

## Ideological Open-mindedness is a State-Based Cognitive Style Needed for Critical Thinking: A Scoping Review

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### Abstract

*Ideological open-mindedness (IOM) is the ability to engage with diverse viewpoints, promoting cognitive flexibility, critical thinking, and reducing polarization. Effective methods for enhancing IOM are still underexplored. This scoping review investigates interventions aimed at improving IOM by analyzing studies from four databases (ERIC, PsycINFO, Medline, and Web of Science). Articles were included if they tested interventions directly related to IOM. Findings were summarized using tables, figures, a concept map, and a logic model. The search identified 22 studies, with interventions including group workshops and activities that foster perspective-taking and critical thinking. These interventions led to significant and meaningful improvements in IOM, measured through various cognitive and behavioural assessments. Societal contexts and group norms influence IOM, a construct that may be best conceptualized as a dynamic, context-dependent cognitive trait that works in tandem with critical thinking. Further research is needed to standardize IOM measures and assess long-term and cross-context effects.*

**Keywords:** cognitive psychology; open-mindedness; cognitive flexibility; critical thinking; polarization

### 1. Introduction

Ideological tension is an inherent part of a pluralistic society (Parra et al., 2023), but in recent years, distrust and disrespect towards those who hold opposing ideological views has reached unprecedented levels (Collins et al., 2022; Finkel et al., 2020; Iyengar et al., 2019). In response, “debiasing techniques” have been developed to reduce affective polarization and promote open-mindedness (Erceg et al, 2022). Such techniques aim to improve individual openness to different ideologies as a means of addressing societal tensions.

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Ideological open-mindedness (IOM) broadly refers to the ability to engage with diverse perspectives and opposing views (Ferkany, 2019; Shim & Perez, 2018). It involves both the cognitive capacity to consider new, potentially conflicting ideas and the behavioural disposition to engage respectfully with those ideas (Kwong, 2023). IOM is closely linked to critical thinking, among other traits, as it fosters cognitive flexibility and reflective reasoning (Ennis, 1996, Miura et al., 2020).

Although research on IOM has advanced, relatively little is known about effective methods to reliably improve it, particularly in ways that lead to secondary benefits like enhanced critical thinking. While cognitive training can increase flexibility (Jackson et al., 2012), the IOM-related personality trait of openness to experience has shown mixed results in terms malleability (Costa & McCrae, 1994; Sander et al., 2017). Furthermore, different conceptualizations of open-mindedness—such as active open-minded thinking (Baron et al., 2017)—suggest that IOM may be more state-based than trait-based; that is, it is influenced by context and group dynamics as compared to a more stable personality trait (Moaz et al., 2023; Ottati & Wilson, 2018). Given the importance of IOM in education, psychotherapy, and society, there is a pressing need to better understand how to improve it. This scoping review explores existing interventions designed to enhance IOM across diverse populations and contexts.

It is not entirely known whether targeted interventions can improve IOM. Research has suggested the personality trait of openness to experience (including a sub-facet of openness to ideas) to be relatively enduring and stable over time (Sander et al., 2017), yet different conceptualizations of openness have yielded different results. For example, active open-minded thinking has been described as a thinking style that can be practiced and learned (Baron et al., 2017; Erceg, 2022), and researchers have highlighted the key role of context (or state-based) versus personality level (or trait-based) open-minded thinking. Particularly within groups, in-group versus out-group membership and being part of societal minorities or majorities can have important impacts on fluctuations in open-mindedness to novel or different ideas (Moaz et al., 2023; Ottati & Wilson, 2018).

How best to improve open-mindedness to novel or different ideas remains relatively obscure, yet such improvements have important implications in education (Huynh & Grossman, 2020), in psychotherapy practice for open and active listening skills (Collins et al., 2022), and to broader society for reducing polarization (Erceg et al., 2022). By synthesizing the current evidence, we aim to identify and spotlight effective strategies for fostering open-mindedness, with the goal of reducing polarization and promoting more constructive societal dialogue.

Existing research on IOM employs different terminology to refer to the same or similar constructs. Open-mindedness has been referred to as ideological openness, active open-minded thinking, open-minded cognition, openness to others (to difference, to criticism), and just openness. In psychology, openness is most often associated or measured with openness to experience, a personality trait within the Factor Five Inventory (FFI) which contains a sub-facet called openness to ideas (Costa & McCrae, 1987). For clarity and convenience here, an umbrella term of ideological open-mindedness (IOM) will be used to refer to these overlapping constructs—both personality traits and others. This consolidation is based on a need to harmonize overlapping terms in reviewing related studies, and on research that has found correlations between trait openness to experience and elements of IOM such as cognitive flexibility, intellectual humility, critical thinking, and creativity (Baas et al., 2013; Leary et al., 2017). As such, IOM refers to a number of psychological proclivities (manifested through emotions, attitudes, and behaviours) that together represent a willingness “to have one’s beliefs and values challenged and a desire to interact and learn from others who are different from oneself” (Shim & Perez, 2018, p. 455). It has also been defined as involving intellectual curiosity, open thinking and inquiry, openness to diverse ideas, and a readiness to reconsider one’s own and others’ views (Haidt & Lukianoff, 2019; Hare, 1979; Miura et al., 2020).

In focusing on studies that target IOM and closely related constructs, our research question is: what interventions have been shown to improve ideological open-mindedness? The purpose of this review is to

map existing evidence on interventions targeting IOM and related constructs, and to highlight any emerging trends in the literature.

## **2. Materials and Methods**

### *2.1. Protocol*

This scoping review followed the Preferred Reporting Items for Systematic Review Protocols Statement (Moher et al., 2015) and the PRISMA Extension for Scoping Reviews (Tricco et al., 2018). The methodology is based on Arksey & O'Malley's (2005) five-step framework: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting data, and (5) collating, summarizing, and reporting results. As per scoping review guidelines, there are no limitations on study design, and quality assessment was not conducted, prioritizing breadth over depth of information. The protocol was not pre-registered, and the dataset is publicly available through Open Science Framework.

### *2.2. Identifying the Research Questions*

The central question guiding this review is: What interventions improve ideological open-mindedness (IOM) or related traits such as openness to diverse ideas? IOM encompasses cognitive flexibility, open thinking, intellectual curiosity, and engagement with diverse viewpoints. This review was motivated by the relevance of IOM to education, societal polarization, and mental health outcomes.

### *2.3. Eligibility criteria and Information Sources*

We included peer-reviewed studies that targeted IOM interventions in general populations of all ages and education levels, published in English or French. No restrictions were placed on study design, discipline, or publication year, but conference proceedings and dissertations were excluded. Eligible studies had to contain interventions (e.g., workshops, training programs) aimed at improving IOM. Theoretical articles were included if they reviewed concrete evidence of interventions. Studies that treated IOM as a predictor variable, or those primarily focused on separate literatures of multiculturalism, intercultural competence, or organizational psychology, were excluded, as IOM improvement was not the centralized aim. We searched four databases: PsycINFO, ERIC, Web of Science, and Medline, on February 19, 2024.

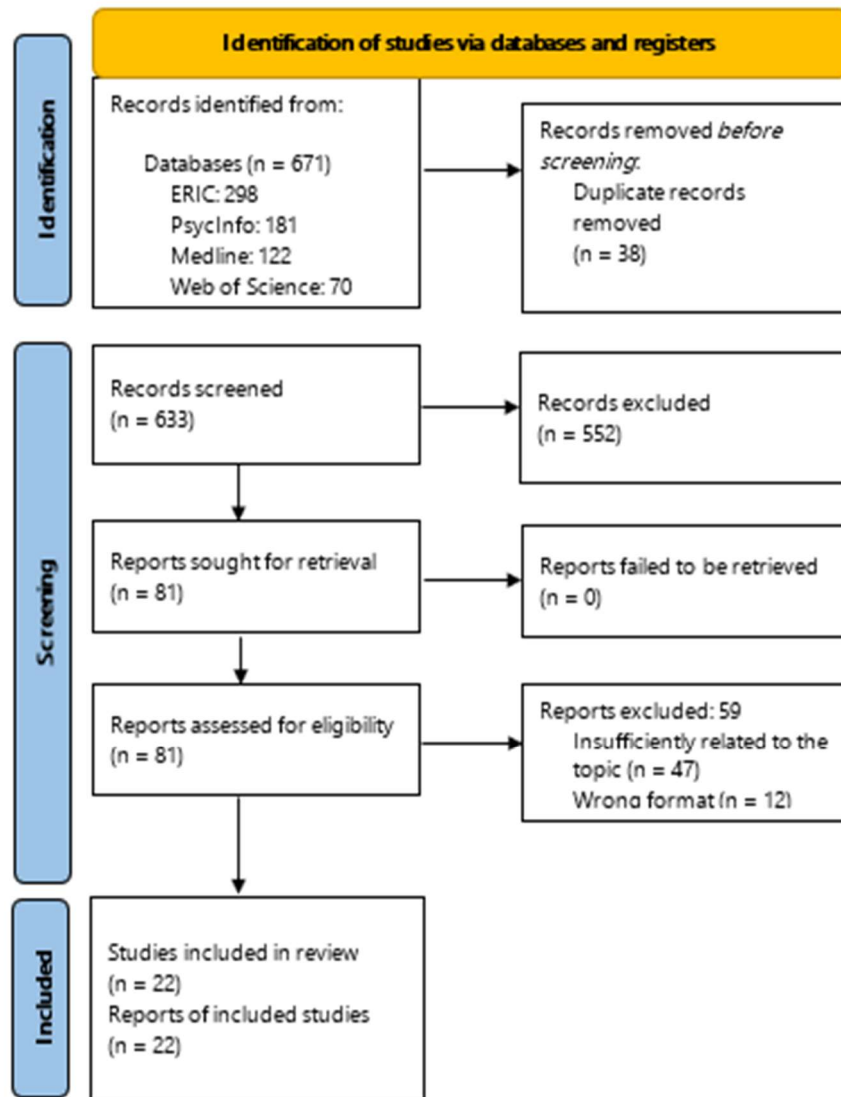
### *2.4. Search Strategy*

Search terms were developed in consultation with a research librarian and refined through prior research. The final search strategy is detailed in Supplemental Information, File 1. Search terms were peer-reviewed.

### *2.5. Selection of Sources of Evidence*

Search results were imported into EndNote and uploaded to Covidence for screening and duplicates were removed. In keeping with screening protocol recommendations from Higgins and Deek (2008), five reviewers, trained on eligibility criteria but without prior knowledge of the topic, conducted blind trials with 50 articles at a time, achieving an agreement rate of 80% before proceeding. Disagreements were resolved through group discussion. Articles were retained for full-text screening when consensus was reached. At this stage, reviewers assessed the relevance of studies to the research question and IOM constructs. Articles were excluded if they lacked intervention details, were in the wrong format, or did not meet the inclusion criteria. A PRISMA flow diagram (Figure 1, Appendix A) outlines the selection process.

Figure 1. PRISMA flow chart



### 2.6. Data Items and Charting

Data were charted using a structured Excel spreadsheet, capturing information on study characteristics (e.g., author, year, country), research design, methodology, sample demographics, intervention details, outcome measures, and barriers/facilitators to improving IOM. Reviewers worked collaboratively in a shared document, with a post-hoc quality assurance check on 15 randomly selected articles. If there were more than two disagreements, all articles by that reviewer were reassessed. The final list of included articles is in Supplemental Information, File 2.

### 2.7. Synthesis of Results

Data were synthesized using visual concept maps and a logic model, following guidelines from the W.K. Kellogg Foundation (2004) and Smith et al. (2020). This approach was selected for its readability and clarity in mapping the relationships between interventions, outcomes, and the research question, as well as identifying trends in IOM research.

### 3. Results

Refer to Appendix A (Figure 1) for a PRISMA diagram illustrating the search and screening procedure, which identified 22 unique citations after full-text reviews conducted by five readers. In total, 81 articles were retained for full-text review, and 30% (22 articles) were included in the final analysis. A list of excluded citations is available upon request (most exclusions were for insufficiently related content, lack of interventions for IOM, or reporting findings specific to other fields).

#### 3.1. Characteristics of the Included Studies

Refer to Appendix B (Table 1) for a summary of key descriptive characteristics of the included studies (e.g., origin, year, construct identified, research designs), and below for details.

**Table 1.** Description of included studies

Study characteristics			
(N=22)			
Year of publication			
	1976–2011	1	5%
	2012–2014	3	14%
	2015–2017	4	18%
	2018–2020	6	27%
	2021–2023	8	36%
Location			
	United States	8	36%
	Germany	3	14%
	Netherlands	2	9%
	Croatia	1	5%
	France	1	5%
	Italy	1	5%
	Japan	1	5%
	United Kingdom	1	5%
	Norway	1	5%
	Saudi Arabia	1	5%
	Sweden	1	5%
Type of study			
	Quantitative	13	59%
	Qualitative	6	27%
	Mixed methods	3	14%
Population			
	General population	8	36%
	University students	7	32%
	Elderly	2	9%
	Teenagers	1	5%
	Children	1	5%
	Teachers (secondary)	1	5%
	Religious practitioners	1	5%
Data collection method			
	Survey/questionnaire	14	64%
	Interview/focus	5	23%

	Literature review	1	5%
	Survey/questionnaire	1	5%
	Survey/questionnaire and interview/focus group/group	1	5%
Study design	Experiment or Observational or Theoretical	10	45%
	Experimental design and Observational or naturalistic	10	45%
		1	5%
		1	5%

### 3.1.1. Core Constructs

Common IOM-related constructs examined across studies included critical thinking, cognitive flexibility, openness, perspective-taking, open-mindedness, openness to experience, and active open-minded thinking. Figure 2 shows the frequency with which these constructs were stated within study research questions and aims. These constructs have been widely linked to ideologically open attitudes and cognitive flexibility, suggesting their relevance for interventions aimed at improving IOM. Due to their high conceptual overlap, definitions used by the reviewed studies are provided below in order to clarify what was specifically targeted by the study interventions. These constructs were frequently discussed across studies, highlighting their common theme of openness to new or different perspectives, and their relationship to IOM.

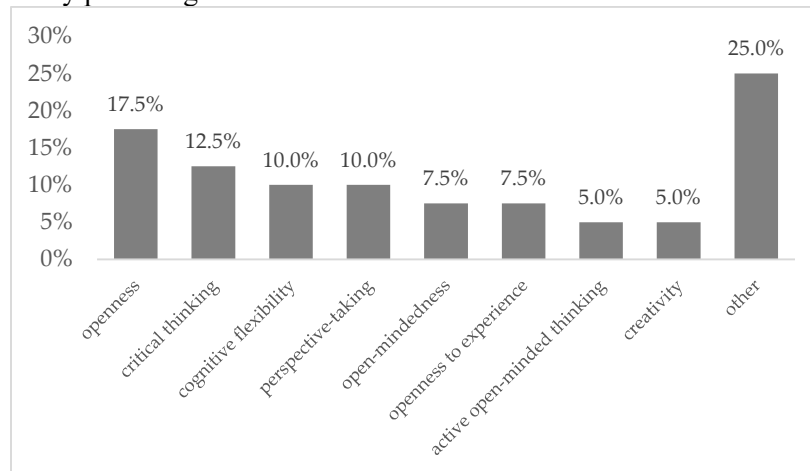
Critical Thinking and the cognitive styles of Need for Closure or Need for Cognition have been correlated with improvements in IOM (Metz et al., 2020). This construct was defined as reflective reasoning aimed at deciding what to believe or do; critical thinking requires open-mindedness both to consider and to fairly evaluate others' viewpoints (Ennis, 1996; Miura et al., 2020).

Perspective-taking has been associated with increased openness to differing viewpoints (Song & Shi, 2017). Defined as understanding others' viewpoints, which is closely related to openness and the ability to revise one's beliefs based on new information (Spencer et al., 2020).

Cognitive Flexibility has been shown to increase tolerance for ambiguity, particularly in stressful or politically charged environments (Karami & Parra-Martinez, 2021; Jost et al., 2003; Atlas et al., 2003). Described as the ability to switch between different perspectives and adapt to new information (Kleiman & Enisman, 2018; Rietzschel et al., 2007). This construct is considered fundamental for effective IOM interventions.

Intellectual Humility and Dogmatism (reversed) have also been highlighted as related constructs (Leary et al., 2017; Ferkany, 2019; Higgins, 2009). Whereas intellectual humility represents an openness to having one's ideas challenged, dogmatism is regarded as negatively correlated to IOM, and represents processing new information in a way that reinforces or confirms preexisting ideas (Ottati et al., 2023).

Openness: Defined, in ideological terms, as the willingness to consider and possibly revise one's beliefs (Riggs, 2010; Xu & Petty, 2020). In some studies, openness was assessed through personality traits, such as openness to experience, which includes cognitive flexibility and intellectual curiosity (Costa & McCrae, 1992; Mühlig-Versen et al., 2012).

**Figure 2.** Constructs by percentage of focus in included studies

Note: Constructs included both primary and secondary focus of article. Others included 10 individual mentions of: cognitive reflection, democratic learning, dialogic argumentation, divergent thinking, ideological openness, open-minded cognition, openness to criticism, problem finding, self-disclosure, and wise reasoning.

### 3.1.2. Study Aims

The main stated aims of the studies varied, with the majority (13 studies, 59%) stating a focus on improving openness (including measurement and enhancement of IOM). Other aims included improving out-group contact (6 studies, 27%) and promoting dialogue (3 studies, 14%) through interventions targeting IOM.

### 3.1.3. Outcome Measures

Table 2 provides a summary of the outcome measures employed across the studies. Not all studies included formal outcome measures; some relied on self-constructed questionnaires assessing constructs such as divergent thinking, creativity, and cognitive flexibility.

**Table 2.** Outcome measures by included record

Included record ( <i>N</i> =12)	Measure	Original citation
Tittler et al., 1976	The Dogmatism Scale	Rokeach, 1960
Jackson et al., 2012	International Personality Item Pool - Abridged Big-Five Dimensional Circumplex (IPIP-AB5C) Big Five Inventory (BFI) Alternate Uses Test	Goldberg, 1999  John & Srivastava, 1999 Reese et al., 2001
Mühlig-Versen et al., 2012	Neuroticism Extroversion Openness Five Factor Inventory (NEO-FFI; German) Locus of Control Scale	Borkenau & Ostendorf, 1993 Levenson, 1981
Stathi et al., 2014	Inclusion of Others in the Self Scale	Aron et al., 1992
Cargile, 2015	Authoritarianism-Conservatism-Traditionalism (ACT) Scale (short form)	Duckitt et al., 2010

	Social Dominance Orientation (SDO) Scale (short form)	Pratto et al., 1994
	Individualized Trust Scale	Wheless & Grotz, 1977
Miura et al., 2020	Neuroticism Extroversion Openness Five Factor Personality Inventory (NEO-FFI; revised)	Costa & McCrae, 1992
	Power to Live questionnaire (index on stubbornness)	Sugiura et al., 2015
	Individualized Trust Scale	Wheless & Grotz, 1977
Erceg et al., 2022	The Cognitive Reflection Test	Erceg et al., 2020
	Active Open-Minded Thinking (AOT) Scale	Baron, 2019 as developed from Stanovich & West, 1997
	Faith in Intuition Scale	Norris et al., 1998
	Science Curiosity measure	Kahan et al., 2017
	Individualized Trust Scale	Wheless & Grotz, 1977
Ayoub et al., 2022	Active Open-Minded Thinking (AOT) Scale	Ibrahim et al., 2010 as developed from Stanovich & West, 1997
	Runco Creativity Assessment Battery (rCAB) (problem generation test)	Runco & Acar, 2010; Runco et al., 2016
Zhu et al., 2023	Reappraisal Scale (six-item)	Gross & John, 2003
	Suppression Scale	Gross & John, 2003
	Runco Ideational Behavior Scale	Runco et al., 2001
	Big Five Inventory (BFI)	John & Srivastava, 1999

### 3.1.4. Theoretical Frameworks

Table 3 lists the theoretical frameworks discussed in the reviewed studies. These frameworks provided the basis for intervention strategies targeting IOM-related constructs, as outlined in subsequent sections.

**Table 3.** Theoretical frameworks

Included record ( <i>N</i> =14)	Theory	Original citation
Stathi et al., 2014	Intergroup Contact Theory	Allport, 1954; Pettigrew, 1998
Cargile, 2015	Motivation Lateralization Theory System Justification Theory	Harmon-Jones, 2003 Jost and Hunyady, 2002
Lindahl & Folkesson, 2015	Theory of Open-mindedness Communication Codes	Dewey, 1933 Bernstein, 1974
Sander et al., 2017	Lifespan Development Theory Sociogenomic Theory	Baltes, 1977
Adelman et al., 2018		

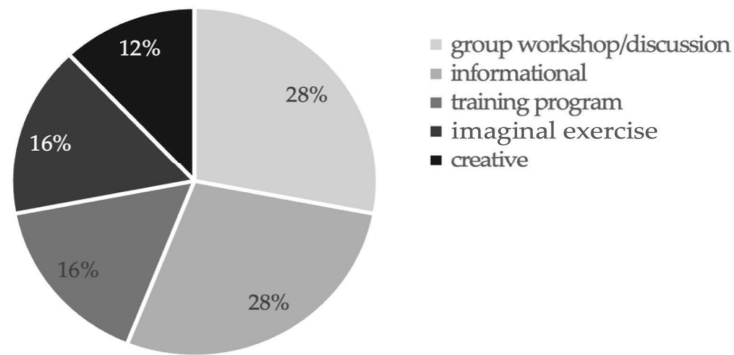


	Social Identity Theory	Roberts & Jackson, 2008
Huynh & Grossman, 2020	Theory of Wisdom Construal Level Theory Whole Trait Theory	Glück & Bluck, 2013 Lieberman & Trope, 2014 Fleeson, 2001
Xu & Petty, 2020	Transtheoretical Model Social Influence Principal of Reciprocity	Norcross et al., 2011 Cialdini & Goldstein, 2004
Miura et al., 2020	Belief Revaluation	Fletcher et al., 2001
Pagnini et al., 2021	Langerian Approach to Mindfulness	Langer, 1989
Knab et al., 2021	Latitude of Acceptance	Hameiri et al., 2020
Erceg et al., 2022	Gullible Conspiracism Hypothesis	Prooijen, 2019
Ayoub et al., 2022	Differentiated Model of Giftedness and Talent	Gagné, 2005
Moaz et al., 2023	The Flexible Merit Standard Model The Theory of Planned Behavior Motivated Group Cognition Social Identity Theory The Intergroup Sensitivity Effect The In-group Out-group Hypothesis The Variable Group Norm Hypothesis The Dogmatic Majority Hypothesis	Ottati & Wilson, 2018 Ajzen, 1991 De Dreu et al., 2008 Hogg, 2001 Hornsey & Imani, 2004 Moaz et al., 2023 Moaz et al., 2023 Moaz et al., 2023
Parra et al., 2023	The Educational Friction Modelling Framework The Deliberative Model of Democracy The Agonistic Model Informed Grounded Theory	Parra et al., 2021 Mouffe, 2005a Mouffe, 2005a Thornberg, 2012

### 3.1.5. Format of Intervention

Figure 3 illustrates the various formats of interventions used across studies. These included informational formats (e.g., reading materials, videos), creative formats (e.g., writing tasks, course design), cognitive or mindfulness-based training, and imaginal exercises (e.g., role-playing with out-group members). Some studies employed multiple intervention formats (e.g., informational and creative), which are counted in each relevant category.

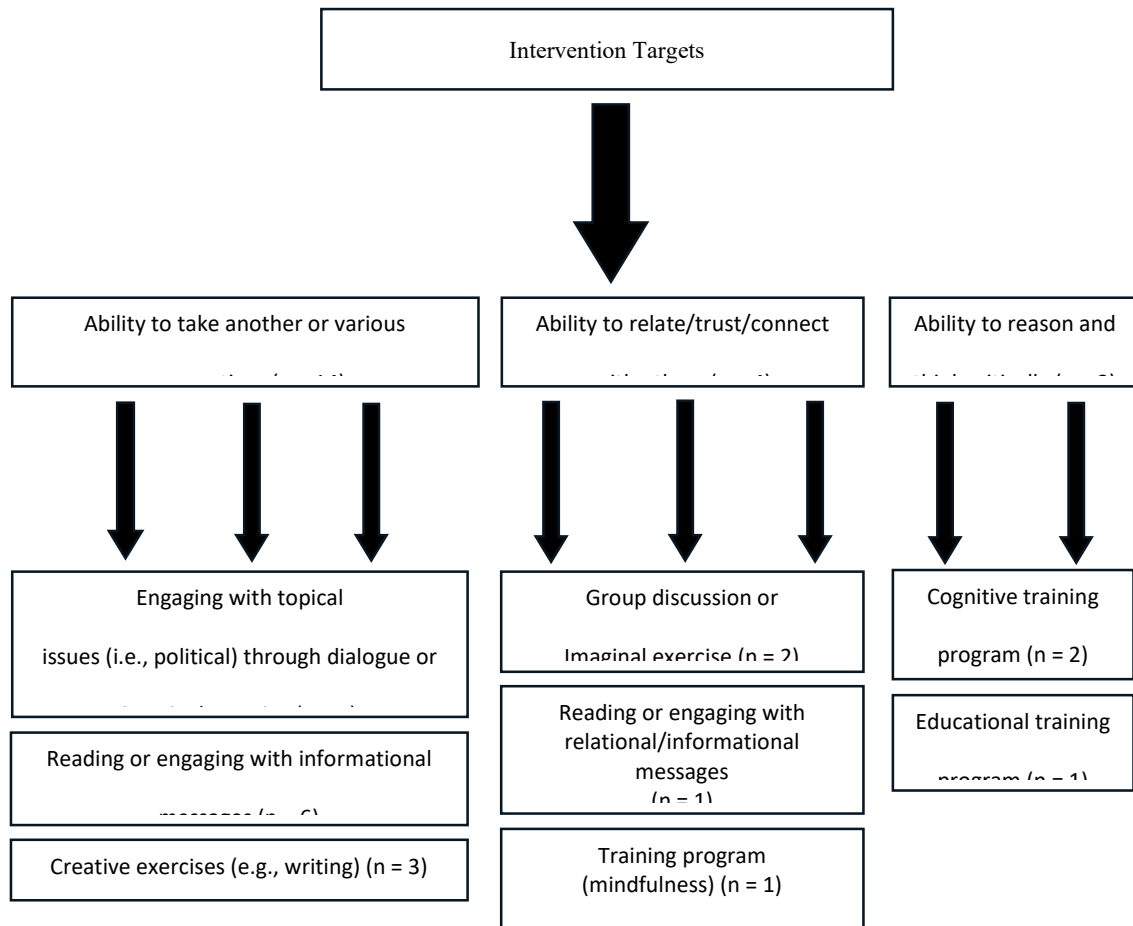
**Figure 3.** Interventions formats in included studies



Note: 3 articles contained more than one format (informational and creative, informational and imaginal exercise, and imaginal exercise and group workshop/discussion). Each format was counted towards that category total.

3.1.6. Target of Intervention

**Figure 4** summarizes the primary targets of interventions (though there was some overlap, section 3.1.1. above summarizes the interventions’ secondary goals of improving core constructs). Most study



interventions focused directly on activities targeting increased perspective-taking (n = 14), followed by openness to others and higher reasoning. Interventions across targets featured some level of participant

engagement such as a creative writing exercise, critical dialogue on a topic, or exposure and active exchange with new information such as through dialogue or group discussion. **Figure 4.** Targets of interventions to improve IOM

### 3.2. Results of Individual Sources of Evidence

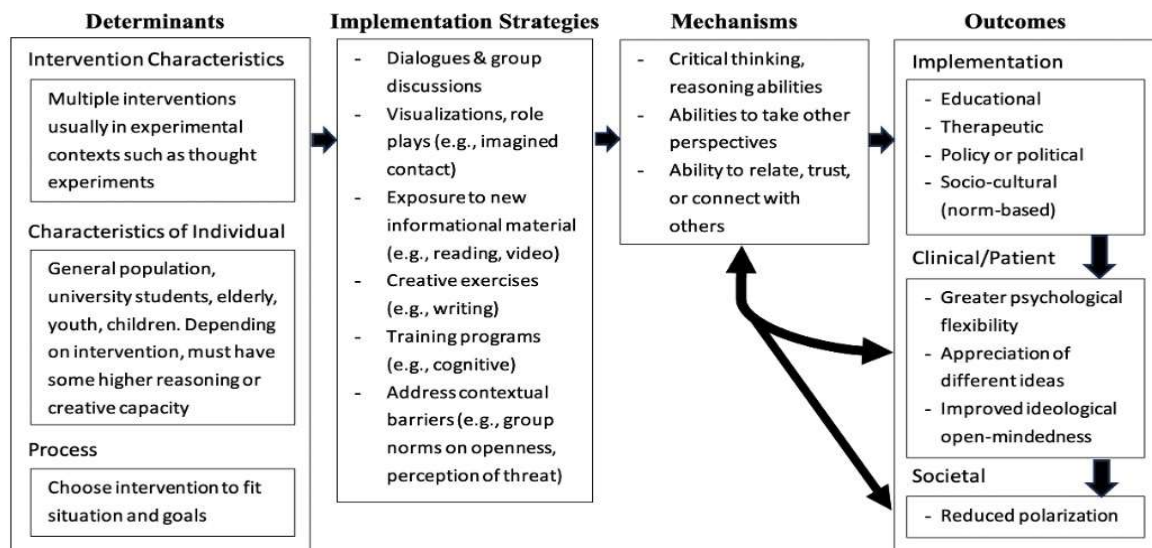
For the detailed extraction table for each of the individual sources of evidence, refer to Supplementary Materials, File 3.

### 3.3. Synthesis of Results

Figure 5 presents a logic model synthesizing the findings of the reviewed studies. Based on the Kellogg Foundation's public health guidelines, this model maps how interventions targeting IOM-related constructs (e.g., critical thinking, perspective-taking) can lead to improvements in outcomes like educational achievements, societal engagement, and mental health. Group discussions (intervention strategy), as an example, target critical thinking (mechanism) through exposure to differing viewpoints, and can in turn enhance openness (outcome). The reciprocal relationship between mechanism and outcome is suggested in this model (see Note), illustrating the dynamic nature of IOM development.

As an indication of the growth of research in this area, over half of the studies included in the review were published since 2018, and more than one-third were published since 2021. Several studies provided valuable insights into the effectiveness of different interventions for improving IOM. Examples include Xu and Petty's (2020) use of two-sided messaging to promote respect for alternate viewpoints within a university setting which led to greater openness and willingness to engage in a recommended action. Another university study, Lindahl and Folkesson (2015), found that an approach of using forms of explanatory communication in group discussions fostered perspective-taking. Notably, believing that a dialogue counterpart was more open to learning also resulted in greater openness in the main participant (Collins et al., 2022). A common thread throughout several studies was an emphasis on re-framing cognitions associated with either out-groups, counter arguments, or new information. These will be summarized below by population.

Figure 5. Logic model of interventions to improve IOM



Note: Mechanisms and outcomes may have an interchangeable relationship (e.g., IOM may be both improved through greater critical thinking while also being a necessary component to greater critical thinking).

### 3.3.1. General population studies (no age limits)

In studies with general adult populations, interventions such as two-sided messaging and re-framing threat perception were found to improve openness to alternative views. For example, Adelman and Dasgupta (2019) explored the factors that influenced how receptive people were to criticism from within their own group. They found that people were less open to criticism when they felt their group was under threat. Specifically, the perception of a national security threat (such as a crisis or political instability) led to a decrease in openness to criticism, regardless of whether it came from someone within the group or from outside it. The study showed that framing criticism as being aimed at a shared "common good" or an important national value helped people become more open to criticism, whether it came from in-group or out-group members (Adelman & Dasgupta, 2019, p. 751). In another example, two-sided messaging (framing conversations in a way that included respectfully acknowledging a participant's views on an issue while also presenting an alternative view) was found to improve openness to counter-attitudinal moral information (Xu & Petty, 2020).

### 3.3.2. Education studies

Techniques aimed at improving ideological openness in educational settings included group discussion exercises both online and in-person, and emphasized an importance of certain contextual factors and on re-framing challenges. For instance, during the COVID-19 lockdown, a private online social media group helped students develop flexible thinking, openness, and perspective-taking by teaching cognitive reappraisal strategies to reframe difficult situations (Pagnini et al., 2021). Participants noted that the feeling of community and facing the same threats together enhanced social cohesion and resistance to division within the group. Similarly, an exercise focused on emotional re-appraisal and perspective-taking was found to enhance cognitive flexibility. It was noted that both re-appraisal and creativity require similar cognitive processes (e.g., flexibility) that require viewing situations in a new way which may challenge default interpretations (Zhu et al., 2023).

Additionally, a group dialogue game helped undergraduate students develop debating skills, integrate diverse viewpoints, and engage more deeply with peers when discussing complex or controversial topics (Noroozi et al., 2016). In classroom settings, group discussions on socio-scientific issues wherein the language used contained greater vocabulary, complexity, and precision was found to encourage perspective-taking among adolescents. This approach promoted detailed explanations of ideas in relation to new perspectives (Lindahl & Folkesson, 2015).

In university classrooms, intentional discussions of sensitive topics or extreme statements were shown to promote democratic education and foster better understanding of living with differences. However, these benefits depended on trust, which played a crucial role in encouraging flexibility toward alternative viewpoints during discussions (Parra et al., 2023). This highlights the importance of interpersonal trust and connection in interventions aimed at improving IOM.

### 3.3.3. Other

Finally, through a brain imaging study, support was found that a particular region of interest is activated through open-minded thinking. In the only neuropsychological study of the sample, Miura and colleagues (2020) found that taking another perspective on an issue enhanced brain activity in an area believed to underlie the cognitive components of open-minded thinking, the right parieto-frontal network, and that having a stubborn personality was negatively correlated with activation in this area.

For those articles that had a clear hypothesis stated, 13 (68%) found support for that hypothesis, 4 (18%) found partial support, and 2 (9%) did not find support for the hypothesis. While an exploration of the detailed characteristics of each dataset that found support for a hypothesis relevant to our research questions is beyond the scope of this review, Table 3 summarizes these articles along with their main constructs targeted as well as the intervention types that supported these; highlights from these are also described

below. Those that did not find support were a cognitive training program aiming to improve openness to experience, and an informational exercise (to consider an opposing argument) aimed at improving active open-minded thinking; both measured change through well-established questionnaires.

**Table 4.** Main constructs and interventions in studies finding support of hypotheses for improved IOM

**Study characteristics**

(N=17)

Citation	Support found (Y/partial)	Target construct	Intervention(s)
Adelman et al., 2018	Y	Openness to criticism	Informational
Ayoub et al., 2022	Y	Active open-minded thinking	Training program (educational)
Burmansah et al., 2019	Y	Openness	Training program
Cargile, 2015	partial	Openness to different others	Informational
Collins et al., 2022	Y	Perspective-taking	Imaginal ex., group workshop..
Erceg et al., 2022	N	Active open-minded thinking	Informational
Jackson et al., 2012	Y	Openness to experience	Training program (cognitive)
Knab et al., 2021	partial	Cognitive flexibility	Informational
Lindahl & Folkesson, 2015	Y	Perspective-taking	Group workshop/discussion
Miura et al., 2020	Y	Open-mindedness	Creative (written)
Moaz et al., 2023	partial	Open-mindedness	Imaginal exercise
Mühlig-Versen et al., 2012	Y	Openness to experience	Group workshop/discussion
Noroozi et al., 2016	Y	Dialogic argumentation	Group workshop/discussion
Pagnini et al., 2021	Y	Openness	Group workshop/discussion
Sander et al., 2017	N	Openness to experience	Training program (cognitive)
Stathi et al., 2014	Y	Openness to different others	Imaginal exercise
Tittler et al., 1976	partial	Openness	Group workshop/discussion
Xu & Petty, 2020	Y	Ideological openness	Informational
Zhu et al., 2023	Y	Cognitive flexibility	Informational, creative

#### 4. Discussion

These results contribute to the advancement of current thinking and research on ideological open-mindedness (IOM) and provide guidance for the development of interventions of continued research. Constructs of importance to this endeavor include critical thinking, cognitive flexibility, intellectual humility, and perspective-taking, among others. These constructs have shown repeated citation in relation and correlation with openness traits, and as seen in Figure 2, were of importance within the review sample. Although not examined as a main construct related to IOM, the construct of trust also came up in at least three (13.6%) of the studies here; it was not explored further given an unavailability of research precedence linking trust and openness traits, but this finding lends additional support to an interpersonal element of IOM. To our knowledge, this is the first review to examine improvement of ideological open-mindedness and related constructs together under the broader term of IOM and to synthesize existing interventions for its improvement.

In sum, the sample articles retrieved found that: 1) a variety of personality, contextual, cognitive, interpersonal, group-level, and even neurological factors impacted changes in IOM such that existing interventions were often dependent on these mediating factors in their effectiveness at improving IOM; 2) that IOM can be conceived of as a learnable cognitive construct or thinking style that is subject to change and context-sensitive; 3) that it may be worth distinguishing the personality trait from the cognitive thinking

style in this field of research; and, 4) that there are several issues within the interdisciplinary literature that impede clarity and rigour of study on improvements to this construct. Below we address some of the issues found and provide further summary of key points addressing our research question of what effective interventions exist to improve IOM.

In response to the research question of what interventions exist to improve IOM, three general ability areas of IOM were targeted for improvement in the sample: 1) taking a different perspective from one's own (67%), 2) connecting or relating to different others (19%), and 3) ability to reason and think critically (14%). These abilities were shown to improve through interventions in one or more of five main categories, in order of frequency in the sample, of 1) group workshop/discussion (28%), 2) informational intervention (28%), 3) training program (16%), 4) imaginal exercise (16%), and 5) creative (12%). These findings suggest that active engagement with new material (whether that is through information and training, imaginal exercises, creative forms, or through dialogues exchanging ideas with others) is a necessary component of improving IOM traits. Notably, there were interchangeable relationships with IOM traits and IOM itself; for example, greater cognitive and psychological flexibility seemed to require some level of initial open-minded thinking to "access" new ideas, but that this flexibility, once initiated or developed, contributed to improved IOM (see Figure 5, Note).

There were some mixed findings in the sample regarding whether openness to experience is a malleable trait across the lifespan which may reflect some of the challenges in conceptualizing IOM (situationally-dependent) as inclusive or not of trait openness to experience (a personality trait generally considered to be stable). Attempts to change openness to experience or IOM through cognitive training have developed in recent studies wherein open-minded thinking has been repeatedly described and supported to be a cognitive thinking style that can be learned through practice (Baron et al., 2017, as cited in Erceg, 2022). Perhaps more interestingly for the purposes of this review, open-mindedness to diverse viewpoints itself appeared on the whole to be unstable across situations, and showed susceptibility to a wide range of situational and contextual influences (e.g., Glück et al., 2015, as cited in Huynh & Grossman, 2020).

There was a notable overlap between university and general population studies in that both found some form of perception to be a mediator of IOM improvements; in others words, university student (and general population) participants both demonstrated more open-minded cognition towards ideas coming from those in their in-group as compared to rival or neutral groups, but this type of effect was mediated by different perceptions in both of these studies (Adelman & Dasgupta, 2019; Moaz et al., 2023). In the general population, perception of threat mediated openness to alternative viewpoints and to criticism of one's own ideas (Adelman & Dasgupta, 2019). In the university study, normative perceptions (or how open-minded participants believed they should be towards the speaker) mediated open-minded cognition towards both in-group and out-group messages (Moaz et al., 2023). These findings lend support to the Flexible (Situational) Merit Standard Model of open-minded cognition (Ottati & Wilson, 2018), a theory that articulates the situational nature of this complex construct. In accordance with this context-based model, status as a minority or majority member also impacted increases or decreases in open-minded cognition towards those with opposing views in that those who believed that the majority of others agreed with their opinions felt they could interact more dogmatically (i.e., closed-minded) with those with whom they disagreed (Moaz et al., 2023). The authors cautioned that a dogmatic majority may not have long term advantages as it can result in conformity pressure through majority members' unwillingness to engage with opposing ideas. It was suggested that active endorsement of open-minded social norms can reduce intergroup polarization across political views; that is, increasing the normativity of openness to out-groups led to increased open-mindedness in both left-leaning and right-leaning participants (Moaz et al., 2023).

One issue identified by this review was the limited ability of studies to propose an intervention that had lasting effects across contexts—a considerable challenge given the construct's situational nature. A possible exception was the 2021 study by Knab and colleagues which used an intervention of "paradoxical leading questions" (questions that presented an exaggerated form of the participants' already held beliefs) to increase both openness and cognitive flexibility among those with right-wing and anti-refugee attitudes.

Here, the authors proposed that the effects on cognitive flexibility would impact cognitive processes beyond the experiment content or situation of the study. Given the growing support and acknowledgement for a conceptualization of open-mindedness as situationally dependent, these findings are important to our research question in both their framing of IOM as a cognitive processing style, and their suggestion that this construct can be subject to longer lasting improvement. The authors suggested that increased open-mindedness was a reflection of cognitive flexibility (Knab et al., 2021), or indicated “being in a cognitive flexibility mindset” that reduced stereotypes and prejudice towards out-groups (Knab et al., 2021, p. 228). Once activated, this more flexible mindset was said to establish a generalized information processing approach that can be free of context and applied to unrelated settings (Crisp & Turner, 2011, as cited in Knab et al., 2021; Kleiman & Enisman, 2018, as cited in Knab et al., 2021; Sassenberg & Moskowitz, 2005, as cited in Knab et al., 2021; Sassenberg et al., 2017, as cited in Knab et al., 2021). It should be noted that these suggestions have not been backed, to date, by empirical evidence, but nonetheless provide possible mechanism theories on how cognitive flexibility could be an enduring mindset once developed as well as provide further links between this trait and IOM. While contextual factors that may confound, mediate, or moderate effects of interventions (such as situational framing, threat perception, or normative cultural factors) on individuals’ IOM must continue to be controlled for and studied, further research should be undertaken to investigate longitudinal increases to cognitive flexibility and IOM.

As an illustration of how contextual changes impact IOM, we note that an approach of guiding or teaching can sometimes lead to greater open-mindedness yet in other situations can lead to greater polarization depending on perceptions as well as on individual and cultural differences (Huynh & Grossman, 2020). For example, evaluations of counter-arguments were shown to be impacted by individuals’ personal perceptions of a dialogue counterpart as either more or less eager to learn about their perspectives (Collins et al., 2022). Interventions in these situations aimed to have participants revise, update, or re-frame their beliefs about a message—such as revisiting what would constitute a “normative” amount of openness to demonstrate towards political outgroups (Moaz et al., 2023). While these findings have moral implications beyond the scope of the present review, they suggest future research potential in improving IOM through psychology approaches such as cognitive re-structuring, a form of cognitive behaviour therapy that supports psychological flexibility through re-framing messages (Harris, 2019).

Another issue was the heterogeneity of the study sample in terms of a wide variety of definitions of IOM concepts, intervention approaches, and outcome measures for detecting changes in IOM. About 14% of the sample studies focused on openness to experience as a main construct and used a form of the FFI as an outcome measure, and most other articles focused on closely related constructs more suggestive of a cognitive style (e.g., open-mindedness, open-minded cognition, active open-minded thinking). Studies employed a wide range of terminology, measures, and theories to refer to constructs that seem to have a high definitional and correlational overlap, rendering broader comparative analysis (e.g., meta-analysis) to any statistically rigorous degree at this point impossible. Definitions overlap in that constructs some might describe as elements of IOM (e.g., intellectual humility) are elsewhere described as constructs that require IOM. These inconsistencies are perhaps reflective of an interchangeable relationship between mechanism and outcome as depicted in Figure 5; or, of the high level of correlational overlap between IOM-related traits—which are difficult to disentangle given their similarities. Going forward, rather than including the traditionally more stable personality trait of openness to experience within the analysis, it may be helpful in attempting to understand IOM as a construct to conceptualize it as a cognitive thinking style that has some bearing in cognitive ability and function and is impacted by context and perception. Developing such a conceptualization would require a more consistent application of validated outcome measure instruments (i.e., a widely accepted alternative to the FFI). This theoretical framework has been supported by the open-minded cognition model (Price et al., 2015; Ottati & Wilson, 2018; Knab et al., 2021), by the Flexible Merit Standard Model (Ottati & Wilson, 2018), and by other findings that depict IOM as highly context-dependent, and aligns with the comparatively context-dependent nature of other cognitive abilities (e.g., information processing, availability of cognitive resources, and cognitive flexibility; Karami & Parra-



Martinez, 2021). In other words, given IOM's links to cognitive flexibility, there may be limits to IOM in contexts that reduce the information processing required for IOM.

## **5. Conclusions**

While somewhat expected that the study of a complex construct would leave many questions unanswered, concrete and practically-applicable interventions were fewer than expected, and there appears to be little agreement across IOM literature on how best to conceptualize, measure, and intervene upon this construct. That said, this niche field has grown in recent years, and effective interventions have been shown to function in experimental contexts. Effective interventions included those that considered contextual mediators of IOM traits, and those in the formats identified and highlighted above. Relatively new theoretical frameworks have also been proposed applicable to IOM improvements. In particular, models that consider cognitive and psychological flexibility warrant continued focus in research on improving IOM. More study should be undertaken on factors that impact changes in IOM such as religious, moral, cultural, and socio-economic factors. Other personality and cognitive factors should also be investigated such as need for closure, fluid and crystallized intelligence, cognitive resource depletion under threat or informational overload, and working memory ability which includes the capacity to hold onto and consider several (i.e., incompatible) ideas together.

This study is not without its limitations. We were limited by the exclusion of literature on organizational psychology (e.g., team-building) and on multiculturalism or intercultural competence. Further study would be required to investigate what is likely to be a vast literature of findings on openness (e.g., openness in group dynamics, cultural tolerance, intercultural empathy) and these fields. Search terms may not have captured all articles relevant to the research question given the variability of key terms in this field, and some traits that would normally be associated with greater IOM such as wisdom and creativity were mentioned only briefly due to the proportion of their mention in the sample (Figure 2). At the time of the search, we did not investigate findings on topics of neuroeducation or heuristics, and how interventions in these areas may be mapped to IOM improvements, nor were we able to comment in-depth on how bias impacts IOM, however the authors would encourage such future studies given the influence of perception on IOM supported by this review. Based on our findings, we suggest that future reviews or studies examining ideological openness consider differentiating between personality-level openness and openness as a cognitive style—such as in their article searches and exclusion criteria. Although measures of openness to experience are well established, the dominant conceptualization of the construct as stable and trait-based is at odds with the conceptualization of IOM as a state-based, malleable, cognitively- and contextually-influenced construct.

Research specific to interventions that improve IOM and related traits has only recently begun to increase. There is an active need to continue developing an understanding of how open-minded cognition is context-dependent, on how exactly improvements in IOM are also context-dependent, and therefore on how to develop measures, experiments, and interventions that address this point. Research on in-group and out-group openness provides important understanding on how mediating factors such as perception (of threat, of social norms) impacts open-mindedness to close or distant others. We have three recommendations for future studies. First, we did not encounter any longitudinal articles and it was rare to uncover findings with later follow-ups or demonstrations of long-term improvements of IOM. To improve research in this field, more investigation into both the longevity and the cross-contextual nature of findings is needed. That is, whether improvements reflect true lasting change beyond the duration of the study. Second, nearly half of the studies did not use validated measures of openness, and measures varied widely in studies that did use known and validated measures considering that the constructs of focus were so similar. This variability may be due, in part, to the context-dependent nature of the construct which renders it more difficult to measure, or to the lack of availability of scales specific to the exact constructs being measured by each study. Future research should consider consolidating scale measures to achieve greater cohesion in studying IOM. Related to this, while theoretical frameworks were heterogeneous; the Flexible Merit Standard Model and the models on open-minded cognition appeared to represent the latest theories in this field. Third (and relatedly), in



order to consolidate findings in this area, it may be beneficial to aim for further clarity or harmonization of terminology and theory. Bringing traits and constructs of cognitive openness together under one umbrella term (e.g., such as through the open-minded cognition model or as ideological open-mindedness) may help to synthesize the high number of overlapping related definitions found here, to improve measurement of a distinct construct, to reduce researcher ambiguity, and to improve efforts of disseminating scientific findings to a wider audience. To better understand what improves IOM, we should also consider what does not improve IOM (i.e., the “file drawer problem”), or studies that focus on what reduces IOM or increases dogmatism.

Finally, increased IOM, it should be noted, is not an improvement in all situations. As described by Halpern (2013), greater critical thinking can lead to a net benefit when there is less openness to false ideas. It is likely that IOM exists, as Higgins (2009) has suggested in his philosophical application of Aristotle’s Golden Mean Theory to open-mindedness, on a continuum that comprises both deficiency and excess. In other words, ideal IOM lies in the balance between dogmatism and gullibility, and there seems to be a certain relativism to the virtue of traits such as open-mindedness and dogmatism (Higgins, 2009; Ottati, 2023). Future research needs to examine the application of this theory to practice if we are to reach greater progress in understanding both how to improve IOM, and what doing so truly signifies.

Obtaining reliable evidence for the improvement of a context-dependent construct such as IOM is not a simple endeavor, and we credit the authors of all studies reviewed for this undertaking. Despite many challenges in this relatively new field of research, fostering related traits through interventions highlighted here which aimed at improving critical thinking, cognitive flexibility, and perspective-taking, among others, demonstrate promise towards outcomes of improved IOM. A cyclical relationship then occurs wherein greater IOM, in turn, appears to build upon increases in the former traits.

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