Australian Government

Information resilience

The impact of mental and physical health on resilience to misinformation

A report prepared by the Australian Academy of Science and the Australian Academy of Health and Medical Sciences for the **National Science and Technology Council**

chiefscientist.gov.au

Copyright

Disclaimer

The purpose of this publication is to provide an evidence base on information resilience for policy makers.

The Commonwealth as represented by the Department of Industry, Science and Resources has exercised due care and skill in the preparation and compilation of the information in this publication.

The Commonwealth does not guarantee the accuracy, reliability or completeness of the information contained in this publication. Interested parties should make their own independent inquires and obtain their own independent professional advice prior to relying on, or making any decisions in relation to, the information provided in this publication.

The Commonwealth accepts no responsibility or liability for any damage, loss or expense incurred as a result of the reliance on information contained in this publication. This publication does not indicate commitment by the Commonwealth to a particular course of action.

Contents

Executive summary

This report addresses the question: 'How can knowledge about the physiological underpinnings of trust be used to enhance resilience to mis and disinformation?'

- Understanding the brain processes involved in developing and experiencing trust in information sources provides insights into why people may believe and share misinformation.
- Trust is not an isolated function of one specific brain region or circuit. It is complex and involves multiple brain regions and processes.
- Individual and collective information resilience is underpinned by social cohesion and connectedness, adequate cognitive functioning, and healthy emotional regulation.
- Mental health and information resilience exhibit a reciprocal relationship: poor mental health can increase susceptibility to misinformation, and misinformation can exacerbate poor mental health.
- Given that around 1 in 5 Australians report being diagnosed with depression, anxiety or another mental illness at some point in their lifetime, better prevention, support, treatment and awareness of such conditions could boost Australia's collective information resilience.
- Social connectedness is key to cultivating both mental health and information resilience. Loneliness/isolation can worsen mental health and, in turn, susceptibility to misinformation as feedback and moderation by others is removed.
- Healthy individuals are better equipped to navigate society, including their capacity to identify and critique misinformation. Consequently, enhancing physical and mental health through exercise, sleep, and nutrition may also indirectly support resilience, for instance, by improving emotional regulation and cognition.
- Emerging evidence suggests there may be potential indirect benefits to information resilience through interventions such as mental health programs, physical health interventions that improve cognition, mindfulness training, and cognitive behavioural therapy. However, research on the direct impact of these on information resilience is limited; therefore, links between these remain speculative.

Key terms

The concepts of misinformation, disinformation, information resilience and trust were defined in *Information resilience: How misinformation undermines social cohesion, trust and democracy* (Platow et al. 2026). For the purposes of this report, some of these definitions have been updated so that they are more specific to the content of this report and the brain processes identified.

Misinformation is false or misleading information spread regardless of the intent to mislead. **Disinformation** is false or misleading information that is deliberately spread.

In *Information resilience: How misinformation undermines social cohesion, trust and democracy*, misinformation was used to broadly refer to all forms of false or misleading content (including disinformation). This was to align with understandings of both experts and laypeople, and since research generally does not distinguish between misinformation and disinformation. This report will continue to use misinformation as an overarching term for consistency between reports.

Information resilience was defined in *Information resilience: How misinformation undermines social cohesion, trust and democracy*. For the purposes of this report, this definition has been expanded to include information interrogation and critique. Competency in interrogating and critiquing information was identified as an important cognitive process underlying information resilience. Information resilience is thus defined as *individuals' and society's capacity to interrogate information for accuracy and to ward off or recover from the negative impact of misinformation when encountered.*

Trust was defined in *Information resilience: How misinformation undermines social cohesion, trust and democracy* as the 'degree to which people feel they can rely or depend on someone or something.' For the purposes of this report, the term *entity* is used rather than *something* to more precisely describe the objects of trust.

Entity encompasses a broad range of sources, including information sources (such as media outlets, digital platforms or social networks), organisations, governments and connected professionals (such as the Chief Scientist or Chief Medical Officer), or specific professions (such as scientists, medical professionals, lawyers, politicians or journalists).

Thus, this report defines trust as *the degree to which people feel they can rely or depend on someone or an entity.*

Introduction

With the advent of personal information and communication platforms and systems – such as social media – and the use of artificial intelligence in this space, misinformation can spread more rapidly than ever before. Data, information, and knowledge are vulnerable to manipulation, change, and artificial construction. This makes it difficult to 'inoculate' potential users and decision-makers against misinformation.

This report addresses how the brain and body respond to misinformation and how understanding these processes might be used to strengthen Australians' information resilience. It explores the brain areas and pathways that underpin trust, providing insights into why people believe and share misinformation, and what interventions could help.

This report also investigates whether improvements in overall physical and mental health could correlate with improved information resilience. Interventions piloted in Australia and elsewhere are examined, as are strategies and considerations for implementing interventions in an Australian context.

1 The anatomical and neurophysiological basis of trust

Trust is a complex concept, but there are psychological frameworks that explain the components involved. Trust involves the willingness to be vulnerable and rely on the actions of others (Mayer et al. 1995). Trust is also a social tool to signal group loyalty and foster group cohesion.

However, misplaced trust can have negative impacts. As discussed in *Information resilience: How misinformation undermines social cohesion, trust and democracy*, believing in misinformation can fuel distrust in key pillars of societal function and enhance misguided fear (Platow et al. 2026).

As discussed in *Information Resilience: A framework for misinformation interventions*, critical thinking allows people to assess the credibility of information, and to make an informed decision about whether they should trust it ('informed trust') (Newman et al. 2026).

Understanding the processes involved in developing and maintaining trust is aided by an understanding of brain anatomy (its structure and circuitry) and function (neurophysiology). Parts of the brain engaged during tasks involving trust can be studied using fMRI (functional magnetic resonance imaging), which can identify activated brain regions and their functional connectivity. These are elaborated below.

Trust is not an isolated function of one specific brain region or circuit. It is a complex construct that involves multiple brain regions and neural processes. Trust emerges from an individual's experiences, social interactions, and contexts.

Perceived trustworthiness depends on individual and interpersonal factors. To reach a state of trust, individuals must be able to:

- sense and interpret the external world monitor outcomes and learn from them
- flexibly update beliefs based on new information
- assess risk and be willing to take risks
- manage feelings of fear or vulnerability.

These factors rely on the different parts of the brain that deal with:

- attention and perception
- memory, knowledge and learning
- executive function and cognitive control
- risk assessment and decision-making
- emotional regulation
- interpersonal sensitivity.

Factors such as cultural norms, social and economic circumstances, familiarity, or reputation can shape how much an individual trusts information or an information source. The relative importance of these factors depends on whether people are assessing the trustworthiness of information itself, or an information source. For example, familiarity can relate to both a piece of information and an information source, whereas reputation relates only to information sources.

Perceived plausibility of information and its congruence with existing knowledge, beliefs, or worldviews will affect whether or not a piece of information is trusted. Any intervention to address how individuals decide what information they trust must account for this complexity.

However, trust can also be deliberately influenced through manipulation of information, persuasive techniques, or creating artificial feelings of closeness or familiarity.

Recognising that trust is complex, flexible, and susceptible to external forces allows for better understanding of how people evaluate information and its sources.

1.1 Attention and perception

Perception allows people to take in sensory information and make sense of it. People are constantly receiving perceptual information through the 5 senses: sight, hearing, smell, touch, and taste. People can also sense their body in physical space (proprioception) and sense and interpret internal body signals like heart rate (interoception).

The human body has gating systems aimed at addressing imminent threats to survival, which redirect attention to the most pressing stimuli. During stressful situations, the adrenal glands release cortisol (the 'stress' hormone), which can improve attention in the short term by focusing on the immediate stressor while suppressing other cognitive processes (Schilling et al. 2013; Schwabe and Wolf 2013). However, chronic stress can lead to impairments in attention (Lupien et al. 2018).

Proprioception and interoception also allow individuals to sense signs of stress such as muscle tension and heart rate. Even if they are not consciously aware of this, this information is processed and can influence perception and attention. By training individuals to manage stress, mental health and by strengthening their cardiovascular system, it may be possible to improve attentional abilities.

People often make errors when they are forced to make decisions quickly in experimental settings. This could be extrapolated to suggest that not having enough time to properly evaluate the accuracy of information could make people generally more prone to accepting misinformation. Information, media and digital literacy can help people to learn the features of trustworthy information as discussed in *Information Resilience: A framework for misinformation interventions* (Newman et al. 2026).

1.2 Biases

People may use 'rules of thumb' (heuristics) to simplify the process of assessing information. They are more likely to process and trust information when its source is perceived to be similar to themselves, especially in terms of their beliefs, values and social group membership (in-group bias). In-group bias is a central aspect of human behaviour, as people want the protection of the in-group from threats (Fu et al. 2012). As discussed in *Information resilience: How misinformation undermines social cohesion, trust and democracy*, trusting information from in-group members can cause people to overlook whether a source has relevant expertise, leading to greater belief in misinformation (Platow et al. 2026). Social media posts are more likely to be shared if they contain negative information about an out-group (a social group with which an individual does not identify) (Rathje et al. 2021). These posts may be successful as they appeal to emotions such as anger.

People are also more likely to trust in and believe information if it is consistent with their existing knowledge, beliefs and worldviews (confirmation bias) (Hills 2019).

People also tend to be more aware of and react more strongly to negative information (negativity bias). They exhibit greater physiological activation (such as heart rate variability) when viewing negative video news content compared to neutral or positive content (Soroka et al. 2019). Heart rate variability is linked to attentiveness and emotional regulation (generating emotional responses of appropriate timing and magnitude) (Soroka et al. 2019).

Biases can lead to misinformation being interpreted as plausible regardless of its objective accuracy (Alexander et al. 2022).

Proponents of misinformation can take advantage of the attentional bottleneck (limits to how much information people can process) and heuristics. Due to information overload, social media users may not spend time evaluating the credibility of the information they encounter. As social media feeds tailor content to users using algorithms, users tend to see information that supports their existing beliefs, which reinforces confirmation bias.

As discussed in *Information resilience: How misinformation undermines social cohesion, trust and democracy*, sensational or polarising information often garners more attention on social media (Platow et al. 2026). Attention can be directed towards threats as a consequence of the negativity bias. Being aware of these heuristics and biases may help individuals to critically evaluate information.

1.3 Memory, knowledge and learning

Information Resilience: A framework for misinformation interventions discusses responsive interventions to support individuals to update their knowledge and memory to counter the impact of misinformation (Newman et al. 2026).

Memories are formed through connections between neurons (nerve cells that send and receive signals). These connections are made stronger if they are consistently

activated. The more the brain performs a task, the stronger the neural network becomes. This may be why repeated correct information or misinformation are reinforced (Alexander et al. 2022).

People are thus more likely to believe that a (false) statement is true if it is repeated, even when it contradicts their prior knowledge (Fazio 2020). This is called the 'illusory truth effect'.

Online spaces can become 'echo chambers' as algorithms will provide users with more misinformation if they engage with this content (Amazeen et al. 2024). This leads to misinformation being continually reinforced and shared.

Emotional memories are also stronger. From an evolutionary perspective, these are important for effectively remembering potential threats. Following an emotional event, brain areas associated with memory and learning (the hippocampus) and fear (the amygdala) are activated to consolidate long-term memories of significantly emotional events (Richter-Levin and Akirav 2000).

1.4 Executive function and cognitive control

Executive functions are higher-order cognitive processes that serve working memory (the ability to manipulate and use information while it is being stored) and cognitive control to enable and support complex thinking and behaviour. In the brain, the dorsolateral prefrontal cortex in the frontal lobe is one of the crucial areas for these functions, facilitating tasks such as planning, decision-making, and inhibitory controls (Friedman and Robbins 2022; Snyder et al. 2015). This structure is part of a complex network (Niendam et al. 2012).

Executive functions enable critical thinking by helping individuals process information, evaluate evidence, manage competing information, and resist impulsive judgements.

Through these reflective processes, individuals can identify biases and make reasoned decisions about granting or withholding trust.

1.5 Risk assessment and decision-making

Individuals need to be able to assess risk and be willing to take risks in order to trust information from others. An inability to feel safe can diminish trust and bonding, irrespective of the source (Fonagy and Luyten 2018). Examining cases where trust and information resilience are disrupted due to differences in the brain provides insights into how these processes function.

These processes are disrupted in the context of personality disorders (Fonagy and Luyten 2018). Borderline personality disorder, for instance, is a mental illness that is characterised by mistrust of others. While borderline personality disorder is an extreme example of diminished trust, it illustrates that the capacity to trust differs across the population. When an individual's sense of stability about themself or others is disrupted, it may cause increased resistance to forming trusting bonds or changing trust from one source to another. Focusing on restoring a stable sense of self or one's

neural representation of another may set the groundwork to improve trust (Fonagy and Luyten 2018). This includes therapy to help individuals to understand and infer their own mental state or that of others (see the section below on interpersonal sensitivity).

Another example where these processes are disrupted is in a rare birth defect known as corpus callosum dysgenesis. The corpus callosum is a large bundle of white matter fibres connecting the brain's 2 hemispheres. When disrupted during development, it limits the sharing of information between the 2 cerebral hemispheres.

Corpus callosum dysgenesis is linked to increased persuadability, credulity and sensitivity to social trickery (Barnby et al. 2022). Those diagnosed with a corpus callosum disorder are at risk of being more accepting of misinformation. Integration of information between the 2 sides of the brain may be a key mechanism underlying metacognitive (understanding your own thinking) processes such as personal introspection, which are essential in trust and the evaluation of others' intent.

1.6 Emotional regulation

In the short term, emotional responses can influence how individuals respond to misinformation (Ecker et al. 2022). Across a wide range of emotions, higher emotionality is associated with belief in misinformation, and encouraging people to 'rely on their emotions' can increase their belief in misinformation (Martel et al. 2020).

Anger can reduce critical thinking and increase reliance on preexisting beliefs or biases (Martel et al. 2020). This could encourage uncritical acceptance and sharing of this information. Anger has also been shown to promote belief in COVID-19 misinformation (Han et al. 2020).

Other specific emotional states, such as happiness, can also make people more vulnerable to deception (Forgas and East 2008).

Long-term emotional regulation is also important. Chronic exposure to stress leads to changes in the volume of the areas of the brain involved in emotional regulation (the hippocampus, amygdala, and prefrontal cortex) (Lupien et al. 2018). Chronic stress can impair decision-making and promote reliance on cognitive shortcuts, making people less likely to critically evaluate information (von Rosenberg 2020; Friedman et al. 2017).

1.7 Interpersonal sensitivity

To decide whether to trust information provided by another person, individuals need to be able to not only understand their own mental state but also infer the mental state (e.g. intentions) of others. This is important for their understanding of how accurate the conclusions they draw are and whether they need more information to evaluate accuracy.

Trust has been extensively investigated using 2-player games and fMRI (functional magnetic resonance imaging) (Montague et al. 2015). fMRI has shown that activity in an area of the brain associated with decision-making and risk processing (the medial prefrontal cortex) was associated with an individual's expectations of how the other

player would act. Activity in an area of the brain associated with social processing (the posterior superior temporal sulcus) was associated with the outcome of the other player's actions (Hampton et al. 2008).

People also need to monitor outcomes and learn from them to make sensible decisions about whom to trust. fMRI studies have shown that an area of the brain involved in decision-making (the orbitofrontal cortex) is important for 'social reinforcement learning', where people learn to trust others based on how they act (Fett et al. 2014). These studies show that trust is governed by a complex interplay of various brain regions.

The hormone dopamine also plays an important role in learning who to trust and forming accurate representations of other people's intentions (Schuster and Lamm 2025). Experiments involving volunteers playing a 3-player game requiring trust and being administered medications to reduce dopamine activity resulted in a reduction in perceived threats from other players (Barnby et al. 2024). Dopamine is vital for integrating information and is involved in multiple processes of normal, healthy cognition. Disruption to an individual's typical dopamine regulation can transiently alter healthy cognition. Chronic disruption to striatal and prefrontal dopamine is linked to symptoms of psychosis, such as hallucinations and cognitive impairment (Schmack et al. 2021; Howes and Shatalina 2022).

2 The role of physical health in information resilience

Sleep, diet and exercise have been shown to improve the cognitive processes identified in the previous section of this report. As aspects of trust and the perception and interpretation of misinformation rely on higher cognitive skills, improvements in physical health could possibly increase information resilience. However, there is very little research investigating this link, so the associations outlined below are indirect.

2.1 Sleep

Sleep supports higher cognitive functions by enabling memory consolidation, enhancing problem-solving abilities, and stabilising learning outcomes (Ashworth et al. 2014). A proposed function of sleep is to facilitate waste removal from the brain through lymphatic drainage, and poor lymphatic drainage occurs in ageing-related disorders such as Alzheimer's and Parkinson's diseases (Jiang-Xie et al. 2025). As Australia's population continues to age and grow, so will the prevalence of Alzheimer's – the most common type of dementia (Health Direct 2024). It is predicted that the number of Australians with dementia will more than double by 2058 to 849,300 (533,800 women and 315,500 men) (Australian Institute of Health and Welfare 2024a).

There is a complex and bidirectional relationship between sleep and dementia, as the underlying brain pathology may lead to disturbed sleep, and sleep disturbance may contribute to the development of dementia (Wennberg et al. 2017).

Studies have shown that sleep deprivation impairs the ability to integrate emotion and cognition to guide moral judgements (Killgore et al. 2007; Frenda et al. 2014). Sleep deprivation also impairs attention and slows reaction times (Kirszenblat and van Swinderen 2015). Excessive social media and technology use is generally associated with poorer sleep quality and mental health (Alonzo et al. 2021). While most Australians meet national sleep recommendations, nearly half (48%) of all adults report at least 2 sleep-related problems (Australian Institute of Health and Welfare 2021).

2.2 Diet

Diet is important to support brain health. Poor diet (such as a 'Western diet' high in saturated fats and refined carbohydrates) is associated with impairments in cognition, learning and memory (Kanoski and Davidson 2011). Poor diet is also correlated with neurobiological changes in an area of the brain that is responsible for memory and learning (the hippocampus).

Adequate nutrition is important for brain development, especially in pregnancy and infancy when neurodevelopmental processes are occurring (Prado and Dewey 2014). Essential nutrition necessary for brain development includes protein, fatty acids, and

micronutrients such as iron. In adolescence, healthier dietary patterns are associated with a higher attention capacity (Henriksson et al. 2017).

Poverty is strongly associated with several risk factors implicated in poor developmental outcomes, such as suboptimal nutrition. Poverty in early childhood is associated with several changes to anatomy in the brain, including smaller white matter, cortical grey matter, and hippocampal and amygdala volumes (Luby et al. 2013).

Diet is also important for mental health. Nutrient-dense diets significantly reduce depressive symptoms through modulation of pathways involved in inflammation and the hypothalamic–pituitary–adrenal axis (a communication system between areas of the brain and glands that produce hormones) (Marx et al. 2023).

2.3 Exercise

Physical exercise has beneficial effects on cognition, for instance by enhancing neuroplasticity (the brain's ability to adapt throughout life). Exercise has been shown to trigger the formation of new neurons (neurogenesis), synaptic plasticity, and blood flow (Hötting and Röder 2013).

Among children, there is emerging evidence showing an association between physical activity and cognition (Erickson et al. 2019; Biddle et al. 2019). There is greater evidence for the impact of physical activity in older adults improving measures of executive function, cognition, attention, and processing speed (Erickson et al. 2019; Walsh et al. 2020). Physical activity has beneficial impacts on cognition in ageing, particularly via the action of brain-derived neurotrophic factor (BDNF) (Walsh et al. 2020). BDNF promotes the connection and reorganisation of neurons in the brain (Li et al. 2024). High-intensity short-duration activity is likely to be effective in promoting BDNF response and by extension, brain health.

Physical activity also improves sleep quality and emotional regulation via the increase of BDNF, which optimises neural networks related to sleep regulation, facilitating sleep initiation and maintenance (Li et al. 2024). Low-intensity exercise such as tai chi enhances the tone of the vagus nerve (the main nerve that carries signals between the brain, heart, and digestive system). This adjusts the reactivity of areas of the brain and the glands that produce hormones (the hypothalamic–pituitary–adrenal axis) and significantly reduces cortisol levels and stress responses (Li et al. 2024).

BDNF also plays a role in the relationship between exercise and memory (Loprinzi and Frith 2019). Aerobic exercise in adults increases the size of the hippocampus, leading to improvements in memory. Increased hippocampal volume is associated with increased levels of BDNF (Erickson et al. 2011).

Physical activity also leads to improved mental health. An overview of systematic reviews found that physical activity improves symptoms of depression, anxiety and distress among the general population, people with diagnosed mental health disorders, and people with chronic conditions (Singh et al. 2023).

3 The role of mental health in information resilience

Individual and collective information resilience is underpinned by social cohesion and connectedness, adequate cognitive functioning, and healthy emotional regulation. Each of these factors can both impact and be impacted by mental health.

3.1 Mental health and information resilience: a reciprocal relationship

Mental health and information resilience exhibit a reciprocal relationship, whereby:

3.1.1 Poor mental health can increase susceptibility to misinformation.

Anxiety, depression, and loneliness can increase the extent to which an individual perceives themselves as vulnerable, particularly under stressful conditions (Delmastro and Paciello 2022). Self-perception of vulnerability is connected to information-processing biases that can increase susceptibility to misinformation (Freeman and Garety 2014).

Research has also shown that an individual's anxiety levels can increase their likelihood of believing misinformation (Albarracin et al. 2021).

Loneliness and social isolation are increasingly prevalent in Australia and comparable nations. During the COVID-19 pandemic, Australians' self-reported levels of loneliness increased (Wilkins et al. 2024) as their levels of social participation (e.g. in volunteering, social groups, sporting clubs, and religious gatherings) decreased (Aldrich 2023). Loneliness has increased substantially among Australians aged 15 to 24 relative to older age groups (Wilkins et al. 2024), and in many instances, levels of social participation have not yet returned to pre-pandemic levels (Eime et al. 2024). Feelings of loneliness are often associated with the objective experience of social isolation – defined as having objectively few social relationships and infrequent social contact (Australian Institute of Health and Welfare 2024c). In 2022, almost 1 in 7 (15%) Australians were experiencing social isolation, with this figure as high as 18% among Australian men (Australian Institute of Health and Welfare 2024c).

The relationships between social connectedness and cohesion, mental wellbeing, and information resilience are addressed below.

3.1.2 Misinformation can exacerbate poor mental health.

Mental health and misinformation exist in a reciprocal relationship whereby poor mental health can degrade information resilience, while misinformation can negatively impact mental health. Some ways in which misinformation can affect mental health include by instilling a sense of threat about the world and contributing to confusion and

uncertainty, and by encouraging behaviours such as doomscrolling (Borges do Nascimento et al. 2022; Chen and Cheng 2024).

To illustrate, during the COVID-19 pandemic, pandemic-related misinformation was associated with worsened sleep quality (Chen and Cheng 2024) and psychological distress (Ali et al. 2021). For the general population, stress levels were often increased due to the social isolation that could result from lockdown measures and the overwhelming amount of often conflicting information available online (Chen and Cheng 2024). Within the healthcare workforce, misinformation degraded some professionals' psychological health by undermining their efforts to mitigate the impact of COVID-19 (Ali et al. 2021).

3.2 Mental health, cognition and brain health

Good cognitive functioning enables individuals to critique information and make logical judgments regarding the trustworthiness of an information source and the likely accuracy of information.

Strong evidence supports a link between mental health, cognition and brain health. One extensive systematic review and meta-analysis identified depression-related differences in the structure of a specific region of the brain – the hippocampus – and found that these differences are further modulated by comorbid anxiety (Espinoza Oyarce et al. 2020). Given that an estimated 19% of Australians, and up to 23% of women, report being diagnosed with depression, anxiety or another serious mental illness at some point in their lifetime, better prevention, support, and treatment of such conditions could boost Australia's collective information resilience (Australian Institute of Health and Welfare 2024b).

Inflammation in the brain or central nervous system (neuroinflammation) is one mechanism involved in degrading the cognitive functioning of individuals experiencing mental illnesses such as depression (Setiawan et al. 2018). Neuroinflammation is associated with mental fatigue and mood alteration (Brusaferri et al. 2022).
A comparison of COVID-19 studies revealed that pandemic-related social stressors and psychological distress elevated brain levels of 2 independent neuroinflammatory markers – translocator protein and myoinositol – in otherwise healthy individuals (Brusaferri et al. 2022).

Stress-induced neuroinflammation has been shown to particularly impact the prefrontal cortex – the area of the brain that supports our highest-order cognitive abilities (Arnsten 2009). Even uncontrolled mild acute stress can inhibit prefrontal cognitive abilities, while more extended stress exposure can degrade prefrontal neural connections (Arnsten 2009). These processes can diminish prefrontal cortex function in otherwise healthy individuals, (Arnsten 2009) and worsen existing cognitive disorders in individuals living with them (Arnsten 2015).

This growing understanding of how stress can contribute to negative neurophysiological changes lends further impetus to developing and implementing health and social interventions that reduce stress and enhance emotional resilience.

3.3 Social connectedness and information resilience

Social connectedness is linked to information resilience in various ways. For example, a lack of social connection can make individuals more vulnerable to fringe groups who share and perpetuate unevidenced beliefs (Moulding et al. 2016; Campelo et al. 2018). Recent research has connected the long-term effects of loneliness to conspiracy theorising in middle age by demonstrating that this tendency can be predicted by how lonely an individual felt as an adolescent (Bierwiaczonek et al. 2024).

Strong evidence supports that, more broadly, social connectedness relates to information resilience through its links to mental health outcomes (Holt-Lunstad 2024). This connection is bidirectional – loneliness and lack of social connectedness are detrimental to mental health, and poorer mental health increases the risk of loneliness and limited social interaction (Sbarra et al. 2023).

Given that loneliness can increase vulnerability to poor mental health, addressing the loneliness being felt by growing numbers of Australians may be one way to strengthen information resilience.

A lack of social connectedness can also make individuals more vulnerable to misinformation by weakening overall social cohesion and trust. *Information resilience: How misinformation undermines social cohesion, trust and democracy* defined social cohesion as 'group members' shared subjective sense of common bonds and common purpose', and outlined the cyclical process that frequently occurs between this phenomenon and information resilience (Platow et al. 2026).

As information is more believable when it comes from sources perceived as 'in-group', weakening the experience of common bonds and purpose risks further fragmenting the information ecosystem that individuals navigate (American Psychological Association 2023).

The mental wellbeing and social cohesion that reinforce information resilience can be cultivated through community building and social connectedness. For example, as explored in *Information Resilience: the role of cultural and community institutions* (section 2) (Academy of the Social Sciences in Australia 2026), social infrastructure such as public libraries can provide access to accurate information while fostering diverse connections and strengthening community resilience (Aldrich 2023).

Modelling has demonstrated the positive impacts of interventions focused on fostering social connectedness, through which individuals can build friendships, widen their employment opportunities, and receive guidance and counselling when experiencing health issues (Li et al. 2025).

4 Interventions to increase information resilience

Most research-based interventions aimed at combating misinformation focus on strategies such as media literacy, digital literacy and prebunking/debunking. *Information Resilience: A framework for misinformation interventions* covers these interventions (Newman et al. 2026). Such interventions use education, information source expertise, or peer network dynamics to assist individuals, groups and society in general in evaluating information and improving information resilience.

Education-related interventions outlined in Table 1 of *Information Resilience: A framework for misinformation interventions* can enhance foundational knowledge and skills that:

- helps people assess information in online spaces
- encourages the updating of beliefs and knowledge after exposure to misinformation
- supports a high-quality information environment.

In turn, this could influence trust-related pathways by offering potential improvements in:

- executive function and cognitive control
- memory, knowledge and learning
- risk assessment and decision-making
- interpersonal sensitivity.

Therefore, this report explores how social, mental, and physical interventions connect to trust-related pathways, as depicted in Figure 1.

4.1 Mental and physical health interventions

Healthy individuals are better equipped to navigate society and this includes their capacity to identify and critique misinformation. Consequently, better mental and physical health could indirectly support information resilience – for instance by improving emotional regulation and cognition.

Research specifically addressing misinformation interventions that target physical or mental health is limited. This likely stems from the complex and dynamic nature of information resilience. Pinpointing a single factor is challenging because an individual's information resilience is influenced by various factors functioning at different social levels (individual, group, and societal).

Nevertheless, some emerging (but indirect) evidence points to potential benefits for information resilience from health interventions. These include mental health programs, physical health programs that improve cognition, mindfulness training, and

cognitive behavioural therapy. Future research could directly investigate the efficacy of such interventions in a controlled manner.

4.2 Mental and physical health interventions in Australia

The following section outlines evidence on mental and physical health programs that have been trialled in Australia.

4.2.1 Lifestyle intervention programs

Programs that target physical activity and nutrition may improve information resilience. An Australian online lifestyle intervention program that targeted physical activity, nutrition, cognitive activity and mental health improved global cognition (Brodaty et al. 2025). This could potentially improve information resilience through improved cognitive function as part of improved overall health. Programs like these can be delivered at scale with the potential for population-level rollout and would have broader health benefits beyond information resilience.

4.2.2 Mental health programs

Programs that foster social connectedness and mental wellbeing (e.g. support groups) may reduce the social isolation that often correlates with susceptibility to misinformation.

Community mental health programs are designed to provide services in settings such as homes or community centres rather than in hospitals or institutional settings. A systematic review of community mental healthcare programs in Australia found that case management programs significantly improve social support among clinical populations with severe mental illness. Case management programs involve a long-term, intensive approach to an individual's care in the community and offer support from a multidisciplinary team. The structure of this approach allows individuals' wider psychosocial outcomes to be addressed (O'Donnell et al. 2020).

Evaluation of group psychotherapy programs in Australia has shown that they provide opportunities to create social bonds and are acceptable to people experiencing loneliness and depression/anxiety (Cruwys et al. 2022).

These interventions could be suitable for populations who may be vulnerable to misinformation due to mental health and social isolation.

4.3 Mental and physical health interventions internationally

The following section outlines international evidence on mental and physical health interventions that may inform Australian approaches. These global insights may need to be adapted to an Australian context.

4.3.1 Physical health interventions

Physical interventions such as aerobic exercise and resistance training have been shown to improve cognitive function in people aged over 50 (Northey et al. 2018). This includes domains such as attention (including the ability to process information rapidly), executive function, and working memory. As these mechanisms are involved in critically evaluating information, improvement in these domains could improve information resilience.

4.3.2 Loneliness interventions

Interventions such as teaching social and emotional skills and psychological therapy significantly reduce loneliness among young people (Eccles and Qualter 2021). As loneliness can increase susceptibility to misinformation, these interventions could improve information resilience. However, this has not been directly tested. Similarly, the direct efficacy of social interventions such as encouraging participation in sports clubs and community social groups warrants further investigation.

4.3.3 Mindfulness

Evidence suggests that mindfulness-based stress reduction programs increase emotional regulation, which could improve information resilience (Sanilevici et al. 2021). Mindfulness meditation interventions reduce stress and are associated with reductions in amygdala activity (a part of the brain involved in anxiety and fear) (Taren et al. 2014; Dutcher et al. 2021).

Mindfulness-based cognitive therapy has been associated with reduced cognitive and emotional reactivity, which may help individuals respond to stressors more adaptively and improve emotional regulation (Gu et al. 2015). However, the evidence supporting this mechanism remains preliminary and context dependent.

Mindfulness also improves an individual's ability to understand and infer the mental state of themselves or others. Mindfulness is a metacognitive process whereby the individual acknowledges and accepts their thoughts (Jankowski and Holas 2014). Mindfulness interventions have also been shown to improve empathy (the ability to share and understand the mental state of others) (Hu et al. 2022).

4.3.4 Cognitive behavioural therapy

Cognitive behavioural therapy (CBT) is a form of psychological treatment that involves changing unhelpful ways of thinking (Fordham et al. 2021). This approach helps patients to recognise their distortions in thinking and then re-evaluate them.

Additionally, CBT emphasises emotional regulation, helping individuals manage reactions such as the anger that misinformation often provokes to bypass critical thinking (Beck and Fernandez 1998). CBT has also been shown to improve emotional regulation among those with depression (Forkmann et al. 2014).

As CBT develops the skills needed to evaluate information effectively, it could offer a possible intervention to improve information resilience. However, this is challenging to

implement at a population level, and doing so would require more direct evidence that it would have the desired outcome on information resilience.

4.3.5 Combined approaches

Combining interventions to combat misinformation outperforms individual approaches (Bak-Coleman et al. 2022). It may be more effective to combine the mental and physical health interventions presented in this report with the educational interventions presented in *Information Resilience: A framework for misinformation interventions* (Newman et al. 2026).

As discussed in that report, scientific literacy helps to develop the skills to determine the trustworthiness and credibility of information, through an understanding of how knowledge is created. Providing the public with access to trusted scientific information written in lay terms on topics of interest is important for developing trust in science and countering misinformation. It also helps people learn how to assess content by providing them with reliable information and the evidence that supports this (American Psychological Association 2023).

4.4 Considerations for these interventions in an Australian context

4.4.1 Diversity, equity and inclusion

Including people from underrepresented communities is critical when designing and implementing interventions to ensure they can benefit everyone (Amazeen et al. 2024). As discussed in *Information resilience: How misinformation undermines social cohesion, trust and democracy*, societal inequality, exclusion and sub-optimal education may affect susceptibility to misinformation (Platow et al. 2026).

People experiencing social deprivation (a lack of resources, such as income, education and healthcare) are more likely to experience mistrust, paranoia, and poor mental health outcomes (Wickham et al. 2014a, 2014b). These factors may increase susceptibility to misinformation.

Interventions should be culturally responsive to the unique needs of Australia's multicultural communities to build information resilience, including specifically First Nations people and culturally and linguistically diverse groups. Research in Australia indicates that culturally responsive physical and mental health interventions are more effective and acceptable among diverse communities (El Masri et al. 2021; Blignault et al. 2022).

Barriers to participation – such as cost, internet access, or time commitments – will need to be considered and addressed. Interventions should be provided in multiple formats (digital and in-person) to include urban, regional, and remote populations.

Age group should be taken into consideration when providing interventions, as young people and older adults trust and respond to misinformation differently. Older adults are more susceptible to misinformation – for example, they shared the most 'fake news'

during the 2016 US election (Brashier and Schacter 2020). This is due to a range of factors, including elements of cognitive decline, as well as social changes (such as higher trust in others), and a lack of digital literacy (Brashier and Schacter 2020). Australian adults of all age groups (18–70+) have a low level of ability to verify information online, with older Australians tending to have slightly lower ability. Adult Australians also overestimate their ability to verify online information (Park et al. 2024). Young Australians tend not to check sources of news stories (Notley et al. 2020). People who are younger and/or financially struggling are less likely to have trust in government and democracy (Strengthening Democracy Taskforce 2024). Age group is also important in terms of the effectiveness of interventions. For example, physical activity interventions can improve cognition, but the strength of this finding varies with age (Erickson et al. 2019).

4.4.2 Alignment with policy

Interventions should be aligned with relevant national strategies, such as public health campaigns or digital literacy frameworks. Understanding the neurophysiological pathways involved in sleep, nutrition and exercise can inform existing public health campaigns.

4.4.3 Data privacy

Any interventions should ensure compliance with privacy laws and ethical guidelines, particularly for digital interventions. Researchers and institutions must independently confirm any proposed interventions are ethically sound, not rely on tacit endorsement of practices (for example, regarding collection of social media user data).

4.4.4 Avoid stigmatising language

Interventions should be designed to support individuals without labelling them as 'vulnerable' or 'susceptible' to misinformation. Focusing on the false content rather than individuals consuming it will reduce the risk of stigmatising target audiences.

4.4.5 Modelling

Modelling could be used to simulate which interventions are likely to be most effective in the Australian context. Systems modelling has shown positive impacts of social connectedness programs in Australia on other domains and could be used to evaluate the potential impact on information resilience (Occhipinti et al. 2021a, 2021b).

4.4.6 Artificial intelligence

Artificial intelligence (AI) and large language models could also support information resilience. This could include education and online tools on how to use these resources. Generative AI could be used to fact-check and address misinformation and may be particularly influential for people who mistrust official sources of information such as government organisations.

Conversations with a generative AI model (GPT-4 Turbo) have been found to reduce belief in conspiracies (Costello et al. 2024). However, the specific cognitive or

psychological processes through which this change occurs were not identified.
In addition, there are risks associated with using AI in this way, since these tools can make mistakes or 'hallucinate'. 'Hallucinating' refers to a response generated by AI that contains false or misleading information presented as fact – for example, referencing scientific publications that do not actually exist in the literature (Hueber and Kleyer 2023).

5 Conclusions

Figure 1 provides a summary of the links between trust-related physiological processes and interventions.

Trust is a complex process involving multiple brain functions, including perception, emotional regulation, memory, decision-making, interpersonal sensitivity and learning. Effective interventions to increase information resilience must acknowledge this complexity. Such interventions could boost information resilience through improving the brain processes involved in making informed decisions about what information and sources to trust.

Enhancing physical health through exercise, sleep and nutrition may indirectly support information resilience by improving emotional regulation and cognition.

Mental health and information resilience exhibit a reciprocal relationship: poor mental health can increase susceptibility to misinformation, and misinformation can exacerbate poor mental health. Social connectedness is key to cultivating both mental and information resilience.

Emerging evidence highlights the potential of case management programs, physical health interventions that improve cognition, mindfulness training and cognitive behavioural therapy, though research on their impact on information resilience remains limited.

Table 1 provides the identified physical and mental health interventions and their mechanisms of action, which may be useful in addressing misinformation.

Effective interventions in Australia will need to address the needs of multicultural and regional communities, align with policy, protect data privacy and avoid stigmatising language. Modelling could be used to evaluate which interventions are likely to be most effective.

Figure 1: Diagram illustrating the potential links between trust-related physiological processes and interventions.

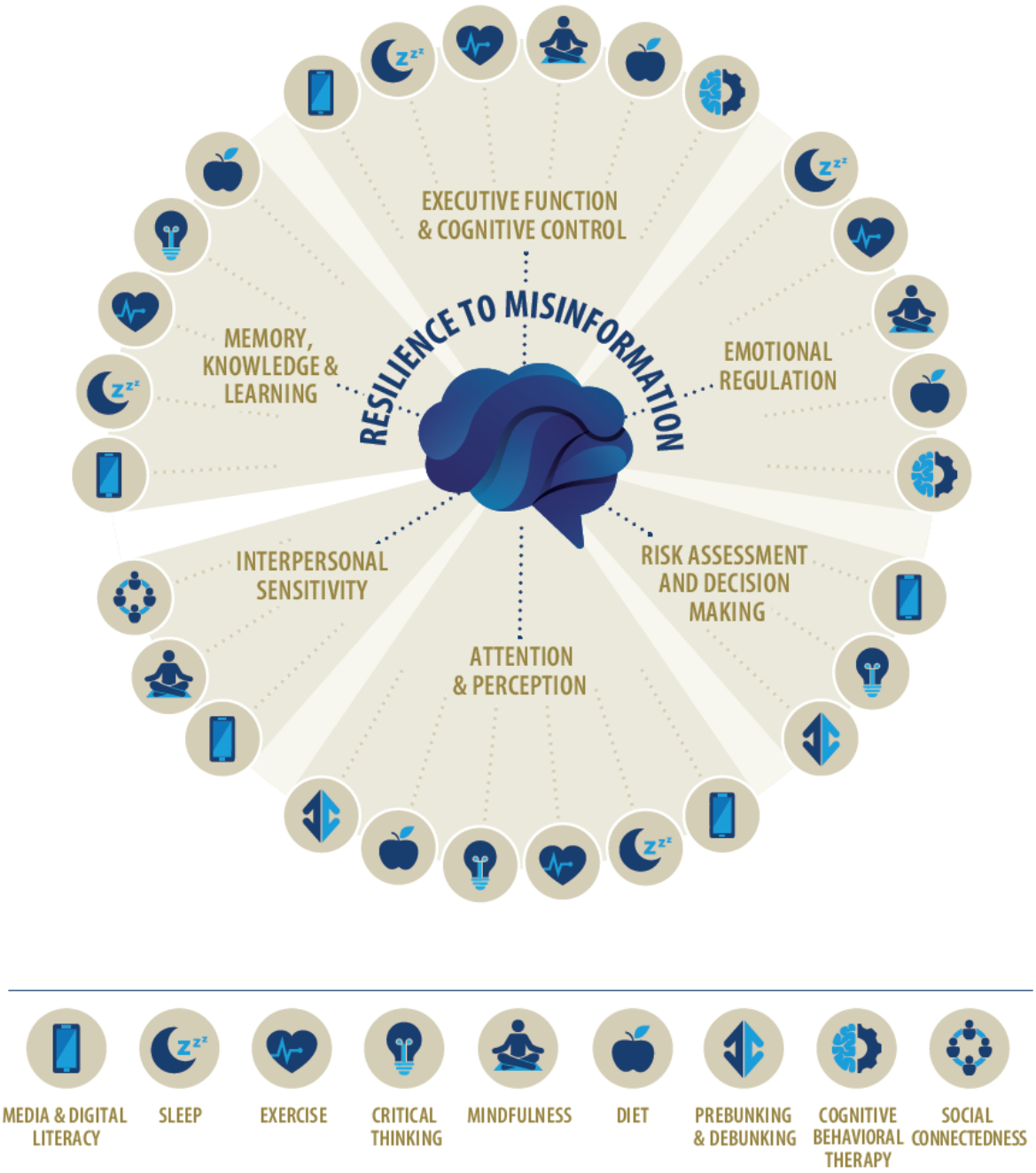

Table 1: Identified physical and mental interventions and their mechanisms of action.

Intervention	Mechanism of action
Sleep	• Improves cognitive function including memory consolidation, enhancing problem-solving abilities and stabilising learning outcomes (Ashworth et al. 2014). • Improves attention (Kirszenblat and van Swinderen 2015). • Improves emotional regulation (Killgore et al. 2007; Frenda et al. 2014; Alonzo et al. 2021).
Diet	• Promotes attention, memory, learning and cognitive function (Kanoski and Davidson 2011; Henriksson et al. 2017). • Improves emotional regulation. Significantly reduces depressive symptoms through modulation of pathways involved in inflammation and the hypothalamic–pituitary–adrenal axis (Marx et al. 2023).
Exercise	• Stimulates the formation of new neurons (neurogenesis), synaptic plasticity and blood flow, improving cognition (Hötting and Röder 2013). • Improves measures of cognition and attention (Erickson et al 2019; Walsh et al. 2020). • Has beneficial impacts on cognition in ageing, particularly via the action of brain-derived neurotrophic factor (BDNF) (Walsh et al. 2020; Li et al. 2024). • Improves emotional regulation through cortisol response (Li et al. 2024). • Improves memory via BDNF (Loprinzi and Frith 2019; Erikson et al. 2011).
Mental health programs	• Improves social support (O'Donnell et al. 2020).
Mindfulness	• Reduces stress and improves emotional regulation (Sanilevici et al. 2021; Taren et al. 2014; Dutcher et al. 2021). • Reduces cognitive and emotional reactivity (Gu et al. 2015). • Improves an individual's ability to understand and infer the mental state of themselves or others (Jankowski and Holas 2014; Hu et al. 2022).
Cognitive behavioural therapy	• Improves emotional regulation (Beck and Fernandez 1998).

References

Academy of the Social Sciences in Australia (2026*) Information resilience: the role of cultural and community institutions*, report to the National Science and Technology Council, Australian Government Office of the Chief Scientist.

Albarracin D, Albarracin J, Chan MS and Jamieson KH (2021) *Creating conspiracy beliefs: how our thoughts are shaped*, Cambridge University Press.

Aldrich DP (2023) *How libraries (and other social infrastructure spaces) will save us: The critical role of social infrastructure in democratic resilience* [PDF] (lecture), Fulbright Flinders University Lecture Series 8.

Alexander RG, Macknik SL and Martinez-Conde S (2022) 'What the neuroscience and psychology of magic reveal about misinformation', *Publications*, 10(4): 33, https://doi.org/10.3390/publications10040033.

Ali S, Khalid A and Zahid E (2021) 'Is COVID-19 immune to misinformation? A brief overview', *Asian Bioethics Review*, 13(2): 255–277, https://doi.org/10.1007/s41649-020-00155-x.

Alonzo R, Hussain J, Stranges S and Anderson KK (2021) 'Interplay between social media use, sleep quality, and mental health in youth: a systematic review', *Sleep Medicine Reviews*, 56: 101414, https://doi.org/10.1016/j.smrv.2020.101414.

Amazeen MA, Vasquez RA, Krishna A, Ji YG, Su CC and Cummings JJ (2024) 'Missing voices: examining how misinformation-susceptible individuals from underrepresented communities engage, perceive, and combat science misinformation', *Science Communication*, 46(1): 3–35, https://doi.org/10.1177/10755470231217536.

American Psychological Association (2023) *Using psychological science to understand and fight health misinformation: an APA consensus statement*, American Psychological Association.

Arnsten AFT (2009) 'Stress signalling pathways that impair prefrontal cortex structure and function', *Nature Reviews Neuroscience*, 10: 410–422, https://doi.org/10.1038/nrn2648.

Arnsten AFT (2015) 'Stress weakens prefrontal networks: molecular insults to higher cognition', *Nature Neuroscience*, 18: 1376–1385, https://doi.org/10.1038/nn.4087.

Ashworth A, Hill CM, Karmiloff-Smith A and Dimitriou D (2014) 'Sleep enhances memory consolidation in children', *Journal of Sleep Research*, 23(3): 302–308, https://doi.org/10.1111/jsr.12119.

Australian Institute of Health and Welfare (2021) *Sleep problems as a risk factor for chronic conditions*, Australian Institute of Health and Welfare website.

Australian Institute of Health and Welfare (2024a) *Dementia in Australia*, Australian Institute of Health and Welfare website.

Australian Institute of Health and Welfare (2024b) *Prevalence and impact of mental illness,* Australian Institute of Health and Welfare website.

Australian Institute of Health and Welfare (2024c) *Social isolation and loneliness*, Australian Institute of Health and Welfare website.

Bak-Coleman JB, Kennedy I, Wack M, Beers A, Schafer JS, Spiro ES, Starbird K and West JD (2022) 'Combining interventions to reduce the spread of viral misinformation', *Nature Human Behaviour*, 6: 1372–1380, https://doi.org/10.1038/s41562-022-01388-6.

Barnby JM, Bell V, Deeley Q, Mehta MA and Moutoussis M (2024) 'D2/D3 dopamine supports the precision of mental state inferences and self-relevance of joint social outcomes', *Nature Mental Health*, 2(6): 562–573, https://doi.org/10.1038/s44220-024-00220-6.

Barnby JM, Dean RJ, Burgess H, Kim J, Teunisse AK, Mackenzie L, Robinson GA, Dayan P and Richards LJ (2022) 'Increased persuadability and credulity in people with corpus callosum dysgenesis', *Cortex*, 155: 251–263, https://doi.org/10.1016/j.cortex.2022.07.009.

Beck R and Fernandez E (1998) 'Cognitive-behavioral therapy in the treatment of anger: a meta-analysis', *Cognitive Therapy and Research*, 22: 63–74, https://doi.org/10.1023/A:1018763902991.

Biddle SJH, Ciacconi S, Thomas G and Vergeer I (2019) 'Physical activity and mental health in children and adolescents: an updated review of reviews and an analysis of causality', *Psychology of Sport & Exercise*, 42: 146–155, https://doi.org/10.1016/j.psychsport.2018.08.011.

Bierwiaczonek K, Fluit S, von Soest T, Hornsey MJ and Kunst JR (2024) 'Loneliness trajectories over three decades are associated with conspiracist worldviews in midlife', *Nature Communications*, 15: 3629, https://doi.org/10.1038/s41467-024-47113-x.

Blignault I, Saab H, Woodland L, Giourgas K and Baddah H (2022) 'Promoting mental health and wellbeing in multicultural Australia: a collaborative regional approach', *International Journal of Environmental Research and Public Health*, 19(5): 2723, https://doi.org/10.3390/ijerph19052723.

Borges do Nascimento IJ, Pizarro AB, Almeida JM, Azzopardi-Muscat N, Gonçalves MA, Björklund M and Novillo-Ortiz D (2022) 'Infodemics and health misinformation: a systematic review of reviews', *Bulletin of the World Health Organization*, 100: 544–561, https://doi.org/10.2471/BLT.21.287654.

Brashier NM and Schacter DL (2020) 'Aging in an era of fake news', *Current Directions in Psychological Science*, 29(3): 316–323, https://doi.org/10.1177/0963721420915872.

Brodaty H, Chau T, Heffernan M, Ginige JA, Andrews G, Millard M, Sachdev P, Anstey KJ, Lautenschlager N, McNeil JJ, Jorm L, Kochan NA, Maeder A, Welberry H, San Jose JC, Briggs N, Popovic G, Mavros Y, Rangel CA, Noble Y, Radd-Vagenas S, Flood VM, O'Leary F, Lampit A, Walton CC, Barr P, Singh MF and Valenzuela M (2025) 'An online multidomain lifestyle intervention to prevent cognitive decline in at-risk older adults: a randomized controlled trial', *Nature Medicine*, 31: 565–573, https://doi.org/10.1038/s41591-024-03351-6.

Brusaferri L, Alshelh Z, Martins D, Kim M, Weerasekera A, Housman H, Morrissey EJ, Knight PC, Castro-Blanco KA, Albrecht DS, Tseng C-E, Zürcher NR, Ratai E-M, Akeju O, Makary MM, Catana C, Mercaldo ND, Hadjikhani N, Veronese M, Turkheimer F, Rosen BR, Hooker JM and Loggia ML (2022) 'The pandemic brain: neuroinflammation in non-infected individuals during the COVID-19 pandemic', *Brain, Behavior, and Immunity*, 102: 89–97, https://doi.org/10.1016/j.bbi.2022.02.018.

Campelo N, Oppetit A, Neau F, Cohen D and Bronsard G (2018) 'Who are the European youths willing to engage in radicalisation? A multidisciplinary review of their psychological and social profiles', *European Psychiatry*, 52: 1–14, https://doi.org/10.1016/j.eurpsy.2018.03.001.

Chen S and Cheng C (2024) 'Unveiling coronasomnia: pandemic stress and sleep problems during the COVID-19 outbreak', *Nature and Science of Sleep*, 16: 543–553, https://doi.org/10.2147/NSS.S459945.

Costello TH, Pennycook G and Rand DG (2024) 'Durably reducing conspiracy beliefs through dialogues with AI', *Science*, 385(6714): eadq1814, https://doi.org/10.1126/science.adq1814.

Cruwys T, Haslam C, Haslam SA, Rathbone JA and Donaldson JL (2022) 'Acceptability and feasibility of an intervention to enhance social group belonging: evidence from three trials of Groups 4 Health', *Behavior Therapy*, 53(6): 1233–1249, https://doi.org/10.1016/j.beth.2022.06.011.

Delmastro M and Paciello M (2022) 'Depression, reduced education, and bias perceptions as risk factors of beliefs in misinformation', *Scientific Reports*, 12(1): 16408, https://doi.org/10.1038/s41598-022-20640-7.

Dutcher JM, Boyle CC, Eisenberger NI, Cole SW and Bower JE (2021) 'Neural responses to threat and reward and changes in inflammation following a mindfulness intervention', *Psychoneuroendocrinology*, 125: 105114, https://doi.org/10.1016/j.psyneuen.2020.105114.

Eccles AM and Qualter P (2021) 'Review: alleviating loneliness in young people – a meta-analysis of interventions', *Child and Adolescent Mental Health*, 26(1): 17–33, https://doi.org/10.1111/camh.12389.

Ecker UKH, Lewandowsky S, Cook J, Schmid P, Fazio LK, Brashier N, Kendeou P, Vraga EK and Amazeen MA (2022) 'The psychological drivers of misinformation belief and its

resistance to correction', *Nature Reviews Psychology*, 1: 13–29, https://doi.org/10.1038/s44159-021-00006-y.

Eime R, Harvey J and Charity M (2024) 'Australian sport and physical activity behaviours pre, during and post-COVID-19', *BMC Public Health*, 24: 834, https://doi.org/10.1186/s12889-024-18245-y.

El Masri A, Kolt GS and George ES (2021) 'Feasibility and acceptability of a culturally tailored physical activity intervention for Arab-Australian women', *BMC Women's Health*, 21: 131, https://doi.org/10.1186/s12905-021-01250-3.

Erickson KI, Hillman CH, Stillman CM, Ballard RM, Bloodgood B, Conroy DE, Macko RF, Marquez DX, Petruzzello SJ and Powell KE (2019) 'Physical activity, cognition, and brain outcomes: a review of the 2018 physical activity guidelines', *Medicine & Science in Sports & Exercise*, 51(6): 1242–1251, https://doi.org/10.1249/mss.0000000000001936.

Erickson KI, Voss MW, Prakash RS, Basak C, Szabo A, Chaddock L, Kim JS, Heo S, Alves H, White SM, Wojcicki TR, Mailey E, Vieira VJ, Martin SA, Pence BD, Woods JA, McAuley E and Kramer AF (2011) 'Exercise training increases size of hippocampus and improves memory', *Proceedings of the National Academy of Sciences*, 108(7): 3017–3022, https://doi.org/10.1073/pnas.1015950108.

Espinoza Oyarce DA, Shaw ME, Alateeq K and Cherbuin N (2020) 'Volumetric brain differences in clinical depression in association with anxiety: a systematic review with meta-analysis', *Journal of Psychiatry and Neuroscience*, 45(6): 406–429, https://doi.org/10.1503/jpn.190156.

Fazio LK (2020) 'Repetition increases perceived truth even for known falsehoods', *Collabra: Psychology*, 6(1): 38, https://doi.org/10.1525/collabra.347.

Fett AKJ, Gromann PM, Giampietro V, Shergill SS and Krabbendam L (2014) 'Default distrust? An fMRI investigation of the neural development of trust and cooperation', *Social Cognitive and Affective Neuroscience*, 9(4): 395–402, https://doi.org/10.1093/scan/nss144.

Fonagy P and Luyten P (2018) 'Attachment, mentalization, and the self', in Livesley WJ and Larstone R (eds), *Handbook of personality disorders: theory, research, and treatment*, The Guilford Press, New York.

Fordham B, Sugavanam T, Edwards K, Stallard P, Howard R, das Nair R, Copsey B, Lee H, Howick J, Hemming K, Lamb SE (2021) 'The evidence for cognitive behavioural therapy in any condition, population or context: a meta-review of systematic reviews and panoramic meta-analysis', *Psychological Medicine*, 51(1): 21–29, https://doi.org/10.1017/s0033291720005292.

Forgas JP and East R (2008) 'On being happy and gullible: mood effects on skepticism and the detection of deception', *Journal of Experimental Social Psychology*, 44(5): 1362–1367, https://doi.org/10.1016/j.jesp.2008.04.010.

Forkmann T, Scherer A, Pawelzik M, Mainz V, Drueke B, Boecker M and Gauggel S (2014) 'Does cognitive behavior therapy alter emotion regulation in inpatients with a depressive disorder?', *Psychology Research and Behavior Management*, 7: 147–153, https://doi.org/10.2147/prbm.s59421.

Freeman D and Garety P (2014) 'Advances in understanding and treating persecutory delusions: a review', *Social Psychiatry and Psychiatric Epidemiology*, 49: 1179–1189, https://doi.org/10.1007/s00127-014-0928-7.

Frenda SJ, Patihis L, Loftus EF, Lewis HC and Fenn KM (2014) 'Sleep deprivation and false memories', *Psychological Science*, 25(9): 1674–1681, https://doi.org/10.1177/0956797614534694.

Friedman A, Homma D, Bloem B, Gibb LG, Amemori KI, Hu D, Delcasso S, Truong TF, Yang J, Hood AS, Mikofalvy KA, Beck DW, Nguyen N, Nelson ED, Toro Arana SE, Vorder Bruegge RH, Goosens KA and Graybiel AM (2017) 'Chronic stress alters striosome-circuit dynamics, leading to aberrant decision-making', *Cell*, 171(5): 1191–1205.e28, https://doi.org/10.1016/j.cell.2017.10.017.

Friedman NP and Robbins TW (2022) 'The role of prefrontal cortex in cognitive control and executive function', *Neuropsychopharmacology*, 47: 72–89, https://doi.org/10.1038/s41386-021-01132-0.

Fu F, Tarnita CE, Christakis NA, Wang L, Rand DG and Nowak MA (2012) 'Evolution of in-group favoritism', *Scientific Reports*, 2: 460, https://doi.org/10.1038/srep00460.

Gu J, Strauss C, Bond R and Cavanagh K (2015) 'How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies', *Clinical Psychology Review*, 37: 1–12, https://doi.org/10.1016/j.cpr.2015.01.006.

Hampton AN, Bossaerts P and O'Doherty JP (2008) 'Neural correlates of mentalizing-related computations during strategic interactions in humans', *Proceedings of the National Academy of Sciences*, 105(18): 6741–6746, https://doi.org/10.1073/pnas.0711099105.

Han J, Cha M and Lee W (2020) 'Anger contributes to the spread of COVID-19 misinformation', *Harvard Kennedy School Misinformation Review*, 1(3), https://doi.org/10.37016/mr-2020-39.

Health Direct (2024) *Alzheimer's disease*, Health Direct website.

Henriksson P, Cuenca-García M, Labayen I, Esteban-Cornejo I, Henriksson H, Kersting M, Vanhelst J, Widhalm K, Gottrand F, Moreno LA and Ortega FB (2017) 'Diet quality and attention capacity in European adolescents: the Healthy Lifestyle in Europe by Nutrition in Adolescence (HELENA) study', *British Journal of Nutrition*, 117(10): 1587–1595, https://doi.org/10.1017/S0007114517001441.

Hills TT (2019) 'The dark side of information proliferation', *Perspectives on Psychological Science*, 14(3): 323–330, https://doi.org/10.1177/1745691618803647.

Holt-Lunstad J (2024) 'Social connection as a critical factor for mental and physical health: evidence, trends, challenges, and future implications', *World Psychiatry*, 23(3): 312–332, https://doi.org/10.1002/wps.21224.

Hötting K and Röder B (2013) 'Beneficial effects of physical exercise on neuroplasticity and cognition', *Neuroscience & Biobehavioral Reviews*, 37(9 Pt B): 2243–2257, https://doi.org/10.1016/j.neubiorev.2013.04.005.

Howes OD and Shatalina E (2022) 'Integrating the neurodevelopmental and dopamine hypotheses of schizophrenia and the role of cortical excitation–inhibition balance', *Biological Psychiatry*, 92(6): 501–513, https://doi.org/10.1016/j.biopsych.2022.06.017.

Hu Z, Wen Y, Wang Y, Lin Y, Shi J, Yu Z, Lin Y, Wang Y (2022) 'Effectiveness of mindfulness-based interventions on empathy: a meta-analysis', *Frontiers in Psychology*, 13, https://doi.org/10.3389/fpsyg.2022.992575.

Hueber AJ and Kleyer A (2023) 'Quality of citation data using the natural language processing tool ChatGPT in rheumatology: creation of false references', *RMD Open*, 9: e003248, https://doi.org/10.1136/rmdopen-2023-003248.

Jankowski T and Holas P (2014) 'Metacognitive model of mindfulness', *Consciousness and Cognition*, 28: 64–80, https://doi.org/10.1016/j.concog.2014.06.005.

Jiang-Xie LF, Drieu A and Kipnis J (2025) 'Waste clearance shapes aging brain health', *Neuron*, 113(1): 71–81, https://doi.org/10.1016/j.neuron.2024.09.017.

Kanoski SE and Davidson TL (2011) 'Western diet consumption and cognitive impairment: links to hippocampal dysfunction and obesity', *Physiology & Behavior*, 103(1): 59–68, https://doi.org/10.1016/j.physbeh.2010.12.003.

Killgore WDS, Killgore DB, Day LM, Li C, Kamimori GH and Balkin TJ (2007) 'The effects of 53 hours of sleep deprivation on moral judgment', *Sleep*, 30(3): 345–352, https://doi.org/10.1093/sleep/30.3.345.

Kirszenblat L and van Swinderen B (2015) 'The yin and yang of sleep and attention', *Trends in Neurosciences*, 38(12): 776–786, https://doi.org/10.1016/j.tins.2015.10.001.

Li I, Skinner A, Varidel M, Zhao J, Hickie IB and Occhipinti J-A (2025) 'Understanding drivers of loneliness: machine learning insights from the HILDA survey', *Research Directions: Depression,*2: e3, https://doi.org/10.1017/dep.2025.2.

Li L, Liu Z, Cai Y, Sun H, Chen L, Gao X, Xiong J, Qian H and Xie Y (2024) 'Optimal exercise dose and type for improving sleep quality: a systematic review and network meta-analysis of RCTs', *Frontiers in Psychology*, 15: 1466277, https://doi.org/10.3389/fpsyg.2024.1466277.

Loprinzi PD and Frith E (2019) 'A brief primer on the mediational role of BDNF in the exercise–memory link', *Clinical Physiology and Functional Imaging*, 39(1): 9–14, https://doi.org/10.1111/cpf.12522.

Luby J, Belden A, Botteron K, Marrus N, Harms MP, Babb C, Nishino T and Barch D (2013) 'The effects of poverty on childhood brain development: the mediating effect of caregiving and stressful life events', *JAMA Pediatrics*, 167(12): 1135–1142, https://doi.org/10.1001/jamapediatrics.2013.3139.

Lupien SJ, Juster RP, Raymond C and Marin MF (2018) 'The effects of chronic stress on the human brain: from neurotoxicity, to vulnerability, to opportunity', *Frontiers in Neuroendocrinology*, 49: 91–105, https://doi.org/10.1016/j.yfrne.2018.02.001.

Martel C, Pennycook G and Rand DG (2020) 'Reliance on emotion promotes belief in fake news', *Cognitive Research: Principles and Implications*, 5: 47, https://doi.org/10.1186/s41235-020-00252-3.

Marx W, Manger SH, Blencowe M, Murray G, Ho FY, Lawn S, Blumenthal JA, Schuch F, Stubbs B, Ruusunen A, Desyibelew HD, Dinan TG, Jacka F, Ravindran A, Berk M and O'Neil A (2023) 'Clinical guidelines for the use of lifestyle-based mental health care in major depressive disorder: World Federation of Societies for Biological Psychiatry (WFSBP) and Australasian Society of Lifestyle Medicine (ASLM) taskforce', *World Journal of Biological Psychiatry*, 24(5): 333–386, https://doi.org/10.1080/15622975.2022.2112074.

Mayer RC, Davis JH and Schoorman FD (1995) 'An integrative model of organizational trust', *The Academy of Management Review*, 20(3): 709–734, https://doi.org/10.5465/AMR.1995.9508080335.

Montague PR, Lohrenz T and Dayan P (2015) 'The three R's of trust', *Current Opinion in Behavioral Sciences*, 3: 102–106, https://doi.org/10.1016/j.cobeha.2015.02.009.

Moulding R, Nix-Carnell S, Schnabel A, Nedeljkovic M, Burnside EE, Lentini AF and Mehzabin N (2016) 'Better the devil you know than a world you don't? Intolerance of uncertainty and worldview explanations for belief in conspiracy theories', *Personality and Individual Differences*, 98: 345–354, https://doi.org/10.1016/j.paid.2016.04.060.

Newman EJ, Ecker UKH, O'Neil M and Tay LQ (2026) *Information Resilience: a framework for misinformation interventions*, report to the National Science and Technology Council, Australian Government Office of the Chief Scientist.

Niendam TA, Laird AR, Ray KL, Dean YM, Glahn DC and Carter CS (2012) 'Meta-analytic evidence for a superordinate cognitive control network subserving diverse executive functions', *Cognitive, Affective, & Behavioral Neuroscience*, 12(2): 241–268, https://doi.org/10.3758/s13415-011-0083-5.

Northey JM, Cherbuin N, Pumpa KL, Smee DJ and Rattray B (2018) 'Exercise interventions for cognitive function in adults older than 50: a systematic review with

meta-analysis', *British Journal of Sports Medicine*, 52(3): 154–160, https://doi.org/10.1136/bjsports-2016-096587.

Notley T, Hua MD, Zhong F and Chambers S (2020) *News and young Australians in 2020: how young people access, perceive and are affected by news media* [PDF], Research Report, Western Sydney University and Queensland University of Technology.

O'Donnell R, Savaglio M, Vicary D and Skouteris H (2020) 'Effect of community mental health care programs in Australia: a systematic review', *Australian Journal of Primary Health*, 26: 443–451, https://doi.org/10.1071/PY20147.

Occhipinti JA, Skinner A, Carter S, Heath J, Lawson K, McGill K, McClure R and Hickie IB (2021a) 'Federal and state cooperation necessary but not sufficient for effective regional mental health systems: insights from systems modelling and simulation', *Scientific Reports*, 11: 11209, https://doi.org/10.1038/s41598-021-90762-x.

Occhipinti JA, Skinner A, Iorfino F, Lawson K, Sturgess J, Burgess W, Davenport T, Hudson D and Hickie IB (2021b) 'Reducing youth suicide: systems modelling and simulation to guide targeted investments across the determinants', *BMC Medicine*, 19: 61, https://doi.org/10.1186/s12916-021-01935-4.

Park S, Notley T, Thomson TJ, Hourigan A and Dezuanni M (2024) *Online misinformation in Australia: adults' experiences, abilities, and responses*, University of Canberra and Western Sydney University. https://doi.org/10.60836/jpmm-dw04.

Platow MJ, Hirst G, Aroni R, Gilchrist A, Huynh HP, Li K, Newman E, Tay LQ and Zwikael O (2026) *Information resilience: how misinformation undermines social cohesion, trust and democracy*, report to the National Science and Technology Council, Australian Government Office of the Chief Scientist.

Prado EL and Dewey KG (2014) 'Nutrition and brain development in early life', *Nutrition Reviews*, 72(4): 267–284, https://doi.org/10.1111/nure.12102.

Rathje S, Van Bavel JJ and van der Linden S (2021) 'Out-group animosity drives engagement on social media', *Proceedings of the National Academy of Sciences*, 118(26): e2024292118, https://doi.org/10.1073/pnas.2024292118.

Richter-Levin G and Akirav I (2000) 'Amygdala-hippocampus dynamic interaction in relation to memory', *Molecular Neurobiology*, 22: 11–20, https://doi.org/10.1385/MN:22:1-3:011.

Sanilevici M, Reuveni O, Lev-Ari S, Golland Y and Levit-Binnun N (2021) 'Mindfulness-based stress reduction increases mental wellbeing and emotion regulation during the first wave of the COVID-19 pandemic: a synchronous online intervention study', *Frontiers in Psychology*, 12, https://doi.org/10.3389/fpsyg.2021.720965.

Sbarra DA, Ramadan FA, Choi KW, Treur JL, Levey DF, Wootton RE, Stein MB, Gelernter J and Klimentidis YC (2023) 'Loneliness and depression: bidirectional Mendelian

randomization analyses using data from three large genome-wide association studies', *Molecular Psychiatry*, 28: 4594–4601, https://doi.org/10.1038/s41380-023-02259-w.

Schilling TM, Kölsch M, Larra MF, Zech CM, Blumenthal TD, Frings C and Schächinger H (2013) 'For whom the bell (curve) tolls: cortisol rapidly affects memory retrieval by an inverted U-shaped dose–response relationship', *Psychoneuroendocrinology*, 38(9): 1565–1572, https://doi.org/10.1016/j.psyneuen.2013.01.001.

Schmack K, Bosc M, Ott T, Sturgill JF and Kepecs A (2021) 'Striatal dopamine mediates hallucination-like perception in mice', *Science*, 372(6537): eabf4740, https://doi.org/10.1126/science.abf4740.

Schuster BA and Lamm C (2025) 'How dopamine shapes trust beliefs', *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 136: 111206, https://doi.org/10.1016/j.pnpbp.2024.111206.

Schwabe L and Wolf OT (2013) 'Stress and multiple memory systems: from "thinking" to "doing"', *Trends in Cognitive Sciences*, 17(2): 60–68, https://doi.org/10.1016/j.tics.2012.12.001.

Setiawan E, Attwells S, Wilson AA, Mizrahi R, Rusjan PM, Miler L, Sharma S, Kish S, Houle S and Meyer JH (2018) 'Association of translocator protein total distribution volume with duration of untreated major depressive disorder: a cross-sectional study', *The Lancet Psychiatry*, 5(4): 339–347, https://doi.org/10.1016/S2215-0366(18)30048-8.

Singh B, Olds T, Curtis R, Dumuid D, Virgara R, Watson A, Szeto K, O'Connor E, Ferguson T, Eglitis E, Miatke A, Simpson CEM and Maher CE (2023) 'Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews', *British Journal of Sports Medicine*, 57(18): 1203–1209, https://doi.org/10.1136/bjsports-2022-106195.

Snyder HR, Miyake A and Hankin BL (2015) 'Advancing understanding of executive function impairments and psychopathology: bridging the gap between clinical and cognitive approaches', *Frontiers in Psychology*, 6, https://doi.org/10.3389/fpsyg.2015.00328.

Soroka S, Fournier P and Nir L (2019) 'Cross-national evidence of a negativity bias in psychophysiological reactions to news', *Proceedings of the National Academy of Sciences*, 116(38): 18888–18892, https://doi.org/10.1073/pnas.1908369116.

Strengthening Democracy Taskforce (2024) *Strengthening Australian democracy: a practical agenda for democratic resilience* [PDF], Department of Home Affairs, Commonwealth of Australia.

Taren AA, Creswell JD, Gianaros PJ, Lindsay EK, Fairgrieve A, Brown KW, Rosen RK, Ferris JL, Julson E and Marsland AL (2014) 'Mindfulness meditation training alters stress-related amygdala resting state functional connectivity: a randomized controlled trial', *Social Cognitive and Affective Neuroscience*, 10(12): 1758–1768, https://doi.org/10.1093/scan/nsv066.

von Rosenberg J (2020) 'Emotional turmoil and time constraints decrease the ability of team members to communicate effectively and make decisions', *Air Medical Journal*, 39(4): 245–248, https://doi.org/10.1016/j.amj.2020.05.004.

Walsh EI, Smith L, Northey J, Rattray B and Cherbuin N (2020) 'Towards an understanding of the physical activity–BDNF–cognition triumvirate: a review of associations and dosage', *Ageing Research Reviews*, 60: 101044, https://doi.org/10.1016/j.arr.2020.101044.

Wennberg AMV, Wu MN, Rosenberg PB and Spira AP (2017) 'Sleep disturbance, cognitive decline, and dementia: a review', *Seminars in Neurology*, 37(4): 395–406, https://doi.org/10.1055/s-0037-1604351.

Wickham S, Shryane N, Lyons M, Dickins T and Bentall RP (2014a) 'Why does relative deprivation affect mental health? The role of justice, trust and social rank in psychological wellbeing and paranoid ideation', *Journal of Public Mental Health*, 13(2): 114–126, https://doi.org/10.1108/JPMH-06-2013-0049.

Wickham S, Taylor P, Shevlin M and Bentall RP (2014b) 'The impact of social deprivation on paranoia, hallucinations, mania and depression: the role of discrimination, social support, stress and trust', *PLOS ONE*, 9(8): e105140, https://doi.org/10.1371/journal.pone.0105140.

Wilkins R, Vera-Toscano E and Botha F (2024) *The Household, Income and Labour Dynamics in Australia Survey: selected findings from waves 1 to 21 – the 18th annual statistical report of the HILDA survey* [PDF], Melbourne Institute: Applied Economic & Social Research, the University of Melbourne.

Appendix A: Contributing experts and peer reviewers

Lead expert

Professor Linda Richards AO FAA FAHMS

Edison Professor and Chair, Department of Neuroscience, Director, McDonnell Center for Cellular & Molecular Neurobiology, Washington University School of Medicine, and Honorary Professor, Queensland Brain Institute.

Expert contributors

- Associate Professor Michelle Amazeen, Boston University
- Dr Joseph Barnby, Royal Holloway, University of London
- Professor Emeritus Deborah Bunker, University of Sydney
- Professor Nicolas Cherbuin, Australian National University
- Professor Peter Dayan FRS, Max Planck Institute for Biological Cybernetics
- Professor Ian Hickie AO FAHMS FASSA, University of Sydney
- Associate Professor Piers Howe, University of Melbourne
- Distinguished Professor Anna Peeters AM FAHMS, Deakin University
- Distinguished Professor Maree Teesson AC FAHMS FASSA, University of Sydney

Peer reviewers

- Emeritus Professor Max Coltheart AM FAA FASSA, Macquarie University
- Professor Ullrich Ecker, University of Western Australia

Acknowledgements

Professor Jason Mattingley FASSA (University of Queensland) and Professor Anthony Hannan (The Florey Institute of Neuroscience and Mental Health) from the Australian Academy of Science's National Committee for Brain and Mind provided input into the report draft.

The production of this report was supported by: Dr Ruby Guyatt, Khaled Chakli and Catherine Luckin of the Australian Academy of Health and Medical Sciences; Dr Jasmine Schipp, Dr Hayley Teasdale, Rakshanya Sekar, Lauren Sullivan, Chris Anderson and Anna-Maria Arabia OAM of the Australian Academy of Science. Edited by Lydia Hales and Ellen Rykers of the Australian Academy of Science. Graphic design by Leah Albert of the Australian Academy of Science.