Prevalence and Intervention Strategies of Health Misinformation Among Older Adults: a Meta-Analysis

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Declaration of conflicting interest

The authors declare that they have no competing interests.

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Ethics approval

The process of this study did not involve any new direct investigation or data collection of human or animal participants. Therefore, an exemption was obtained from the institutional ethics committee.

Data availability statement

The data sets generated during and/or analyzed during this study are available in the Open Science Framework repository (https://osf.io/74a9j/?view_only=92595339458646479f1fb8efc6bf847a).

Abstract

The rapid expansion of the Internet and social media has intensified the spread of health misinformation, posing significant risks, especially for older adults. This meta-analysis synthesizes evidence on the prevalence and interventions of health misinformation among older adults. Our findings reveal a high prevalence rate of 47% (95% CI [33%, 60%]), surpassing recent estimates. Offline research settings have a higher prevalence of health misinformation. Despite methodological variances, the prevalence remains consistent across different measures and development levels. Interventions show significant effectiveness (Hedges' g = 0.76, 95% CI [0.25, 1.26]), with graphic-based approaches outperforming video-based ones. These results underscore the urgent need for tailored, large-scale interventions to mitigate the adverse impacts of health misinformation on older adults. Further research should focus on refining intervention strategies and extending studies to underrepresented regions and populations.

Keywords: infodemic; health misinformation; meta-analyses; older adult; intervention; prevalence.

Introduction

The exponential growth of the Internet and social media has significantly accelerated the dissemination of misinformation, particularly within the domain of health (Allen et al., 2024; Larson, 2018). During the COVID-19 pandemic, health misinformation spread globally through social media, posing a serious threat to public health (Loomba et al., 2021; Roozenbeek et al., 2020; Zarocostas, 2020). Older adults, as digital immigrants, have been particularly vulnerable to health misinformation (Ball et al., 2019; Grinberg et al., 2019; Guess et al., 2019). For example, the dissemination of misinformation about COVID-19 prevention and treatment has led to increasingly severe and critical conditions, and higher death rates among older adults (Mueller et al., 2020). Although many studies suggest that older adults are more sensitive to health misinformation, research findings on this issue are inconsistent (Nan et al., 2022). Additionally, there is a pressing need to develop effective solutions to combat misinformation (Brashier, 2024; Kozyreva et al., 2024). This study summarizes the prevalence and intervention strategies of health misinformation among older adults.

Older Adults and Health Misinformation

Health misinformation can be defined as a health-related claim that is based on anecdotal evidence, false, or misleading due to a lack of existing scientific knowledge (Suarez-Lledo and Alvarez-Galvez, 2021). During the COVID-19, the WHO described the rampant spread of health misinformation as an *infodemic*: too much information, including misinformation or misleading information, in digital and physical environments during a disease outbreak (Choukou et al., 2022; Hao and Basu, 2020; World Health Organization, 2022). Health misinformation poses a significant potential threat to the public. It impedes

the capacity of individuals to make well-informed decisions about their health, which can ultimately result in adverse health outcomes, including illness and death (Southwell et al., 2023; Swire-Thompson and Lazer, 2020; Wilhelm et al., 2023). Moreover, the presence of health misinformation can impede the efficacy of public health responses and policies, thereby endangering global public health (Borges Do Nascimento et al., 2022; Larson, 2018).

While citizens of all ages are at risk from misinformation, older adults are particularly susceptible (Brashier and Schacter, 2020). Studies found that users aged 50 and over account for 80% of misinformation distribution (Grinberg et al., 2019). People aged 65 and over share up to seven times more unsubstantiated information, arguably making them super-spreaders of misinformation (Guess et al., 2020).

Older adults are frequently exposed to fake news and are more susceptible to the effects of health misinformation (Vivion et al., 2024). Due to their inherent characteristics of immune aging and high levels of underlying disease, older adults are more attentive to health information and have become the most affected demographic during the COVID-19 pandemic, leading to vaccine hesitancy and endangering lives and health (Bloom et al., 2024; Hsieh et al., 2022; Wu and Brennan-Ing, 2023). The problem of health misinformation negatively affecting older adults is likely to intensify in the coming years: on one hand, the population over 65 will nearly double by 2050 (The United Nations, 2023), and on the other hand, artificial intelligence technology can vividly create fake news and spread misinformation at viral rates (Chen et al., 2019), making misinformation increasingly sophisticated and difficult to recognize. Some large-scale surveys and interview studies also have found that older adults may have lower susceptibility to health

misinformation, indicating a greater ability to identify false information (Roozenbeek et al., 2020; Ross et al., 2014; Vivion et al., 2024).

Influencing Factors About Older Adults Receiving Misinformation

There are many factors that lead older adults to fall into health misinformation. Regarding individual factors, the most common influences on older adults' susceptibility to misinformation are cognitive decline and lack of digital skills (Ali and Qazi, 2022; Brashier and Schacter, 2020; Jacoby and Rhodes, 2006; Lee, 2018; Sádaba et al., 2023). Additionally, older adults with better physical health, higher education levels, higher income levels (Wu et al., 2019), and stronger analytical reasoning skills (Pehlivanoglu et al., 2022) are less susceptible to misinformation. Conservative attitudes, conspiracy beliefs (Pakalniskiene et al., 2022), distrust of healthcare (Blomberg, 2022), higher frequency of news consumption (Pehlivanoglu et al., 2022), loneliness (Forgas, 2019), and increased anxiety (Sun et al., 2020) all make older adults more susceptible to health misinformation.

In addition to audience characteristics, the traits of information disseminators also influence the perception of misinformation. Health misinformation that contains emotions (Gabarron et al., 2021). On social media, each additional emotional word in the content increases its spread by 20% (Brady et al., 2017). People are more likely to believe misinformation shared by influencers or trusted individuals within their networks (Sun et al., 2020). Social media bots also contribute to increased susceptibility to misinformation. These bots comment on and support specific content to help creators gain certain benefits, which creates the false impression that a particular viewpoint has received broad public support (Mihaylov et al., 2018), thereby increasing susceptibility to misinformation (Zerback et al., 2021).

Social media platforms contribute significantly to the spread of misinformation through biased algorithms. These algorithms prioritize content that is likely to engage users, often amplifying sensational or emotionally charged misinformation over factual content (Kozyreva et al., 2020). The use of engagement-based metrics means that misinformation that elicits strong reactions is more likely to be promoted. This creates echo chambers where users are exposed primarily to information that reinforces their existing beliefs (Törnberg, 2018). Cinelli et al. (2020) compared strictly regulated social media platforms such as Twitter, Instagram, and YouTube with less regulated platforms such as Gab and Reddit, finding that while all of these platforms can promote the spread of misinformation, it is more likely on less regulated platforms.

Developing Interventions for Older Adults

While misinformation cannot be eliminated, it can be managed through various interventions (Kozyreva et al., 2024; Tangcharoensathien et al., 2020). Recognizing the seriousness of the infodemic, social media platforms and governments have introduced strategies to mitigate misinformation (Gentili et al., 2023; Hartley and Vu, 2020; Kozyreva et al., 2020). For example, some social media platforms alert users when they encounter unverified information and enhance related algorithm mechanisms (Bode and Vraga, 2015, 2018; Meixler, 2017). Authorities encourage users to report or flag misinformation to social media companies (Etienne and Çelebi, 2023; Gimpel et al., 2021; Pennycook and Rand, 2019a).

Research indicated that older adults and younger people benefit differently from misinformation interventions. It is beneficial to provide younger individuals with education regarding related topics, but older adults may benefit from education about the

dissemination of information on social media (Ayalon, 2024). Interventions and experimental studies in other fields have also found heterogeneity among older adults (Fernández-Aguilar et al., 2020; Robb et al., 2003). Therefore, it is necessary to implement targeted interventions for older adults.

Several studies have been conducted on improving the skills of identifying online misinformation by teaching digital literacy to older adults (Moore and Hancock, 2022; Susanty et al., 2023). Efforts have been made to implement a variety of interventions and tools to increase older adults' resilience to health misinformation and to mitigate the harmful effects of the infodemic on this population (Brashier and Schacter, 2020). However, the effectiveness of interventions targeting older adults has not been consistently demonstrated.

The Present Study

As an infodemic, it is crucial to understand the prevalence of health misinformation among older adults and develop strategies to address it. Currently, several studies have systematically reviewed the issue of health misinformation. For example, Suarez-Lledo and Alvarez-Galvez (2021) systematically reviewed the main health misinformation topics and their prevalence on different social media platforms. Walter et al. (2021) used meta-analysis to evaluate the relative impact of social media interventions designed to correct health misinformation. Marecos et al. (2024) systematically summarized low-cost interventions that can be quickly implemented on social media to combat health misinformation. However, there is a lack of comprehensive evidence on the prevalence of health misinformation among older adults and the effectiveness of interventions. As previously mentioned, there is no consensus on whether older adults are highly susceptible

to health misinformation, nor is there clarity on the effectiveness of targeted interventions. This study utilizes meta-analysis to address the following questions:

RQ1: What is the prevalence of health misinformation among older adults?

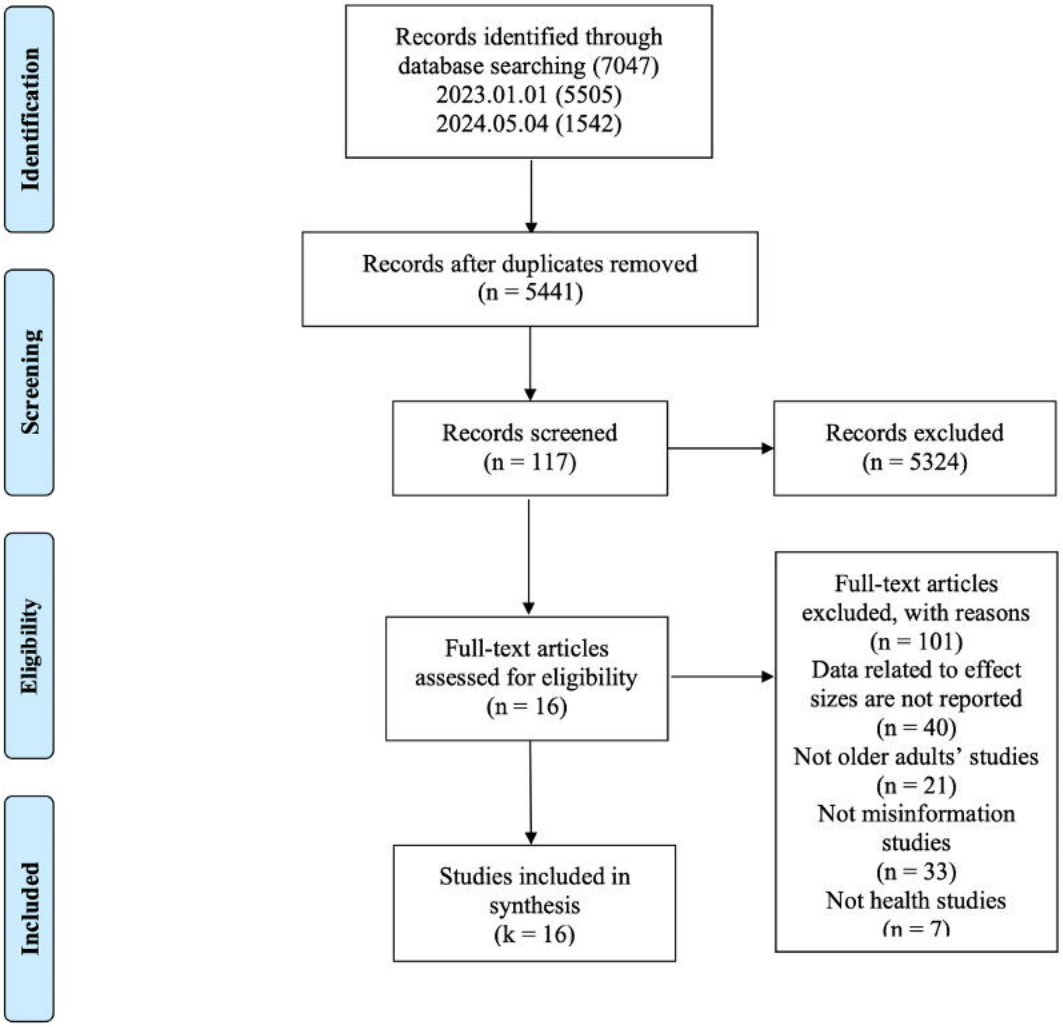
RQ2: How effective are health misinformation interventions aimed at older adults?

Method

Literature Search

We applied guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Liberati et al., 2009). The PRISMA flowchart is shown in Figure 1. Relevant keywords related to older adults and misinformation were used to search four mainstream English databases (Web of Science, Scopus, ProQuest, PubMed) and the largest Chinese journal article database (CNKI) to increase the global representativeness of the literature search. The search included Chinese and English empirical studies published before January 1, 2023. We conducted a secondary search on 4 May 2024. A detailed description of the search strategy can be found in the Supplementary materials. This study was not pre-registered, but all analytical data and code are publicly accessible on the OSF platform: https://osf.io/74a9j/?view_only=92595339458646479f1fb8efc6bf847a.

Figure 1. PRISMA flowchart of the study selection process.



Notes: n means the number of literatures, and k means the number of studies in literature.

Inclusion Criteria

Studies meeting the following criteria will be included after the initial literature search:

(1) Empirical research related to health misinformation. Our focus is on misinformation in the context of the internet rather than traditional media, such as newspapers.

(2) Studies provided information on the prevalence or effect size or reported relevant data that could be converted into these measures. Since continuous outcomes cannot assess prevalence, this study only includes prevalence results presented as percentages.

(3) Studies primarily focused on the older adult population: Typically refers to adults aged 50 and above.

(4) Studies that have undergone peer review are considered, whereas preprints and theses are not included.

After a systematic search, the identified studies will be imported into Endnote 20 for screening. Duplicates will be removed, and two trained coders will independently evaluate the studies based on the screening criteria using the title and abstract content. The coders will then assess the full text of the studies that meet the inclusion criteria. In cases where the two coders disagree on the inclusion of a study, a third researcher will be consulted to reach a consensus.

Data Extraction

For the study on the prevalence of health misinformation among older adults, the following information was extracted: author(s), publication year, country, sample size, age, setting, outcome, measurement, prevalence rate, and confidence interval. For the study on interventions for health misinformation among older adults, the following information was extracted: author(s), publication year, country, sample size, age, setting, outcome, measurement, and intervention type. When studies provided data but could not be converted to effect sizes, we requested raw data like the corresponding author of the paper.

Quality Assessment

To assess the quality of the included studies, the Crombie cross-sectional study

evaluation tool was used to evaluate prevalence studies, and the Cochrane Risk of Bias 2 tool (RoB 2.0 tool) was used to assess intervention studies (Crombie, 1996; Sterne et al., 2019). Funnel Plot(Duval and Tweedie, 2000) and Egger's regression test (Egger et al., 1997) were utilized to investigate publication bias in intervention studies.

Data Analysis

Given that the effect of the intervention was examined in this study by comparing the standardized difference between the intervention and control groups, the standardized mean deviation Hedges' g was utilized as an effect size to test the intervention's effectiveness. Hedges' g is the standardized mean difference between the two group means and provides a more accurate estimate of the effect size than Cohen's d (Grissom and Kim, 2005). Due to the potential discrepancies between the many studies included in this meta-analysis, a random effects model was utilized in this study. Q statistic and I^2 statistic were used to estimate heterogeneity (Higgins et al., 2003). A p-value< .05 was considered statistically significant.

We also conducted a subgroup analysis to examine how different subgroups affect prevalence and intervention effects. The primary subgroup variables include setting (online or offline), outcomes (credibility or sharing), measurement (distinguished news, behavior change, and experience), levels of country development (HDI), and intervention type (course, graphic, and video).

Firstly, older adults respond differently to misinformation in various settings. As digital immigrants, older adults are more familiar with news in offline environments (Bourne et al., 2020; Choudrie et al., 2021). Research also indicates that older adults perform worse when dealing with online misinformation but fare better in offline settings

(Ross et al., 2014). The effectiveness of interventions may also vary depending on the setting (Beleigoli et al., 2019).

Secondly, researchers use different methods to assess the impact of misinformation (Maertens et al., 2024). We selected the most common assessment methods as primary outcome measures: credibility assessment and sharing intention (Lu and Zhong, 2022; Zhou et al., 2023). Many studies point out inconsistencies between these two measures, as they involve different cognitive processes (Carnahan et al., 2022; Pennycook, Epstein, et al., 2021).

Thirdly, there is significant heterogeneity in the methods used to measure misinformation (Nan et al., 2022). Although different news posts remain the primary method, there are substantial differences (Pennycook, Binnendyk, et al., 2021; Roozenbeek et al., 2022). This study distinguishes the following three measurement methods: distinguished news, information-related behavior change, and reporting experience. Additionally, we also focus on the setting in which the research is conducted. In online versus offline settings, older adults may process information differently due to environmental differences (Gunter et al., 2002).

Fourthly, we evaluated the impact of different levels of country development based on the Human Development Index (HDI) (Nations, 2022). Research on misinformation often neglects low-development regions (Blair et al., 2024), where the prevalence of health misinformation and the effectiveness of interventions may differ (Badrinathan, 2020; Wang et al., 2019). People in highly developed regions tend to have better educational backgrounds and digital skills, enabling them to better cope with misinformation and accept related interventions (Antonijević et al., 2023; Graetz et al., 2020).

Finally, we focused on different types of interventions against misinformation. Researchers have used various modalities for misinformation interventions (Hu et al., 2023; Kozyreva et al., 2024), and it is crucial to identify and promote the most effective types among older adults. We focused on three common intervention types: course, graphic, and video.

All analyses were performed using the meta (Version 6.2-1), dmeta (Version 0.0.9000), and metafor package (Version 3.8-1) of R software(Balduzzi et al., 2019; Harrer et al., 2019; Viechtbauer, 2010).

Results

Characteristics of Studies

A total of 7,047 articles were identified through the literature search, and 16 independent studies (n = 11,633) were included. Table 1 summarizes the contents of the included studies. Among these, 11 studies reported on the prevalence of health misinformation, and five evaluated interventions. Most of the research on health misinformation among older adults comes from China (n = 5) and the US (n = 4). The studies primarily use online platforms (n = 12), focus on misinformation credibility (n = 14), and measure misinformation using distinguished news (n = 10).

Table 1. Characteristics of studies included in the meta-analysis.

Author & Year	Country	Sample	Age	Setting	Outcome	Measurement	Study Type
Aysen Kutan (2022)	Turkey [b]	117	>50	Online	Credibility	DN	Prevalence
Gansler (2005)	US [a]	136	>65	Online	Credibility	DN	Prevalence
Min Seong (2021)	US [a]	2086	>50	Online	Credibility	DN	Prevalence
Moore (2022)	US [a]	381	67	Online	Credibility	DN	Intervention
Oliveira (2023a)	Brazil, Portugal [a]	304	>50	Online	Credibility	DN	Prevalence
Oliveira (2023b)	Multi [a]	1214	>50	Online	Credibility	DN	Prevalence
Saling (2021)	Australia [a]	1225	>50	Online	Sharing	Exp	Prevalence

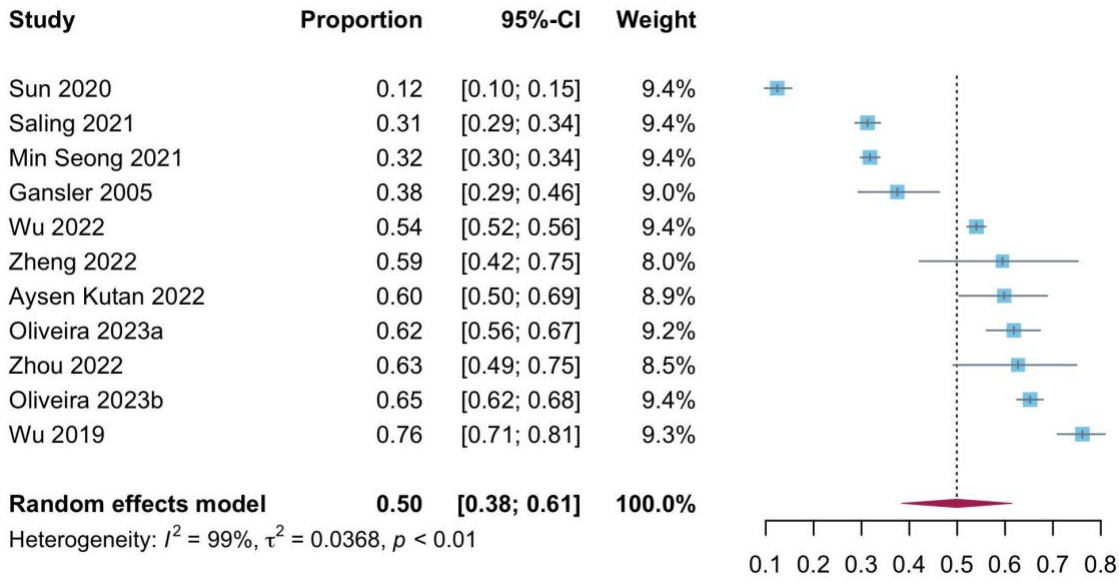
Sitzman (2022)	US [a]	77	65	Online	Credibility	DN	Intervention
Sun (2020)	China[b]	556	>46	Online	Credibility	DN	Prevalence
Susanty (2023)	Indonesia[a]	126	>60	Offline	Credibility	BC	Intervention
Vivion (2022)	Canada [a]	1500	>50	Online	Credibility	BC	Intervention
Wu (2022)	China[b]	2533	60-91	Offline	Credibility	Exp	Prevalence
Wu (2019)	China[b]	302	>60	Offline	Credibility	DN	Prevalence
Yousuf (2021)	Holland [a]	980	>60	Online	Credibility	BC	Intervention
Zheng (2022)	China[b]	37	67-72	Online	Sharing	Exp	Prevalence
Zhou (2022)	China[b]	59	58-83	Offline	Credibility	DN	Prevalence

Notes: UK: The United Kingdom; US: The United States; DN: Distinguished News; BC: Behavior Change; Exp: Experience. [a] very high level of country development. [b] high levels of country development. For Sun (2020), although they included older adults starting from age 45 based on the local country's definition, we decided to include the study.

Prevalence of Health Misinformation

The heterogeneity test obtained a significant result (Q = 1324.44, P<.001, I^2=99.2, t^2=0.04). Figure 2 displays the forest plot of the prevalence of misinformation among older adults, with a pooled estimate of 49.92% (95% CI [38.37%, 61.47%]). Using a one-study removal approach, we found that the exclusion of individual studies did not significantly impact the overall result (from 47.19%, 95% CI [35.81%, 58.57%] to 53.72%, 95% CI [43.94%, 63.51%]). The results of the quality assessment indicated that five studies were of grade A quality, four studies were of grade B quality, and two studies were of grade C quality.

Figure 2. Pooled proportion of different study outcomes.



We further examined subgroup analysis, as shown in Table 2, and the result revealed a significant difference in the prevalence of misinformation across survey settings (Q=4.06, p=.044). The prevalence of misinformation measured offline was significantly higher than that measured online. There were no significant differences in the prevalence of other subgroup variables.

Table 2. Effects of subgroup variables on the proportion.

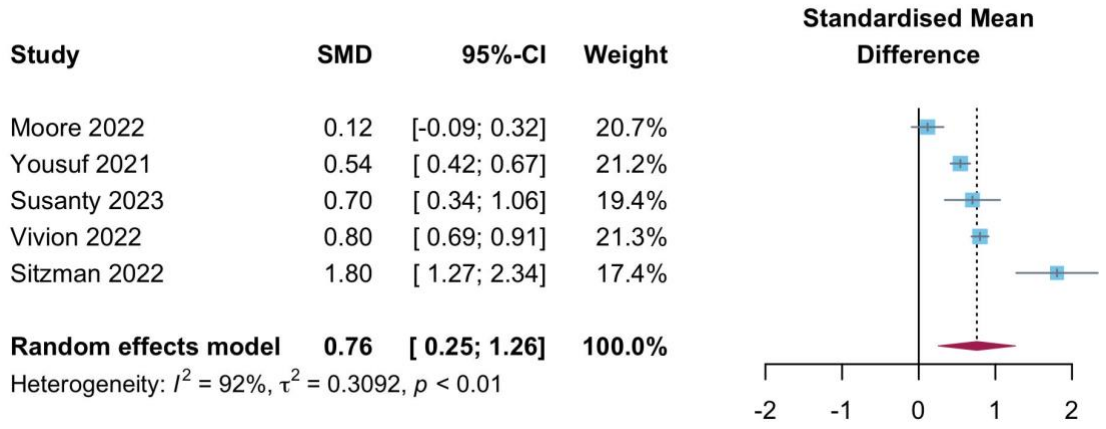
Variable	Prop	k	LL	UL	Q	*p*
Proportion	49.92%	11	38.37%	61.47%	1324.44	<.001
Setting					4.06	.044
Online	44.55%	8	31.01%	58.09%		
Offline	64.26%	3	50.69%	77.84%		
Outcome					0.20	.659
Credibility	51.13%	9	37.87%	64.39%		
Sharing	44.24%	2	16.70%	71.78%		
Measurement					0.09	.766
Distinguish news	50.78%	8	35.75%	65.81%		
Experience	47.32%	3	30.17%	64.48%		
HDI					0.14	.706
Very High	47.81%	6	34.87%	60.74%		
High	52.67%	5	30.97%	74.36%		

Notes: LL and UL represent the lower and upper limits of the 95% CI of proportion, and k means the number of independent studies.

Intervention of Health Misinformation

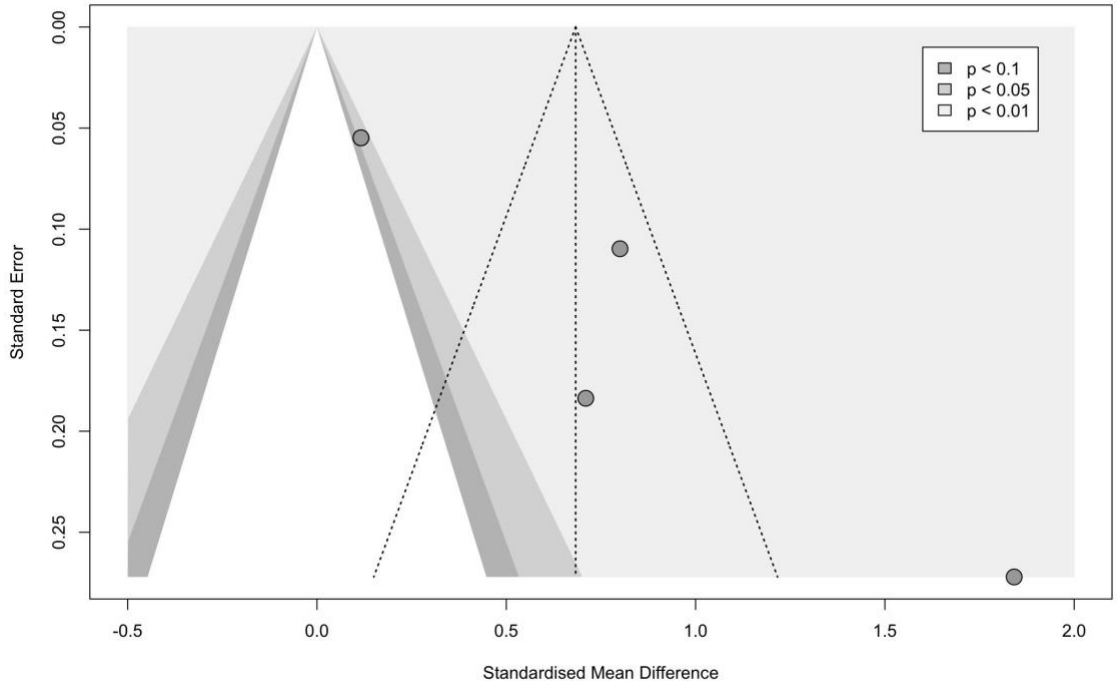
For intervention studies, all studies were delivered via online platforms. The heterogeneity was significant (Q=53.22, p<.001, I^2=92.50, *tau2*=0.31). The forest plot of intervention for health misinformation with older adults is presented in Figure 3. Using a one-study removal approach, we found that the exclusion of individual studies had an impact on the overall result (from g = 0.54, 95%CI [0.24, 0.84] to g = 0.92, 95%CI [0.41, 1.42]). The result indicated that existing interventions can significantly enhance older adults' capacity to deal with health misinformation (g = 0.76, 95%CI [0.25, 1.26], p<.001). The results of the quality assessment indicated that three studies were high risk and two were low risk.

Figure 3. Pooled effect size of different study outcomes.



We used a funnel plot and an Egger's test to examine the publication bias of intervention studies. The funnel plot is presented in Figure 4. For the trim and fill method, no new studies were added. In the current study, the result of Egger's test (p = .803) indicates the absence of significant publication bias.

Figure 4. Funnel plot of the included studies.



We analyzed subgroup variables that may influence the intervention effect. Subgroup variables with fewer than two studies were excluded (Zhao et al., 2007). Due to the limited number of overall studies, most subgroup variables could not be further analyzed. Table 3 shows a significant difference across intervention types ($Q = 25.79$, $p < .001$). The effectiveness of graphic-based interventions was significantly higher than that of video-based interventions. There were no significant differences in the effectiveness of other subgroup variables. It should be noted that due to the small number of included studies, caution is needed when interpreting the results related to publication bias and subgroup analyses.

Table 3. Effects of subgroup variables on misinformation intervention.

Variable	g	k	LL	UL	Q	p
Main effect	0.76	5	0.25	1.26	53.22	<0.001
Intervention Type					25.79	<0.001
Graphic	1.28	2	0.28	2.28		
Video	0.56	2	0.44	0.68		
Measurement					0.10	.757
Distinguish news	0.94	2	-0.71	2.60		
Behavior Change	0.68	3	0.49	0.86		

Notes: LL and UL represent the lower and upper limits of the 95% CI of proportion, and k means the number of independent studies.

Discussion

The crisis caused by the infodemic remains a major threat to our society, and older adults with higher susceptibility to health misinformation should receive more attention. In the current environment, it is critical to develop effective and implementable interventions. This study used meta-analysis to synthesize evidence on the prevalence and interventions of health misinformation among older adults.

Prevalence of Health Misinformation Among Older Adults

Our findings revealed a high prevalence of health misinformation among older adults, with a rate of 47% (95% CI [33%, 60%]), which is higher than recent estimates of health misinformation prevalence among the representative population (1.7%-32.4%) (Zhao et al., 2023). Our findings revealed a high prevalence of health misinformation among older adults, with a rate of 47% (95% CI [33%, 60%]), which is higher than recent estimates of health misinformation prevalence among the representative population (1.7%-32.4%) (S. Zhao et al., 2023). A subgroup analysis revealed that the prevalence of health misinformation was higher when researchers conducted assessments in offline settings

compared to online environments. When assessments are conducted offline, they often involve more non-verbal communication and potential social connections (Lieberman and Schroeder, 2020), which may increase trust in the information provided by researchers (Glanville et al., 2013; Paladin, 2010). Additionally, we found no significant differences in the prevalence of health misinformation among older adults when using different measurements and outcomes, suggesting that measurement methods do not impact the result of health misinformation prevalence. Similarly, there was no significant difference in health misinformation prevalence across different levels of country development, indicating that health misinformation is a serious problem across all development levels and requires targeted intervention measures (Janmohamed et al., 2021; Nsoesie et al., 2020). It is worth noting that studies on the prevalence of health misinformation among older adults have a significant proportion conducted in China. Unlike other countries, China's strict filtering and censoring of information on social media platforms may lead people to place greater trust in information from familiar groups and social media (Tai and Fu, 2020).

Intervention Strategies of Health Misinformation Among Older Adults

Interventions can significantly combat health misinformation among older adults (g = 0.76, 95% CI [0.25, 1.26]). This is a substantial effect, greater than the previously reported effects of health misinformation interventions (Janmohamed et al., 2021: d=0.40,95%CI [0.25,0.55]; Walter et al., 2021: d=0.40,95%CI [0.25,0.55]). This indicates that health misinformation interventions designed for older adults may offer considerable benefits and may prove more effective than interventions for other people. Given the greater harm that health misinformation poses to older adults (Bloom et al., 2024; Wu and Brennan-Ing, 2023), designing and implementing large-scale interventions for this demographic is highly

valuable (Czerniak et al., 2023). Subgroup analysis revealed an interesting phenomenon: graphic-based interventions were more effective than video-based interventions. A possible reason is that older adults may find it easier to become distracted during long videos, whereas graphic interventions can help them maintain attention and remember key information by segmenting content and highlighting important points (Lindenberger and Mayr, 2014; Pratt and Wood, 1984). Older adults also process information more slowly than younger adults, and the graphic format allows them to read and understand information at their own pace, leading to better reception of the intervention (Bopp and Verhaeghen, 2007; Ebaid and Crewther, 2019). Previous research has also highlighted the limitations of video interventions for combating health misinformation (Beleites et al., 2024). However, these results should be interpreted cautiously due to the limited number of studies.

Implementation Guidance

This study provides essential guidance for current efforts to combat health misinformation. The dissemination of misinformation among older adults is a serious problem that can harm the health and property of older adults if it leads to incorrect behaviors. Additionally, interventions targeting health misinformation among older adults are effective, and relevant organizations should continue to design and implement such interventions for this population while expanding their scope.

Based on the current findings, this study can provide some implementation suggestions for future research.

Firstly, current research lacks studies on misinformation correction. Even after misinformation is corrected, it may continue to affect individuals' cognition and behaviors,

known as the continued influence effect (Ecker et al., 2022). This issue poses a higher risk for older adults (Blomberg, 2022; Swire et al., 2017). How to help older adults quickly eliminate the influence of previously received misinformation after correction deserves further exploration.

Secondly, most interventions only included older adults but lacked comparisons with other populations. Future studies should examine whether interventions implemented in the general population are equally effective for older adults and compare them with interventions designed specifically for older adults. For example, accuracy prompts and psychological inoculation have been tested on a large scale(Pennycook and Rand, 2022; van der Linden et al., 2021). It would be beneficial to ascertain which interventions are more likely to be beneficial or detrimental to older people. Furthermore, comparing the prevalence of misinformation and the effects of interventions among different age groups, such as younger adults or other populations, could provide insights into potential differences. Current intervention studies have small sample sizes and lack representation from the Global South (Badrinathan and Chauchard, 2024). There is a need to increase research investment and improve sample representativeness.

Thirdly, the outcome assessments in this study primarily focus on misinformation credibility or sharing intention. However, these methods can lead to significant biases and risks, such as reducing trust in accurate information(Modirrousta-Galian and Higham, 2023). Many researchers now recommend using discernment to evaluate intervention effectiveness (Guay et al., 2023; Higham et al., 2023; Lu et al., 2023), which involves increasing belief in accurate information while reducing belief in misinformation. Researchers have also developed objective misinformation scales to reduce measurement

errors (Maertens et al., 2024). Future research needs to reduce heterogeneity in measurement tools and methods among older adults.

Finally, current interventions against the health misinformation targeted at older adults are almost conducted online. While this approach can achieve better dissemination, it may not effectively reach older adults who lack digital literacy (Sádaba et al., 2023). Future research should evaluate the social validity of interventions and explore other ways to design interventions that can reach more older adults. The issue of the prevalence of health misinformation in traditional media is equally important for older adults. Older adults may be exposed to both internet information and content from traditional media. Excessive trust in traditional media may lead to less critical thinking about its content (Christensen, 2017; Pennycook and Rand, 2019b).

References

Ali A and Qazi IA (2022) Digital Literacy and Vulnerability to Misinformation: Evidence from Facebook Users in Pakistan. *Journal of Quantitative Description: Digital Media* 2.

Allen J, Watts DJ and Rand DG (2024) Quantifying the impact of misinformation and vaccine-skeptical content on Facebook. *Science* 384(6699). American Association for the Advancement of Science: eadk3451.

Antonijević M, Bradić-Martinović A, Banović J, et al. (2023) Is There a Relationship Between Country Development and Citizens' Level of Digital Skills? *Economic Analysis* 56(1). 1: 57–68.

Ayalon L (2024) Age differences in the context of climate change: Does exposure to a fake consensus statement make a difference? *PLOS ONE* 19(3). Public Library of Science: e0298219.

Aysen Kutan F, Gunay C, Nurver Turfaner S, et al. (2022) Impaired Perceptions and Conspiracy Beliefs about the Way of Emergence of the COVID-19 Infection. *International Journal of Environmental Research and Public Health* 19(9): 5557.

Badrinathan S (2020) Educative Interventions to Combat Misinformation: Evidence From a Field Experiment in India. APSA Preprints. Available at: https://preprints.apsanet.org/engage/apsa/article-details/5f4551172472620012f82a40 (accessed 11 July 2024).

Badrinathan S and Chauchard S (2024) Researching and countering misinformation in the Global South. *Current Opinion in Psychology* 55: 101733.

Balduzzi S, Rücker G and Schwarzer G (2019) How to perform a meta-analysis with R: a

practical tutorial. *BMJ Ment Health* 22(4): 153–160.

Ball C, Francis J, Huang K-T, et al. (2019) The Physical–Digital Divide: Exploring the Social Gap Between Digital Natives and Physical Natives. *Journal of Applied Gerontology* 38(8). SAGE Publications Inc: 1167–1184.

Beleigoli AM, Andrade AQ, Cançado AG, et al. (2019) Web-Based Digital Health Interventions for Weight Loss and Lifestyle Habit Changes in Overweight and Obese Adults: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research* 21(1): e9609.

Beleites F, Adam M, Favaretti C, et al. (2024) Evaluating the impact of short animated videos on COVID-19 vaccine hesitancy: An online randomized controlled trial. *Internet Interventions* 35: 100694.

Blair RA, Gottlieb J, Nyhan B, et al. (2024) Interventions to counter misinformation: Lessons from the Global North and applications to the Global South. *Current Opinion in Psychology* 55: 101732.

Blomberg M (2022) *Communicating Veracity: The Impact of Emotion and Multimodal Resources for Correcting Online Misinformation in Older Adults*. Ph.D. University of Kansas, Ann Arbor.

Bloom DE, Pecetta S, Scorza FB, et al. (2024) Vaccination for healthy aging. *Science Translational Medicine* 16(745). American Association for the Advancement of Science: eadm9183.

Bode L and Vraga EK (2015) In Related News, That was Wrong: The Correction of Misinformation Through Related Stories Functionality in Social Media. *Journal of Communication* 65(4): 619–638.

Bode L and Vraga EK (2018) See Something, Say Something: Correction of Global Health Misinformation on Social Media. *Health Communication*. Routledge. Epub ahead of print 2 September 2018.

Bopp KL and Verhaeghen P (2007) Age-Related Differences in Control Processes in Verbal and Visuospatial Working Memory: Storage, Transformation, Supervision, and Coordination. *The Journals of Gerontology: Series B* 62(5): P239–P246.

Borges Do Nascimento IJ, Beatriz Pizarro A, Almeida J, et al. (2022) Infodemics and health misinformation: a systematic review of reviews. *Bulletin of the World Health Organization* 100(9): 544–561.

Bourne KA, Boland SC, Arnold GC, et al. (2020) Reading the news on Twitter: Source and item memory for social media in younger and older adults. *Cognitive Research: Principles and Implications* 5(1): 11.

Brady WJ, Wills JA, Jost JT, et al. (2017) Emotion shapes the diffusion of moralized content in social networks. *Proceedings of the National Academy of Sciences* 114(28). National Academy of Sciences: 7313–7318.

Brashier NM (2024) Fighting Misinformation Among the Most Vulnerable Users. *Current Opinion in Psychology*. Elsevier: 101813.

Brashier NM and Schacter DL (2020) Aging in an Era of Fake News. *Current Directions in Psychological Science* 29(3). SAGE Publications Inc: 316–323.

Carnahan D, Ulusoy E, Barry R, et al. (2022) What should I believe? A conjoint analysis of the influence of message characteristics on belief in, perceived credibility of, and intent to share political posts. *Journal of Communication* 72(5): 592–603.

Chen C-Y, Shae Z-Y, Chang C-J, et al. (2019) A Trusting News Ecosystem Against Fake

News from Humanity and Technology Perspectives. In: *2019 19th International Conference on Computational Science and Its Applications (ICCSA)*, July 2019, pp. 132–137. Available at: https://ieeexplore.ieee.org/document/8853600 (accessed 11 July 2024).

Choudrie J, Banerjee S, Kotecha K, et al. (2021) Machine learning techniques and older adults processing of online information and misinformation: A covid 19 study. *Computers in Human Behavior* 119: 106716.

Choukou M-A, Sanchez-Ramirez DC, Pol M, et al. (2022) COVID-19 infodemic and digital health literacy in vulnerable populations: A scoping review. *DIGITAL HEALTH* 8. SAGE Publications Ltd: 20552076221076927.

Christensen CL (2017) Healthy Ageing and Mediated Health Expertise. *Nordicom Review* 38(s1): 9–23.

Cinelli M, Quattrociocchi W, Galeazzi A, et al. (2020) The COVID-19 social media infodemic. *Scientific Reports* 10(1). 1. Nature Publishing Group: 16598.

Crombie IK (1996) *The Pocket Guide to Critical Appraisal*. London : BMJ Pub. Group. Available at: http://archive.org/details/pocketguidetocri0000crom (accessed 12 July 2024).

Czerniak K, Pillai R, Parmar A, et al. (2023) A scoping review of digital health interventions for combating COVID-19 misinformation and disinformation. *Journal of the American Medical Informatics Association* 30(4): 752–760.

Duval S and Tweedie R (2000) Trim and Fill: A Simple Funnel-Plot–Based Method of Testing and Adjusting for Publication Bias in Meta-Analysis. *Biometrics* 56(2): 455–463.

Ebaid D and Crewther SG (2019) Visual Information Processing in Young and Older Adults. *Frontiers in Aging Neuroscience* 11. Frontiers.

Ecker UKH, Lewandowsky S, Cook J, et al. (2022) The psychological drivers of misinformation belief and its resistance to correction. *Nature Reviews Psychology* 1(1). 1. Nature Publishing Group: 13–29.

Egger M, Smith GD, Schneider M, et al. (1997) Bias in meta-analysis detected by a simple, graphical test. *Bmj* 315(7109): 629–634.

Etienne H and Çelebi O (2023) Listen to What They Say: Better Understand and Detect Online Misinformation with User Feedback. *Journal of Online Trust and Safety* 1(5). 5.

Fernández-Aguilar L, Latorre JM, Martínez-Rodrigo A, et al. (2020) Differences between young and older adults in physiological and subjective responses to emotion induction using films. *Scientific Reports* 10(1). Nature Publishing Group: 14548.

Forgas JP (2019) Happy Believers and Sad Skeptics? Affective Influences on Gullibility. *Current Directions in Psychological Science* 28(3). SAGE Publications Inc: 306–313.

Gabarron E, Oyeyemi SO and Wynn R (2021) COVID-19-related misinformation on social media: a systematic review. *Bulletin of the World Health Organization* 99(6): 455-463A.

Gansler T, Henley SJ, Stein K, et al. (2005) Sociodemographic determinants of cancer treatment health literacy. *Cancer* 104(3): 653–660.

Gentili A, Villani L, Valz Gris A, et al. (2023) The challenge of infodemic: a scoping review of strategies to tackle health-related fake news. *European Journal of Public Health* 33(Supplement_2): ckad160.1434.

Gimpel H, Heger S, Olenberger C, et al. (2021) The Effectiveness of Social Norms in Fighting Fake News on Social Media. *Journal of Management Information Systems*. Routledge. Epub ahead of print 2 January 2021.

Glanville JL, Andersson MA and Paxton P (2013) Do Social Connections Create Trust? An Examination Using New Longitudinal Data. *Social Forces* 92(2): 545–562.

Graetz N, Woyczynski L, Wilson KF, et al. (2020) Mapping disparities in education across low- and middle-income countries. *Nature* 577(7789). Nature Publishing Group: 235–238.

Grinberg N, Joseph K, Friedland L, et al. (2019) Fake news on Twitter during the 2016 US presidential election. *Science* 363(6425). Washington: Amer Assoc Advancement Science: 374-+.

Grissom RJ and Kim JJ (2005) *Effect Sizes for Research: A Broad Practical Approach*. Effect sizes for research: A broad practical approach. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Guay B, Berinsky AJ, Pennycook G, et al. (2023) How to think about whether misinformation interventions work. *Nature Human Behaviour* 7(8). Nature Publishing Group: 1231–1233.

Guess A, Nagler J and Tucker J (2019) Less than you think: Prevalence and predictors of fake news dissemination on Facebook. *Science Advances* 5(1). Washington: Amer Assoc Advancement Science: eaau4586.

Guess AM, Nyhan B and Reifler J (2020) Exposure to untrustworthy websites in the 2016 US election. *Nature Human Behaviour* 4(5). Berlin: Nature Research: 472–480.

Gunter B, Nicholas D, Huntington P, et al. (2002) Online versus offline research:

implications for evaluating digital media. *Aslib Proceedings* 54(4). MCB UP Ltd: 229–239.

Hao K and Basu T (2020) The coronavirus is the first true social-media “infodemic”. Available at: https://www.technologyreview.com/2020/02/12/844851/the-coronavirus-is-the-first-true-social-media-infodemic/ (accessed 10 July 2024).

Harrer M, Cuijpers P, Furukawa T, et al. (2019) Dmetar: Companion R package for the guide’doing meta-analysis in R’. Available at: http://dmetar.protectlab.org/ (accessed 19 June 2023).

Hartley K and Vu MK (2020) Fighting fake news in the COVID-19 era: policy insights from an equilibrium model. *Policy Sciences* 53(4): 735–758.

Higgins JP, Thompson SG, Deeks JJ, et al. (2003) Measuring inconsistency in meta-analyses. *Bmj* 327(7414): 557–560.

Higham PA, Modirrousta-Galian A and Seabrooke T (2023) Mean rating difference scores are poor measures of discernment: The role of response criteria. *Current Opinion in Psychology* 56. Elsevier: 101785.

Hsieh J, Mirza R, Hull J, et al. (2022) UNDERSTANDING OLDER ADULTS’ FLU VACCINE HESITANCY: THE ROLE OF MEDICAL MISINFORMATION. *Innovation in Aging* 6(Supplement_1): 674.

Hu B, Ju X-D, Liu H-H, et al. (2023) Game-based inoculation versus graphic-based inoculation to combat misinformation: a randomized controlled trial. *Cognitive Research: Principles and Implications* 8(1): 49.

Jacoby LL and Rhodes MG (2006) False Remembering in the Aged. *Current Directions in Psychological Science* 15(2). SAGE Publications Inc: 49–53.

Janmohamed K, Walter N, Nyhan K, et al. (2021) Interventions to Mitigate COVID-19 Misinformation: A Systematic Review and Meta-Analysis. *Journal of Health Communication*. Routledge. Epub ahead of print 2 December 2021.

Kozyreva A, Lewandowsky S and Hertwig R (2020) Citizens Versus the Internet: Confronting Digital Challenges With Cognitive Tools. *Psychological Science in the Public Interest* 21(3). 3: 103–156.

Kozyreva A, Lorenz-Spreen P, Herzog SM, et al. (2024) Toolbox of individual-level interventions against online misinformation. *Nature Human Behaviour* 8(6). Nature Publishing Group: 1044–1052.

Larson HJ (2018) The biggest pandemic risk? Viral misinformation. *Nature* 562(7727): 309–309.

Lee NM (2018) Fake news, phishing, and fraud: a call for research on digital media literacy education beyond the classroom. *Communication Education*. Routledge. Epub ahead of print 2 October 2018.

Liberati A, Altman DG, Tetzlaff J, et al. (2009) The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *Annals of Internal Medicine* 151(4). American College of Physicians: W-65.

Lieberman A and Schroeder J (2020) Two social lives: How differences between online and offline interaction influence social outcomes. *Current Opinion in Psychology* 31. Privacy and Disclosure, Online and in Social Interactions: 16–21.

Lindenberger U and Mayr U (2014) Cognitive aging: is there a dark side to environmental support? *Trends in Cognitive Sciences* 18(1). Elsevier: 7–15.

Loomba S, de Figueiredo A, Piatek SJ, et al. (2021) Measuring the impact of COVID-19 vaccine misinformation on vaccination intent in the UK and USA. *Nature Human Behaviour* 5(3). Nature Publishing Group: 337–348.

Lu C, Hu B, Li Q, et al. (2023) Psychological Inoculation for Credibility Assessment, Sharing Intention, and Discernment of Misinformation: Systematic Review and Meta-Analysis. *Journal of Medical Internet Research* 25(1): e49255.

Lu S and Zhong L (2022) From Believing to Sharing: Examining the Effects of Partisan Media's Correction of COVID-19 Vaccine Misinformation. *International Journal of Communication* 16(0). 0: 22.

Maertens R, Götz FM, Golino HF, et al. (2024) The Misinformation Susceptibility Test (MIST): A psychometrically validated measure of news veracity discernment. *Behavior Research Methods* 56(3): 1863–1899.

Marecos J, Tude Graça D, Goiana-da-Silva F, et al. (2024) Source Credibility Labels and Other Nudging Interventions in the Context of Online Health Misinformation: A Systematic Literature Review. *Journalism and Media* 5(2). 2. Multidisciplinary Digital Publishing Institute: 702–717.

Meixler E (2017) Facebook is dropping its fake news red flag warning after finding it had the opposite effect. Available at: https://time.com/5077002/facebook-fake-news-articles/ (accessed 11 March 2022).

Mihaylov T, Mihaylova T, Nakov P, et al. (2018) The dark side of news community forums: opinion manipulation trolls. *Internet Research* 28(5). Emerald Publishing Limited: 1292–1312.

Min SJ (2021) Who Believes in Conspiracy Theories? Network Diversity, Political

Discussion, and Conservative Conspiracy Theories on Social Media. *American Politics Research* 49(5): 415–427.

Modirrousta-Galian A and Higham PA (2023) Gamified inoculation interventions do not improve discrimination between true and fake news: Reanalyzing existing research with receiver operating characteristic analysis. *Journal of Experimental Psychology: General*: Advance online publication.

Moore RC and Hancock JT (2022) A digital media literacy intervention for older adults improves resilience to fake news. *Scientific reports* 12(1): 1–9.

Mueller AL, McNamara MS and Sinclair DA (2020) Why does COVID-19 disproportionately affect older people? *Aging* 12(10): 9959–9981.

Nan X, Wang Y and Thier K (2022) Why do people believe health misinformation and who is at risk? A systematic review of individual differences in susceptibility to health misinformation. *Social Science & Medicine* 314: 115398.

Nations U (2022) *Human Development Report 2021-22*. *Human Development Reports*. 8 September. United Nations. Available at: https://hdr.undp.org/content/human-development-report-2021-22 (accessed 28 February 2023).

Nsoesie EO, Cesare N, Müller M, et al. (2020) COVID-19 Misinformation Spread in Eight Countries: Exponential Growth Modeling Study. *Journal of Medical Internet Research* 22(12): e24425.

Oliveira RM de, Sousa ÁFL de, Sousa AR de, et al. (2023) Misinformation about COVID-19 among middle-aged and older migrants residing in Brazil and Portugal. *Revista da Escola de Enfermagem da USP* 57. Universidade de São Paulo, Escola de Enfermagem: e20220401.

Oliveira RM de, Araújo AAC, Araújo PO de, et al. (2023) Agreement with COVID-19 disinformation among Portuguese-speaking older adults: an international study. *Revista Brasileira de Enfermagem* 76. Associação Brasileira de Enfermagem: e20230091.

Pakalniskiene V, Kairys A, Jurkuvenas V, et al. (2022) Could Belief in Fake News Predict Vaccination Behavior in the Elderly? *International Journal of Environmental Research and Public Health* 19(22).

Paladin M (2010) Cues of Nonverbal Communication and Persuasiveness of the Individual. *Management* 5(3). Management. - Fakulteta za Management, ISSN 1854-4223. - Vol. 5.2010, 3, p. 261-277.

Pehlivanoglu D, Lighthall NR, Lin T, et al. (2022) Aging in an 'Infodemic': The Role of Analytical Reasoning, Affect, and News Consumption Frequency on News Veracity Detection. *Journal of Experimental Psychology-Applied* 28(3): 468–485.

Pennycook G and Rand DG (2019a) Fighting misinformation on social media using crowdsourced judgments of news source quality. *Proceedings of the National Academy of Sciences* 116(7): 2521–2526.

Pennycook G and Rand DG (2019b) Lazy, not biased: Susceptibility to partisan fake news is better explained by lack of reasoning than by motivated reasoning. *Cognition* 188. The Cognitive Science of Political Thought: 39–50.

Pennycook G and Rand DG (2022) Accuracy prompts are a replicable and generalizable approach for reducing the spread of misinformation. *Nature Communications* 13(1). Nature Publishing Group: 1–12.

Pennycook G, Binnendyk J, Newton C, et al. (2021) A Practical Guide to Doing Behavioral

Research on Fake News and Misinformation. *Collabra-Psychology* 7(1). Oakland: Univ California Press: 25293.

Pennycook G, Epstein Z, Mosleh M, et al. (2021) Shifting attention to accuracy can reduce misinformation online. *Nature* 592(7855): 590–595.

Pratt JD and Wood LE (1984) Cognition and Elderly People. *Ageing & Society* 4(3): 273–304.

Robb C, Haley WE, Becker MA, et al. (2003) Attitudes towards mental health care in younger and older adults: Similarities and differences. *Aging & Mental Health*. Taylor & Francis Group. Epub ahead of print 1 March 2003. DOI: 10.1080/1360786031000072321.

Roozenbeek J, Schneider CR, Dryhurst S, et al. (2020) Susceptibility to misinformation about COVID-19 around the world. *Royal Society Open Science* 7(10). Royal Society: 201199.

Roozenbeek J, Maertens R, Herzog SM, et al. (2022) Susceptibility to misinformation is consistent across questionframings and response modes and better explained by myside bias and partisanshipthan analytical thinking. *Judgment and Decision Making* 17(3): 547–573.

Ross M, Grossmann I and Schryer E (2014) Contrary to Psychological and Popular Opinion, There Is No Compelling Evidence That Older Adults Are Disproportionately Victimized by Consumer Fraud. *Perspectives on Psychological Science* 9(4). SAGE Publications Inc: 427–442.

Sádaba C, Salaverría R and Bringué X (2023) Overcoming the Age Barrier: Improving Older Adults' Detection of Political Disinformation With Media Literacy. *Media and*

Communication 11(4). PRT: 113–123.

Saling LL, Mallal D, Scholer F, et al. (2021) No one is immune to misinformation: An investigation of misinformation sharing by subscribers to a fact-checking newsletter. *Plos One* 16(8 August).

Sitzman DM, Rheams J, Babineau AL, et al. (2022) Older and younger adults' revision of health misconceptions. *Memory* 30(2): 172–189.

Southwell BG, Machuca JO, Cherry ST, et al. (2023) Health Misinformation Exposure and Health Disparities: Observations and Opportunities. *Annual Review of Public Health* 44(Volume 44, 2023). Annual Reviews: 113–130.

Sterne JA, Savović J, Page MJ, et al. (2019) RoB 2: a revised tool for assessing risk of bias in randomised trials. *bmj* 366.

Suarez-Lledo V and Alvarez-Galvez J (2021) Prevalence of Health Misinformation on Social Media: Systematic Review. *Journal of Medical Internet Research* 23(1): e17187.

Sun Z, Cheng X, Zhang R, et al. (2020) Factors Influencing Rumour Re-Spreading in a Public Health Crisis by the Middle-Aged and Elderly Populations. *International Journal of Environmental Research and Public Health* 17(18).

Susanty S, Sarasmita MA, Sudarma IW, et al. (2023) Animated video development COVID-19 prevention and management for anxiety among older adults in Indonesia. *Geriatric Nursing* 49: 13–21.

Swire B, Ecker UKH and Lewandowsky S (2017) The role of familiarity in correcting inaccurate information. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 43(12). US: American Psychological Association: 1948–1961.

Swire-Thompson B and Lazer D (2020) Public Health and Online Misinformation: Challenges and Recommendations. *Annual Review of Public Health* 41(Volume 41, 2020). Annual Reviews: 433–451.

Tai Y and Fu K (2020) Specificity, Conflict, and Focal Point: A Systematic Investigation into Social Media Censorship in China. *Journal of Communication* 70(6): 842–867.

Tangcharoensathien V, Calleja N, Nguyen T, et al. (2020) Framework for Managing the COVID-19 Infodemic: Methods and Results of an Online, Crowdsourced WHO Technical Consultation. *Journal of Medical Internet Research* 22(6): e19659.

The United Nations (2023) World Social Report 2023: Leaving No One Behind In An Ageing World. Available at: https://desapublications.un.org/publications/world-social-report-2023-leaving-no-one-behind-ageing-world (accessed 11 July 2024).

Törnberg P (2018) Echo chambers and viral misinformation: Modeling fake news as complex contagion. *PLOS ONE* 13(9). Public Library of Science: e0203958.

van der Linden S, Dixon G, Clarke C, et al. (2021) Inoculating against COVID-19 vaccine misinformation. *eClinicalMedicine* 33.

Viechtbauer W (2010) Conducting meta-analyses in R with the metafor package. *Journal of statistical software* 36(3): 1–48.

Vivion M, Anassour Laouan Sidi E, Betsch C, et al. (2022) Prebunking messaging to inoculate against COVID-19 vaccine misinformation: an effective strategy for public health. *Journal of Communication in Healthcare* 15(3): 232–242.

Vivion M, Reid V, Dubé E, et al. (2024) How older adults manage misinformation and information overload - A qualitative study. *BMC Public Health* 24(1): 871.

Walter N, Brooks JJ, Saucier CJ, et al. (2021) Evaluating the Impact of Attempts to Correct

Health Misinformation on Social Media: A Meta-Analysis. *Health Communication*. Routledge. Epub ahead of print 10 November 2021.

Wang Y, McKee M, Torbica A, et al. (2019) Systematic Literature Review on the Spread of Health-related Misinformation on Social Media. *Social Science & Medicine* 240: 112552.

Wilhelm E, Ballalai I, Belanger M-E, et al. (2023) Measuring the Burden of Infodemics: Summary of the Methods and Results of the Fifth WHO Infodemic Management Conference. *JMIR Infodemiology* 3(1): e44207.

World Health Organization (2022) Infodemic management of WHO Information Net Work for Epidemics. Available at: https://www.who.int/teams/risk-communication/infodemic-management (accessed 26 March 2022).

Wu J (2022) Management of Health Rumor Transmission Among the Susceptible Elderly During Sudden Public Health Emergencies. *Scientific Research on Aging* 10(04): 66–77.

Wu J, Sun Y and Li HB (2019) Research on the spread of rumors in the elderly susceptible groups: information, channels and audiences. *Journal of Qingdao University of Science and Technology(Social Sciences)* 35(03): 81–87.

Wu Y and Brennan-Ing M (2023) Information Consumption, Trust Dynamics and COVID-19 Vaccine Hesitancy among Older Adults: Implications for Health Messaging. *Vaccines* 11(11). 11. Multidisciplinary Digital Publishing Institute: 1668.

Yousuf H, van der Linden S, Bredius L, et al. (2021) A media intervention applying debunking versus non-debunking content to combat vaccine misinformation in elderly in the Netherlands: A digital randomised trial. *EClinicalMedicine* 35: 100881.

Zarocostas J (2020) How to fight an infodemic. *The Lancet* 395(10225): 676.

Zerback T, Töpfl F and Knöpfle M (2021) The disconcerting potential of online disinformation: Persuasive effects of astroturfing comments and three strategies for inoculation against them. *New Media & Society* 23(5): 1080–1098.

Zhao HAO, Wayne SJ, Glibkowski BC, et al. (2007) The impact of psychological contract breach on work-related outcomes: a meta-analysis. *Personnel psychology* 60(3): 647–680.

Zhao S, Hu S, Zhou X, et al. (2023) The prevalence, features, influencing factors, and solutions of COVID-19 vaccine misinformation: a systematic review. *JMIR Public Health and Surveillance* (9): e40201.

Zheng MN (2022) Research on Discourse Spreading Space in WeChat Groups for the Elderly during Major Public Health Events. *News and Writing* (07): 65–75.

Zhou J, Xiang H and Xie B (2022) Better safe than sorry: a study on older adults' credibility judgments and spreading of health misinformation. *Universal Access in the Information Society*. Epub ahead of print 2022. DOI: 10.1007/s10209-022-00899-3.

Zhou J, Xiang H and Xie B (2023) Better safe than sorry: a study on older adults' credibility judgments and spreading of health misinformation. *Universal Access in the Information Society* 22(3): 957–966.