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A systematic review of growth mindset intervention implementation strategies

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Abstract

Growth mindset interventions, which seek to teach the belief that attributes can change, are increasing in popularity and being leveraged to improve health. As these interventions expand in scope, there is a critical need for a systematic review of existing implementation practices to help move the field towards more robust, impactful, and replicable science. To meet this need, we took a three-fold approach. First, we created a framework for the implementation of mindset interventions (FIMI) using an inductive, interpretive approach that merged existing fidelity frameworks with growth mindset expert opinions. Second, we used the FIMI to frame a systematic, descriptive review of mindset intervention protocols and to create a checklist for transparent reporting of mindset intervention strategies. Third, we provided future research directions that can help to improve the impact of mindset interventions in health-related contexts.

KEYWORDS

fidelity, health, interventions, implementation, mindsets, systematic review

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1 | INTRODUCTION

The bridge between a promising idea and the impact on students is implementation.

—Berman & McLaughlin, 1976, p. 349

There has been a recent surge in scientific and public interest in the potential impact of wise interventions designed to alter how people think of themselves and their experiences (Walton & Wilson, 2018; Yeager & Walton, 2011). Prevalent among these are *growth mindset interventions*: programs designed to promote the belief that people can develop their abilities, attributes, and traits. Interest in growth mindset research is illustrated by multiple recent meta-analytic reviews (Burnette et al., 2020; Costa & Faria, 2018; Sisk et al., 2018) and by extensions that go beyond academic outcomes, including employee engagement (Keating & Heslin, 2015), bias reduction (Okonofua et al., 2016), and entrepreneurial motivation (Billingsley et al., 2021). Some of the most promising extensions examine mindsets and health-related outcomes (Burnette & Finkel, 2012; Schleider & Weisz, 2018). Indeed, a meta-analysis of the link between growth mindsets and mental-health related outcomes found meaningful effects for treatment value, coping, and reduced psychological distress (Burnette et al., 2020).

However, as noted in the quote above, effective implementation of interventions is needed to fully bring these findings to fruition. In the current work, we offer a three-fold approach to improve implementation fidelity. First, we create a framework for the implementation of mindset interventions (FIMI) combining existing fidelity frameworks with growth mindset expert opinions. Second, we use the FIMI as a foundation for our systematic review of existing implementation practices and to create a checklist for transparent reporting. Third, we generate recommendations to improve research on mindset intervention implementation strategies in the future—particularly, those aimed at promoting health.

1.1 | Implementation fidelity

With extensions of growth mindset research to health contexts and the increased interest in interventions, there is a critical need for attention to implementation fidelity, which is the degree to which a program is delivered as intended (Dumas et al., 2001; Dusenbury et al., 2003). Null results due to failure to implement can lead to erroneous conclusions about the validity of the theory behind an intervention and the potential of the approach (i.e., a Type III error, Dobson & Cook, 1980). Furthermore, varying implementation strategies leads to heterogeneity in effects, making it difficult to interpret the true source of dissimilar effect sizes (Miller & Rollnick, 2014). Although the importance of fidelity in psychosocial interventions is not new (Carroll et al., 2007), existing fidelity frameworks do not encompass the strategies most relevant to growth mindset interventions. Thus, we developed a conceptual *framework for the implementation of mindset interventions* (FIMI).¹ This tailored fidelity framework in combination with an accessible growth-mindset-specific reporting tool can improve transparency, replicability, and impact as well as foster expansions. Before detailing our methodological approach for creating this specific framework, we outline the foundational theory underpinning growth mindset interventions.

1.2 | Mindset theory

Mindsets are implicit theories about the potential malleability of an attribute that organize the way people ascribe meaning to events (Creed et al., 2009; Dweck & Leggett, 1988; Molden & Dweck, 2006). They are considered implicit because they often operate without people's awareness, and theories because they are viewpoints about the nature of human characteristics (Dweck & Yeager, 2019). Researchers distinguish between two main theories: a growth mindset and a fixed mindset. Those with a stronger growth mindset believe that human attributes are malleable and can be developed, whereas those with a stronger fixed mindset believe they are stable and cannot be cultivated.

Across a range of achievement contexts, mindsets predict self-regulatory strategies and ultimately performance (Burnette et al., 2013). For example, individuals with stronger growth mindsets tend to persevere in the wake of setbacks and remain optimistic about the potential for future success. These individuals also seek challenges and exhibit resilience (Dweck & Yeager, 2019). However, growth mindset meaning systems are not always predictive of expected outcomes (e.g., Bahnik & Vranka, 2017), and links are not universally positive. For example, in stigmatized contexts, stronger growth mindsets are linked to negative outcomes such as blame and prejudice, leading researchers to posit the double-edged sword model of growth mindsets (DES). This model outlines the negative as well as positive impacts of growth mindsets, and highlights how future interventions, especially in potentially stigmatizing domains such as mental health, will require a nuanced approach capable of harnessing the benefits of growth mindsets while avoiding their costs (Hoyt & Burnette, 2020).

1.3 | Growth mindset interventions

Early mindset intervention research focused on enhancing academic performance and closing achievement gaps. The first two published growth mindset interventions in academics focused on counteracting the adverse consequences of stereotype threat, which is the underperformance that can arise from the situational threat of confirming a negative stereotype (Aronson et al., 2002; Good et al., 2003).² Students in the interventions, relative to controls, reported greater motivation and improved academic performance when facing challenges. Although some subsequent studies replicated these effects, others failed to do so. For example, findings from a well-powered intervention ($N = 6320$), found statistically significant, but small, effects on academic performance for low achieving students (National Study of *Learning Mindsets*; Yeager et al., 2019). However, another large-scale intervention ($N = 2917$) failed to find meaningful effects for any of the academic outcomes (*Changing Mindsets* Effectiveness Trial; Foliano et al., 2019).

Although there are many potential reasons for these diverging effects, in the current work we highlight how differing intervention implementation strategies may contribute to failures to replicate. Indeed, the procedures for these interventions varied greatly. For example, *Learning Mindsets* (Yeager et al., 2019) consisted of two sessions lasting under an hour, whereas *Changing Mindsets* (Foliano et al., 2019) was designed to be delivered for 2 hours every week for 8 sessions, although actual practices varied widely. *Learning Mindsets* was delivered online with high researcher control of content, whereas *Changing Mindset* was delivered in the classroom, by teachers. Implementation strategies for delivery of content also differed. *Learning Mindsets* incorporated metaphors and 'sticky' components of the message (e.g., the brain is like a muscle) along with neuroscientific evidence and activities to help students internalize the message. In *Changing Mindsets*, researchers trained teachers in mindset theory, providing them with access to lesson plans with activities, videos, and posters.

Any or all of these implementation differences might contribute to differences in outcomes. Overall, we suggest that the field needs a more systematic understanding of the strategies that contribute to effective delivery of growth mindset interventions—a formula that can be used to improve fidelity across desired outcomes and goals. To contribute to the discussion of best implementation practices, we developed an organizing framework for the implementation of mindset interventions (FIMI). We used this framework as the foundation for our systematic review of the literature and the development of a reporting tool to improve replicability and transparency.

2 | METHODS

2.1 | FIMI component development

To develop the FIMI components, we integrated information from existing fidelity frameworks and surveyed growth mindset intervention experts (see Figure 1). First, we consulted gold-standard implementation literature in related disciplines (e.g., health behavior; Borrelli et al., 2005). This literature revealed a lack of consensus, motivating us to identify

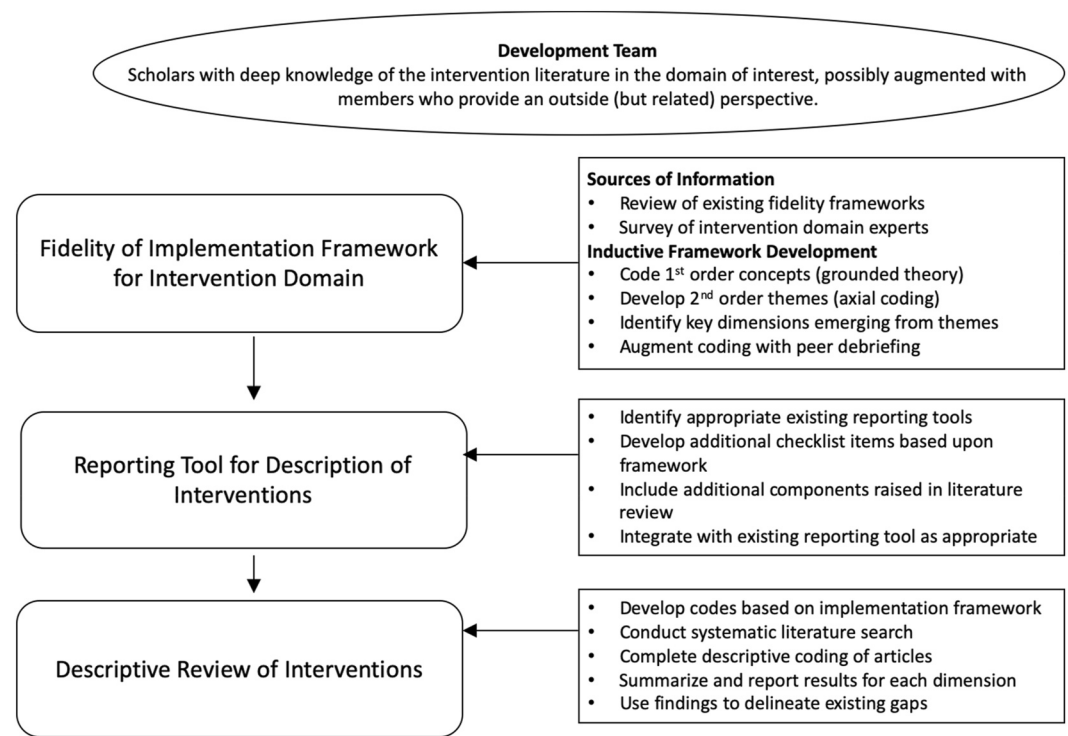


FIGURE 1 Methodological approach for developing implementation fidelity frameworks

common features across frameworks. For example, in the context of substance use, implementation fidelity entailed six components: adherence, essential versus non-essential elements, dose, quality, responsiveness, and program differentiation (Dane & Schneider, 1998). In contrast, a fidelity framework for health behavior research (Borrelli et al., 2005) focused on five components: design, training, delivery, receipt, and enactment. Another line of work identified four required components: design, training, monitoring of intervention delivery, and intervention receipt (Gearing et al., 2011). Overall, across related disciplines, there was limited overlap in components and no mutually agreed-upon framework.

In addition and importantly, existing fidelity work often emphasizes components that are not relevant for most growth mindset interventions, such as training of supervisors and therapists as well as monitoring of adherence to session-by-session manualized therapy procedures (e.g., Gearing et al., 2011). Thus, we developed a unique framework and reporting tool for the necessary fidelity components in growth mindset interventions. We felt such a tool specific to growth mindset interventions was prudent as these are under scrutiny, and at the same time are being applied to new and important domains such as improving mental health. Additionally, considering the massive heterogeneity in both effect sizes and implementation practices in growth mindset interventions (see Burnette et al., *in press*), a tailored fidelity approach can enhance precision in reporting and thus provide more rapid progress in identifying 'what works'.

To further develop the fidelity components, we sought feedback from experts in the field of growth mindset interventions. Two criteria had to be met to qualify as a growth mindset intervention expert: they had to have at least two published articles in the domain of mindset interventions (in any author order) and they had to be currently research-active in the area of mindsets. We excluded authors of the current paper. We identified twelve experts and invited them to participate in a survey about the components of mindset interventions. The primary question was, 'What are the key components, steps, or processes for the successful implementation of a growth mindset intervention?' with a prompt to list five to six components. We also asked about the length of the intervention, what content should be included, and where it should be delivered. Five experts responded (42% response), with three completing the survey and two referring us to blogs or chapters that outlined best practices for mindset interventions.

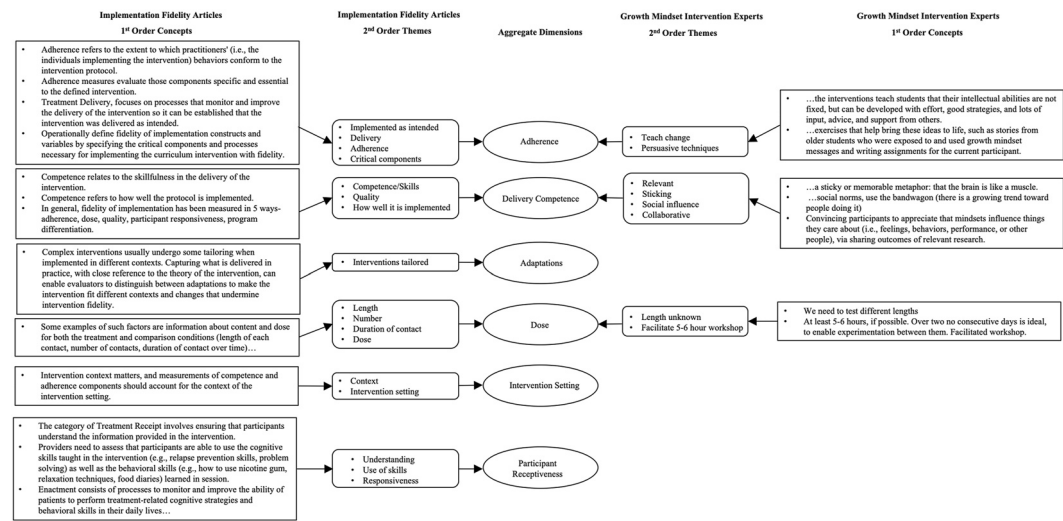


FIGURE 2 Data structure for the framework for the implementation of mindset interventions (FIMI) development

To integrate our two forms of data—existing fidelity frameworks and growth mindset intervention expert opinions—we followed inductive approaches for data analysis devised for the development and linking of theoretical concepts and processes (Gioia et al., 2013; Glaser & Strauss, 1969; Strauss & Corbin, 1998). This in-depth, systematic, approach enabled the development of the FIMI with the six primary components of adherence, delivery competence, adaptations, dose, intervention setting, and participant responsiveness (see Figure 2). We developed the framework in the systematic review. We subsequently used the FIMI to create our reporting checklist and to guide our comprehensive overview of existing practices.³

Without an a priori scheme, we inductively coded the fidelity articles. Although existing fidelity frameworks failed to map perfectly onto mindset interventions, in combination with the responses from experts, they provided a solid launching point. Namely, we combined the fidelity articles and expert opinions following the guidelines of grounded theory, which enabled us to conceptualize latent patterns among the qualitative data (Gioia et al., 2013; Glaser & Strauss, 1969; Walsh et al., 2015). In the first step of the coding, we used both branches of information to code, line-by-line, sentences and paragraphs and to note any direct statements related to implementation fidelity (e.g., Gioia et al., 2013). In the second step, we identified axial coding, connections and overlap (Strauss & Corbin, 1998). Specifically, we assigned labels to first-order concepts and then situated these into clearly delineated higher-order themes (i.e., second-order themes) by identifying relationships between and among the codes and looking for patterns. In an iterative manner, going back and forth between primary data and emergent themes, and drawing on existing theory, we refined the fidelity components (Glaser & Strauss, 1969). Finally, the first author identified various subcomponents and a larger organizing framework for these components (see Figure 2). Additionally, following well-established procedures (Gioia et al., 2013), we employed various techniques to ensure model robustness. For example, we engaged in peer debriefing, and while the first author focused on initial data collection and analysis, another author provided an objective ‘outsider’ perspective on final concepts, themes, and dimensions.

2.2 | Reporting tool development

To develop a tool for open reporting of mindset interventions, we integrated the 6 components of the FIMI (adherence, delivery competence, adaptations, dose, intervention setting, and participant responsiveness) with an existing

checklist for precise reporting of interventions in clinical research studies (i.e., Template for Intervention Description and Replication Checklist, TIDieR; Hoffmann et al., 2014). We created reporting items specific to mindset interventions based on the FIMI components, integrated these components into the appropriate sections of the TIDieR, and elaborated on other important implementation fidelity issues related to growth mindset interventions. Users should first complete the TIDieR checklist and then supplement it with the FIMI checklist.

2.3 | Systematic review

We undertook our comprehensive analysis of the existing mindset intervention literature using the FIMI components as a foundation. We built on a recent meta-analysis (Burnette, Billingsley et al., 2022), and in November 2021 updated the search from that project based on the criteria below, incorporating the most recent available articles to arrive at our final list of included manuscripts (see Figure 3). We used the following databases: ERIC, PsycInfo, ProQuest Dissertation and Theses, Google Scholar. Search terms included various combinations of multiple keywords (e.g., 'lay theories', 'implicit theories', 'mindset', 'growth mindset', and 'intervention') starting with the year—2002—of the first published intervention (i.e., Aronson et al., 2002).

Four criteria had to be met for inclusion. First, the study had to test the effectiveness of a mindset intervention designed to foster stronger beliefs in the malleability of an attribute. We excluded studies that featured an experimental manipulation in a laboratory setting rather than an intervention, correlational designs, and descriptions of intervention development. Second, the intervention had to seek to improve one of three primary goals guiding the majority of mindset intervention work—academic performance, mental health, or social/interpersonal functioning. Third, the intervention needed to focus primarily on fostering a growth mindset and could not include substantial additional content targeting other putative mechanisms of change (e.g., mindfulness practices; Samuel & Warner, 2021). Fourth, when multiple published manuscripts reported on the same intervention and sample, we included only unique information. However, we coded each unique sample even if it used a similarly named intervention—for example, interventions that used the *Brainology* program (MindsetWorks, 2017) were coded separately using information available in the reporting articles, as not all researchers used all components of this intervention. If multiple

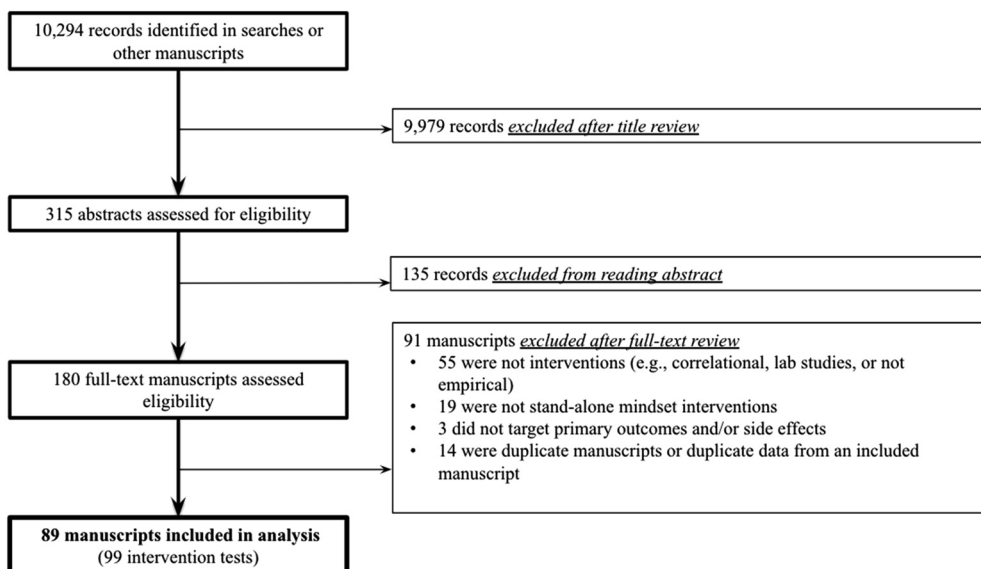


FIGURE 3 Literature search for descriptive review

versions of an intervention were tested in the same study with different participants, we counted each version as a separate sample. For example, Dommett et al. (2013) tested both a teacher-delivered version of the intervention and a computer-delivered version. Figure 3 outlines our search procedures and inclusion/exclusion decisions.

The search identified 89 articles (see Burnette, Knouse et al., 2022 for full reference list) reporting on 99 samples in which mindset interventions were tested. We developed a set of coding definitions and guidelines for the FIMI components and subcomponents, refined the coding scheme to improve reliability, and then proceeded with descriptive coding. We coded intervention information from the manuscripts themselves and from resources directly linked or cited in the manuscripts, including appendices, supplementary materials, linked websites, or cited manuscripts when these were described as using identical intervention methods. As mentioned, manuscripts reporting secondary analyses of intervention data already published were not counted as unique instances of an intervention; however, these reports were examined for additional information on the intervention.

To prepare for the coding, the second and fourth authors independently coded the first ten studies in alphabetical order. In the first round, the coders identified two studies that should be excluded based on closer examination of their content. For the remaining studies, coders compared their coding decisions, discussed disagreements, and further refined the coding scheme in consultation with the research team. Using the revised codes, the two coders then independently coded the next ten articles, one of these was excluded based on closer examination of content. For the remaining nine articles, the percentage agreement across the FIMI codes was 89%, which was judged sufficient to proceed independently. The coders divided the remaining studies, each coding approximately half of the remaining articles.

3 | RESULTS

In the sections below, for each of the FIMI components, we (a) provide a definition and outline how the component was developed, (b) elaborate on what should be reported using the FIMI checklist (<https://osf.io/qw5pm/>), and (c) describe the results of our systematic review for that component.

3.1 | FIMI components: Definition, reporting standard, & descriptive review

1. **Adherence.** Adherence is delivering the intervention as prescribed and is often used synonymously with the term 'active ingredients' or 'core components' (Dane & Schneider, 1998). We included adherence based on fidelity articles as well as expert feedback (see Figure 1). On one hand, fidelity articles included general sentences and constructs related to the inclusion of key ingredients, core components, and essential elements. On the other hand, mindset experts focused on what those core components are for mindset interventions. Experts agreed on two aspects that should be included in interventions, and this content matched the first two published mindset interventions (Aronson et al., 2002; Good et al., 2003). The essential elements are: (1) delivering the message that a specific trait, attribute, ability, or emotion is malleable, and (2) a well-defined attitude change tactic to help participants internalize the message and adopt the malleability message. In order for adherence to be met, a mindset intervention must include both components. In addition to including these two components, in the FIMI Checklist, authors should denote what type of attitude change tactic they incorporated (see <https://osf.io/qw5pm/>).

In terms of a descriptive analysis, although all interventions included in our review reported incorporating a form of the malleability message, the use of clearly defined and discernible attitude change tactics is more variable—21 of 99 mindset intervention tests do *not* report specific attitude change tactics. Overall, 21.2% failed to meet adherence and there is heterogeneity in activities. Moving forward, growth mindset interventions should include both the

malleability message and an adequately described attitude change strategy. Additionally, researchers need to consider participants' differential engagement in such attitude change tactics to promote effectiveness (Lee et al., 2022).

2. **Delivery Competence.** Delivery competence refers to the tactics used in conveying the growth mindset message. The fidelity articles included information related to competence and skillful delivery of the intervention. Experts in mindset research delineated, specifically, what many of these competencies are, noting eight common themes regarding how to competently deliver the mindset message: (i.) include neuroscience information, (ii.) use credible sources, (iii.) provide scientific evidence of the potential for change, (iv.) respect student autonomy, (v.) incorporate social norms and social modeling, (vi.) include content to avoid blame and encourage self-compassion, (vii.) make it personally relevant, and (viii.) incorporate metaphors that make the message 'sticky'. Additional work will be needed to reach agreement among experts on which delivery strategies are sufficient. To facilitate reporting of this relatively detailed information, researchers can use the FIMI reporting checklist to describe the presence of these elements in an efficient way.

Within the literature, there is remarkable variety in delivery strategies and a lack of detail in reporting. For example, the *Brainology* training program, which incorporates both computerized and in-person exercises for students, is both proprietary and relatively dense with content. Manuscripts investigating the effects of *Brainology*, as well as other manuscripts, tend not to provide detailed information on delivery strategies (Donohoe et al., 2012). Due to the lack of clear reporting, we could only code 4 of the sub-components of delivery competence—namely, the inclusion of scientific evidence (87% of reports included scientific evidence, and 83% reported specifically including neuroscience evidence), social or peer norms (54% included this), personal relevance (69% included this), and sticky metaphors (70% included this).

3. **Adaptations.** Adaptations, or what are often referred to as secondary elements, include content that is related to, but distinct from, the malleability message and its associated attitude change tactics. 'Secondary' does not indicate that these elements are unimportant or necessarily have a lesser impact. For this dimension, researchers should note any element that is not directly yoked to the message that the attribute can change. For example, some interventions included sense of purpose messages in addition to malleability messages (Paunesku et al., 2015) or emphasized that struggles and failure are normal and surmountable (Aronson et al., 2002). Although these tactics are implicitly related to the growth mindset message, they are not clearly about the malleable nature of the attribute, yet might be crucial. Other adaptations of mindset messages may represent a misunderstanding of what growth mindsets are, sometimes called false growth mindsets. For example, focusing exclusively on effort can backfire as effort alone—without effective strategies, resources, support and mentorship—is insufficient and can lead to self-blame (Dweck & Yeager, 2019). Reporting of all elements is critical, as introducing adaptations can undermine internal validity by introducing a confound that can 'muddy the waters' with respect to making attributions for the effective ingredients of interventions. Thus, the FIMI reporting checklist includes a place to report these adaptations (see <https://osf.io/qw5pm/>). In terms of our descriptive review, we were unable to code this component adequately, as we largely focused on interventions that did not include major non-growth-mindset intervention components.
4. **Dose.** Dose of the intervention captures the concept of 'exposure' to intervention components (Dane & Schneider, 1998), including number of sessions, duration, and frequency—these are key aspects of program integrity that may influence the size of effects observed in different studies. We identified this dimension based on common themes in fidelity articles and expert opinions. Authors should report the number of intervention sessions, or contact points as well as the minutes of each session and the total duration of the intervention. Although researchers frequently report dose, there is no standardized 'minimum exposure' in the field. In terms of total duration, interventions ranged from 15 min to 24 h. Troublingly, no data were reported on this variable for 23% of interventions. Mean duration was 172.75 min (SD = 258.61); however, given the presence of a few

extremely long interventions, the median of 90 min might better reflect central tendency and the large standard deviation suggests massive variability in dose across protocols. The total number of sessions/modules or contact points ranged from 1 to 40 and reporting of this variable was better, with only 4% failing to specify. Notably, 46% of interventions took place in a single session. Overall, additional research will be needed to identify the most efficient and effective dose; however, these efforts will continue to be thwarted if intervention researchers do not clearly report the dose—i.e., number of sessions and total time.

5. **Intervention Setting.** Intervention setting identifies the 'how' and 'where' of intervention implementation, including the modes of delivery and the context. We identified this component based on implementation fidelity articles, although experts alluded to it as well. In terms of mode of delivery, information on the identity and training of the people who convey the mindset message should be included and considered from a theoretical perspective. The source is an important factor in the extent to which messages are persuasive to the target audience (Wilson & Sherrell, 1993). In terms of context, authors should report where the intervention is delivered. Furthermore, schools are often already saturated with growth mindset messages. For example, the *Changing Mindsets* intervention that failed to impact student outcomes concluded that over a third of the teachers in the control condition already had growth mindset training (Foliano et al., 2019). Additionally, the *Learning Mindsets* intervention found supportive school cultures and norms to be a critical component for intervention effectiveness. In summary, authors must delineate the mode of delivery, including the source (e.g., experts, researchers), and the setting.

In terms of descriptive analysis, we first coded delivery setting in terms of mode of delivery. Most interventions were computerized/online (40%) with some strictly in-person (21%) and a few that were paper-only such as reading articles or handouts (10%) or only consisted of a video (2%). A substantial minority used a combination of these techniques (24%) and only 2% failed to report this information. Next, we coded the message source—who delivered the message to participants? The majority of messages were delivered by a researcher (41%) or teacher (33%), including computerized interventions that were administered by these sources. Another 14% of messages were attributed to an organization, such as a school system or university. Finally, 3% reported some other message source and, for 8% of interventions, this information was not reported or could not be coded. Additionally, in terms of source, we could not adequately code details about the researchers and teachers delivering the message. As for existing affordances, defined as 'features of contexts that make an adaptive perspective possible' (Walton & Yeager, 2020, p. 219), this information was rarely reported and only 13% of interventions indicated that the mindset message was supported by other systems/structures in the context of the intervention—for example, teachers using these strategies in their day-to-day instruction. Given recent scholarship suggesting that affordances are critical for the growth mindset seed to take root, more details on the person delivering the message and the context in which interventions are implemented are critical.

6. **Participant Responsiveness.** Participant responsiveness assesses engagement with the intervention materials. Are participants paying attention and are they able to understand and integrate the information being presented? We derived this dimension from both the fidelity articles and expert opinions. In of the fidelity literature, this dimension sometimes includes the term 'enactment', defined as the extent to which participants engage in the intervention and enact the prescribed skills. In the context of mindset interventions, we focus on two related, yet distinct, aspects of responsiveness. First, researchers should use and report best practices to make the intervention interesting and applicable to the specific development stage, culture, and context (Yeager et al., 2016). Second, the intervention should include an assessment of participation/engagement (e.g., comprehension quizzes, attention-checks) that go beyond the attitude change writing exercises. Yeager and colleagues used two such assessments in their design analysis, noting these as fidelity measures (Yeager et al., 2016). We suggest that this type of participant engagement is critical for fidelity but it is not exhaustive—simply put, implementation fidelity involves much more than just participation. Of the interventions included in our descriptive analysis, only 56% reported using participant responsiveness practices or assessments, and very few of these reported the results of

these assessments of attention and comprehension in the manuscript. We recommend that intervention researchers check for participant engagement and elaborate on it in the FIMI. Also, they should use the information for sensitivity analyses and to demonstrate that the intervention was received as intended.

4 | DISCUSSION

We started with the central idea that, '*The bridge between a promising idea and the impact on students is implementation*' (Berman & McLaughlin, 1976, p. 349), and we identified a critical need—namely, a concise summary of existing implementation practices in the growth mindset intervention literature. To provide this review, we first developed components of mindset intervention implementation strategies by drawing upon existing fidelity models and feedback from experts in the field of growth mindset interventions. We engaged in an inductive process to identify six components of mindset intervention delivery practices: adherence, delivery competence, adaptations, dose, intervention setting, and participant responsiveness. The FIMI highlights the importance of adding implementation fidelity to discussions about the efficacy (or, lack thereof) of mindset interventions and offers a tool for open reporting.

Our descriptive review highlighted gaps in reporting of implementation strategies. This 'thinness', or the lack of information pertaining to implementation fidelity, although fairly common, is problematic as it precludes those working on systematic reviews and meta-analyses from effectively quantifying meaningful sources of heterogeneity between studies (Roen et al., 2006). Inadequately described interventions also impede replication efforts and make it difficult to identify effective elements (Abraham & Michie, 2008). To help address this problem, we created the FIMI Reporting Checklist (<https://osf.io/qw5pm/>), for use in tandem with the established and more general TIDieR checklist (Hoffman et al., 2014), when developing, pre-registering, and reporting growth mindset interventions. The checklist can also be used by journal editors and reviewers to assess the adequacy of descriptions of mindset interventions in submitted manuscripts, especially as researchers seek to extend these interventions to health. Importantly, the FIMI checklist is designed to be used in concert with other standards of reporting for intervention studies common in health behavior research (e.g., CONSORT, Schulz et al., 2010).

The FIMI can aid in the extension of growth mindsets to new contexts such as mental health, where existing evidence is promising and expanding. For example, findings from a recent meta-analysis (Burnette et al., *in press*) suggest that effects of mindset interventions on mental health when implemented with targeted subgroups and with high fidelity ($d = 0.32$, 95% CI [0.10, 0.54]) are stronger than the effects for academic achievement ($d = 0.14$, 95% CI [0.06, 0.22]). However, the number of studies for mental outcomes is limited and more work is needed. As the field continues to extend these interventions to improve health, the FIMI can be a springboard for future research examining how to maximize fidelity.

4.1 | Future directions

Our approach for developing a refined checklist tailored to a specific intervention context (i.e., mindsets) provides a scaffold that can be used in other fields. That is, supplemental reporting guides that are developed via systematic reviews may help with implementation practices in fields that lack fidelity assessments and standards, that have remaining unexplained heterogeneity, and that are growing in popularity and scope. We hope the current paper's methodological scaffold (see Figure 1) contributes to such future work.

Furthermore, our descriptive review delineated some of the strengths and weaknesses of existing mindset intervention practices, which paves the way for additional empirical work. For example, adherence requires including an attitude change activity, as this is a key ingredient designed to internalize growth mindsets. These tactics maximize durability and belief perseverance and make the message accessible (Aronson et al., 2002). Yet, a 21.2% rate of failure to adhere to this core component is fairly high, and the developers of future interventions should incorporate

this component and report on it. As for delivery competence, the best way to deliver the growth mindset message has been discussed (e.g., Keating & Heslin, 2015; Yeager et al., 2016; Zhang, 2022), but more work is needed to understand which of these practices are critical for the transfer of a growth mindset, especially when moving beyond academic performance to health-related contexts. Furthermore, an important avenue for future inquiry related to implementation practices is the environment—where are these interventions most effective? What provides a 'rich soil' for the needed health mindset seed to flourish? Are contextual affordances the same in health as in academics?

Finally, without an assessment of fidelity, researchers cannot understand if null findings are a result of a failure to effectively deliver a mindset message or if mindset interventions are not working as well as they could. In developing fidelity assessments, we first need a standard of implementation. The FIMI and our comprehensive review provide a platform for delineating where there is agreement (e.g., adherence) and where more work is needed (e.g., dose) to understand how to most powerfully administer growth mindset interventions. The goal here was not necessarily to dictate mindset intervention best practices, but rather to draw attention to the need for standards and empirical studies focused on the most effective implementation strategies. Future work should also seek to create a reliable and valid measure of fidelity. A well-developed fidelity measure can enhance methodological rigor (e.g., increase statistical power) and improve internal validity. Importantly, a standard of implementation and assessment of fidelity must remain responsive to changes in mindset interventions ranging from theoretical advancements to expansions in scope.

5 | CONCLUSIONS

We opened this paper with a discussion of the expanding popularity and application of growth mindset interventions, which has appropriately led to scrutiny—scholars and policy-makers alike are asking if these interventions are effective in addressing societal issues. Before conclusive decisions are made regarding the value (or, lack thereof) of mindset interventions, we first need a better understanding of what constitutes the most impactful implementation. To help with this endeavor, we created a fidelity framework, the FIMI. We then used this to provide a systematic review of existing practices and to develop a reporting tool. We sought to spark discussions of fidelity and transparent reporting in growth mindset intervention research and more generally in behavioral science—such considerations are an important part of the heterogeneity revolution (Bryan et al., 2021). We hope that our approach can inspire researchers to improve fidelity, which can contribute to more robust, impactful, and replicable science.

ACKNOWLEDGMENTS

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

DATA AVAILABILITY STATEMENT

We collected no new data. The coding files that support the descriptive review are available upon request and available on OSF.

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ENDNOTES

¹ The term 'implementation' has a variety of meanings in the literature. While our work focuses on *fidelity of implementation*—the extent to which an intervention is delivered as intended—we also at times use the term 'implementation' on its own.

to indicate the way that interventions are delivered in a given study. This should be distinguished from 'implementation science', which focuses on methods to promote uptake and sustained use of established evidence-based practice by practitioners (Eccles & Mittman, 2006).

² In addition to these two interventions in academics, Helsin and colleagues (2005, 2006) effectively fostered stronger growth mindsets of people with implications for performance appraisals and employee coaching.

³ Checklist is on <https://osf.io/qw5pm/>.

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