Psychological Interventions for Mis/Disinformation Detection: A Systematic–Narrative Review of Their Effectiveness for Older Adults

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Abstract

Misinformation and disinformation are increasingly used to deceive individuals online. Identifying such deception can be particularly challenging for older adults. It is therefore crucial to understand how older users navigate online spaces. Despite the development of several interventions aimed at enhancing people's ability to detect misinformation, their effectiveness among older adults remains underresearched. This systematic-narrative review identified interventions which target the psychological mechanisms contributing to online vulnerability and focused on their effectiveness among adults aged 50+. Searches were performed across PsycINFO, ERIC, Academic Search Ultimate, MEDLINE, Scopus, Google, and Policy Commons. Of the 1058 results retrieved, 16 articles were eligible for inclusion. Data regarding the implementation and outcome of interventions were extracted, enabling us to perform a narrative synthesis analysis. Aligning with previous research, three primary intervention types were identified: bunking, boosting, and nudging. Interventions provide mixed effectiveness among older adults but bunking programmes appear to be the most effective by facilitating discernment of both true and false content. Several interventions contributed to negative side-effects among older adults, such as an overconfidence in detection ability and decreased sharing of true information. Overall, psychological interventions provide a promising mechanism to support digital deception detection, but age-specific approaches are necessary to protect older users from the harms of false information online.

Keywords: misinformation, disinformation, older adults, psychological interventions

Introduction

Following widespread digital literacy initiatives, older adults are increasingly entering enter online spaces. Despite this, technology adoption among the oldest users remains lower than other age groups with around 2.4 million adults aged 65+ using the internet less than once a month (Age UK, 2025). Among older adults that are online, around 15% claim not to consider whether news content they see is true (Ofcom, 2024), hence they are also more likely to engage with false information unintentionally (Brashier & Schacter, 2020; Unfried & Priebe, 2024). The older population are described as ‘digitally disadvantaged’ due to this increased difficulty using technologies in comparison to younger ‘native’ users (Cui et al., 2024), and the consequences of their vulnerability are clear, with an older adult falling victim to a scam approximately every 40 seconds (Age UK, 2024).

How best for users to detect online deception such as misinformation (the spread of information not known to be false) and disinformation (the deliberate spread of falsehoods with intent to cause deceit) is unclear (Praveenkumar, 2024). Misinformation is commonly used as an overarching term to encapsulate both forms of deception, hence will be used throughout this paper to refer to both concepts. Impacts of such deception were apparent throughout the coronavirus pandemic in which health misinformation impeded vaccine intentions in the United Kingdom (UK) and the United States (US) (Loomba et al., 2021; Zhao & Tsang, 2024). Concern for older adults in particular is warranted, as a stronger belief in conspiracy theories is associated with lower willingness to get vaccinated, leaving those most at risk of illness if infected, especially vulnerable (Pakalniškienė et al., 2022). Political misinformation is also consistently implicated in unfair election outcomes, with some actors using fake news as a tactic to sway voter opinion (Lee, 2019). This is particularly salient for older adults who attain the highest voter turnout (Matsubayahsi & Lu, 2021) but can also remain loyal to political parties despite recognising those parties as contributors to misinformation (Sharevski et al., 2025). As a result, older adults possess both an objective vulnerability and awareness of the problem which makes them vulnerable to unique

challenges when operating online. To address these real-world impacts, it is necessary to understand why individuals are vulnerable to deceptive content, and how the believability of false information is influenced by psychological mechanisms underlying information processing.

Psychological Mechanisms Underlying Vulnerability

The phenomenon of misinformation can be explained through Information Manipulation Theory, which suggests that deceptive messages exploit communication mechanisms such as the quantity, quality, manner, and relevance of information (McCornack et al., 2014). For instance, false information may remove certain details (quantity), distort truths (quality), and be presented ambiguously to a specific audience (manner and relevance). Understanding these manipulative tactics is key to designing interventions which enhance people's recognition of deceptive content.

An explanation can also be sought by focusing on the receiver of the misinformation; Truth Default Theory (Levine, 2022) describes an inherent bias to believe others and when applied to an online context suggests that individuals assume content within their social media feed is authentic (Chan et al., 2025). A default to believe things as true is an adaptive process which enables passive consumption of information, with active consideration of credibility only occurring when there is reason to suspect something as untrue. This cognitively efficient process conserves the mental resources otherwise required for constant critical appraisal. Nonetheless, the truth default effect is enhanced within social media, due to social validation from other users in the form of 'likes' and 'follows' which increases the perceived credibility of content (Luo et al., 2022; Walther et al., 2022).

Drawing on Dual Processes Theory, this reliance on passive consumption reflects a 'system one' style of thinking, characterised by less critical engagement in comparison to 'system two' thinking which is more reflective (Frankish, 2010; Kahneman, 2011, Kahneman & Tversky, 1974). Social media reinforces system one thinking by relying on the rapid spread and consumption of information with minimal consideration of credibility, leaving users more

vulnerable to misinformation (Early et al., 2020). As a result, the depth and speed of cognitive processing influence how accurately individuals can discern information. Both true and false information can be complex to understand (Tavakoli et al., 2023), often leading to less consideration about accuracy and greater reliance on ease of processing. Among individuals such as older adults, reductions in processing speed and working memory make it harder to critically evaluate online content. Consequently, the rapid consumption of information on social media may further limit their ability to engage critically, increasing susceptibility to misinformation. Similarly, information overload is a strong predictor of misinformation sharing, particularly among those with low cognitive ability (Apuke et al., 2024). Nonetheless, when false information is presented in a simple manner and requires less cognitive effort to process, users have greater cognitive resources available to engage with additional content (Plass et al., 2010).

The effects of misinformation become further strengthened due to the continued influence effect, whereby falsehoods remain believable even after being corrected (Buczel et al., 2022). As such, simply labelling information as false is often insufficient to minimise its influence (Lewandowsky et al., 2012). The persistence of misinformation is compounded by confirmation biases, where users are more likely to believe information or continue to believe information which aligns with their prior knowledge (van der Meer et al., 2020; Zhou & Shen, 2022). Social media algorithms amplify confirmation bias patterns, contributing to a cycle of vulnerability in which individuals are repeatedly exposed to misinformation (Zimmer et al., 2019). Crucially, one in five internet users are unaware that algorithms influence what people view online (Ofcom, 2024) and for older adults with limited digital literacy, it may be harder to recognise when they are within an ‘echo chamber’ of repeated similar content facilitated by these mechanisms. Taken together these findings illustrate that features of social media, such as content presentation, algorithms and information overland, interact with psychological factors to play a key role in susceptibility to misinformation.

Age Related Vulnerabilities

Misinformation susceptibility among older users is often attributed to age-related cognitive changes, such as memory loss and decreased self-efficacy (Baghel et al., 2019; Freese et al., 2006) which are also associated with lower technological skills (Ikeda et al., 2022). Due to underreporting, the rates of victimisation are likely higher than reflected in the literature (Koning et al., 2025), with society-wide stigma facing older adults acting as a barrier to reporting deceit (Burton et al., 2022; Burnes et al., 2017). Similarly, ‘Data Ageism’ (the lack of data surrounding older adults' technology use) is apparent in institutions which aim to foster an inclusive digital environment (Fernández-Ardèvol & Grenier, 2024). Policies and interventions that are created based on such skewed data risk being ineffective among older adults, leaving them vulnerable to digital deception.

Nevertheless, technology supports the independence and relationships that older adults desire and technology adoption is linked to increased quality of life (Hajek & König, 2021; Long et al., 2024; Sinclair & Grieve, 2017). Consequently, users need to possess the skills to use technology effectively and the knowledge necessary to protect themselves from online deception — having such skills reduces vulnerability to crimes such as cyber fraud, in which older adults are disproportionally targeted (Kemp et al., 2023).

Although technological ability varies among adults, ageing charities consistently emphasise the need for training to reduce online victimisation (Age UK, 2020). The nature of evolving technology also requires digital literacy skills to develop in parallel. Due to cognitive decline associated with age, older adults often do not perceive themselves as capable of adjusting to these changes, with some even describing digital technology as ‘disempowering’ (Hill et al., 2015). By ensuring approaches are age-informed, training programmes should increase the confidence of older adults to engage with content safely (Barrie et al., 2021).

However, confidence should be proportional to performance to ensure that overconfidence does not affect decision-making (Lyons et al., 2021). When individuals overestimate their ability to identify false content, they may be more likely to spread false information unintentionally. The ‘nobody fools me’ perception refers to an assumption where

people believe they are less susceptible to misinformation than others, even when their actual detection ability does not support this belief (Martínez-Costa et al., 2023). Similarly, the ‘third person effect’ describes how individuals assume that others are more susceptible to misinformation than themselves (Yoo et al., 2022). These biases contribute to misplaced confidence and could reduce individuals' motivation to critically evaluate information. Accordingly, interventions should maintain the balance between confidence and detection ability to support effective learning.

Psychological Interventions to Enhance Misinformation Detection

Psychological interventions provide an appropriate strategy to enhance false information detection by targeting psychological mechanisms such as intuitive thinking, cognitive failures, and illusory truth which predispose individuals to believe deception (Ecker et al., 2022). Previous research identified various intervention categories (boosting, nudging, and bunking) which aim to reduce misinformation susceptibility by influencing these psychological functions (Gwiaździński et al., 2023; Heley et al., 2025; Roozenbeek et al., 2023).

Boosting interventions such as literacy programmes use educational tools to target an individual’s competencies and empower decision making (Hertwig & Grüne-Yanoff, 2017). Rather than inoculating against specific examples of misinformation, boosting supports increased critical thinking and long-term resilience by training general skills. Digital training and education are a common focus of policy attempts to support online behaviour and address the ‘digital divide’ (Good Things Foundation, 2024; Moore & Hancock, 2022).

In contrast, nudging interventions present a visual alert alongside online information to guide desirable choices without restricting behaviour (Hertwig & Grüne-Yanoff, 2017; Herzog & Hertwig, 2025). One example, an accuracy nudge, is a warning on a social media post that encourages people to consider the legitimacy of content (Xue et al., 2024). Therefore, nudging interventions focus on modifying attentional biases towards specific information rather than boosting general skills (Hertwig & Grüne-Yanoff, 2017). Boosting

requires greater active engagement than nudging, potentially reducing the success of these interventions among an older population. Despite this, the review by Gwiaździński et al. (2023) highlighted the possible benefits of combining approaches by illustrating that integrating nudging with techno-cognition (interfaces which support misinformation detection) may further enhance individuals' ability to identify false information.

Bunking interventions are subdivided into pre-bunking and debunking approaches. Pre-bunking interventions warn people about possible false information in an attempt to pre-empt and counteract potential harm, whereas debunking interventions retroactively counteract the effects of misinformation through corrective information (Tay et al., 2022). Pre-bunking intervention design draws on Inoculation Theory, whereby exposing users to a weakened form of misinformation, followed by corrective information, acts as a 'vaccine' against further deception (Traberg et al., 2022). Gamification based on Inoculation Theory is a common approach to tackling misinformation susceptibility and can be used to educate large numbers of online users (Kiili et al., 2024; Roozenbeek & van der Linden, 2019). Consequently, bunking is distinct from nudging and boosting, in targeting particular types of misinformation, with debunking in particular considered a specialised approach by employing corrective information to address specific instances of misinformation (Bruns et al., 2024).

Table 1
An overview of psychological intervention types

Intervention Type	How do they work?	Example
Boosting	Education and training to develop competencies	Literacy Training
Nudging	Prompts/cues to encourage people to consider the credibility of information	Warning Alerts
Bunking	*Pre-bunking:* Highlights misinformation examples and tactics prior to exposure	Gamification
	Debunking: Provides corrective information after exposure	Corrective Infographics

Cultural Influences

Technology adoption among older adults is shaped by the state of digitalisation within a country, and cultural context. Technology use tends to be higher in countries, often Westernised, at greater stages of digitalisation (Pirhonen et al., 2020). In contrast, technology adoption among older adults in less developed countries remains lower, despite improved digital literacy initiatives to address the digital divide (Choudhary & Bansal, 2022). Additionally, as outlined in Hofstede's framework (Hofstede, 2011), intervention effectiveness may operate as a function of cultural orientation. In individualistic cultures, users will be more likely to seek information individually from direct sources (Lee et al., 2013), increasing vulnerability to political misinformation through confirmation biases. Boosting interventions which prioritise individual knowledge may be particularly effective in addressing this reliance. In collectivistic cultures, users consume content shared by others with similar views to themselves, leading to higher trust in ingroup sources, hence collectivism is associated with the spread of misinformation (Lee et al., 2013). Older adults use of social media for connectedness mirrors this collectivist orientation and may explain why some older adults frequently believe falsehoods shared by friends (Sun et al., 2020). Nudging interventions which employ social cues such as likes and shares, may be particularly effective in collectivist cultures to disrupt this influence of in-group trust. More generally, these patterns highlight that alongside age; cultural context must be considered in intervention design.

Our Aims

Our review aimed to assess the extent to which psychological interventions for mis/disinformation detection are effective among older adults. We defined older adults as aged 50+ to acknowledge that age-related changes, particularly psychological changes, begin around this age (Centre for Ageing Better, 2024; Hartshorne et al., 2015). Despite a prior scoping review focusing on the efficacy of psychological interventions to detect misinformation generally (Gwiaździński et al., 2023), to our knowledge this is the first review to assess the effectiveness of psychological interventions for older adults specifically.

We defined an effective intervention as increasing the detection of misinformation but also considered its effects on behaviour and cognition. Behavioural outcomes of interest included a lower sharing rate of false information and cognitive outcomes included changes to psychological mechanisms such as critical thinking and literacy skills. Where possible we drew comparisons across age groups to consider if older adults and younger adults respond differently to certain interventions. In doing so, our review offers practical insights to inform the design of interventions which support older adults to detect and resist varying types of misinformation.

Method

Eligibility criteria

For inclusion in this review (see Table 2), articles had to consider the effectiveness of a psychological intervention to enhance older adults' (50+) ability to detect false information. The minimum age was set at 50 years to reflect the lower age boundary in studies looking at 'older adults', whilst also acknowledging that other studies define 'older' as starting at age 60 or 65 years. Our review encompassed interventions to detect both misinformation and/or disinformation due to the similarity and interchangeability of these terms. Studies were classified as psychological intervention studies if participants were exposed to a task/stimulus/programme which targeted a psychological mechanism to aid in the detection of false information. Conference abstracts, review papers, and opinion pieces were excluded to ensure our results encompassed original research reported in full, this included grey literature such as postgraduate theses where full methodological detail was available. Work published since the 1st of February 2004 was included to correspond with the start-up date of Facebook which is consistently implicated in the spread of false information (Bernal, 2018). This date was further informed by a previous review on this topic (Gwiaździński et al., 2023).

Table 2
Inclusion and Exclusion Criteria Used to Assess Article Eligibility

Inclusion Criteria	Exclusion Criteria
Sample includes individuals aged 50+ and age is considered in the analysis of intervention effectiveness	Sample only includes individuals under the age of 50
An intervention study, using a manipulation/intervention to help participants detect a form of digital mis/disinformation	Does not have a focus on a form of online mis/disinformation
Published between 4th February 2004 to 31st December 2024 (20 years and 11 months)	Data cannot be aggregated by age to identify older adults
Including Grey Literature such as postgraduate theses	Does not consider age as a factor when looking at effectiveness of the intervention
Written in English	Reviews, conference abstracts and study protocols
Empirical research using qualitative, quantitative, or mixed-methods designs	Duplicate publications
Including papers aimed at developing or testing a measure	Studies without a psychological intervention/manipulation targeting misinformation/disinformation detection
	Published before 4th February 2004 or after 31st December 2024
	Not written in English

Information Sources

Searches were conducted in EBSCOhost using a predetermined set of search strategies specific to each database (PsycINFO, ERIC, Academic Search Ultimate, MEDLINE Complete), by using subject headings and abstract terms. An additional grey literature search was performed in Policy Commons and the first 200 results in-order of relevance were extracted to encompass reports from varying disciplines. The first 50 results of a Google search were also screened. The date of the last search for each database was 6th January 2025. Searching these sources allowed us to identify research at varying stages of publication to somewhat mitigate publication bias. We adopted the PRISMA 2020 guidelines for systematic reviews (Page et al., 2021) and to ensure transparency and

replicability, our pre-registration, search strategies, query strings, and results are available on the OSF (https://osf.io/rd5j2/). See Supplemental Materials for PRISMA checklist.

Selection Process

Screening was performed manually in Zotero by a single reviewer. Records were screened by title, abstract, and full text with in-text searching for ‘age’, ‘older’, and ‘younger’ to identify discussion of age. In addition, we also identified where authors had grouped participants into age categories. While most studies explicitly labelled participants as ‘older adults’, in cases where categories were not defined, we assigned the label of older adults to participant groups with a minimum age of 50. The number of results excluded at each stage was documented (see Figure 1). In a minor deviation from the preregistered exclusion criteria, conference abstracts were excluded, but full conference papers with adequate methodological detail were retained for full text screening. A substantial portion of misinformation research was excluded due to exclusively sampling participants under the age of 50 or failing to report age specific outcomes, therefore limiting its relevance to this review.

Data Collection Process

Manual data collection from all eligible articles was performed using a pre-designed spreadsheet in Microsoft Excel by a single reviewer. All results which were compatible with each outcome were sought from each study, including from within any supplementary material.

Pilot Extraction

A pilot of five articles allowed the reviewer to familiarise themselves with the extraction tool and assessment method. This also enabled the reviewer to ensure the data extraction tool was effective.

Data Items

Our primary outcome of interest was the intervention effect on the mis/disinformation detection ability of older adults. Second to this, we considered effects on cognition such as critical thinking and behavioural outcomes such as information sharing. Furthermore, we extracted data relating to the following: article details (e.g., year and country of publication), participants, intervention details (e.g., mode of delivery and length), mis/disinformation definitions and task, evaluative points and additional details. Cases where information could not be obtained were labelled as ‘can’t tell’ in the data extraction sheet.

Synthesis Method

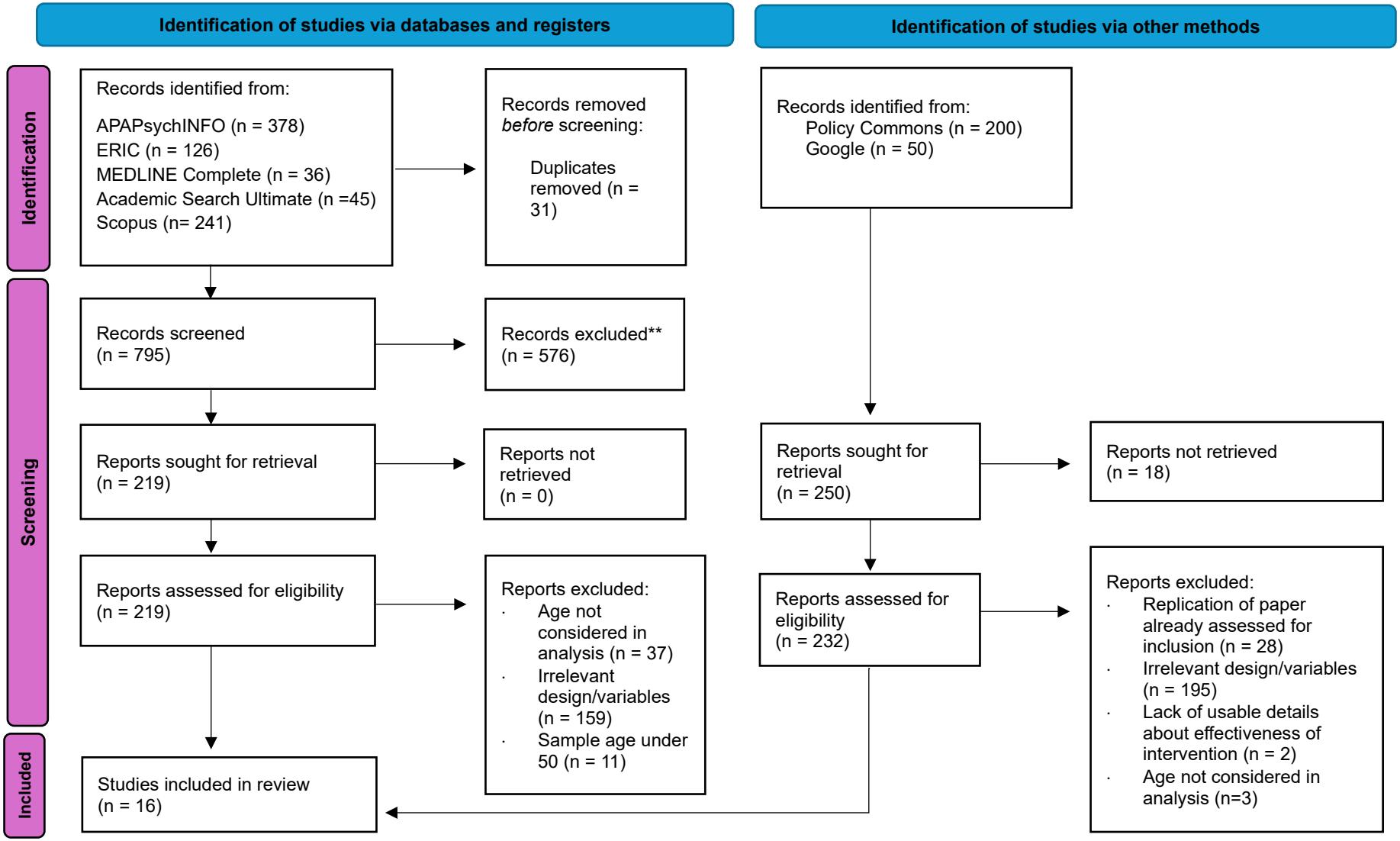
A narrative systematic approach was adopted, informed by the frameworks from Popay et al. (2006) and Turnbull et al. (2023). These frameworks guided the grouping of studies by theme, such as intervention type. This approach was necessary due to the variety of age groups across studies which result from varying definitions of ‘older adults’. Additionally, the review integrates qualitative and quantitative research whilst considering contextual factors that influence effectiveness. A narrative approach enabled us to encapsulate these differences across research design, whilst the systematic nature of searching and reporting enhances the transparency and replicability of findings.

Study Risk of Bias Assessment

Due to these expected variations in interventions and methodology, the 2018 version of the Mixed Methods Appraisal Tool (MMAT) was implemented to evaluate each article (Hong et al., 2018). A single reviewer categorised the design of each article before assessing its quality across five criteria specific to that design. The MMAT allowed us to detect trends in methodological quality, and we anticipated trends to be reflective of research into older age groups, such as lower sample sizes (Quine & Browning, 2007). To ensure transparency, all scores have been documented in Excel and are available on the OSF. Additionally, the MMAT was incorporated in our pilot to allow practice and ensure consistency by our reviewer.

Figure 1

A PRISMA flow diagram to show the study selection process at each stage of screening



Results

The final sample (*N*=16) contains various intervention types, categorised into bunking (*n*=9), boosting (*n*=5) and nudging (*n*=2). Across the literature, older adults generally benefited from psychological interventions, particularly those based on bunking and boosting approaches (see Table 4). Ten studies enabled direct comparisons across age groups, with older adults outperforming younger adults in four of these articles. As shown in Table 4, multiple studies reported negative outcomes among older adults, such as overconfidence and scepticism in true news. In addition, despite refining our search to literature published from 2004 onwards, our earliest eligible article was from 2017. Research was conducted in a variety of countries, with a quarter of the studies conducted in the US, and a quarter consisting of cross-cultural work (see Table 4). The majority of studies sampled participants aged 50+ (10/16) but the highest age threshold for 'older adults' was set at 65+ (2/16).

Table 3

Quality Assessment Summary from Mixed Methods Appraisal Tool (MMAT)

Study Design	Number of Articles	Quality Notes
Qualitative	1	· exploratory approach · limited detail in results
Randomised Controlled Trials	8	· blinding not reported · high attrition in some studies · unclear intervention adherence · participation randomisation performed adequately
Non-randomised	6	· confounding variables mostly accounted for · used evidence-based measures
Quantitative Descriptive	1	· use of snowball sampling · covariates considered in analysis

Table 4

Summary of each article included in the review and main outcomes of interest

Category	Authors	Year	Country/Context	Intervention	Sample Size (50+)	Older Adult Age****	Design	Did older adults benefit? *	Did older adults outperform YA?	Did the intervention lead to negative consequences in older adults?
Bunking	Roozenbeek & van der Linden	2019	UK	Pre-bunking BadNews Game	~940**	50+	Non-randomised	✓	✗	✗
	Roozenbeek et al.	2020	Sweden, Germany, Greece & Poland	Pre-bunking BadNews Game	~1421**	50+	Non-randomised	✓	✗	✗
	Leder et al.	2024	South Africa, UK & Mexico	Pre-bunking BadNews Game + Feedback	5	50+	Randomised Controlled Trial	✓	✗	✗
	Lees et al.	2023	US	Pre-bunking Spot the Troll Quiz Game	937	60+	Randomised Controlled Trial	✓	✗	✓
	Yousuf et al.	2021	Netherlands	Debunking, Scripts & social norm modelling	N/A	60+	Randomised Controlled Trial	✓	♦	✗
	Craig & Vijaykumar	2023	UK	Debunking, Infographics	237	55+	Non-randomised	✓	✓	✗
	Vijaykumar et al.	2021	UK & Bazil	Debunking, Infographics	729	55+	Randomised Controlled Trial	✓	✓	✓
	Kessler & Bachmann	2022	Germany	Debunking, Images & Text	329	50-59, 60-74	Randomised Controlled Trial	✓	✗	✓

Category	Authors	Year	Country/Context	Intervention	Sample Size (50+)	Older Adult Age****	Design	Did older adults benefit? *	Did older adults outperform YA?	Did the intervention lead to negative consequences in older adults?
	Swire	2017	Australia	Debunking, Familiarity & Detailed Corrections	109	50+	Randomised Controlled Trial	✓	♦	✗
Boosting	Moore & Hancock	2022	US	MediaWise for Seniors Course	381	50+	Non- randomised	✓	♦	✗
	Sádaba et al.(a)	2023	Spain	Media Literacy Course	87	50+	Non-randomised	✓	♦	✓
	Sádaba et al. (b)	2023	Spain	Media Literacy Course	87	50+	Non-randomised	✓	♦	✗
	Polacow	2023	US	Comic Strip	89	50-65	Randomised Controlled Trials	✗	✓	✗
	Giannakopoulou et al.	2023	Slovenia	Gamification Design/Living Labs	45***	65+	Qualitative	✓	♦	✗
Nudging	Xiang et al.	2024	China	Accuracy nudges	80	50+	Quantitative Descriptive	✓	✗	✓
	Huff & Umanath	2017	US	Increasing Warnings + Examples	87	65+	Randomised Controlled Trials	✓	✓	✗

Note. ✓= yes, ✗ = no, ♦ = didn't sample younger adults. YA= Younger adults. * = 'Benefit' refers to improvements in misinformation detection, cognition, or behaviour. N/A = aged 50+ sample size not specified. ** = estimated based on supplementary data available. *** = Results based on Slovenian pilot only.

Intervention Types

Bunking Interventions

The largest category identified was bunking interventions (n = 9/16 papers), which consisted of pre-bunking and/or debunking approaches to correct misinformation at different time points. Pre-bunking interventions adopted a gamification approach to apply principles of Inoculation Theory (Traberg et al., 2022), whereas debunking interventions relied on visual forms of corrective information such as infographics.

Pre-Bunking. Older adults may benefit less than younger adults from games which are designed for a younger population. Three out of four pre-bunking studies used the game 'BadNews' which inoculates individuals against deception strategies by requiring participants to adopt the role of a scammer (Leder et al., 2024; Roozenbeek & van der Linden, 2019; Roozenbeek et al., 2020). In the US, the game led to a significant reduction in reliability ratings of Tweets containing the deception strategies with minimal variation across age groups (Roozenbeek & van der Linden, 2019) and this finding replicated across players from Sweden, Germany, Greece, and Poland, with an effect size of d= 0.37 (Roozenbeek et al., 2020). Crucially, the intervention did not increase scepticism towards real news, as participants' ratings of credible items remained unchanged (Roozenbeek et al., 2020). However, older participants showed smaller improvements in discerning the reliability of fake news compared to younger adults ($\beta = –0.082$, $p < 0.001$). The authors suggested this difference was due to the game design targeting younger users aged 15-35, and potential gaps in literacy skills among older adults (Roozenbeek et al., 2020). Some design features did enhance performance, as participants who received helpful feedback after gameplay rated misinformation as less reliable and real news as more reliable than those who didn't receive feedback, demonstrating greater discriminability of information (Leder et al., 2024). Moreover, the intervention produced a sustained effect across age groups, as evidenced by greater discriminability of information up to one week post playing, particularly among those in the feedback condition (Leder et al., 2024). The final pre-bunking study used a 'Spot the

Troll Quiz' game which required players to identify inauthentic Twitter accounts (Lees et al., 2023). The game was effective across age groups, however older adults (60+) were less accurate than younger adults when classifying real and fake accounts. This finding indicates age disparities in ability to spot the fake accounts which disseminate false information (Lees et al., 2023). Crucially, this article also assessed possible cross-protection effects and found that awareness of inauthentic accounts leads to increased scepticism of headlines, including among older adults. Overall, pre-bunking by gamification provides a promising approach to tackling misinformation susceptibility, but age-related differences in digital literacy, and game design, can limit its effectiveness among older adults.

Debunking. Debunking relies on participants accepting that new information should replace previously encountered content, hence trusted figures play a pivotal role in delivering corrective information. Yousuf et al. (2021) identified that combining debunking scripts with social norm modelling and accurate information led to a greater rejection of vaccine myths and increased confidence in governmental messaging, in comparison to conditions lacking one or more of these elements. As the debunking scripts were delivered by well-known scientists, this reinforces the role of reliable sources to successfully distribute corrective information. Moreover, these findings highlight the use of debunking to convey important corrective health messages to older adults, an age group who are particularly at-risk from disease transmission.

Extending the concept of trusted figures to organisations, two articles analysed the effectiveness of infographics from the World Health Organisation. Both Craig and Vijaykumar (2023) and Vijaykumar et al. (2021) found that older adults (55+) in the UK performed better on misinformation detection tasks than younger adults. Craig and Vijaykumar (2023) described older adults' high baseline performance as a 'ceiling effect', which limited the extent to which the intervention could improve their misinformation detection. Corrective infographics supported accurate ratings of credibility, and reduced user willingness to share misinformation, but these effects weakened following a second exposure to misinformation.

Vijaykumar et al. (2021) provided a cross-cultural comparison by sampling adults in Brazil and the UK. In the UK, corrective information occasionally led to increased misinformation belief among older adults, indicating a backfire effect. In Brazil, corrective information did reduce belief in misinformation, but this reduction was not statistically significant. Corrective information was consistently rated as more credible and more likely to be shared. Older adults experienced this effect more strongly in comparison to younger adults. Hence, Vijaykumar et al. (2021) highlight that older adults consider corrective information as more credible, in turn strengthening the behavioural response of sharing the information. However, the evidence from Craig and Vijaykumar (2023) highlights that repeated corrective information may be necessary for effective debunking.

Another study which analysed the use of visual media also identified potential backfire effects among older adults. Kessler and Bachmann (2022) identified that using different image types (no image, machine-technical image, image of an expert, diagrams) did not increase the persuasive power of corrective information. Instead, online articles, particularly those rated as more credible and viewed for longer, had a greater corrective effect. However, in some cases myth belief increased among older adults (aged 60-74) following exposure to a correction, therefore indicating a backfire effect. This finding raises concerns for certain users, as corrective information may inadvertently reinforce misinformation.

Moving on from visual methods, one article considered the level of detail which should be provided in corrective information (Swire et al., 2017)**.** Debunking strategies were strengthened by providing detailed information, hence Swire et al. (2017) concluded that misinformation corrections should state why misinformation is inaccurate to promote long-term belief change. After reading corrective information, participants' belief in facts increased while belief in myths decreased, demonstrating initial effectiveness. When considering the durability of effects, the increased belief in facts remained sustained over a one-week period. Further analysis identified that participants aged 50–64 were better able to maintain

corrected beliefs than those aged 65+, particularly after a three-week period. Overall, while detailed explanations helped reduce misinformation belief among adults age 50+, this benefit was reduced among those in the oldest age group.

Boosting Interventions

Boosting interventions aimed to increase individuals' competency to detect misinformation by enhancing literacy skills and knowledge about misinformation. These interventions consistently lead to improved discernment of both true and false content, and four out of five articles exclusively recruited older adults.

A structured online course taught digital skills such as lateral reading [1] to older adults aged 50+ (Moore & Hancock, 2022). This course led to improved truth discernment and misinformation detection. Participants experienced a significant increase in the likelihood of performing research before discerning the veracity of a headline, demonstrating a greater use and understanding of the skills. Drawing influence from Moore and Hancock (2022), Sádaba et al. (2023a) implemented a media literacy project to teach techniques and digital skills. Engagement with at least five sessions had a positive impact on the discernment of true information but produced smaller improvements in identification of false headlines**.** Participation in the literacy project did support judgement confidence, however this was interpreted as overconfidence due to detection accuracy not necessarily improving. The media literacy project also enhanced recognition of political bias within headlines by reducing polarised thinking to facilitate decision making which was less swayed by participants' own political views (Sádaba et al., 2023b).

Other interventions emphasised the role of visual media to support misinformation detection. A comic strip intervention did not significantly improve misinformation detection in comparison to a text-based or control condition (Polacow, 2023). However, older adults were

[1] Lateral reading refers to the process of evaluating information credibility by leaving the webpage to see if other sources support or contradict the information.

significantly better than younger adults at detecting misinformation when exposed to the comic strip and reported significantly higher trust and acceptance of the comic strip in comparison to the text condition. Similarly, the ‘FiDo’ project used a game ‘Authenticity’ to enhance older adults’ (65+) critical thinking and fact checking skills (Giannakopoulou et al., 2023). By allowing older adults an active role in intervention design, ‘Authenticity’ is an example of an age-informed strategy with the target population as its core consideration. Older adults displayed enthusiasm for the game and fact checking sources whilst debating the concept of fake news. Some participants found false information stimuli too easy to discern, but the game was realistic by representing how fake news is encountered online. This project provides insights into the usefulness of gamification whist highlighting the value of focus groups to design usable interventions.

Nudge-Based Interventions

Only two studies analysed nudge-based interventions, with each focusing on different forms of nudges to alter behaviour. Xiang et al. (2024) examined accuracy nudges and Huff and Umanath (2017) considered how increasing warning strength affects misinformation detection accuracy. Xiang et al. (2024) found that older adults (50+) exposed to an accuracy nudge rated true and false information as more credible compared to younger adults, reflecting a generalised trust but reduced ability to discriminate between true and false information. The nudge led to increased reading of articles before rating headline credibility, although older adults demonstrated this reading behaviour less frequently than younger adults. The accuracy nudge also led to a decrease in engagement with both true and false information, indicating a general reduction in sharing behaviour rather than a specific decrease in misinformation sharing. In contrast, Huff and Umanath (2017) identified that increasing warning intensity, by providing examples of additive and contradictory misinformation, improved younger adults’ detection accuracy but had less impact on older adults. This lower influence on older adults was likely due to their higher performance at baseline, particularly when identifying contradictory misinformation. These findings illustrate

an age-related propensity to spontaneously monitor for errors, which supports misinformation detection.

Discussion

The aim of this review was to analyse the effectiveness of psychological interventions to enhance older adults' ability to identify misinformation. We classified interventions into categories of nudging, boosting, and bunking to highlight how these approaches can enhance misinformation detection. Studies considered interactions with a range of social media sites, with the most common being Facebook, X (formerly known as Twitter), and WhatsApp. We observed that research surrounding this topic became increasingly prevalent from 2017 onwards, coinciding with real-world events such as political campaigns including Brexit and the US elections in 2016, and later propelled by the coronavirus pandemic. In turn, the interventions predominantly focused on addressing either health (vaccine) or political misinformation, highlighting that research is aiming to address the main topics of concern reported by older adults (NewsGuard, 2023). An increase in attention around 2017 to 2020, also aligns with figures indicating the proportion of adults age 75+ regularly accessing the internet almost doubled from 2013 to 2020 (Office for National Statistics, 2020).

Do older adults benefit from psychological interventions?

Across the review, interventions consistently improved misinformation detection, with all the bunking studies, four out of five boosting studies and both nudging studies producing some benefit among older adults. This pattern reinforces the potential value of applying bunking, boosting, and nudging interventions to enhance older adults' detection of misinformation. Similarly, we identified a trend in the psychological mechanisms targeted by interventions, with a consensus that critical thinking is a key factor underlying susceptibility.

Bunking interventions, specifically debunking interventions, are influenced by user perceptions of the actor delivering the intervention. Hence, is it recommended for corrective

messages to be conveyed by actors that an audience will trust (Lewandowsky et al., 2020). This review aligns with these recommendations by showcasing the use of trusted figures and organisations to distributed corrective information (Orr, 2024). As older adults have a higher propensity to trust others (Bailey & Leon, 2019), endorsement of corrective information by influential people could further facilitate debunking effectiveness among this age group (Yousuf et al., 2021). Despite these applications, Craig and Vijaykumar (2023) highlight that the effect of corrective information is limited if participants encounter subsequent misinformation. This is particularly worrying due to the possible Illusory Truth Effect associated with repeat exposure, where familiarity increases perceived accuracy (Udry & Barber, 2024; Vellani et al., 2023). Given that repeated misinformation exposure is likely in real content consumption (van der Linden, 2022), there is a need for debunking interventions to provide sustained beneficial effects against misinformation.

When considering a pre-emptive approach, pre-bunking through gamification was effective across age groups and cultures, with enhanced detection if feedback is provided (Leder et al., 2024). Teaching inoculation techniques also enables individuals to learn deception strategies, supporting the understanding of mechanisms outlined in Information Manipulation Theory such as the manner in which impersonation occurs (McCornack, 2014). Targeting these competencies aids in the development of a cross-protection effect whereby participants can discern different forms of misinformation (e.g., health and political content). Crucially, this facilitates an effectiveness beyond experimental conditions and stimuli. When considering additional benefits such as cost effectiveness and widespread application (Kiili et al., 2024), pre-bunking gamification presents itself as a useful strategy to enhance false information detection across populations. Conversely, requiring users to adopt the role of a scammer could enable people to learn and misuse these skills to generate their own deceptive content (Roozenbeek et al., 2019). This risk is somewhat mitigated as the game doesn’t teach people to benefit financially or politically from the deception but should still be

acknowledged in intervention design. Moreover, pre-bunking through gamification may have limited reach among older adults, therefore limiting its application among vulnerable users.

Boosting interventions led to positive effects on detection accuracy, cognition, and behaviour (see Table 4). Boosting consistently supported the discernment of true headlines (Sádaba et al., 2023a), whilst also facilitating research behaviour in which participants consulted sources before deciding whether to share a headline (Moore & Hancock, 2022). This illustrates a dual outcome and showcases how both behavioural and cognitive changes are key to curb the spread of false information. In addition, the benefits of incorporating feedback as demonstrated in a pre-bunking game (Leder et al., 2024), mirrors techniques used in boosting interventions to target domain-specific competences (Hertwig & Grüne-Yanoff, 2017). Therefore, these findings also highlight possible benefits to combining boosting and pre-bunking interventions. Besides improving detection accuracy, Polacow (2023) provides evidence that boosting interventions are perceived as more trustworthy and useful among older adults and are widely accepted by individuals with lower literacy skills. However, potential downsides of boosting included an overconfidence among older adults and substantial rates of attrition (Sádaba et al., 2023a). Boosting may also only be effective among older adults with the capability to intake the information, reinforcing the role of tailored education further.

Conclusions surrounding the effectiveness of nudge interventions were also mixed. Although nudge interventions did support misinformation detection, the finding that adults wrongly judge more true information as credible in Xiang (2024) contradicts Huff and Umanath's (2017) findings that older adults have an existing detection ability prior to the intervention. Accordingly, nudge interventions may be less effective for older adults who are naturally more vigilant, but unobservant older adults may still benefit. Additionally, educational and cognitive factors should be considered to counteract possible negative effects on truth discernment due to evidence that nudges can prime a generalised distrust in all news content. Finally, nudges only provide a surface level approach, and don't address

deeper level processing which are needed to consistently detect and resist misinformation across contexts.

Furthermore, the contradictory findings identified across nudge interventions may be due to underlying differences in task design and the emotional salience of stimuli. While Huff and Umanath (2017) focused on misinformation about fictional stories, Xiang (2024) examined COVID-19 misinformation which was highly relevant and likely more emotionally salient. Misinformation is often emotive to increase persuasion (Ecker et al., 2022), particularly when promoting anti-vaccine views, and older adults may response differently to neutral and emotionally salient misinformation. Therefore, greater attention to the role of emotion is necessary, as stronger nudges may be needed to address misinformation of particular emotional salience.

Negative Outcomes for Older Adults

Several interventions lead to negative consequences (see Table 4), which contributed to worse discernment (Kessler & Bachmann, 2022; Vijaykumar et al., 2021) or decreased sharing of true information (Xiang et al., 2024). This influence on true information aligns with existing suggestions that interventions increase scepticism of content (Hoes et al., 2024; Lees et al., 2023), and such unintended consequences remain understated (Roozenbeek et al., 2024). Scepticism may be greater among older adults due to lower levels of confidence when using technology (Wilson et al., 2023), thus could account for why younger ‘native’ users did not consistently illustrate similar trends. Although scepticism could act as a protective factor against deception, we suggest interventions should facilitate the rejection of false information and acceptance of true information. By supporting engagement with both types of information, novel true information can still receive sufficient attention online, even though false information tends to spread quicker (Vosoughi et al., 2018).

Did older adults and younger adults perform differently on detection tasks?

Among studies that sampled across age groups, six out of ten reported that older adults either performed worse on misinformation detection tasks or showed less

improvement following intervention (see Table 4). This lends support to suggestions that older adults are vulnerable online (Brashier & Schacter, 2020), but we also identified several challenges to this assumption. For instance, older adults were spontaneously more vigilant for misinformation (Huff & Umanath, 2017) and less vulnerable to health misinformation (Craig & Vijaykumar, 2023). A decreased vulnerability to health misinformation could be explained by older adults' more frequent interactions with health services, leading to greater familiarisation with trustworthy information sources. In addition, the higher detection ability of older adults in Polacow (2023) could be linked with positive perceptions of the comic strip itself, highlighting how participant experience interacts with intervention outcomes. Accordingly, while older adults are easily perceived as more vulnerable by society, we should consider lived experiences which may provide specific strengths in identifying information relevant to themselves. This may serve as a protective factor against deception.

Did psychological interventions improve older adults' confidence?

Confidence and self-efficacy are known to influence older adults' engagement with technology (Berkowsky et al., 2017; Wilson et al., 2023), but these factors were considered minimally in the literature. Aligning with previous research, older adults reported low levels of self-efficacy which did not improve following pre-bunking (Lees et al., 2023). One potential approach to improve self-efficacy, is the provision of structured encouragement by incorporating feedback (Leder et al., 2024). However, our review also identified that older adults can be susceptible to overconfidence (Sádaba et al., 2023a), as participants falsely believe that partaking in an intervention has improved their misinformation detection ability. This finding aligns with recent evidence that increased exposure to fake news can contribute to an overconfidence where participants incorrectly presume their familiarity with misinformation has improved their detection ability (Altay et al., 2025). In conclusion, ensuring competence can foster confidence without leading to overconfidence is vital to intervention design and aligns with recommendations for more audience tailored interventions (Roozenbeek et al., 2024).

Contextual Considerations

Several studies collected data during the coronavirus pandemic and focused on vaccine misinformation (Rathore & Farooq, 2020). As the pandemic is labelled an ‘infodemic’ (Sasidharan et al., 2020), data collected may not be representative of the digital age today (Yousuf et al., 2021). Similarly, technological shifts across society may shape false information detection. Several studies were published in 2023, during which there was increased public discourse surrounding newer technologies (Qi et al., 2024) and research conducted during this period may be confounded by individual factors such as participant knowledge, awareness, and experiences with technology.

Our review also encapsulates evidence from a variety of countries; hence cultural differences could account for some variation in our findings. For example, despite both Moore and Hancock (2022) and Sádaba et al. (2023a) implementing digital literacy programmes, Sádaba et al. (2023a) identified smaller improvements in the detection of false headlines. This discrepancy could be due to cultural context and differences between their Spanish and American samples, which aligns with evidence that technology use differs across countries (Lee et al., 2013; Skare & Soriano, 2021) and reinforces the need for culturally sensitive approaches consider cultural dimensions (Hofstede., 2011). In particular, the majority of research was conducted in Western countries such as the UK or US which potentially limits the generalisability of findings. Although cross-cultural research supported the use of the pre-bunking game ‘BadNews’ (Roozenbeek et al., 2020), additional work which did not meet our eligibility criteria due to having a 40+ age group found that these positive effects did not replicate in Singapore (Wong & Wu, 2023). Whilst it is possible the slightly younger older adult age group contributed to these differences; it is likely that the cultural context influenced the effectiveness of the intervention. In addition, Vijaykumar et al. (2021) identified effects on truth discernment were particularly strong in the UK in comparison to Brazil, further demonstrating how intervention effects differ in non-Western settings where information-sharing behaviours and technology use differ. Blair et al. (2024)

suggest that interventions designed for Western settings, particularly boosting interventions, may not be effective among other populations without significant adaptation. Overall, as interventions should be targeted towards the population they intend to support, there is a need for greater cultural understanding to tailor interventions to specific audience characteristics (Roozenbeek et al., 2024).

Recommendations

1) Recruitment should focus on older adults across a wide age range, including those age 50 to those over 70. Treating age as a continuous variable, can allow greater consideration of subgroup behaviour to address our limited understanding of those over 70. To address low sample sizes inherent to research with older adults, researchers should actively recruit larger samples, containing those who are less active and offline. This will help to overcome the selection bias caused by online recruitment which excludes some of the most vulnerable individuals. Plus, obtaining larger and more representative samples will support a greater generalisability of findings.
2) To enhance transparency, researchers should report full outcome data including details surrounding attrition. When a participant fails to complete an intervention, researchers should seek to understand why, to assess if this was due to intervention usability. During our quality assessment we noted that intervention studies are limited due to difficulty identifying if participants engaged with the intervention as desired. By including attention checks and measuring engagement, researchers can better identify if participants are participating fully in the intervention. This may be particularly necessary among older adults who experience experimentally induced fatigue (Jacelon et al., 2007).
3) Whilst assessing the implementation of psychological interventions, researchers should also gather cultural data in parallel to identify the populations for which the

intervention appears effective or ineffective. Greater understanding of this effectiveness will help assess generalisability across contexts.

4) Overall, improving methodological quality through areas such as recruitment, will aid in addressing data ageism and strengthen the literature for future intervention design.
5) Beyond these methodological recommendations, future interventions should be age informed by acknowledging older adults' cognitive and digital requirements. This will aid in improving accessibility, relevance, and alignment between confidence and accuracy to ensure older adults are adequately supported.

Future Research

Psychological interventions should foster sustained cognitive and behavioural outcomes to reduce susceptibility to deception over time. However, it remains unclear if older and younger adults benefit equally from psychological interventions long-term. Within our review we identified conflicting conclusions, with older adults struggling to maintain their disbelief in misinformation following debunking (Swire et al., 2017) but showing a sustained detection ability one week after pre-bunking (Leder et al., 2024). Durable effects may be harder to foster among older adults with age-related memory decline, aligning with suggestions that memory is a core process underlying susceptibility (Swire-Thompson et al., 2023). Roozenbeek et al. (2024) highlight the need for research to assess the decay of effects, hence research could consider how interventions interact with constant misinformation exposure to ensure protection beyond the experimental setting. Future research must consider how age interacts with further individual differences such as self-efficacy and experience. By recognising the unique challenges facing older adults and addressing intersectional factors, interventions can address potential barriers and acknowledge subgroups for equitable impact. In addition, more research is necessary to identify how lab-based interventions translate into real world effectiveness, as the extent to which these intervention effects generalise across misinformation type/topic remains unclear.

We join the growing number of researchers calling for greater efforts to enhance individuals' ability to recognise deceptive strategies more broadly, rather than addressing singular instances of misinformation.

Considerations of the Review

The reviewer followed PRISMA guidelines to maintain replicability and transparency (Page et al., 2021), hence all data relating to the project is accessible (https://osf.io/rd5j2/). Due to the rapidly evolving nature of misinformation research, it is possible that new work has since been published, and ongoing updates of this evidence base are necessary as the population continues to age. We acknowledge the use of a single reviewer as a limitation and controlled for this by completing a pilot extraction and using Zotero to document each stage of the screening process. Due to the narrative nature of the review, no formal reporting bias or certainty of evidence has been assessed. The findings should be interpreted with the acknowledgement that reporting bias may influence results, although this issue was partially controlled for this through the searching of grey literature.

Conclusion

Our review highlights that psychological interventions, particularly boosting and bunking approaches, are effective in improving older adults' ability to detect misinformation. Nudging interventions showed fewer promising results and may be less impactful for older adults who possess existing detection abilities. Crucially, interventions should aim to foster a deception detection ability which is proportional to confidence, thereby addressing issues of overconfidence. Current evidence is limited by a lack of understanding regarding the older adult age group age 70+, who make up a vast number of online users. As such, future research should aim to address this underrepresentation whilst also assessing the long-term effectiveness of interventions. We suggest that interventions should adopt a dual focus approach to support the detection of both true and false content and provide benefits for both cognition and behaviour. Given the different types of misinformation and severity of associated deception, it is crucial to acknowledge that a one-size fits all approach will not

work. Due to the interaction between culture and technology use, interventions should be tailored to the context and culture in which they are intended to operate. Overall, this will help ensure psychological interventions are an effective method to support older adults to detect deception in the digital age.

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Nightingale: Supervision; writing - review & editing. Faraz Ahmed: Supervision; writing - review & editing. Trevor Crawford: Supervision; writing - review & editing.

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