literacy Strategies</b> .....	35
3.2.1. Media Literacy strategy .....	35
3.2.2. Impact of media literacy for countering disinformation .....	36
<b>3.3 Results of Grey Literature review</b> .....	37
3.3.1 Disinformation effects .....	37
3.3.2 Media literacy strategy to counter disinformation .....	38
<b>4. Conclusions</b> .....	40
<b>4.1. Conclusions of Systematic Literature Review</b> .....	40
4.1.1 General Study Characteristics .....	40
4.1.2 Media Literacy Interventions Characteristics .....	41
4.1.3 Outcome Variables.....	41
4.1.4 Effects of Media Literacy Interventions on Outcome Variables .....	42
4.1.5 General Conclusion .....	43
<b>4.2. Conclusions of Literature review on MIL strategies</b> .....	44

<b>4.3. Conclusions of Grey Literature Review</b> .....	44
<b>5.Recommendations</b> .....	46
<b>References</b> .....	0
<b>APPENDICES from Systematic Literature Review</b> .....	0
Appendix A: Search String.....	0
Appendix B: Codebook.....	0

## SUMMARY

The report *"Countering Disinformation: A review of the scientific and grey literature Characteristics, effectiveness and impact of media literacy interventions and strategies"* is a review of scientific research and documents from international organizations on disinformation and media literacy. The study has been carried out in the framework of the project OMEDIALITERACY- Overview of the challenges and opportunities of media literacy policies in Europe, funded by the European Media and Information Fund.

The study analyses the effectiveness and impact of media literacy strategies and interventions to counter misinformation. The report is divided into four main sections. The first section introduces the current context of disinformation and media literacy. The second one provides a literature review on the definition and effects of disinformation. The third section describes the methodology used in the review of the scientific and grey literature, including the inclusion and exclusion criteria. Subsequently, the fourth section presents the results of the analysis of the analyzed articles and documents. This section includes a description of the characteristics of media literacy interventions, their effectiveness in reducing the effects of misinformation and the impact of media literacy. The fifth and final section of the report provides recommendations for being dialogue with diverse stakeholders, academics policy makers, journalists, trainers, educational practitioners, and citizens.

One of the positive findings is that Media and Information Literacy interventions and strategies have shown their effectiveness in equipping citizens with skills and competences to tackle disinformation in their everyday lives. However, there is a requirement for more empirical data to further establish their effectiveness. The challenge lies in developing monitoring and evaluation methodologies to gather data in both the short and long term. Additionally, there is a need to evaluate the impact of Media and Information Literacy interventions and strategies in order to identify successful actions at the micro, meso, and macro levels.

## KEY FINDINGS

- **Disinformation has negative effects at different levels: micro, meso, and macro.** At the micro-level, individuals may experience confusion, anxiety, and difficulty distinguishing between true and false information. At the meso-level, organizations may suffer from a loss of trust and credibility, harming their reputation and goals. At the macro-level, disinformation can lead to a general distrust in media, government, democracy, and institutions, posing a threat to deliberative democracies and social cohesion. These levels are interconnected and can impact each other.
- **The lack of consensus on the most effective outcome measures poses a challenge when comparing different approaches of Media Literacy interventions.** In the literature on media literacy interventions, there are methodologically sound studies focusing on theory-inspired (inoculation approaches) and practice-inspired (general media literacy information or education approaches) interventions. However, there is no consensus on the most effective outcome measures, making it difficult to compare different approaches.
- **Urgent challenge is to develop monitoring and evaluation protocols for collecting empirical data of the impact of media literacy interventions** and strategies addressed to diverse targets in the overcoming of the disinformation.
- **Many studies aim to improve the accuracy of judging truthfulness, but this may not address the psychological and behavioural effects of disinformation.** Fewer studies directly measure psychological and behavioural effects such as knowledge, beliefs, attitudes, intentions, and behaviour. The evidence for the effectiveness of media literacy interventions on truth assessment is abundant but shows a decrease in accuracy for judging correct information. The effectiveness on psychological outcomes is mixed, with a 50/50 success rate. Long-term effects are also mixed, and no intervention type stands out as particularly successful. Furthermore, very few studies objectively measure improvements in participants' media literacy.
- **The studies related to the media literacy strategies analysed** show them to be effective in counteracting misinformation. These strategies include fact-checking and media literacy education actions carried out mostly by organizations such as libraries, adult education, or higher education.
- **The media literacy education actions analysed are shown to contribute to the fight against misinformation.** Studies analysed show that media literacy-based interventions increase the critical capacity and digital skills of citizens. Participants in media literacy spaces improved their ability to distinguish between real and fake news, increased their understanding of important skills to identify online misinformation and improved their ability to investigate the veracity of news.

- **The grey literature reviewed highlights the essential role of quality journalism, Media and Information Literacy (MIL) and Fact-Checkers** in combating disinformation and building a trustworthy and democratic public sphere.

## GLOSSARY

**Active Inoculation:** An inoculation strategy in which people are actively urged to understand how (the spread of) disinformation works, generally involving some form of perspective taking or role play in which the audience member is standing in the shoes of the disinformation creator.

**Disinformation:** False information which is deliberately intended to mislead the receiver of the information; information that is spread with bad intentions. Disinformation differs from misinformation in the sense that it is deliberate, misinformation just entails inaccurate information.

**General Media Literacy Interventions:** A media literacy intervention focused on trying to educate people on the possible threat of disinformation, and to provide them with a number of resources that enhances their capacity to identify false information and to be able to withstand its persuasive effects, without exposing them to actual disinformation. Media literacy intervention refers to targeted efforts aimed at enhancing individuals' ability to critically analyze, evaluate, and navigate media content. These interventions seek to empower individuals with the skills and knowledge necessary to discern between credible and unreliable information, understand media biases, and actively engage with media in a responsible and informed manner.

**Inoculation:** A media literacy intervention based on the metaphorical idea that people can be vaccinated against disinformation to build immunity. An inoculation intervention consists of two parts: exposing people to (1) a pre-emptive forewarning about the threat of manipulating and persuasive content and (2) a weakened dose of the disinformation parallel to strong refutations explaining why the disinformation is incorrect, which techniques to mislead are being used, and which possible flaws can be found in the argumentation.

**Issue-Based Media Literacy Interventions:** A media literacy intervention that focuses on individual instances of disinformation and tries to warn the audience about the particular type of disinformation and refutes it by providing strong counterarguments.

**Logic-Based Corrections:** A media literacy intervention that corrects the disinformation by explaining the fallacious reasoning in the disinformation argumentation.

**Media Literacy:** Individuals' ability to access and critically analyze and evaluate media messages, empowering them to make informed decisions about the media they consume, create, and share. The European Commission (2017) defines Media Literacy as the different media and distribution methods. Likewise, UNESCO (2023) defines media and information literacy as those actions that encourage people to develop a critical mindset towards information and the use of

digital technologies. It encompasses understanding media production and manipulation, exercising critical thinking to assess accuracy and credibility of media messages, and recognizing the impacts of misleading content.

**Media Literacy Strategy:** this concept refers to the approaches and techniques used to develop critical thinking skills and empower individuals to effectively analyze, evaluate, and navigate various forms of media. These strategies aim to enhance individuals' ability to comprehend, interpret, and respond to media messages and own content creation in a responsible and informed manner.

**Passive Inoculation:** An inoculation strategy in which people are seen as spectators and passively receive the inoculation message.

**Source-Based Corrections:** A media literacy intervention that corrects the disinformation by undermining the plausibility of the disinformation or the credibility of its source.

**Technique-Based Media Literacy Interventions:** A media literacy intervention that focuses on improving the audience's ability to identify and guard themselves against various underlying disinformation techniques.

# 1. Introduction

Given the substantial prevalence of disinformation in our online media landscape, it is necessary to urgently develop effective media literacy interventions that can comprehensively shield individuals from the adverse consequences of disinformation. These interventions should enhance people's capacity to critically evaluate the information they encounter.

However, research yields mixed results regarding the effects and impact of these interventions, whereas organizational documents demonstrate their effectiveness. To address this challenge, it is crucial to gain a deeper comprehension of the attributes and efficacy of media literacy strategies and interventions employed to mitigate the impact of misinformation.

We undertook a comprehensive investigation, including a systematic literature review that incorporated experimental articles examining the effectiveness of various intervention. Additionally, we conducted a review of specific quantitative and qualitative scientific articles pertaining to the subject, as well as an assessment of the most relevant papers sourced from international organizations, the grey literature, and experimental research.

Aiming to provide a clearer picture of the effects of misinformation that media literacy interventions could potentially address, we first establish the context and objectives of the study to underscore the importance of addressing the issue of misinformation and media literacy. Secondly, we delve into exploring the effects of misinformation to gain insights into media literacy interventions, and finally, we analyze their impact on citizenship. Thirdly, we present the results obtained from both the reviews of scientific articles and the grey literature. Lastly, we present the conclusions of each review, offering a synthesis of the key findings and highlighting the characteristics and effects of media literacy interventions.

## 1.1 Disinformation Effects

In this section, we provide an overview of various types of disinformation effects as described in recent literature. We have classified these effects into three contextual levels of impact: micro-level (effects of disinformation on individuals), meso-level (effects of disinformation on organizations), and macro-level (effects of disinformation on institutions and society at large). It is important to note that these levels are interconnected and can influence each other. For example, disinformation at the micro-level can contribute to disinformation at the macro-level by spreading false information through social media and other channels. Similarly, disinformation at the macro-level can contribute to a loss of trust in institutions, which can in turn contribute to disinformation at the micro-level.

### ***Micro-Level Effects of Disinformation***

This level refers to the individual level, where people are exposed to disinformation and may be influenced by it. The effects of disinformation at this level include confusion, anxiety, and a decreased ability to distinguish between true and false information.

On a micro-level, exposure to disinformation can have a durable impact on people's beliefs, attitudes, behavioural intentions, and behaviours. According to the theory of Gilbert (1991), our minds must create mental images of information to be able to understand that information, which necessitates temporary automatic acceptance of that information (Gilbert, 1991; Grice, 1975). This initial acceptance makes it difficult to analyze the information on veracity (i.e., the accuracy or truthfulness of the information). Thus, when people are exposed to disinformation, they often immediately accept the information as truthful, to be able to understand it. This acceptance poses a challenge to scrutinize its veracity. Consequently, exposure to disinformation can result in poor judgement and a degradation in quality of internalized information (e.g., Hemsley & Snyder, 2018).

Disinformation relating to a topic, person, or organization can of course also affect our beliefs and attitudes about that topic, person, or organization. These more abstract (and in practice often negative) beliefs and attitudes are often held with strong conviction and can in turn influence other beliefs and attitudes; for example, people who fiercely deny the scientific evidence supporting climate change also often believe they are sufficiently informed about climate change to make such claims (Leiserowitz et al., 2011). Such beliefs also relate to the inferences we make about the topic, person, or situation the disinformation is about. If, for example, we receive the information that a politician committed fraud (i.e., the concrete behaviour shown), people spontaneously and implicitly create more abstract opinions about this politician (e.g., "this person is untrustworthy").

Similarly, beliefs and inferences we form based on disinformation may also affect the attitudes we form about the topic of the disinformation. Political disinformation for example can lead to feelings of alienation, inefficacy, and cynicism towards politicians (Balmas, 2014). Moreover, studies show that our attitudes and impressions of a person or organization change when we read disinformation about that person or organization, congruent to the valence of the disinformation (e.g., Van Huijstee et al., 2022). So, we think more positively about a person when we have read that they did something great, and we become more negative about someone when we have read that they committed fraud, even though we may the information that we read may have turned out not to be true.

Subsequently, the decisions people make, can also be based on these false beliefs (Lewandowsky et al., 2012). The belief that the 5G network was responsible for the COVID-19 pandemic has led to vandalism in numerous countries, with cellphone masts being set on fire (Lewandowsky & Cook, 2020). Other COVID-19 misperceptions led to decreased compliance with public health guidelines and less willingness to get vaccinated (Roozenbeek et al., 2020). Before the COVID-19 pandemic, vaccine hesitancy (based on the incorrect premise that childhood vaccines caused autism; see Krishna and Thompson (2021) for an overview on this topic) also increased due to disinformation (e.g., Dubé et al., 2015; Kata, 2010). In relation to politics, research shows that people's intentions to vote for a politician decreases when negative disinformation is read about that politician (Huijstee et al., under review). The effects of disinformation can even occur without our awareness, since our decisions, behavioural intentions, and actual behaviour can be unconsciously affected by the disinformation (e.g., Bastick, 2021).

Online social media behaviour also is affected by disinformation and its resulting beliefs. If we encounter online disinformation and we are not aware that the information is incorrect, we might like or share such posts with our fellow social media users, who are then also confronted with disinformation. This creates a vicious circle, since research shows that repeated exposure to false news headlines leads participants to consider them as more accurate than headlines seen for the first time (Pennycook et al., 2017). Research on the spread of online disinformation on Twitter shows that disinformation, especially false political news, spreads faster and to a broader audience than correct information (Vosoughi et al., 2018). Moreover, false news was more novel than correct news, suggesting that social media users are more likely to share new (and thus incorrect) information than they would share older correct information. The fact that novel news spreads so fast is especially problematic because Twitter feeds that are more recently updated are seen as more trustworthy (Westerman et al., 2014), causing the fast false news disseminators to gain trust due to their frequent updates.

### ***Meso-Level Effects of Disinformation***

This level refers to the organizational level, where institutions and organizations may be negatively affected by disinformation. The effects of disinformation at this level include a decrease in the credibility of official information and a loss of trust in institutions.

On a meso-level, organizations can also be negatively affected by disinformation. Disinformation can for example diminish the credibility of official information published by political parties, hereby threatening the institutional legitimacy of and undermining the political party (Bennet & Livingston, 2018). Moreover, in the context of for-profit organizations, research shows that when a brand is advertised alongside a fake news article (even without a direct connection between the fake news article and the advertisement of the brand), people can develop negative attitudes toward the brand, as well as a loss in brand trust (Visentin et al., 2019). Disinformation that directly relates to the organization can even have extreme negative consequences, such as damaging their reputation (e.g., Allport & Postman, 1947). Moreover, when disinformation about a brand is spread in social networks (which goes quickly because such information often has typical clickbait qualities ensuring strong engagement; Munger, 2020), misrepresentation increases and more false content may be added to the disinformation, which causes the disinformation to be spread even more quickly (e.g., DiFonzo & Bordia, 2007). Although these clickbait qualities of disinformation can increase website traffic and even clicks for brands which can be translated into advertising revenues (e.g., Carlson, 2020), disinformation (even unrelated to the brand) can have numerous negative consequences, such as harming brand reputation (Berthon & Pitt, 2018), and lowering perceived trustworthiness and credibility (Visentin et al., 2019).

### ***Macro-Level Effects of Disinformation***

This level refers to the societal level, where disinformation can have a broader impact on society as a whole. The effects of disinformation at this level include a general distrust in media, government, democracy, and other institutions, which can threaten deliberative democracies.

Among the negative consequences of disinformation on the macro- (societal) level, are general distrust in media, government, democracy, and other institutions. The spread of

disinformation is therefore seen as threatening deliberative democracies (e.g., Bennet & Livingston, 2018; Van Aelst et al., 2017). The confidence that the media report news “fully, accurately, and fairly” has dropped dramatically since the 1970s in the United States, reaching the lowest point in 2016 just before the presidential election (Gallup, 2019). Therefore, traditional news sources need to redesign the way they practice journalism (Wahutu, 2019; Creech & Roessner, 2019). When trust in the media falters, and therefore trustworthy sources of political information disappear or are ignored, it is understandable that one develops a distrust in democracy and politics. This might lead to lower political participation (e.g., when one feels that the “system is rigged”). This distrust in politicians, democracy, and political discourse (Smith, 2019) can also lower citizen confidence in related institutions, such as government, law, science, or healthcare. Additionally, the presence of disinformation also allows populist politicians to disregard the correct information provided by regular media (e.g., the famous “fake news” comments of Donald Trump about CNN). This furthermore increases the gap between consumers of accurate and inaccurate information. Disinformation therefore can delegitimize the entire electoral process, disturb the common democratic order (McKay & Tenove, 2021), and change vote shares (Allcott & Gentzkow, 2017).

All in all, disinformation can have numerous detrimental effects for individuals, organizations, and society at large. While the effects of disinformation on a micro-level may seem relatively harmless, people’s negative beliefs and attitudes about for example a politician based on disinformation, can propagate upwards, which might lead to the undermining of political or democratic organizations on a meso-level, which can ultimately threaten democracy on a macro-level by decreasing trust in institutions, lowering political participation, or changing voting behaviours. It is therefore extremely important to find effective ways to counter the negative consequences of disinformation.

## 1.2 Media Literacy Interventions

The objective of media literacy interventions is to educate individuals in cultivating critical thinking skills and becoming more discerning consumers of media. This enables them to effectively differentiate between accurate and reliable information, and false or misleading information. Furthermore, media literacy interventions aim to foster responsible content creation, ensuring that individuals are accountable for the information they share.

There are several ways in which we can try to minimize disinformation’s potential harmful influence on individuals. One commonly used (and well researched) approach is the use of fact-checks. Social media platforms like Facebook for instance frequently use third-party fact-checkers to investigate social media posts containing potential disinformation and provide these posts with labels for accuracy (e.g., “Disputed by 3<sup>rd</sup> Party Fact-Checkers”).

However, research has shown that this type of fact-checking by itself may not be sufficient in eliminating the negative consequences of disinformation. In fact, an entire branch of literature on the continued influence effect of disinformation states that although corrections of disinformation generally decrease people’s belief in the veracity of the information, corrections, such as fact-checks, do not completely neutralize the affective influence of the disinformation (Lewandowsky, 2012). This means that there is a discrepancy between people’s

actual belief (i.e., veracity judgements) in the disinformation (consciously realizing and accepting that the information is incorrect) and the influence the disinformation still has on our beliefs, attitudes, and behaviour (Lewandowsky, 2012). In addition to not always being effective, the scalability of fact-checking as a solution to disinformation is limited. Fact-checking is a time-consuming and resource-intensive process that needs to be repeated for every new piece of disinformation that is being distributed. Given the recent increase in the production of disinformation (Zhao et al., 2023), fact-checking every piece of information that contains potential disinformation may become increasingly difficult.

Academics, practitioners, and governments have therefore been searching for more effective ways to protect people more broadly against (the negative consequences of) disinformation, preferably even before they encounter it (Ecker et al., 2022; Van der Linden, 2022). One of such approaches recently gained more scientific and societal interest and revolves around media literacy (education). The term “media literacy” refers to people’s ability to access and critically analyze media messages (Aufderheide, 1993; Potter, 2010). Media literates are supposed to be able to successfully navigate the media landscape and make informed decisions about the media they consume, share, and/or create because they understand how these media messages are created and/or manipulated. Moreover, media literate people should possess the critical thinking capabilities to evaluate the accuracy and credibility of the media messages they encounter (online) and should be able to understand the consequences of potential misleading media messages (Boh Podgornik et al., 2016; Coiro et al., 2014; Machete & Turpin, 2020; Potter, 2010; Tully et al., 2020).

Thus, media literacy seems to be a vital skill for all generations in today’s society, as it empowers people to effectively cope with the complex and rapidly evolving media landscape. Survey research also provides empirical evidence for this notion and shows that people with higher media literacy skills are better at identifying false news (Jones-Jang et al., 2021), hold less disinformation-induced misperceptions (Xiao et al., 2021), and are less likely to share disinformation online (Khan & Idris, 2019; Wei et al., 2023). Therefore, there has been a growing interest in the development of interventions aimed at enhancing people’s media literacy skills, which can guard people against the potential negative effects of disinformation. However, research suggests such media literacy interventions do not always have their desired impact (Ecker et al., 2022). Through a systematic literature review this study therefore seeks to identify key characteristics of media literacy interventions and to evaluate their effectiveness in enhancing media literacy skills and mitigating the effects of disinformation. This study therefore attempts to answer the following research question: RQ1: What are (a) the characteristics and (b) the effects of media literacy interventions to counter the effects of disinformation?

The review will provide a systematic breakdown of types of media literacy interventions, and the evidence there exists for their effectiveness with respect to specific effects that disinformation may have. It will result in practical suggestions for the development of evidence-based media literacy interventions to promote responsible citizenship in the digital age.

### 1.3. Impact of Media Literacy

Numerous studies on media literacy have consistently demonstrated its positive impact on society (Hobbs & Jensen, 2009; Rasi, Vuojärvi, & Ruokano, 2019; Thoman, Elizabeth, and Tessa Jolls, 2005). In today's digital and interconnected world, media literacy has become crucial for individuals of all ages, spanning from children to adults.

Extensive research and various authors highlight that individuals engaged in media literacy practices can develop skills such as visual literacy (comprehending and creating visual images), digital skills, information analysis abilities, critical evaluation of information, and the utilization of acquired information for personal development.

Renee Hobbs (2021) emphasizes the significance of media literacy across multiple facets of life. She underscores that the meaning of literacy expands as individuals exchange meaning through symbols, acknowledging that skills and competencies differ between reading printed media and reading digital content. Similarly, Pérez-Tornero and Varis (2010) stress the necessity for citizens to develop a conscious attitude within the new global communication society.

Numerous international projects have been established to promote media literacy around the world. One of the most renowned programs is the UNESCO-led Global Teacher Education Programme (<https://www.unesco.org/en/teachers>), which aims to support member states in their ongoing efforts to foster media literacy. Additionally, curricula for teachers have been designed to equip them with the necessary skills to teach media and information literacy in classrooms. Europe has also witnessed the emergence of various media literacy strategies and interventions (Cervi, Paredes, & Pérez-Tornero, 2010), which have been acknowledged by governments and civil society.

Consequently, the implementation of media literacy strategies and interventions empowers individuals to exercise greater control and critical thinking skills when consuming and creating media information. These skills are essential for individuals to approach the information they receive with a discerning and critical mindset.

## 2 Method

This report conducted three literature reviews. The first is a systematic review about effects and media literacy interventions following PRISMA criteria, The second review analyzed grey literature from leading institutions addressing the challenges of disinformation and promoting media and information literacy. The third review concentrated on scientific articles, specifically exploring media and information literacy strategies.

### 2.1. A systematic review about effects and media literacy interventions

A systematic literature review was conducted to investigate the characteristics and effectiveness of media literacy related misinformation intervention strategies to counter the effects of misinformation. We largely followed the checklist of the PRISMA statement (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Page et al., 2021) to report the findings of this review. The following section provides detailed information on the four steps involved in the selection of studies for inclusion in this systematic review: (1) the database search, (2) removal of duplicates, (3) abstract screening, (4) full content screening, and the subsequent final step of (5) article coding. All these steps are illustrated in the flow chart presented in Figure 1.

#### 2.1.1 Database Search Procedure

In step 1, potentially eligible articles were identified through a database search in four electronic databases (SCOPUS, Web of Science, PsychInfo, and ERIC). These databases were chosen based on their perceived relevance to topic (i.e., misinformation intervention strategies). In these databases the publication title, abstract, and keywords were searched for search strings including Boolean operators consisting of three components: (1) Misinformation, (2) intervention strategy and (3) experiment (for the full details of the search string see Appendix A). The search was completed on the 10<sup>th</sup> of January 2023, and included journal articles that were published up until 2022. This database search resulted in 11,637 potentially eligible articles. In step two, we removed 4,852 duplicates resulting in 6,785 potentially eligible articles.

#### 2.1.2 Screening Procedure

To enhance the efficiency and quality of the abstract screening procedure in step 3, all the abstracts of the 6,785 potentially eligible articles were imported into ASReview (version1.1; van de Schoot et al., 2021). ASreview is a machine learning tool that uses an active learning language-based machine learning technique. Abstracts were classified as relevant or irrelevant based on pre-established inclusion and exclusion criteria. The articles must: (1) be written in English, (2) be published in a peer reviewed journal (3) contain experimental research, (4) have tested effectiveness of a misinformation intervention strategy. When in doubt, the full-text articles were analyzed. Meta-analyses, literature reviews, books, chapters in a book, dissertations, proceeding, issues, editorials or conference papers were excluded. The relevancy of titles and

abstracts suggested by ASReview improves with training, leading to higher accuracy in abstract screening. At some point in the active learning process, mainly irrelevant abstracts remain, therefore our stop search criterium was defined as 100 consecutive irrelevant articles. At the time of reaching this criterium, almost 17% of all abstracts were screened for eligibility. This screening resulted in 358 articles eligible for a full content screening.

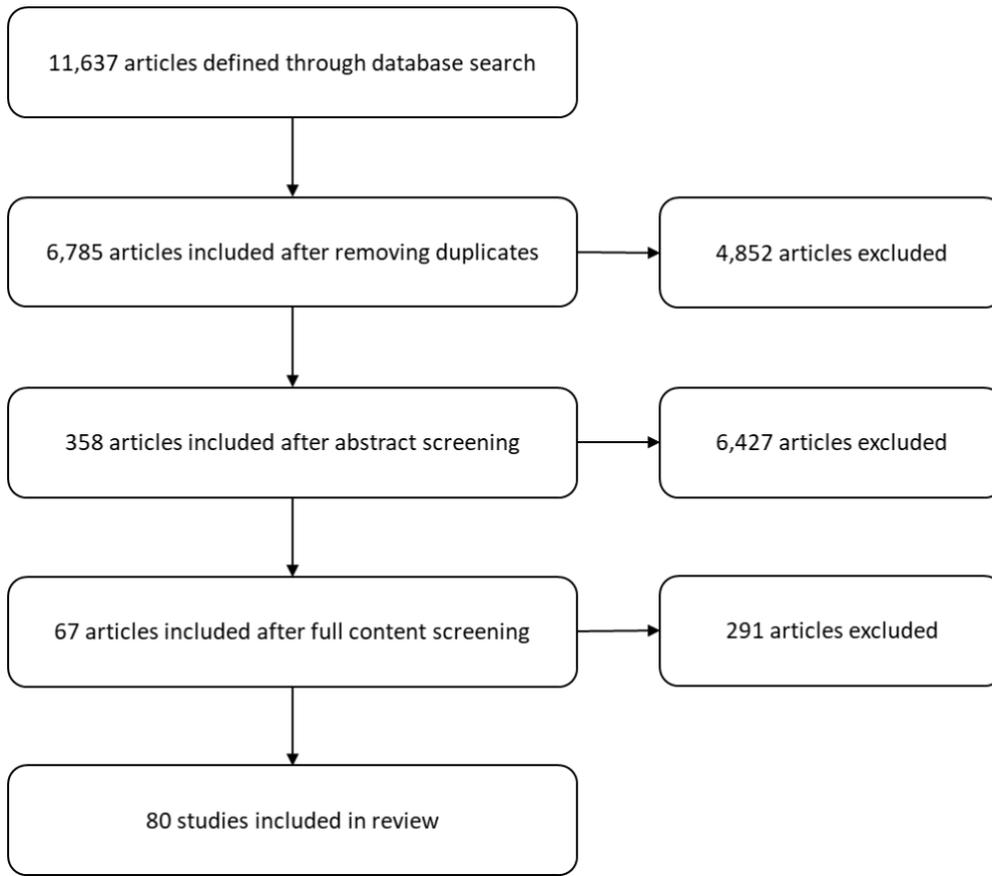
In step 4, the method sections of these articles were then further screened to assess whether the article really complied with our inclusion and exclusion criteria. Moreover, in this step, articles were only included if they tested the effectiveness of a media literacy related misinformation intervention strategy (as opposed to more general fact-based fact-checking intervention strategies). This resulted in 67 articles with a total of 80 studies that were included in the final review.

### 2.1.3 Coding Procedure

In the final step, the characteristics and effectiveness of the media literacy misinformation intervention strategies were coded according to a detailed coding scheme (for the full coding scheme see Appendix B). First, some general article characteristics (e.g., author names, year of publication), and study specifics (e.g., design, sample size, target group characteristics) were coded. We also assessed the articles on their use of open science practices (e.g., open data, preregistration, power analysis).

The content of the articles was then further coded to determine what type of misinformation intervention strategy was used (e.g., debunking, prebunking). These intervention strategies were then further categorized into more specific misinformation intervention strategies (e.g., logic-based correction, passive inoculation, active inoculation etc.). We also coded whether the participants were exposed to a form of misinformation as part of the experimental procedure, and to what type of subjects that misinformation belongs (e.g., health, politics, science etc.). The articles were then further coded for the number and type of dependent variables that were hypothesized to be affected by the misinformation intervention strategy, as well as the timing and place of the dependent variables in the experiment. These dependent variables were further categorized into different types of outcome variables (e.g., veracity judgements, beliefs, attitude etc.). Finally, the direct effects of the misinformation intervention strategies on these outcomes were recorded. If available, the effect size of the relationship between the intervention strategy and the outcome variable(s) were also described.

**Figure 1.** Flow Chart of the Systematic Literature Review Inclusion Process.



\*Annotation: 80 studies included in review from 67 articles included full content screening

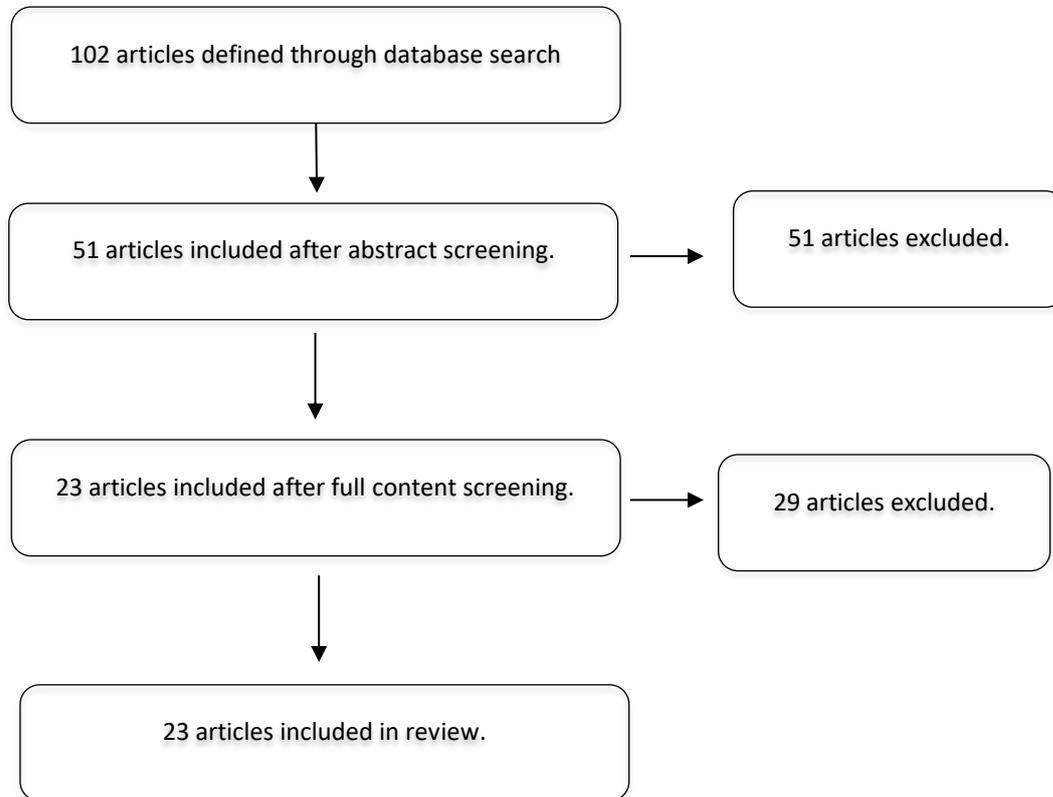
## 2.2. A complementary literature review on MIL strategies

Aimed to complement the results of the systematic review, we have conducted a literature review of Media and Information Literacy in the SCOPUS database through the following search criteria: articles focused on media and information literacy between the period 2019-2023 (January), we obtained 102 articles. The research team checked that the articles were not repeated. The team then proceeded to read and apply the criteria to the abstracts of the articles.

The inclusion criteria referred to those articles that had to be available in English, that were published in a peer-reviewed scientific journal indexed in quartile 1 and quartile 2 journals of SCOPUS; that were published after 2019; that included topics of media literacy activities to counteract information; and that the results were related to effects of disinformation, effects of media literacy interventions, disinformation effects on public opinion formation, media literacy strategy, effects explained by basic social and psychological processes (e.g. memory and attention, attitude formation, and behavioural heuristic) and literacy skills, and impact of media literacy for countering disinformation. In contrast, the exclusion criteria were related to indicators showing that the articles were not available in English, that they were not published in Quartile 1 and Quartile 2 impact journals in SCOPUS database, or that no results of effects of countering disinformation through media literacy appeared in the text.

After applying these criteria, 52 articles were excluded. The 23 included articles were downloaded for further reading. The researchers reapplied the inclusion and exclusion criteria to the texts. After reading, 24 articles were included in the study.

**Figure 2.** Flow Chart of the Complementary Literature Review on MIL



### 2.3. A review of grey literature about disinformation and media Literacy

A grey literature review was conducted to investigate about the scope of disinformation and the effectiveness of the European Media Literacy strategy and interventions to counter it. Grey literature is understood as the information includes content originating from government entities, academic institutions, businesses, and industries, where the primary focus of the producing body is not publishing<sup>1</sup>. A comprehensive research effort was undertaken by exploring prominent European websites on media literacy, including EDMO (European Digital Media Observatory) and the European Commission's Media Literacy Expert Group. Thirty-three relevant articles were identified based on their thematic alignment and their relevance to the research objectives.

Subsequently, a set of criteria was established and applied to the articles in order to determine their inclusion in the grey literature review. The criteria included the following: (1) the articles were published by a government or NGO at the European level, (2) they were

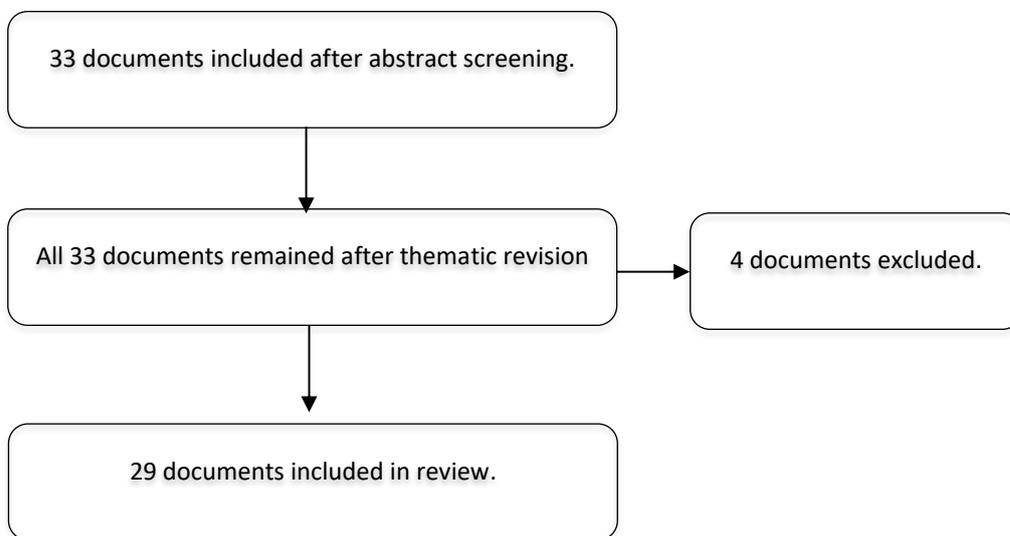
<sup>11</sup> McKenzie, J. (2023). Grey literature: What it is & how to find it | SFU Library. <https://www.lib.sfu.ca/help/research-assistance/format-type/grey-literature>

available in English, (3) they were published after 2018, (4) they were in the form of reports or programs, (5) they addressed media literacy activities aimed at countering disinformation, and (6) they encompassed standards or guidelines pertaining to the effects of disinformation, the impact of media literacy interventions, the influence of disinformation on public opinion formation, media literacy strategies, the effects explained by fundamental social and psychological processes (such as memory and attention, attitude formation, and behavioural heuristics), literacy skills, and the effectiveness of media literacy in combatting disinformation.

Four articles were ultimately excluded, leaving a total of twenty-nine articles for further analysis of their quality. The content of these final articles was examined to extract general information, including the year of publication, authorship, publishing organization, title, and access link. Subsequently, the articles were summarized to determine their purpose and formal structure. Based on the criteria outlined (criteria 6), the information was further analyzed to ascertain whether the articles addressed the effects of disinformation, effective media literacy interventions, the impact of disinformation on the public opinion formation process, institutional media literacy strategies, the effects explained by fundamental social and psychological processes, literacy skills, and/or the effectiveness of media literacy in countering disinformation. As a result of this analysis, the following outcomes were obtained.

**Figure 3.**

*Flow Chart of the Grey Literature Review Inclusion Process.*



## 3. Results

This section is aimed to present the results obtained through the three-literature review carried out, the first section presents the findings obtained in the systematic literature review on Media Literacy Interventions, the second one focused on the complementary literature review on Media and Information Literacy Strategies and the third one focused on grey document literature review.

### 3.1 Results of Systematic Literature review

#### 3.1.1 General Characteristics

First, we report on the descriptive characteristics of the included studies. Experimentally testing the effectiveness of media literacy interventions to counter the effects of disinformation seems to be a rather recent phenomenon. The results indicate that 92.7% (74 studies) of all the included studies were published in the last five years (2018-2022), with as much as 53.8% (43 studies) of all the included studies being (first) published (online) in 2022. Most of these experimental studies were carried out online (81.3% - 65 studies; e.g., playing the “Bad News Game”), while a small percentage was conducted in the field (15% - 12 studies; e.g., media literacy courses taught in a university) or in a lab (2.5% - 2 studies; e.g., an eye-tracking study while reading humorous logic-based corrections of disinformation). The experiments employed various different between-, within-, or mixed-subjects designs, with experimental conditions ranging from 1 to 30 (median = 3 conditions). Moreover, a little over half of all the included studies (56.3% - 45 studies) measured (some of their) outcome variables only with a post-test measure (e.g., *after* the media literacy intervention), while roughly the same amount of studies also measured (some of their) outcome variables using both a pre- and a post-test measure (55% - 44 studies).

#### *Sample Characteristics*

Second, regarding the characteristics of the samples of the included studies, the results show that the sample sizes of the experiments ranged from 20 to 22,632 participants (median = 517 participants). These participants were mainly drawn from population-based samples (68.8% - 55 studies), while some other studies only included student-based samples (15% - 12 studies) or specific target groups (16.3% - 13 studies, e.g., only unvaccinated participants). Due to the diversity in reporting on characteristics such as age, gender, political ideology and educational level (e.g., age is sometimes reported as a mean, as a median, or as a modal bracket), it is difficult to draw any meaningful conclusions about these sample characteristics. However, it is noteworthy that 11.3% (9 studies) and 13.8% (11 studies) of the studies did not report on the age or the gender of the participants respectively. These percentages were even higher in relation to the educational level of participants (45% - 36 studies) or their political ideology (73.9% - 59 studies). Concerning the country of origin of the samples of the included studies, the results show that participants originated from five different continents. However, the results also reveal that there is a Western bias with almost half of the participants (45.1% - 36 studies) being North-American (i.e., USA or Canada), and 21.3% (17 studies) being European participants

(i.e., Germany, France, The Netherlands, Italy, Macedonia, Poland, Romania, Austria, UK or Ukraine). Only 11.3% (9 studies) of the studies recruited Asian participants (i.e., China, Hong Kong, Singapore, South-Korea or Taiwan), 7.5% (6 studies) of the included studies were conducted using African participants (i.e., Ghana or Nigeria), and one study (1.3%) was composed of Australian participants. Finally, 9% (7 studies) of the studies used international samples that consisted of a mix of participants from different countries (e.g., both the USA, Portugal, The Netherlands etc.)

### *Open Science Characteristics*

Third, in terms of the assessment of the open science practices of the included studies, the results show that less than half of the studies (45% - 36 studies) made their data openly available. Moreover, pre-registration, a recommended practice for increasing the credibility and transparency of research findings, was employed by only 27.5% (22 studies) of the included studies. Finally, the majority of the studies (56.3% - 45 studies) did not conduct a power analysis to determine the sample size of their experiment. Of the 43.9% (35 studies) that did power calculations, six studies did not provide details regarding how they conducted the power analysis. Although these percentages may appear modest, they are higher than the overall percentages of studies using open science practices in disciplines such as communication science (Markowitz et al., 2021).

### *Disinformation Topics*

Overall, the studies covered a wide range of disinformation topics. Of the studies reviewed, 16.3% (13 studies) focused on combatting COVID-19 related disinformation, while 12.5% (10 studies) focused on other health-related disinformation about vaccinations, breast cancer, smoking e-cigarettes, raw milk consumption and sunscreen use. Surprisingly, only 13.8% (11 studies) of the included studies tested the effectiveness of media literacy interventions to counter the effects of political related disinformation (including issues such as crime rates, gun control, abortion, and immigration). Additionally, challenging science-related disinformation, primarily climate change, was the focus of 17.5% (14 studies) of the included studies. The remaining 43.8% (35 studies) focused on a variety of disinformation topics such as the Islam or animal protection organizations, or included many different topics that were not explicitly specified (e.g., both politics, health, entertainment, and sports news).

## *3.1.2 Media Literacy Intervention Characteristics*

### *Type of Media Literacy Intervention*

RQ1a pertained to the characteristics of media literacy interventions studied the scientific literature. As it turns out, media literacy interventions have been studied, operationalized and conceptualized in numerous different ways. To categorize these variations we differentiated between various types of media literacy interventions, as well as the types of media literacy skills and knowledge that these interventions aimed to promote. Based on the conceptualizations and operationalizations of the interventions included in this review, we identified five different types of media literacy interventions (which corresponded with classifications used in previous reviews; Ecker et al., 2022): (1) passive inoculation, (2) active

inoculation, (3) general media literacy, (4) logic-based corrections, and (5) source-based corrections. In Boxes 1-3 these different types of media literacy interventions are described in detail. Another classification of media literacy interventions can be made by looking at the different types of media literacy skills and knowledge that these interventions try to influence. Here, we found two different categories (which corresponded nicely to earlier classifications as well; Van der Linden, 2022): (1) interventions that are issue-based and (2) interventions that are technique-based. See Box 4 for more information about these two different types of media literacy. In the subsequent paragraph we will use both the categorizations of Ecker et al. (2022) and Van der Linden (2022) to classify media literacy interventions.

### **BOX 1. Different Types of Media Literacy Interventions: Passive and Active Inoculation**

Inoculation is based on the metaphorical idea that just like vaccines, by exposing people to (1) a pre-emptive forewarning and to (2) a weakened dose of disinformation (along with strong refutations against this disinformation) people can build immunity to later disinformation (i.e., the disease; Ecker et al., 2022; McGuire, 1964;1970; van der Linden, 2022). Thus, an inoculation intervention consists of two elements: first of all, an inoculation intervention warns people against the possible threat of manipulation, by for example stating that some of the information you encounter online about COVID-19 is disinformation and created to intentionally mislead you, thereby creating a desire to defend oneself from this manipulation attack (Ecker et al., 2022; van der Linden, 2022). The second element consists of exposing participants to a weakened form of the attack (i.e., the disinformation) and giving strong refutations against this disinformation by for example identifying the misleading techniques or the fallacies that support the false arguments in the disinformation (Ecker et al., 2022; van der Linden, 2022).

Inoculation interventions can further be divided into two different categories: passive vs. active inoculation strategies (van der Linden, 2022). In **passive inoculation interventions**, people are spectators and passively receive the inoculation message from the researcher (e.g., through exposure to a social media message). In some cases people also need to passively practice with the just acquired media literacy skills taught in the intervention strategy (e.g., a quiz). Passive inoculation interventions thus often take the form of written messages or videos (on for example social media) that (1) passively warn people about the threat of disinformation in general (specific topics such as climate change or COVID-19), and (2) contain (weakened) forms of disinformation (in general or related to a specific topic) and the refutation of this disinformation by identifying the misleading techniques used in the disinformation and/or the flaws in its argumentation. Most of the time, these passive inoculation strategies concern one time exposure, but sometimes the passive inoculation strategies can be more extensive and administered throughout a larger time frame (e.g., a media literacy training of a few hours, or a media literacy course of a few weeks as part of a curriculum at a university).

In contrast, **active inoculation interventions**, revolve around people needing to actively “generate their own ‘antibodies’” (van der Linden, 2022, p. 464). These intervention strategies generally involve some form of ‘perspective taking’ or ‘role play’ by for example standing in the shoes of disinformation creators (Roozenbeek & Van der Linden, 2019). The most popular type of active inoculation is that of gamified inoculation intervention strategies such as the Bad News Game (Roozenbeek & Van der Linden, 2019). In this web-based game people learn about six (misleading) techniques commonly used in disinformation: (1) discrediting opponents, (2) emotional language, (3) increasing intergroup polarization, (4) impersonating people through fake accounts, (5) spreading conspiracy theories, and (6) evoking outrage through Trolling (together these techniques are also known as DEPICT; Roozenbeek & Van der Linden, 2019). In the role of ‘fake news creators’ people are tasked with creating a fake news empire by getting as many followers as they can and increasing their credibility. Throughout this game people receive (1) a pre-emptive forewarning about the threat of manipulation (i.e., the dangers of disinformation), and are (2) exposed to weakened versions of the six DEPICT techniques used to create this disinformation (i.e., the disinformation), thereby inoculating people towards future manipulation attempts using of disinformation using one of these techniques.

### **BOX 2. Different Types of Media Literacy Interventions: General Media Literacy Interventions**

Similar to inoculation strategies, the goal of **general media literacy interventions** is to try to educate people on the possible threat of disinformation, and to encompass them with an array of resources to enhance their capacity to identify false information and to be armed to withstand its negative effects as well (Dumitru et al., 2022; Ecker et al., 2022; Eisemann & Pimmer, 2020). These general media literacy interventions often include information or instructions about rules (e.g., check the source), tips (e.g., observe the writer's tone of voice) or technological aids (e.g., fact-checking tools) that can help them to spot disinformation (Eisemann & Pimmer, 2020). Moreover, these types of interventions also often try to develop people's understanding of the media system, increasing people's critical thinking skills regarding media content and its production (Eisemann & Pimmer, 2020). In contrast to passive or active inoculation interventions, general media literacy interventions do not expose people to a 'weakened' form of disinformation (Ecker et al., 2022). Thus, these types of general media literacy interventions for example often take the form of infographics, guidelines, social media messages, warning people about disinformation, and providing tips on how to spot disinformation, without referencing disinformation.

### **BOX 3. Different Types of Media Literacy Interventions: Logic- and Source-Based Corrections**

Finally, media literacy interventions can also take the form of **logic- or source-based corrections**. In these cases, disinformation is corrected before or after exposure by a correction that (1) either explains the fallacious reasoning in the disinformation arguments (i.e., a logic-based correction; Cook et al., 2017; Ecker et al., 2022), or (2) undermines the plausibility of the disinformation or the credibility of its source (i.e., a source-based correction; Ecker et al., 2022; Hughes et al., 2014). These types of corrections can be classified as forms of media literacy interventions because they also involve increasing peoples' critical thinking skills, and can might be able to provide broader protection against disinformation that employs similar logical fallacies or untrustworthy sources (Ecker et al., 2022; Vraga et al., 2019). These types of general media literacy interventions can for example take the form of a Twitter response to disinformation that contains a humorous cartoon trying to explain the logical fallacy made in the disinformation, or a Facebook message encouraging people to only rely on information from credible sources with relevant expertise in relation to COVID-19 disinformation.

#### **BOX 4. Different Types of Media Literacy: Issue- vs. Technique-Based Media Literacy**

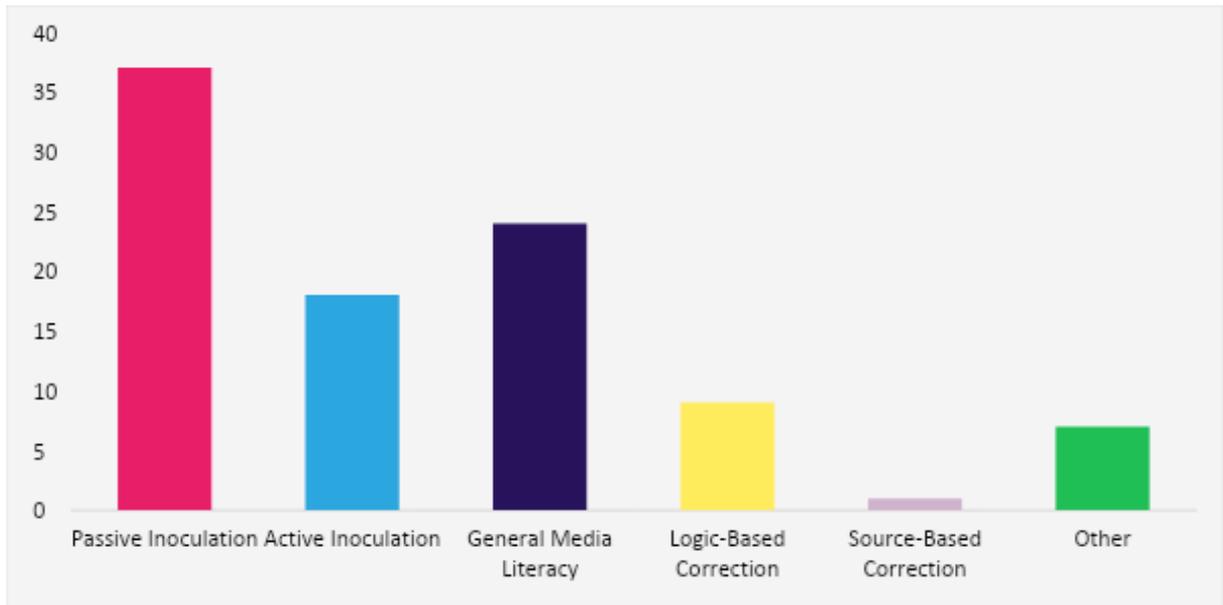
**Issue-based media literacy interventions** often focus on individual instances of disinformation (e.g., COVID-19), that try to warn people about that particular type of disinformation and refute the disinformation by providing strong counterarguments by for example exposing the fallacies in the disinformation arguments (e.g., ‘False claims rely on different techniques such as scaring people with shocking claims: for example, ‘mRNA vaccines can change your DNA forever; Eisemann & Pimmer, 2020; Van der Linden, 2022). Issue-based media literacy interventions therefore only provide protection to the effects very specific instances of disinformation.

In contrast, **technique-based media literacy interventions** are aimed at improving people’s ability to identify and guard themselves against various underlying disinformation techniques. Because these techniques are not tied to only individual instances of disinformation, technique-based media literacy interventions have the potential to arm people to provide resistance against a more broad spectrum of disinformation topics and its underlying manipulation techniques (Cook et al., 2017; Van der Linden, 2022). Based on the studies included in this review, these techniques are not limited to the ‘DEPICT’ techniques used in the active inoculation game *Bad News* (Roozenbeek & Van der Linden, 2019), but include a wide variety of (similar) techniques such as various rhetorical fallacies (e.g., incoherent or mutually exclusive arguments, false dichotomies, jumping to conclusions, correlation is causation, or ad hominem attacks) or writing style (e.g., bad grammar, hyperboles, common man).

#### *Types of Media Literacy Interventions*

In terms of the different types of media literacy interventions that were used in the studies included in this review, the results (see Figure 2) reveal that the majority of the studies (46.3% - 37 studies) investigated the effectiveness of a passive inoculation strategy (e.g., a social media message containing both a warning and a ‘weakened’ form of disinformation including refutations against this disinformation or the misleading techniques used in the disinformation) to counter the effects of disinformation. Additionally, 22.5% (18 studies) of the studies included in this review tested the effectiveness of an active inoculation strategy to counter the effects of disinformation (e.g., gamified inoculation interventions such as the *Bad News Game*, Roozenbeek & Van der Linden, 2019; *Go Viral*, Basol et al., 2021; or *Harmony Square*, Roozenbeek & Van der Linden, 2020). Moreover, 30% (24 studies) of the studies investigated the effectiveness of general media literacy interventions (e.g., infographics with tips on how to spot disinformation). Furthermore, 11.3% (9 studies) of the studies investigated the effectiveness of a logic-based correction (a twitter comment responding to disinformation with a humorous cartoon trying to explain the logical fallacy made in the disinformation), while only 1.3% (1 study) investigated the effectiveness of a source-based correction (Facebook message encouraging people to only rely on information from credible sources with relevant expertise in relation to COVID-19 disinformation.). Finally, 8.8% (7 studies) of the studies included in this review investigated the effectiveness of media literacy interventions that could not be classified into one of the five different categories (e.g., making use of an AI disinformation classification system or encouraging people’s counter factual thinking skills).

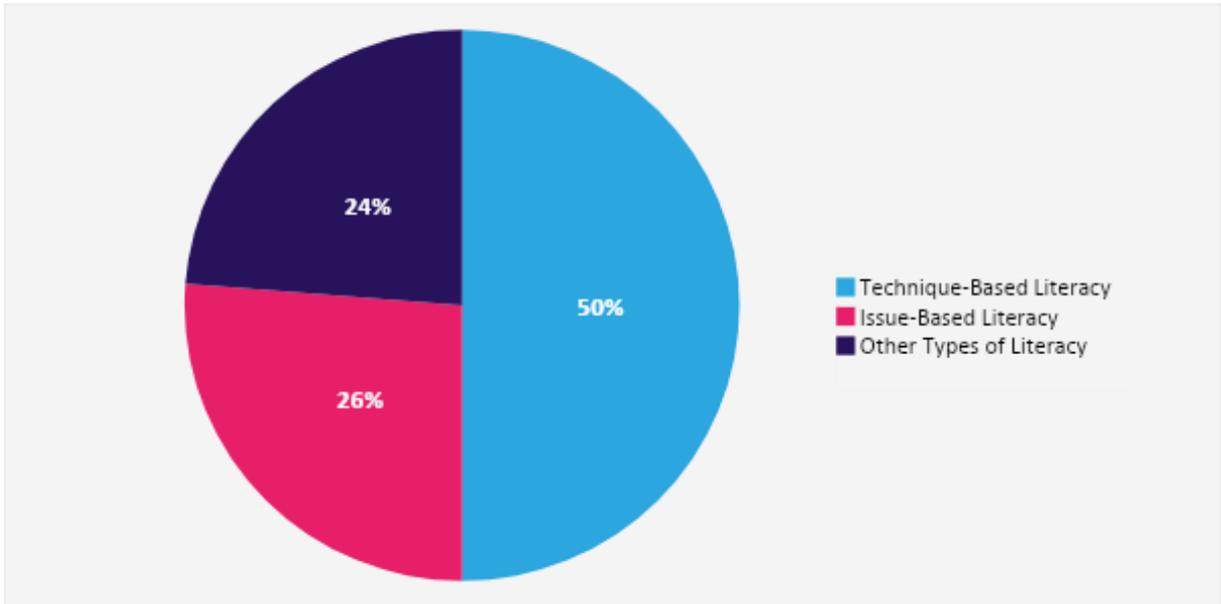
**Figure 4.** *Types of Media Literacy Interventions*



*Types of Media Literacy Skills and Knowledge*

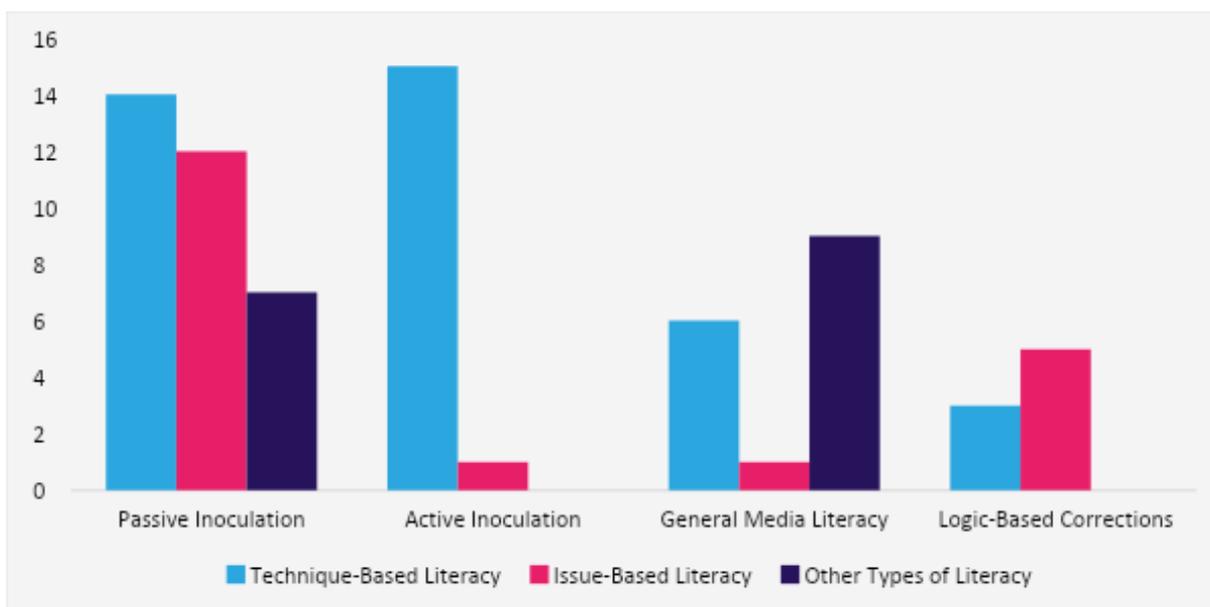
Concerning the different types of media literacy skills and knowledge that the interventions included in this review tried to educate, the results (see Figure 3) show that half of all the studies (50% - 40 studies) investigated the effectiveness of technique-based media literacy interventions (e.g., improving people’s ability to identify and guard themselves against various underlying disinformation techniques such as rhetorical fallacies), while only a quarter of the studies (26.3% - 21 studies) investigated the effectiveness of more specific issue-related media literacy interventions (e.g., protect people to the effects very specific instances of disinformation such as COVID-19, breast cancer or climate change disinformation). In addition, the final quarter of the studies (23.7% - 19 studies) only focused in the effectiveness of very specific types of literacy (e.g., news literacy, deep fake literacy, health literacy, pseudo-science literacy, reverse image searching skills, conjunction errors, counter factual thinking, or astroturfing).

**Figure 5.** *Types of Media Literacy*



Moreover, when combining the different classifications of media literacy interventions, the results (see Figure 4) show that the studies that tested the effectiveness of passive inoculation interventions focused on either technique-based media literacy (42.4.5% - 14 studies), issue-based media literacy (36.4% - 12 studies) and very specific types of literacy (21.2% - 7 studies). In contrast, active inoculation interventions focused mainly on technique-based media literacy (93.8% - 15 studies) and not on issue-based (6.3% - 1 study) or other specific types of literacy. Moreover, general media literacy interventions were also more focused on technique-based media literacy (37.5% - 6 studies) than on issue-based literacy (6.3% - 1 study), but also often investigated the effectiveness of very specific forms of literacy (56.3% - 9 studies). Finally, logic-based correction studies were more focused on issue-based media literacy (62.5% - 5 studies) than on technique-based media literacy (37.5% - 3 studies), and not on very specific types of literacy at all.

**Figure 6. Distribution of Media Literacy Types per Type of Media Literacy Intervention Strategy.**



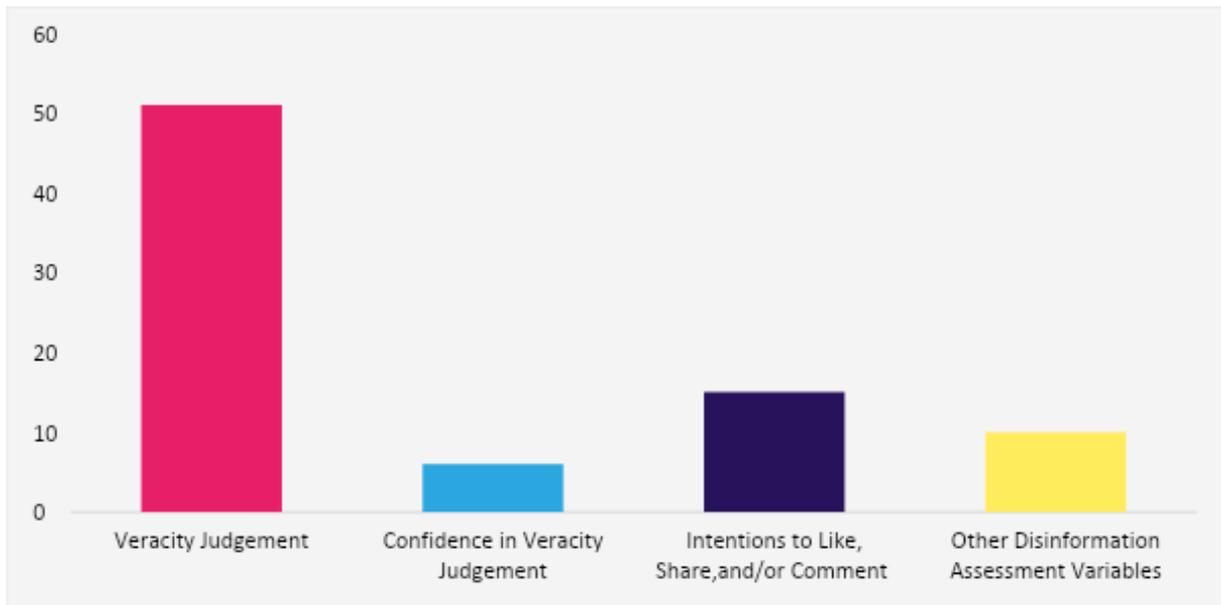
### 3.1.3 Outcome Variables

Disinformation can have a negative impact on a variety of outcome variables. As a result, the studies included in this review also investigated a wide range of outcome variables with varying conceptualizations and operationalizations. However, a key distinction can be made between (1) outcome variables that relate to the assessment of the disinformation and (2) outcome variables that relate to peoples' cognitions and behavior. The former typically involves measures like the accuracy or credibility of the (dis)information presented in the experiments, whereas the later often focuses on participants' (psychological) responses to the disinformation or intervention strategy (e.g., beliefs or attitudes). Based on previous literature and the conceptualizations and operationalizations of the outcome variables in the studies included in this review, these two categories are further specified into more specific outcome variables, presented below.

#### *Disinformation Assessment Variables*

In relation to the disinformation assessment variables, the results (see Figure 5) show that of the included studies, the majority (63.7% - 51 studies) had some sort of veracity measure (e.g., assessing the accuracy, credibility or trustworthiness of the (dis)information). Some of these studies (7.5% - 6 studies) also measured participants' confidence in their veracity judgements. Moreover, 18.7% (15 studies) of the studies included in this review examined participants' intentions to engage in various social media behaviors related to de (dis)information such as liking, sharing or commenting on the (dis)information. Some other disinformation assessment-related outcome variables which were only explored a couple of times, were participants' perceived persuasiveness of the (dis)information (3.8% - 3 studies), participants' perceived vividness and argument strength of the disinformation (3.8% - 3 studies), participants' inferential reasoning about the disinformation (e.g., making conjunction errors; 3.8% - 3 studies), and the amount of references participants made to the original disinformation in open questions (1.3% - 1 study).

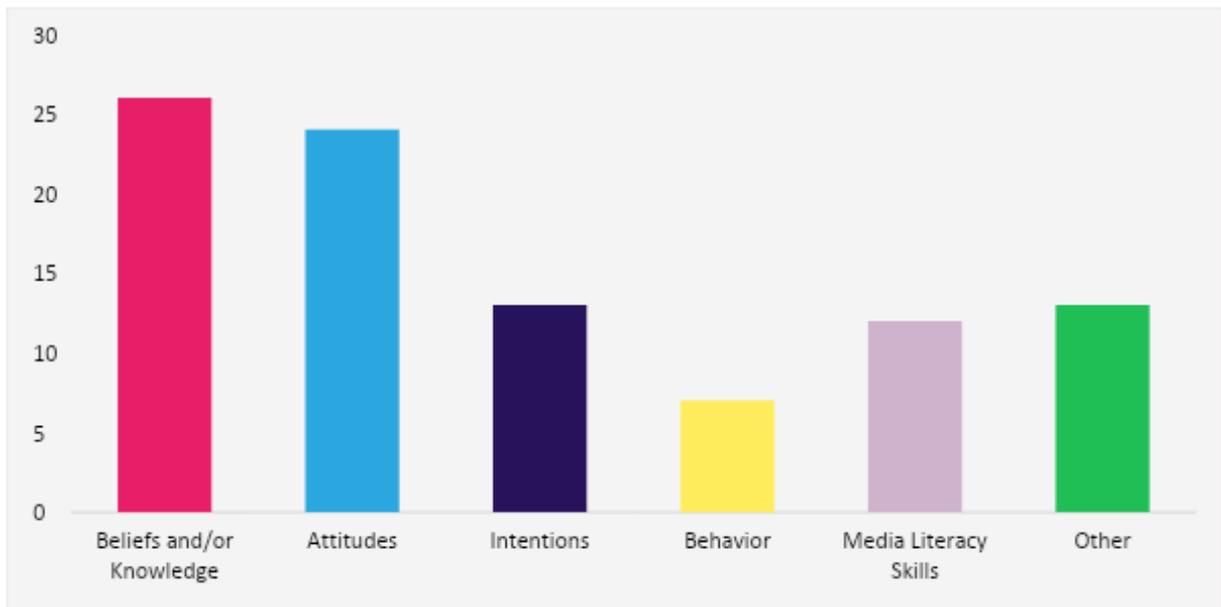
**Figure 7.** *Disinformation Assessment Variables.*



### *Cognitions and Behavior*

In relation to the influence of the media literacy interventions on people's cognitions and behavior, the results (see Figure 6) reveal that of the included studies, participants' beliefs or knowledge about the disinformation topic(s) were the most commonly studied outcome variable (32.5% - 26 studies; e.g., climate change beliefs or knowledge, plant misperceptions, or raw milk perceptions). Participants' attitudes related to the disinformation topic(s) were the second most commonly studied outcome variable (29.9% - 24 studies; e.g., vaccine attitudes, agreement with the disinformation, or trust in scientists), followed by participants' behavioral intentions related to the disinformation topic(s) or their intention to use the literacy skills taught in the intervention, such as participants' intentions to vaccinate, participants' intentions to use sunscreen, or participants' intentions to use reverse image searching in the future (16.2% - 13 studies). Participants actual (social media) behaviors were only measured in 8.8% (7 studies) of the studies (e.g., researching additional info about disinformation or writing a tweet or sharing, liking, or commenting on disinformation). Importantly, only 15.0% (12 studies) of the studies included in this review measures the effect of media literacy interventions on participants' (perceived) media literacy skills. Some other types of outcome variables which were only explored a couple of times were participants' emotional responses (7.5% - 6 studies; anger or perceived threat) or reactance towards the disinformation or the intervention (3.7% - 3 studies; e.g., counterarguing), participants subjective norms towards verifying fake news (1.3% - 1 study), participants' social media mindfulness (1.3% - 1 study), participants' worries about their reputation when sharing disinformation (1.3% - 1 study), and participants physiological attention towards the misinformation and correction measured using an eye tracker (1.3% - 1 study).

**Figure 8** *Cognitions and Behavior*



### *Short- Versus Long-Term Effects*

The majority of the studies (81.3% - 65 studies) focused on the short-term effects of the media literacy intervention by immediately measuring the outcome variables after exposure to the intervention, after a few hours (1.3% - 1 study) or after one day or more (1.3% - 1 study). Only some of the studies focused on the long-term effects of the media literacy intervention by measuring the outcome variables at various different time points (16.3% - 13 studies; e.g., both before exposure to the intervention, immediately after exposure to the intervention and after a week or a month after exposure to the intervention).

### *3.1.4 Effects of Media Literacy Interventions on Outcome Variables*

RQ1b concerned the effectiveness of different media literacy interventions. Detailed results of the relationships between the different types of media literacy interventions classified above and the most important and frequent measured outcome variables, are reported below per outcome variable. The results described below pertain either to studies that compared the effectiveness of the media literacy intervention(s) of interest to a control condition (no intervention exposure), or to studies that used a pre- vs. post-test design. Some studies did not fulfill these criteria and therefore were not taken into account in this part of the review (3 studies used intervention strategies that could not be classified into one of the different types of media literacy intervention categories<sup>10, 17, 32</sup>, 2 studies did not quantitatively reported the results of their experiments<sup>16, 55</sup>, and 6 studies only compared two or more different (media literacy) interventions to each other without a control condition or a pre- vs. post-test design<sup>4, 13, 14, 29, 67</sup>). The following results are therefore based on the 69 remaining studies (see Table 1 and Table 2 for an overview of the results; see Appendix C for all the references of the studies included in this part of the review).

### *Disinformation Assessment Variables*

#### *Veracity*

**Veracity Judgement of Disinformation.** The majority of the studies investigating disinformation veracity judgements (38 studies) found that being exposed to either passive inoculation interventions (14 studies<sup>2, 5, 8, 15, 18, 22, 25, 30, 36, 37, 39,47, 66</sup>), active inoculation interventions (14 studies<sup>8, 9, 27, 35, 42, 43, 44, 45, 46</sup>), general media literacy interventions (8 studies<sup>21, 23, 33, 35, 51, 54, 62</sup>), or logic-based corrections (2 studies<sup>39, 61</sup>) positively increased people's correct assessment of the accuracy, credibility or trustworthiness of the disinformation. However, eleven studies did not find that people became better at identifying disinformation after being exposed to a media literacy intervention<sup>6, 11, 15, 22, 40, 42, 43, 50, 54, 60, 66</sup>, this result was roughly evenly distributed among the different types of media literacy interventions). These findings suggest that media literacy interventions are effective in improving people's skills in identifying false news.

**Veracity Judgement Correct Information.** Interestingly, ten active inoculation interventions (5 studies<sup>8, 42, 43, 44</sup>), general media literacy interventions (4 studies<sup>23, 54, 62</sup>) and one passive inoculation intervention<sup>22</sup> actually reduced people's ability to accurately identify correct information, while only two intervention strategies resulted in increases in people's accurate assessment of the veracity, credibility or trustworthiness of correct information (one passive inoculation study<sup>36</sup> and one active inoculation study<sup>27</sup>). Moreover, seven studies did not find that people became either better or worse at identifying correct information after being exposed to a media literacy intervention, this result was roughly evenly distributed among the different types of media literacy interventions<sup>8, 22, 37, 40, 42, 43</sup>. These results thus indicate that media literacy interventions might cause people to become overly critical of news (sources), and therefore less capable of accurately identifying correct information.

**Discernment Between Disinformation and Correct Information.** On the one hand, media literacy interventions decreased people's ability to accurately identify correct information in most of the studies that measured this, while on the other hand the majority of the studies showed that media literacy interventions increased people's ability to accurately identify disinformation. Additionally, the results of this review indicate that overall, nine passive inoculation (2 studies<sup>36, 47</sup>), active inoculation (4 studies<sup>8, 43, 64</sup>), and general media literacy interventions (3 studies<sup>23, 31</sup>) can increase people's discernment capabilities between disinformation and correct information. Only one passive inoculation intervention<sup>64</sup> and one general media literacy intervention<sup>40</sup> did not find that people became either better or worse at discerning between disinformation and correct information. Therefore, it can be concluded that media literacy interventions are generally successful in equipping individuals with the necessary skills to discern false from correct news information.

### *Confidence in Veracity Judgements*

Almost all (7 studies) of the eight studies that measured people's confidence in their veracity judgments of the (dis)information found that exposure to both passive (4 studies<sup>8, 37, 47, 56</sup>) as well as active inoculation interventions (3 studies<sup>8, 9, 46</sup>) was related to increases in people's confidence in their own veracity judgements. Only one passive inoculation intervention<sup>66</sup> did not find a relationship between exposure to the intervention and people's confidence in their veracity judgements. In addition, none of the studies investigating the effectiveness of general media literacy interventions and logic- or source-based corrections measured people's confidence in veracity judgements at all. All in all, these results suggest that media literacy

interventions seem an effective tool in increasing people’s confidence in distinguishing between correct and false information.

*Intentions to Like, Comment, and/or Share Disinformation*

The majority of the studies (12 studies) that investigated people’s intentions to engage in various social media behaviors show that being exposed to either passive inoculation interventions (6 studies <sup>2, 5, 25, 30, 39, 47</sup>), active inoculation interventions (2 studies <sup>8, 46</sup>), general media literacy interventions (2 studies <sup>21, 33</sup>) or logic based corrections (2 <sup>26, 39</sup>) resulted in people having lower intentions to like, comment on, or share disinformation on social media. Only four studies did not find an effect of being exposed to a media literacy intervention strategy on people’s intentions to engage in various social media behaviors (two passive inoculation studies<sup>8, 25</sup>; one general media literacy study<sup>33</sup>; one logic-based correction study<sup>26</sup>). Thus, overall the results indicate that exposure to a media literacy intervention decreases the likelihood that people will like, comment on, or share disinformation, probably due to increased awareness and critical evaluation of the (false) information.

**Table 1.** *Effects of Different Types of Media Literacy Interventions on Disinformation Assessment Variables.*

	Passive Inoculation			Active Inoculation			General Media Literacy			Logic-Based Correction			Source-Based Correction			Total		
	+	-	∅	+	-	∅	+	-	∅	+	-	∅	+	-	∅	+	-	∅
<b>Veracity Disinformation</b>	14	0	5	14	0	2	8	0	3	2	0	1	0	0	0	38	0	11
<b>Veracity Correct Information</b>	1	1	3	1	5	3	0	4	1	0	0	0	0	0	0	2	10	7
<b>Discernment False/Correct Info</b>	2	0	1	4	0	0	3	0	1	0	0	0	0	0	0	9	0	2
<b>Confidence Veracity Judgement</b>	4	0	1	3	0	0	0	0	0	0	0	0	0	0	0	7	0	1
<b>Intentions Social Media Behavior</b>	6	0	2	2	0	0	2	0	2	2	0	1	0	0	0	12	0	4

Note. + = A significant positive effect; - = A significant negative effect; ∅ = An insignificant effect.

*Cognitions and Behavior*

*Beliefs or Knowledge About the Disinformation Topic*

The results of the studies that measured people’s beliefs or knowledge about the disinformation topic(s) of interest are generally more mixed than those measuring message evaluations. Ten studies did find that a media literacy intervention could reduce the negative consequences of disinformation on for example people’s COVID-19 vaccination beliefs, climate change perceptions, perceived scientific consensus or medical conspiracy beliefs (5 passive inoculation interventions <sup>15, 34, 56, 63, 65</sup>; 1 active inoculation intervention <sup>49</sup>; 3 logic-based corrections studies <sup>49, 52, 60</sup>; 1 source-based correction study <sup>1</sup>), while twelve studies found effects of exposure to a media literacy intervention on people’s beliefs in for example general conspiracies, climate change beliefs, sunscreen perceptions or COVID-19 vaccination beliefs (7 passive inoculation interventions <sup>11, 15, 19, 48, 56, 65</sup>; 4 general media literacy interventions<sup>1, 58, 59</sup>; 2 logic-based corrections studies <sup>52, 60</sup>). Moreover, it is noteworthy that all the general media literacy interventions that measured effects on people’s beliefs found insignificant results; this

is not the case for the other media literacy intervention types. Thus, the results suggests that media literacy interventions have a varying impact on peoples' beliefs about the disinformation topic, and especially general media literacy interventions do not seem to be very effective in influencing people's beliefs.

### *Attitudes About the Disinformation Topic*

Similar to people's beliefs about the disinformation topics, the studies that investigated people' attitudes about the disinformation topics are also characterized by mixed results. More specifically, the majority of studies (12 studies) found no significant effects of exposure to a media literacy interventions on people's attitudes toward for example climate change, vaccinations, or smoking (9 passive inoculation interventions <sup>12, 19, 20, 28, 37, 48, 57, 64</sup>; 2 active inoculation intervention <sup>45, 64</sup>; 1 general media literacy intervention <sup>35</sup>), while seven studies did find that a media literacy intervention could reduce the negative consequences of disinformation on people's attitudes toward for example scientists, the Islam, or vaccinations (6 passive inoculation interventions <sup>3, 7, 12, 19, 30, 38</sup>; 1 logic-based correction study <sup>26</sup>). Interestingly, studies investigating the effectiveness of active inoculation and general media literacy interventions rarely measured their effect on people's attitudes; studies investigating passive inoculation did so much more often. Overall, the results suggest that while some studies show a positive effect of media literacy interventions on people's attitudes about the disinformation topic, there is in general very strong evidence that they are able to strongly impact people's attitudes.

### *Behavioral Intentions*

Not surprisingly, mixed results were also found in regard to studies that examined the effects of media literacy interventions on people's intentions toward (the behavior described in) the disinformation, or the intervention itself. In total seven studies found that exposure to a media literacy intervention could reduce the negative effects of misinformation on for example people's intentions to get vaccinated, or could increase people's intentions to verify news before sharing, or use reverse image searching in the future (5 passive inoculation interventions <sup>3, 32, 38, 39, 52</sup>; 1 general media literacy intervention <sup>40</sup>; 1 logic based-correction study <sup>39</sup>). However, five studies did not find any significant effect of exposure to a media literacy intervention on for example people's purchase intentions, or their cim or the intervention itself.

### *Behavior*

The results of this review show that no studies investigated people's actual behavior in relation to the disinformation topic (e.g., voting, or vaccination uptake). Measures that were used in the studies to investigate some form of behavior in response to a media literacy intervention, were often only related to the intervention itself (e.g., people's actual searching behavior for additional information about a headline). In addition, none of the studies included in the review assessed actual behavior, but instead often asked people for their self-reported behavior ("how often do you..?"), or measured compliance with induced behavior ("now, write a tweet about..."). Overall, three passive inoculation interventions <sup>36, 37, 53</sup> and one general media literacy intervention <sup>41</sup> found that a media literacy intervention could positively influence these latter types of behaviors, while one passive inoculation intervention <sup>30</sup> found no relationship between exposure to the intervention and people's behaviors All in all, there is some, albeit

limited, evidence that media literacy interventions can be effective in promoting positive behaviors educated in the media literacy intervention.

### *Self-Perceived Media Literacy Skills*

Finally, of the studies that measured the effectiveness of media literacy interventions on people's self-perceived media literacy skills, the majority shows a positive effect of exposure to a media literacy intervention and people's self-perceived media literacy skills—such as their social media or disinformation knowledge, their perceived behavioral control toward verifying disinformation, or their self-perceived general media literacy (5 passive inoculation interventions<sup>2, 3, 5, 36, 37</sup>; 1 active inoculation intervention<sup>49</sup>; 1 general media literacy intervention<sup>54</sup>). Noteworthy is that three general media literacy interventions<sup>54, 62</sup> (and no other types of media literacy interventions), did not find a significant effect of exposure to a media literacy intervention and people's self-perceived media literacy or their perceptions of the value of media literacy. Interestingly, although in most studies the implemented media literacy interventions are explicitly intended to increase people's media literacy skills, only a few studies actually measured this outcome variable; moreover these studies mostly focused on people's self-perceived media literacy rather than their actual media literacy skills. All in all, the studies that focused on individuals' media literacy skills generally suggest that media literacy interventions can be effective in increasing individuals' self-perceived media literacy skills; general media literacy interventions may not be as effective in influencing people's self-perceived media literacy skills.

### *Long-Term Effects*

The studies included in this review that focused on the long-term effects of media literacy interventions also show mixed results. One study that investigated the effectiveness of a passive inoculation intervention on people's scientific consensus beliefs about climate change reported a sustained positive effect of this intervention after a week<sup>34</sup>. Moreover, three active inoculation studies also found sustained effects of their interventions on people's correct veracity judgements of disinformation after one week, five weeks, and even after three months<sup>8, 35</sup>. One general media literacy intervention study found that the effect of the intervention on people's correct veracity judgements of misinformation was still present after two weeks, although its magnitude was attenuated by more than half<sup>23</sup>.

Several other studies have found that the effects of media literacy interventions tend to dissipate over time. Two passive inoculation studies showed that the effectiveness of these interventions on people's mistaken beliefs in Russia being accountable for various negative events disappeared in the two weeks after the intervention<sup>65, 66</sup>. Moreover, one passive and one active inoculation study indicated that the effects of these interventions on people's correct veracity judgements of disinformation dissipated after one week (passive)<sup>8</sup> and after two months (active)<sup>35</sup>. A similar result was found for a general media literacy intervention, of which the effects on people's correct veracity judgements of disinformation also disappeared after two weeks<sup>23</sup>. All in all, these findings therefore suggest that media literacy interventions can vary in their long-term effects, and indicate that media literacy interventions may need to be reinforced or repeated in order to maintain their effectiveness.

**Table 3.** *Effects of Different Types of Media Literacy Interventions on Cognitions and Behavior Variables.*

	Passive Inoculation		Active Inoculation		General Media Literacy		Logic-Based Correction		Source-Based Correction		Total	
	+	∅	+	∅	+	∅	+	∅	+	∅	+	∅
<b>Beliefs and Knowledge</b>	5	7	1	0	0	4	3	2	1	0	10	12
<b>Attitudes</b>	6	9	0	2	0	1	1	0	0	0	7	12
<b>Intentions</b>	5	3	0	0	1	0	1	2	0	0	7	5
<b>Behavior</b>	3	1	0	0	1	0	0	0	0	0	4	1
<b>Perceived Media Literacy Skills</b>	5	0	1	0	1	3	0	0	0	0	7	3

Note. + = A significant positive effect; ∅ = An insignificant effect.

## 3.2 Results of Literature review on Media Information Literacy Strategies

The results of the literature review revealed two key findings related to media strategies and the impact of media literacy in countering misinformation. These findings emerge from the 23 articles analysed in this study. The two findings are detailed below.

### 3.2.1. Media Literacy strategy

The results of 8 research studies are related to the Media Literacy Strategy. They all show how the strategies analysed have proven to be effective in countering disinformation. Disinformation refers to misleading information that is generated or disseminated without deliberate or harmful intent. (Ireton, C., & Posetti, 2018) These strategies incorporate organisations and interventions that carry out fact-checking or media literacy education actions such as libraries, adult education or higher education.

In relation to strategies linked to fact-checking, the research "From disinformation to fact-checking: How Ibero-American fact-checkers on Twitter combat fake news" by MíguezGonzález, Martínez-Rolán and García-Mirón (2023), found that boosting the publication of reactive tweets, adjusting the time of publication to the dynamics of the social network, and increasing the use of resources such as images or mentions are effective strategies for promoting interaction in the fight against fake news. The authors argue that organisations' communications using this strategy contribute to media literacy in this way.

The analysed strategies related to educational interventions show that participants in these media literacy spaces improve their ability to distinguish between real and fake news, increased understanding of important skills to identify online misinformation, enhanced ability to investigate the veracity of news (Moore and Hancock, 2022).

Authors such as Young, Boyd, Yefimova, Wedlake, Coward and Hapel (2021), who studied the role of libraries in misinformation programmes, identified three areas where academics supporting libraries in three areas can support media literacy. These are through the design of effective programming, development of tools to keep abreast of misinformation and through interventions in the political and economic contexts that are often barriers to libraries being able to work freely.

Pérez-Escoda (2022), who have researched digital literacy with university students, point out the importance of developing literacy interventions with fake news to take corrective action and train them for when they encounter false information. Other authors such as Cernicova-Buca and Ciurel (2022), who used the game to promote media literacy in students, show that they were effective in improving the interpretation and production of media messages. In relation to the production of content creation, authors Taddeo, Frutos Torres and Cruz Alvarado (2022), found that content creators were more involved in false reporting on social networks.

All studies highlight the importance of developing digital literacy interventions as a viable strategy to address misinformation with citizens (Moore and Hancock, 2022; Pérez-Escoda, 2022; Cernicova-Buca and Ciurel (2022). Research such as that of Chan (2022), who investigated news literacy, fake news recognition and authentication behaviours when viewing false information, found that people with higher media literacy were more likely to draw on personal experiences and characteristics of news content to analyse its veracity, as well as to conduct internet searches to cross-check information.

### 3.2.2. Impact of media literacy for countering disinformation

The results on the impact of media literacy are shown in 9 articles out of all those analysed. All research shows that the application of interventions from different aspects of media literacy are effective in counteracting misinformation.

Studies focusing on media literacy skills show correlations with people's high level of skills Mrah (2022). Thus, the study *Digital Media Literacy in the Age of Mis/Disinformation with university students* (Mrah, 2022) showed that those with higher digital media literacy skills were better able to evaluate the credibility of online information. Tejedor et al, (2021) also showed how students with higher levels of communication literacy had online media as sources of information that contrasted information, rather than social networks where fake news is common. However, students themselves find the need for further literacy training, as they sometimes find it difficult to distinguish fake news from real news.

Despite this handicap, studies find that there is a significant relationship between digital media literacy and the ability to identify disinformation messages online. Therefore, Mrah (2022) highlights the importance of media literacy in the context of the spread of disinformation on the internet. The study "Does media literacy help identification of fake news? Information literacy helps, but other literacies don't" by Jones-Jang, Mortensen and Liu (2021) highlights the importance of information literacy in distinguishing between fake and real news. This suggestion stems from the fact that in the results of their study they found an association between information literacy and the identification of fake news by the participants in their study.

Austin and colleagues (2023), who researched the role of this educational intervention, emphasise the importance of incorporating scientific evidence into the content of the media literacy intervention. Thus, incorporating science into the content could increase the effectiveness of the intervention.

Dame Adjin-Tettey (2022) provides evidence that media literacy reduces the spread of fake news. Similarly, Míguez-González et al. (2023), in their study on how fact-checkers combat misinformation, found that publishing verified information online can enhance digital literacy. Likewise, Yadlin and Shagir (2021), who investigated user comments online regarding media literacy and civic awareness, discovered that comments contributing to truthfulness combat misinformation in the current digital media ecosystem.

Other studies go a step further in relation to the impact of media literacy, namely the study on family communication patterns, media literacy and civic engagement by Patmisari et

al. (2022) found that high levels of media literacy were the significant predictor of civic engagement. Thus, we are not only talking about digital skills, but also about social skills.

In Nygren and Guath's (2022) study on digital news evaluation and corroboration, attitude towards credible news was found to have a prominent effect on students' performance. In addition, a gap in digital civic literacy was observed between students in theoretical and professional programmes. The results underlined the importance.

In conclusion, the results of these 9 research studies show the positive impact of media literacy on the reduction of misinformation. Thus, these educational interventions are a crucial issue in today's society where inaccurate and false messages proliferate.

### 3.3 Results of Grey Literature review

The following are the results of the analysis of grey literature that promotes the overcoming the effects of misinformation and media literacy strategies to counteract it.

#### 3.3.1 Disinformation effects

Twenty-one of the selected documents analyse the effects of the disinformation and start by giving a definition of the concept. Four of them use the one given by the European Commission (2018a) states that verifiably false or misleading information that is created, presented and disseminated for financial gain or to intentionally mislead the public. They further report that this can cause public harm, including threats to democratic political and policy-making processes, as well as to public goods such as the protection of health, the environment or the security of European citizens.

In general, all the sources seem to agree on the fact that disinformation has the power to deceive and harm the population. Most of them talk specifically about the ability of disinformation to destabilise their democratic institutions (European Commission, 2020) as it can both increase people's distrust on governmental institutions and diminish people's capability to build a formed opinion. Irene Khan (2021) points out how this situation is a barrier to human rights. Following with this idea, the European Commission (2018b) expressed how democratic societies depend on public debates that allow citizens to be well informed and to express their will through free and fair political processes.

As we have seen, "trust" -or the loss of it- is one of the major concepts treated within the articles that discuss the effects of disinformation as providing the citizens trust-worthy sources of information seems to be one of the keys to help them building a formed opinion. The EDMO report (Hoffmann et al., 2022) found that trust in democracy cannot be separated from trust in some of its key actors. These actors also include the media, which are essential for monitoring democratic decision-making processes and informing and explaining them to citizens. The source is another important element when it comes to reliance and many articles describe how disinformation is easily spread thanks to the new social networks, amplifying falsehoods, and leading the population to believe in governmental conspiracy theories.

According to a the The European Commission report (2018a) confirms that social networks play a crucial role in the spread of disinformation, as users share content without prior approval. In their public audience survey they point out that misinformation is more easily spread (88%) in online media because it engages users emotionally. As the COVID pandemic heavily impacted the world's population during the last three years, some of the reports focused also on the capability of disinformation to be potentially dangerous for both the individuals' health and the sanitary system. It stands out how the infodemic - the rapid spread of false, inaccurate or misleading information about the COVID pandemic (European Commission, 2021a) and the distrust for the official narratives posed important risks to citizens who opted not to get vaccinated, for instance.

Nevertheless, according to a report of the United Nations Development Program (Zigrand et al., 2022) disinformation is the result of social crises and the collapse of institutions. The NORdic observatory for digital media and information DISorders (Karell & Horowitz, 2022) seems to agree as they described how the European Northern countries, that are often considered mature well-developed societies, manage to dodge disinformation and "have developed strategies to counter so called «fake news»".

In the same regard, nine of the articles analysed how the disinformation effects might be whether mitigated or maximized depending on individuals and collectives' social and psychological processes and their literacy skills. As for example, another nordic report (Grönvall, 2021) explains how people tend to be more resistant to disinformation if they have low levels of polarisation, limited populist communication, high levels of trust in news and a strong media committed to public service. Furthermore, it has been proved how negative feelings as disappointment, anger, fear or threat often increase citizens predisposition to rely on misinformation and even more, the probability to be sharing it. Moreover, Drs Mirjana Tonković, Andrea Vranić and Nebojša Blanuša, from the University of Zagreb (European Commission, 2018a) notes that exposure to fake news, conspiracy theories and biased information processing over a long period of time can lead to extreme attitudes and beliefs. So that can propel even more the spread of disinformation.

Some institutions went even deeper analysing the citizens profile while their tendency to believe and disseminate false information. A study on the Croatian population (Dr. Blanuša et al., 2022) concluded that citizens who trust traditional media less, tend to inform themselves through and trust social media, as well as those who believe in the information they get from other relevant people around them, who consider themselves critical but less aware of media strategies, and who perceive elites and the media establishment as sources of fake news. It made also clear how often the rent and subsequence access to education and culture could interfere on trusting or untrusting false information.

### 3.3.2 Media literacy strategy to counter disinformation

Out of the documents analyzed, twenty-four of them discussed media literacy strategies to combat disinformation campaigns and proposed courses of action within three sectors: public institutions, media, and citizenship. Empowering and training media professionals in the use of fact-checkers has been repeatedly highlighted as one of the most effective solutions to halt the

dissemination of false information, as mentioned in fifteen of the articles. According to the European Commission (Zeybek & Institute for Information Law (IViR), 2018), the most effective approach to counteracting the spread of disinformation online involves independent news organizations and civil society organizations verifying the information.

Establishing independent networks of high-quality journalism and supporting free initiatives and media sources that offer alternative perspectives are crucial elements in the fight against disinformation. Within the public sector, prioritizing "transparency" has emerged as a fundamental objective. This includes efficient labelling and reporting mechanisms for users who engage with false or misleading content (European Commission, 2021b).

However, education remains a primary focus across all domains and age groups to tackle disinformation. Public awareness campaigns and media literacy education programs are being implemented throughout Europe, alongside national initiatives that empower citizens to utilize tools not only to identify false information but also to publicly denounce it. NORDIS (2022) highlighted that the ability to critically evaluate diverse sources of information empowers individuals to form and express informed opinions and actively participate in society. They emphasize that through digital literacy tools, people can assess the accountability of different actors in this field and demand an enhanced digital environment from businesses and decision-makers, benefiting us as citizens. Additionally, the scientific and research community is encouraged to intensify their efforts by providing relevant data and exploring new perspectives to combat disinformation.

Hence, the response to disinformation campaigns requires a collaborative and multifaceted approach across sectors. The United Nations (Zigrand et al., 2022) emphasized that there are diverse strategies employed to combat disinformation in the region. Countering disinformation presents a varied landscape not only at the regional level but also within each country. While independent media and civil society actors are actively engaged in the fight against the proliferation of misinformation in the region, the European Commission (2020) recognizes the significant role played by all stakeholders in countering disinformation and false information dissemination.

In Europe, the key priority is to address disinformation and hate speech through education and training initiatives, while also promoting open political debates. This is crucial for fostering active participation in society and upholding democratic processes.

As for specific media literacy initiatives, only seven of the articles go over some of the European measures that have been implemented over the past five years. New fact-checkers have been introduced as for instance: *FotoVerifier*, *Crowdtangle* or *Tweetdeck* (Dang-Nguyen et al., 2023) (Dierickx et al., 2022). While other report mentions media literacy educational programs and projects on Estonia and Portugal such as *KidsTrustNews*, *Searching for the Truth in the World of Fake News*, *Stories of Children of the World* or *Fake News Hunters* (Centre for Media Pluralism and Media Freedom, 2020).

Although The United Nations (Zigrand et al., 2022) emphasises the importance of monitoring and evaluating the impact of media literacy interventions. The effectiveness of efforts to combat misinformation is important, but their evaluation remains a challenge. Tools to measure the effectiveness of efforts to combat misinformation do exist.

## 4. Conclusions

This section presents the findings of the articles and papers analysed in this report related of the WP1 of OMEDIA Literacy project. The findings show recent developments in media literacy and misinformation from a wide range of scientific research and key documents in the field. The main findings from the systematic literature review, complementary literature review and the Grey Literature Review are presented below.

### 4.1. Conclusions of Systematic Literature Review

This study systematically reviewed 80 studies (from 67 journal publications) to present an overview of the characteristics and effectiveness of media literacy interventions to combat the negative effects of disinformation. The following part provides an overview of the main findings from the systematic literature review and, where relevant, discusses these results in relation to existing literature.

#### 4.1.1 General Study Characteristics

Most studies focusing on the effectiveness of media literacy interventions are relatively recent. Over 90% of the 80 experimental studies we identified were published in 2018 or later. More than half was published in 2022, the last year of our focal period. The set of identified studies clearly had a western bias: studies were mostly conducted in the US, Europe, or a mix of those, while only 20% was conducted in Asia or Africa. Most studies used general population-based samples, with only 15% relying on (generally considered somewhat inferior) student samples. Summaries of demographic data (age, education) are difficult to give, because many included studies did not report (precisely) on age and education level of their participants.

Regarding the quality of the included studies, a first observation is that sample sizes seem to be relatively generous, with a median of 517. Almost 45% of the studies included a priori power analysis, and a similar number included a link to publicly available data. More than a quarter of the studies was pre-registered. These statistics indicate that researchers who study the effectiveness of media literacy interventions maintain relatively high-quality standards and are moderately progressive in terms of adopting open research practices (especially compared to the overall adoption of open science practices in disciplines such as communication science; Markowitz et al., 2021). Nevertheless, specifically regarding making data accessible to the public, there is clearly some progress left to be made.

The focal topic of disinformation differed quite extensively over the included studies. Roughly 30% focused on health (including COVID)-related disinformation, 17.5% on (climate) science disinformation, and 15% on political disinformation. Many studies included several disinformation topics. However, the use of real disinformation about serious topics such as COVID-19, climate change, or politics can be somewhat risky due to the to the continued influence effect (Lewandowsky et al., 2012). Because of the lingering impact of disinformation, even after it has been corrected, using real disinformation in experimental research could inadvertently contribute to the perpetuation of false beliefs among the participants, which could

potentially influence their beliefs, attitudes, and behaviors beyond the experimental setting (Lewandowsky et al., 2012). This means that scholars and practitioners should be cautious when incorporating real disinformation about serious issues in their experimental designs or in the development of their media literacy interventions.

#### 4.1.2 Media Literacy Interventions Characteristics

The media literacy interventions described in the included studies differed both in nature and effectiveness. Using existing typologies of media literacy interventions, we categorized interventions and assessed their prevalence as observed in our study sample (Ecker et al., 2022; Van der Linden, 2022). Intervention strategies using *innoculation*, where users are not only warned but also exposed to examples of disinformation and refutations thereof, were among the most commonly studied (Ecker et al., 2022; McQuire, 1964;1970; Van der Linden, 2022). The highest prevalence had *passive inoculation*, where participants read or watch the intervention rather than actively engage with it, with 46%. *Active inoculation*, where users engage with a intervention (e.g., play a game) was used less frequently (22%). Somewhat more frequently included were *general misinformation literacy interventions* (30%), e.g. using infographics to inform users about ways to identify disinformation (Dumitru et al., 2022; Ecker et al., 2022; Eisemann & Pimmer, 2020).

Some interventions were *logic-based* (11%) or *source based* (1%), prompting users to identify disinformation based on faulty arguments or on a non-credible source (Cook et al., 2017; Ecker et al., 2022; Vraga et al., 2019). The results demonstrate the relative dominance of the— theoretically inspired—innoculation strategies in current literature on disinformation and media literacy. On the other hand, a practice-based approach studying the effects of infographics and other existing informative materials is also prevalent.

Another typology to distinguish media literacy interventions is *issue-based*, relating to the content of the information, vs. *technique-based*, relating to the form of the information (Van der Linden, 2022). Roughly two third of the interventions that we could categorize in this way were technique-based, and only one third issue-based. For passive inoculation this ratio is about equal, but active inoculation interventions are almost without exception technique based. This means that these interventions aim to engage users in identifying disinformation by focusing on *how* disinformation is likely to be presented. The overall emphasis on technique-based interventions can be interpreted as sensible because such interventions generalize over disinformation topics, and thus are more likely to be effective in a broader context and in case of future exposure to new disinformation.

#### 4.1.3 Outcome Variables

It is important to realize we cannot discuss effects of media literacy interventions without specifying the focal outcome variables of such interventions. In fact, in media literacy intervention research, these outcome variables take various shapes and sizes. First, there are the outcomes that relate to users' assessment of the disinformation presented: perceived

veracity, accuracy, or credibility of information. Second, there are psychological outcomes: beliefs, attitudes, behavioral intentions, and behavior. Third, there are outcomes relating to (self-perceived) media literacy skills. In addition, effects can be measured on short term or on longer term.

The majority (64%) of studies included some kind of the veracity measure, or measured participants' sharing/liking intentions (19%), or other variables related to the disinformation message. Slightly fewer studies measured psychological outcomes: participants' beliefs and knowledge (33%), attitudes (30%), intentions (16%), and behavior (9%). Much fewer studies looked at (perceived) media literacy (15%). This is surprising, as improved media literacy is generally proposed as the mechanism by which positive effects of media literacy interventions on veracity judgements and psychological and behavioral outcomes can be explained (Ecker et al., 2022). Nevertheless, this proposed explanatory mechanism is rarely explicitly tested.

Equally surprising is the stronger focus on veracity judgements than on psychological and behavioral outcomes. Several studies (e.g., van Huijstee et al., 2020) have showed a discrepancy between credibility assessments and psychological effects of information; despite messages being evaluated as non-credible, they can still influence users' beliefs, attitudes, and behavior. In addition, the latter outcomes may have much stronger societal impact in terms of, e.g., politics, health, information gathering, and information sharing behavior (Allcott & Gentzkow, 2017; Bennet & Livingston, 2018; Lewandowsky & Cook, 2020; McKay & Tenove, 2021; Roozenbeek et al., 2020; Van Aelst et al., 2017).

Finally, a large majority of the studies (81%) focused only on immediate effects of media literacy interventions (19% also included longer-term effects). This means that only a small fraction of the studies included in this review can make claims about the potential lasting impact and the durability of the effectiveness of these media literacy interventions.

#### 4.1.4 Effects of Media Literacy Interventions on Outcome Variables

All in all, the literature reports on a host of different media literacy interventions on a host of different outcome measures. Effects of media literacy interventions on veracity judgments are the most straightforward. A large majority of the studies (38 vs. 11) showed that users' accuracy in assessing disinformation improved after exposure to a media literacy interventions. None of the tested interventions is clearly superior to the others with respect to this outcome.

Interestingly, more than half of the studies that also tested for a possible negative effect of media literacy interventions on the accurate assessment of valid information, indeed showed this effect. This was especially the case for active inoculation and general media literacy interventions. These results are also consistent with a recent meta-analysis in which a re-analysis of the effectiveness of various active inoculation interventions was conducted. The results of this study showed that after playing a gamified inoculation intervention, people became more critical of both false as well correct forms of information (Modirrousta-Galian & Higham, 2023). However, a more general statistic of discernment between correct and incorrect information shows a general positive effect. Mostly positive effects were also found for users' confidence in

identifying misinformation and information sharing and liking intentions, although these effects usually followed from prior veracity assessments and therefore sometimes seemed somewhat redundant. So, in conclusion, media literacy interventions seem to be quite effective in improving users' ability to identify (and not share) disinformation, but often reduce users' ability to accurately identify correct information. The summative effect, on discernment, is generally positive.

Results of the studies that measured people's psychological outcomes of media literacy interventions are more mixed. In less than half of studies media literacy interventions were able to counteract disinformation effects on users' beliefs and knowledge. In particular general media literacy interventions seemed quite ineffective in that respect. A very similar pattern occurred for users' attitudes resulting from disinformation: less than half of the studies showed that media literacy interventions could counteract such effects. Results for behavioral intentions and (social media) behavior were slightly better: a bit more than half of the studies showed that media literacy interventions could counteract disinformation effects on these behavioral measures. Longer-term psychological effects are similarly mixed: 5 out of 10 studies observed persisting (although reduced) effects of media literacy interventions, the other five did not. These mixed results were found for both veracity judgments and psychological outcomes. These insights are also in line with previous reviews on media literacy interventions that claim that media literacy interventions do not always have their desired impact, and that the effectiveness of these interventions can dissipate over time (Ecker et al., 2022).

All in all, it should be concluded that evidence for the effectiveness of media literacy interventions to reduce the psychological effects of disinformation is decidedly mixed, with an almost perfect 50/50 distribution of studies that found such evidence, and of studies that did not. It is therefore important to recognize that media literacy interventions, while valuable increasing people's veracity skills, cannot single-handedly address all the negative psychological effects of disinformation. Thus, pre-emptively guarding or warning the public against disinformation is not necessarily more effective, and sometimes even sometimes less effective, than debunking (i.e., fact-checking) the disinformation (e.g., Van Huijste et al., under review; Vraga et al., 2020).

Finally, a markedly small number of studies tested whether media literacy interventions indeed improve users' media literacy. Most studies found positive effects, but most also relied on self-perceived media literacy as an outcome variable, and thus might suffer from a placebo effect (Stewart-Williams & Podd, 2004). As a result, rather than reflecting an actual increase in media literacy skills and knowledge, the observed improvements in media literacy may have been impacted by participants' expectations about the media literacy interventions.

#### 4.1.5 General Conclusion

To conclude, in the literature testing the effects of media literacy interventions, we find a methodologically sound and progressive set of studies, with a focus on theory-inspired interventions on the one hand (in particular, inoculation approaches) and practice-inspired interventions on the other (in particular, general media literacy information or education approached). There is no clear convergence on focal outcome measures in the literature, which makes comparing different media literacy approaches in terms of effectiveness difficult. Many studies focus in one way or another on improving the accuracy of veracity judgements, which is

slightly problematic considering the extensive literature on continued influence effects showing that a message's perceived veracity and its persuasive impact is often unrelated. Media literacy interventions that focus on improving veracity judgments thus may be unable to counter psychological and behavioural effects of disinformation. Fewer studies focus directly on measuring different psychological and behavioural effects, such as knowledge, beliefs, attitudes, intentions, and (social media) behaviour. Evidence for the effectiveness of media literacy interventions on veracity assessment or related measures is rather abundant, although studies also show that media literacy interventions often lower accuracy of judging correct information. Evidence for the effectiveness on psychological outcomes is rather mixed; almost literally a case of a 50/50 success rate. Longer-term effects are equally mixed. None of the results are sufficiently clear to be able to identify a type of media literacy intervention as particularly successful. Finally, notably, hardly any study tested whether a proposed media literacy intervention objectively improved actual media literacy skills of participants.

#### 4.2. Conclusions of Literature review on MIL strategies

From the 23 articles analysed and extracted from Scopus database, it is concluded that the impact of media and information literacy is evident in the analysed articles, however more strategies and programs that are currently being implemented need to be analysed.

The studies related to the media literacy strategies analysed show them to be effective in counteracting misinformation. These strategies include fact-checking and media literacy education actions carried out mostly by organizations such as libraries, adult education, or higher education.

The media literacy education actions analysed are shown to contribute to the fight against misinformation. Studies show that media literacy-based interventions increase the critical capacity and digital skills of citizens. Participants in media literacy spaces improved their ability to distinguish between real and fake news, increased their understanding of important skills to identify online misinformation and improved their ability to investigate the veracity of news.

The research analysed highlights the importance of developing digital media literacy interventions as a viable strategy to address misinformation among citizens. Those with higher digital media literacy are more likely to use personal experiences and characteristics of news content to analyse the veracity of news, as well as conduct internet searches to verify information. They also increase their civic engagement.

#### 4.3. Conclusions of Grey Literature Review

The 29 documents that were analysed from the grey literature highlight the importance of acting to counter disinformation. In order to tackle disinformation, some key elements stand out, such as: trust in reliable sources of information, which are identified as key to counteracting disinformation and helping citizens to develop an

opinion based on arguments; the application of strategies to counteract disinformation. They also include fact-checking and independent quality journalism. Thus, they point to the need to strengthen independent media and encourage diversity of perspectives in order to combat disinformation. In conclusion, the documents analysed recognize the power of media literacy in reducing disinformation among the population. One of urgent challenges to cover is to develop monitoring and evaluation protocols for collecting empirical data of the impact of media literacy interventions in the overcoming of the disinformation addressed to diverse targets.

## 5.Recommendations

The recommendations have been formulated based on the diverse contributions identified in this report. A comprehensive analysis of the subject was conducted through three literature review research works. As a result, the recommendations were developed, considering the overall findings.

Considering the key findings identified, the recommendation listed are:

1. Governments and policymakers should prioritize the development and implementation of comprehensive media literacy programs that target individuals at the micro-level, organizations at the meso-level, and society at the macro-level. These programs should aim to enhance critical thinking skills, media and information literacy, and the ability to discern between true and false information, as well as how to be responsible with the own content creation ensuring that it is free of disinformation.
2. Stakeholders involved in media literacy interventions should collaborate to establish standardized outcome measures that can effectively evaluate the impact of different approaches. This will facilitate comparisons and enable the identification of the most MIL effective strategies in combating disinformation.
3. It is crucial to invest in monitoring and evaluation protocols to collect empirical data on the effectiveness of media literacy interventions. These protocols should focus not only on assessing the accuracy of truth judgments but also on measuring psychological and behavioural effects, such as knowledge, beliefs, attitudes, intentions, and behaviours. This comprehensive approach will provide a more holistic understanding of the impact of interventions.
4. Organizations and institutions engaged in media literacy efforts should prioritize initiatives that go beyond improving information assessment skills. They should also consider the psychological and behavioral effects of disinformation and develop interventions that address these aspects effectively. This may involve fostering critical thinking, promoting media literacy education, and encouraging fact-checking initiatives.
5. Media organizations, fact-checkers, and quality journalism outlets play a crucial role in combating disinformation. They should continue their efforts to provide accurate, reliable, and verified information to the public. Collaboration with media literacy initiatives can further strengthen the impact of their work.
6. Media literacy education actions, such as those conducted by libraries, adult education institutions, and higher education, have shown positive results in countering misinformation. Stakeholders should support and expand these initiatives, as they contribute to improving the critical thinking skills and media and information literacy of individuals.
7. Policy makers should recognize the importance of media literacy interventions in building a trustworthy and democratic public sphere. Continued support and funding for research,

development, and implementation of media literacy programs are essential to effectively combat disinformation.

Deepening the analysis of the recommendations regarding the effectiveness and impact of media literacy interventions and strategies, the following recommendations are provided:

### **Activating media and information literacy skills**

In selecting media literacy interventions, a trade-off between effectiveness and time allocation (on the part of the user) should always be considered. We posit that this trade-off may lead to different choices depending on the audience. Regarding media literacy skills and knowledge, different audiences may be in different phases of their learning curves. There are specific audiences (e.g., children, elderly users, lower tech-literate users, users with limited online experience, lower-educated users) who may still have a relatively low level of media literacy. Therefore, in these audiences, comprehensive educational media literacy interventions will produce a steep learning effect. Implementing such—elaborate and therefore incidental—interventions is recommended in such audiences.

Many other audiences, in contrast, already have much more advanced media literacy knowledge—learning effects from educational media literacy interventions are therefore expected to be much weaker. A recommended approach in such more common audiences would be to implement interventions that aim to activate extant media literacy knowledge rather than to educate new media literacy knowledge. Such activating interventions should simply remind users to consider their media literacy knowledge in their upcoming activity of selecting and processing online information. Moreover, activating interventions should be offered timely (i.e., right before exposure to possibly ambiguous information is likely) but can be simple, short, and unobtrusive, and therefore can often be repeated. The latter is advisable, given that evidence for long-term effects of media literacy interventions is weak; this also implicates that interventions should be visually attractive and/or attention grabbing, in order to avoid desensitization.

### **Focus media literacy interventions on information selection rather than on information processing**

Our literature review showed that most media literacy interventions improve the degree to which users are able to process disinformation. As a result, they are better able to assess the veracity of such information. Repeated evidence from continued influence research however suggests that (1) messages evaluated as false may still influence users' beliefs, attitudes, and behaviour (this also became apparent from the present literature review), and (2) processing of disinformation will elicit persuasive effects (even if the outcome of the processing is that the information is false). This leads to the logical conclusion that media literacy interventions should not prompt users to closely examine disinformation (e.g., verify claims, click links, check references), because such activities may possibly increase the psychological effects of the disinformation. Instead, media literacy interventions could focus on improving users' media selection skills, by, e.g., reminding them to check an article's source, the perceived veracity and persuasive intent of the headline, and the channel through which it was referred. If disinformation is dismissed in the phase of article selection instead of article processing, its psychological effects will probably be much more limited.

### **Reinforce the learning through MIL interventions technique-based approach**

Our literature review showed frequent application of both technique-based and issue-based media literacy interventions. A particular advantage of the former type of interventions, is that its effects are generalizable over news topics, which may lead to a greater resilience of users toward disinformation in general, rather than only disinformation about a certain topic. In addition, technique-based media literacy interventions may be more effective in distinguishing disinformation from correct information in the early—information selection—phase. In other words, technique-based media literacy knowledge can usually be applied to an article without needing to read the actual article, this limiting its potential continued influence on psychological effects. By focusing on technique-based media literacy interventions we can enhance user's critical thinking skills more broadly and equip them with the necessary knowledge and tools to be able to navigate the complex media landscape.

### **Prevent a sceptical attitude towards news in general**

A common finding in the current systematic review, and other related literature as well, was that media literacy intervention did not only improve users' accuracy in identifying disinformation, but also reduced users' accuracy in accurately identifying correct information. This effect (which is already well-known in deception detection research) illustrates that media literacy interventions mostly taught users to be sceptical, rather than to genuinely differentiate between information that is likely to be true or false. A possible consequence of repeated exposure to media literacy interventions therefore could be that users will develop a (chronically) sceptical approach to online information, even if this information would come from an entirely trustworthy source. Therefore, our final recommendation would be to focus media literacy interventions on skills that enable users to distinguish disinformation from correct information (and subsequently evade disinformation), rather than to simply evade disinformation. Previously mentioned heuristics, such as checking the news source and the article's perceived persuasive intent could again be of assistance here.

### **Evaluate and analyse the impact of media literacy strategies and interventions.**

Evaluation of media literacy strategies and interventions implemented in the socio-educational context is essential to ensure that they are effective and are benefiting the participants. We therefore recommend: 1) Establishing clear objectives before implementing any media literacy strategy or intervention. 2) Design evaluation indicators, which will help to measure the impact of media literacy actions. 3) Collect data from the action, both quantitative and qualitative, in order to have complete information on the impact of your action. 4) Share your results and experiences with other groups such as other schools, organisations or universities.

### **Implement media literacy strategies and interventions with an impact on citizenship from Human Rights approach**

In the scientific literature, there are media literacy strategies and interventions that have demonstrated effectiveness and a positive impact on citizenship. We encourage educators and practitioners to implement these types of media literacy interventions and strategies from a Human Rights approach. This approach aims to promote societies that are more secure and safe

for all, free from hate speech and disinformation. Therefore, an approach rooted in humanism is necessary to progress in this direction. It is important to develop corresponding evaluation and monitoring tools to gather data on the effectiveness of these interventions in addressing disinformation.

Finally, these types of interventions and recommendations should be implemented through dialogue with the various stakeholders involved. It is important to share the results and progress of the actions taken to assess their effectiveness and make informed decisions.

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## APPENDICES from Systematic Literature Review

### Appendix A: Search String

The search string was constructed as follows: 1. "Fake news" OR "false news" OR "false information" OR misinformation OR disinformation OR rumor\* OR myth\* OR conspiracy; 2. AND correct\* OR prebunk\* OR debunk\* OR combat\* OR tackl\* OR inoculat\* OR literacy OR counter\* OR "fact-check\*" OR disclaim\* OR "continued influence" OR intervention\* OR warning\* OR forewarning\* OR refut\*; AND 3. effect\* OR experiment\* OR survey\* OR questionnaire\* OR participant\*

### Appendix B: Codebook

#### General Information

- Name of the coder
- Full text code (Name of the file of the article as given by first coder)
- Authors (Names of all the authors of the article, separated by a semicolon)
- Year (Year of publication)
- Title (Full title of the article)
- Is the full article available in English?
  - No = 0 → End of coding procedure
  - Yes = 1 → Continue coding procedure
- Is the full article published in a peer-reviewed journal?
  - No = 0 → End of coding procedure
  - Yes = 1 → Continue coding procedure
- Journal (Complete title of the journal in which the article is published)
- How many studies does the article include? If the study reports on the results of different countries report as different studies.
- Report on which study you are now reporting. If an article consists of multiple studies code the study as follows: FULLTEXTCODE(studynumber). Report all questions per study.

#### Study Characteristics

- Does the study employ an experimental design?
  - No = 0 → End of coding procedure
  - Yes = 1 → Continue coding procedure
- Does the study test for (the effectiveness) a misinformation intervention strategy (i.e., the independent variable)?
  - No = 0 → End of coding procedure
  - Yes = 1 → Continue coding procedure
- What is the design of the study? (describe the whole design, specify the conditions and describe if it is a between, within or mixed subjects design)

- Were the participants randomly assigned over the different conditions of the experiments?
  - No = 0
  - Yes = 1
  - Unknown/other = 3 (if other please specify)
- What is the final sample size of the study?
- What is the target group of the study?
  - Students = 1
  - Non-students/Population based = 2
  - Unknown/other = 3 (please specify if other)
- What is the mean age of the participants?
- What is the percentage of females in the study?
- What is the distribution of political affinities (e.g., left-right wing / liberal-conservative)?
- What is the distribution of educational levels (e.g., high school, bachelor's degree)?
- In which country did the study take place (e.g., Dutch participants were used)? If the study took place in more than one country (that were not part of separate studies) you report all countries separated by a semicolon.
- In what setting was the study conducted?
  - Lab = 1
  - Online = 2
  - Field = 3
  - Unknown/other = 4 (please specify if other)
- Is the data used for this study openly available?
  - No = 0
  - Yes = 1
  - Unknown/other = 3 (please specify if other)
- Was the study pre-registered?
  - No = 0
  - Yes = 1
  - Unknown/other = 2 (please specify if other)
- Did the author(s) do a power analysis to determine their sample size? And if so, did the authors explain how they did this power calculation?
  - The authors did not do a power analysis = 0
  - The authors did a power analysis but did not explain how = 1
  - The authors did a power analysis and explained how = 2
  - Unknown/other = 3 (please specify if other)
- Are the reported statistics in the study correct (please run the paper through <https://michelenuijten.shinyapps.io/statcheck-web/>).
  - No = 0
  - Yes = 1
  - Unknown/other = 2 (please specify if other)

**Media Literacy Intervention Characteristics and Effects**

- To test for (the effectiveness) a misinformation intervention strategy, are the participants exposed to a form of misinformation as part of the stimulus materials, or is their belief in a type of misinformation measured with a self-report measure?
  - The participants were exposed to form of misinformation as part of the stimulus materials = 1
  - Participants' belief in a type of misinformation was measures with a self-report measure = 2
  - Unknown/other = 3 (if other please specify)
- According to the author(s), what type of misinformation intervention strategy is tested? Give the exact definition of the misinformation intervention strategy (as given by the author(s)), and specify its conditions. Also provide some information about the characteristics of the misinformation intervention strategy and how it looked like. If multiple misinformation intervention strategies are tested, report them all. Separate them by using semicolon.
- What type of misinformation intervention strategy is used?
  - Debunking (reactive/post-exposure/therapeutic). Debunking involves the correction of a myth or falsehood after people have already been exposed or persuaded by a piece of misinformation. Debunking emphasizes responding to specific misinformation after exposure to demonstrate why it is false. = 1
  - Prebunking (pre-emptive/preventative/prophylactic). Prebunking involves strategies to counter misinformation before people have been exposed or persuaded by a piece of misinformation. Prebunking seeks to help people recognize and resist subsequently encountered misinformation. = 2
  - Concurrently with stimulus material. This involves the correction of a myth or falsehood that is displayed while being exposed to a piece of misinformation = 3
  - Combination = 4 (please specify the combination of which strategies the intervention consists of)
  - Other = 5 (please specify)
- Under which category would you classify the misinformation intervention strategy?
  - Fact based fact-check/pre-emptive correction (i.e., state that information is false and can provide accurate information)
    - No = 0
    - Yes = 1
  - Logic based fact-check/pre-emptive correction (i.e., state that information is false and address the logical fallacies in the misinformation)
    - No = 0
    - Yes = 1
  - Source based fact-check/pre-emptive correction (i.e., state that information is false and undermine the plausibility of the misinformation or the credibility of its source)
    - No = 0
    - Yes = 1

- Presenting factually correct information (without explicitly saying information was false; i.e., providing an infographic or news article with correct information)
  - No = 0
  - Yes = 1
- Generic misinformation warning (i.e., general statements such as “some information you read on the internet is false”)
  - No = 0
  - Yes = 1
- Passive inoculation (i.e., Inoculation interventions combine two elements. The first element is warning recipients of the threat of misleading persuasion. For example, a person could be warned that many claims about climate change are false and intentionally misleading. The second element is identifying the techniques used to mislead or the fallacies that underlie the false arguments to refute forthcoming misinformation. A passive inoculation strategy involves increasing people’s critical-thinking skills by passive information such as a message or a course etc.)
  - No = 0
  - Yes = 1
- Active inoculation (i.e., Inoculation interventions combine two elements. The first element is warning recipients of the threat of misleading persuasion. For example, a person could be warned that many claims about climate change are false and intentionally misleading. The second element is identifying the techniques used to mislead or the fallacies that underlie the false arguments to refute forthcoming misinformation. A active inoculation strategy involves increasing people’s critical thinking skills by actively letting people generate ‘antibodies’ and stand in the shows of for example misinformation producers; e.g., inoculation games such as Bad News and GoViral!)
  - No = 0
  - Yes = 1
- General media literacy intervention (i.e., General media literacy interventions try to educate people on the possible treat of disinformation, and encompass them with an array of resources to enhance their capacity to identify false information and to be armed to withstand its negative effects. They include instructions about rules, tips or technological aids that can help spot disinformation and try to increase people’s knowledge of the media system. In contrast to inoculation, general media literacy interventions do not expose participants to a ‘weakened’ form of disinformation).
  - No = 0
  - Yes = 1
- Other = (please specify)
  - No = 0
  - Yes = 1
- To which category does the subject of the misinformation (beliefs) belong to?
  - Politics

- No = 0
    - Yes = 1
  - Health COVID-19
    - No = 0
    - Yes = 1
  - Health
    - No = 0
    - Yes = 1
  - Science
    - No = 0
    - Yes = 1
  - Crime
    - No = 0
    - Yes = 1
  - Marketing
    - No = 0
    - Yes = 1
  - Entertainment
    - No = 0
    - Yes = 1
  - Unknown/other (if other please specify)
    - No = 0
    - Yes = 1
- How many dependent variables, that are affected by the misinformation intervention strategy or are hypothesized as being affected by the misinformation strategy, does the author report on? Count the number of variables that, according to the author, are/will be affected by the misinformation intervention strategy that is studied. Give the exact definition of the DV (as given by the author) and give each DV a number. Separate them by using a semicolon. For example: 1. Attitude towards political candidate; 2. Beliefs about issue.
  - Describe for each dependent variable when they were measured. Report the number and name of each dependent variable you are referring to in the text box. If more than one dependent variable belongs to the same category separate them using a semicolon.
    - Only after the participants were exposed to the intervention strategy
      - No = 0
      - Yes = 1
    - The same measure was used before and after participants were exposed to the intervention strategy. This measure is used to calculate a difference score
      - No = 0
      - Yes = 1
    - Unknown/other = 3 (if other please specify)
      - No = 0
      - Yes = 1

- Describe for each dependent variable at what time they were measured. Report the number and name of each dependent variable you are referring to in the text box. If more than one dependent variable belongs to the same category separate them using a semicolon.
  - Immediately after the misinformation intervention strategy
    - No = 0
    - Yes = 1
  - After a filler task
    - No = 0
    - Yes = 1
  - After a few hours
    - No = 0
    - Yes = 1
  - After a day or more
    - No = 0
    - Yes = 1
  - Multiple times at different times = 5 (please specify how often and when)
    - No = 0
    - Yes = 1
  - Unknown/other = 6 (if other please specify)
    - No = 0
    - Yes = 1
- Does the authors use the term “continued influence” when discussing the results in the results, conclusion or discussion chapter of the article?
  - No = 0
  - Yes = 1
  - Unknown/other = 3 (if other please specify)
- What are the effects of the misinformation intervention strategy as reported by the author, report both significant as well as non-significant effects? Write down the effects exactly as reported by the author. Give each effect a number and report each effect of the misinformation intervention strategy on the DV (make sure you write down the name of the dependent variable as well). Only report direct effects. Do not report indirect effects. Separate them by using a semicolon. If available report on the effect sizes for each significant relationship. If the effect sizes are not available then report the test statistics of the effects (if those are not available please report the means and standard deviations. For example: 1. Correction does not lead to less negative attitudes toward the politician compared to no correction (M = 4.14, SD = 1.34; M = 4.10, SD = 1.21); 2. Correction reduces peoples’ factual beliefs in the misinformation compared to no correction (Cohen's d = .04).
- Does the study measure any other variables not yet reported on in the codebook? Give the exact definition of the variable (as given by the author), and give each variable a number. Separate them by using a semicolon. For example: 1. Media trust; 2. sadness.

- Do you have any comments/remarks about the study or codebook?