

Enhancing learning resilience and psychological well being through growth mindset interventions among elementary school students

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Abstract

This systematic review synthesizes findings from ten empirical sources investigating the effectiveness of growth mindset interventions among primary school students aged 8–12 years. The review aims to evaluate intervention impacts on students' beliefs about intelligence, learning resilience, academic performance, and psychological well being. A qualitative quantitative integration method was used to examine effect sizes, developmental differences, and contextual moderators. Results consistently indicate that growth mindset interventions successfully shift students' beliefs toward viewing intelligence as malleable, with effect sizes ranging from 0.34 SD for sense of agency to large effects ($d > 0.80$) for covitality in younger students. Effects on learning resilience and academic achievement were more variable: multi-session interventions improved positive failure beliefs, memory performance, and medium- to long-term academic outcomes (0.32–0.48 SD across subjects), whereas single-session interventions produced no significant learning gains. Meta-analytic evidence also demonstrates medium reductions in depressive ($g = -0.44$) and anxiety symptoms ($g = -0.62$), alongside increased school belonging and reduced bullying victimization. Intervention effectiveness was strongly moderated by contextual factors, including supportive parental beliefs about failure, parental investment preferences, student age, school resources, and cultural adaptation. Overall, the evidence supports growth mindset interventions as a promising approach for enhancing resilience and psychological well-being in 8–12-year-olds when implemented across sustained sessions within supportive environments.

Keywords

Growth mindset, Learning resilience, Academic achievement, Psychological well being, Elementary school

Introduction

Global attention to improving the quality of learning in primary schools has gradually shifted from a narrow focus on academic achievement toward strengthening psychological factors that support long term learning success. Contemporary

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educational literature positions students' beliefs about the nature of intelligence as a critical determinant shaping how children respond to challenges, failure, and increasing academic demands as they grow older [1]. Empirical evidence indicates that students who view intelligence as a malleable capacity tend to demonstrate greater perseverance, more adaptive emotional regulation, and higher levels of learning engagement compared to those who endorse fixed intelligence beliefs [2]. The primary school context represents a particularly crucial developmental phase, as self-belief structures, failure attribution patterns, and attitudes toward effort begin to crystallize with relative stability during this period [3]. Inadequate or poorly targeted interventions at this stage may result in long term consequences, including diminished academic resilience and heightened psychological vulnerability.

The growing interest in growth mindset interventions has emerged in response to the need for pedagogical approaches capable of addressing both cognitive and affective dimensions of student development. Growth mindset is understood as a set of beliefs that intellectual abilities can be enhanced through effort, effective strategies, and environmental support [4]. A number of experimental studies have reported that growth mindset-based interventions can shift students' failure attributions from fixed factors toward controllable ones [5]. Such belief changes have been associated with increased learning persistence, greater willingness to embrace challenges, and more positive attitudes toward corrective feedback [6]. Nevertheless, variability in research findings suggests that the effectiveness of these interventions is not uniform across contexts, age groups, or program designs.

Previous research has explored a wide range of growth mindset intervention formats among children and adolescents. Common approaches include single session modules delivering implicit messages about brain plasticity, multi session programs integrated into classroom activities, and technology based digital interventions [7]. Quantitative findings generally report small to moderate effect sizes on academic achievement, particularly in mathematics and literacy [8]. Longitudinal studies further indicate that intervention effects tend to be more stable when programs are implemented continuously and supported by classroom climates that consistently reinforce growth mindset messages [9]. However, some studies have reported non-significant outcomes, especially for single session interventions lacking contextual reinforcement.

Advances in the state of the art reveal that growth mindset research is no longer confined to academic outcomes alone. Researchers have increasingly linked such interventions to indicators of psychological well being, including emotional resilience, school belonging, and children's mental health [10]. Recent meta analyses suggest that growth mindset interventions contribute to reductions in depressive and anxiety symptoms among children and adolescents, although effect sizes display considerable heterogeneity [11]. These findings indicate that growth mindset may function as a psychological protective factor, particularly in helping students cope with academic and social pressures during the primary school years [12].

Despite the rapid expansion of the literature, several conceptual and methodological limitations remain evident. Many studies conceptualize growth mindset primarily as an individual level construct, without adequately considering systemic interactions among students, families, and school environments [13]. Parental beliefs about failure, educational investment preferences, and emotional support at home are often treated as background variables rather than being examined in depth [14]. Moreover, cultural adaptation of interventions remains limited, rendering the generalizability of findings across sociocultural contexts problematic [15]. These gaps suggest the presence of underexplored potential in understanding the mechanisms through which growth mindset interventions operate among primary school children.

Scholarly critique has also been directed at intervention designs that are overly brief and focused on belief change without ensuring transfer to actual learning behaviors. Experimental evidence indicates that shifts in mindset do not automatically translate into improved learning strategies or academic performance unless supported by aligned instructional structures [16]. Multi session interventions that integrate reflective exercises, formative feedback, and teacher modeling have been shown to yield more consistent effects than minimalist approaches [17]. However, empirical evidence synthesizing differences in effects based on intervention duration, student age, and contextual moderators remains fragmented and insufficiently integrated [18].

In response to these gaps, the present study offers a systematic synthesis of empirical evidence on the effectiveness of growth mindset interventions among primary school students aged 8–12 years, with particular emphasis on beliefs about intelligence, learning resilience, academic achievement, and psychological well being. This approach foregrounds contextual factors as central analytical components, including parental support, school resources, and cultural adaptation of interventions [19]. Integrating qualitative and quantitative findings enables a more comprehensive understanding of variability in effect sizes and the mechanisms underlying observed outcomes [20]. This analytical framework contributes theoretically by extending the conceptualization of growth mindset as an ecological developmental phenomenon rather than merely an individual attribute [21].

The objectives of this study are to systematically evaluate the effects of growth mindset interventions on intelligence beliefs, learning resilience, academic achievement, and psychological well being among primary school students aged 8–12 years. The study also aims to identify moderating factors influencing intervention effectiveness, including student age, program design, and characteristics of the learning environment. To achieve these aims, a systematic review methodology integrating qualitative and quantitative evidence is employed. This approach is expected to provide a stronger scientific foundation for the development of sustainable, context sensitive, and practically impactful growth mindset interventions in primary education [22].

Method

This study employed a systematic review design conducted in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) guidelines to ensure transparency, replicability, and consistency in reporting [23]. A qualitative quantitative integrative approach was used to synthesize empirical findings on the effectiveness of growth mindset interventions on learning resilience and psychological well being among primary school students aged 8–12 years [24]. The review protocol was developed prior to the literature search to minimize selection bias and to ensure alignment between the research questions, methods, and outcomes [25].

The literature search was conducted using a semantic search strategy based on a predefined research query across the Semantic Scholar and OpenAlex databases. These databases were selected due to their multidisciplinary coverage and semantic search capabilities, which are well suited to research on educational psychology interventions [26]. The search initially retrieved 50 articles based on algorithmic ranking and citation metadata, which were then screened to identify the 10 most relevant studies for further analysis. Restrictions were applied to peer reviewed journal articles published in English to ensure methodological consistency and quality [27]. All search results were exported and managed using a standardized bibliographic database for subsequent screening [28] (Table 1).

Table 1. Study inclusion and exclusion criteria

Domain	Inclusion Criteria	Exclusion Criteria
Population	Primary/elementary school students aged 8–12 years	Participants aged <8 or >12 years; adolescents, adults, teachers, or parents as primary subjects
Intervention	Growth mindset interventions explicitly targeting beliefs about intelligence/ability as malleable	General motivation, grit, self regulation, or psychosocial programs without a growth mindset component
Outcomes	Measures of learning resilience and/or psychological well being (e.g., academic persistence, coping with failure, self efficacy, anxiety, emotion regulation, well being)	Academic achievement only without resilience or well being indicators; qualitative outcomes only
Study Design	Experimental or quasi experimental designs (RCTs, quasi experiments, pre–post) with quantitative data	Cross sectional, purely correlational, qualitative studies, opinion pieces, or conceptual papers
Setting	Conducted in primary/elementary school settings	Non school settings (e.g., clinical, laboratory only, non formal education)
Publication Type	Eligible empirical studies or relevant systematic reviews/meta analyses	Editorials, textbooks, non peer reviewed proceedings, policy reports without empirical data

Data extraction was conducted using a large language model as a semi-automated support tool to consistently obtain structured information from the included studies, following standardized extraction instructions and manual verification against the original reports [29]. The extracted data encompassed characteristics of growth mindset interventions, participant profiles, measures of learning resilience, academic

achievement as an adaptive proxy, positive and negative indicators of psychological well being, study design features, and contextual moderating factors [30]. Data synthesis was performed using narrative synthesis and descriptive quantitative approaches, interpreting the direction and magnitude of effects as reported in the primary studies without reanalysis. This process was complemented by a conceptual evaluation of study quality, risk of bias, and variability in intervention effectiveness according to student age, cultural context, parental support, and school resources [31].

Results

This review synthesized evidence from 10 studies investigating growth mindset interventions among elementary school students. The included studies comprised 6 primary empirical studies, 3 systematic reviews, and 1 study integrating a meta analysis with an empirical component.

The included studies exhibited considerable geographic diversity, with primary research conducted in China, France, the Netherlands, the UK, and Pakistan. Sample sizes in these studies ranged from 161 to 1,766 participants. Intervention durations varied widely, from single session interventions to eight week programs comprising 90 minute weekly sessions. Similarly, Zhang et al.'s systematic review reported that session lengths ranged from a few minutes to several hours, with the number of sessions spanning from a single session to multiple sessions across several weeks (Table 2).

Table 2. Characteristics of included studies

Study	Study Type	Sample Size	Age Range	Duration
Shan Zhao et al., 2023	Primary study	1766	Mean 10.61 years	8 sessions
François-Xavier Cécillon et al., 2024	Primary study (controlled before after)	311	9-11 years	Not specified
Dagmar Platte et al., 2025	RCT (2x2 factorial)	161	10-12 years	Not specified
Rémi Dorgnier et al., 2024	Pre post experimental	Not specified	4th-5th grade	Not specified
Min-Lin Fang et al., 2021	Quasi experimental	189	9-12 years	8 weeks, 90 min sessions
Joseph Cassidy et al., 2020	Meta analysis + empirical study	2,082 (meta analysis)	9-11 years	Single session
Heather Savvides et al., 2021	Systematic review	Not specified	Primary school	Various
Xu Jiang et al., 2023	Systematic review	13 papers, 14 studies	School aged children and adolescents	Brief interventions
Fatima Jamal Khan et al., 2022	RCT	899	10-14 years	Not specified
Junfeng Zhang et al., 2022	Systematic review	38 studies	Majority secondary; 2.63% primary	Single sessions to dozens

Several studies specifically focused on underserved populations, including schools within France's Priority Education Networks, which serve low-income communities, as well as students from socially marginalized groups such as Latino/a, Black, and lower achieving students. Intervention formats varied, encompassing reading and writing exercises, group discussions, online interactions, and group-based counseling. Notably, some programs, such as Brainology, incorporated animation based online activities to engage participants.

Growth mindset beliefs

All primary studies investigating growth mindset beliefs reported positive changes following intervention. Zhao et al. demonstrated that their intervention strengthened participants' growth mindset regarding intelligence at a three month follow up, which in turn indirectly enhanced positive beliefs about failure and increased the likelihood of adopting adaptive strategies when encountering setbacks. Similarly, Cécillon et al. reported significant improvements in growth mindset, while Platte et al. observed positive effects on mindset beliefs. In addition, Dorgnier et al.'s metacognitive intervention shifted participants toward more malleable beliefs about intelligence, fostering a more constructive view of effort (Table 3).

Table 3. Effect on growth mindset beliefs

Study	Effect on Growth Mindset	Effect Size/Significance	Sustained at Follow up
Shan Zhao et al., 2023	Stronger growth mindset at follow up	Not specified	Yes, with supportive parental beliefs
François-Xavier Cécillon et al., 2024	Significant positive impact	Significant	Not reported
Dagmar Platte et al., 2025	Positive effect observed	Not specified	Not reported
Rémi Dorgnier et al., 2024	Shift toward malleable intelligence belief	Not specified	Not reported
Min-Lin Fang et al., 2021	Improved covitality components	Large effect ($d > 0.80$) for 3rd grade; moderate high ($d > 0.50$) for 5th grade	Yes, at 5 month follow up
Xu Jiang et al., 2023	Mindsets changed toward growth orientation	Effective through brief interventions	Not reported
Fatima Jamal Khan et al., 2022	Improvement in sense of agency	0.34 SD higher in treatment group	Short term

The systematic review by Jiang et al. confirmed that mindsets can be shifted toward a growth orientation through brief growth mindset interventions. However, effect sizes were reported in only two studies. Fang et al. observed large effect sizes ($d > 0.80$) for third grade students and moderate to high effect sizes ($d > 0.50$) for fifth grade students in covitality and its subcomponents. Similarly, Khan et al. found that participants in the intervention group scored 0.34 standard deviations higher on measures of sense of agency compared to the control group.

Learning resilience and academic outcomes

Findings on learning resilience were mixed across studies. Zhao et al. reported that growth mindset interventions enhanced positive beliefs about failure and promoted adaptive strategies when encountering setbacks, which partially buffered students' academic performance from decline at follow up. Similarly, Dorgnier et al.'s metacognitive intervention influenced students' memory strategies, resulting in improved memory performance (Table 4).

Table 4. Effect on learning resilience and academic outcomes

Study	Resilience Related Measure	Effect	Academic Performance Effect
Shan Zhao et al., 2023	Positive failure beliefs, positive strategies when facing failures	Increased	Protected from downward trajectory
Rémi Dorgnier et al., 2024	Memory strategies, positive conception of effort	Improved	Better memory performance
Dagmar Platte et al., 2025	Learning performance	No significant effect	No significant effect
Min-Lin Fang et al., 2021	Persistence (SEHS-P subscale)	Improved (not significant for 5th grade)	Not directly measured
Fatima Jamal Khan et al., 2022	Sense of agency	0.34 SD improvement	Math: 0.48 SD; English: 0.32 SD; Urdu: 0.43 SD

The most pronounced academic effects were reported by Khan et al. in Pakistan, where participants in the intervention group demonstrated statistically significant improvements in Mathematics (0.48 SD), English (0.32 SD), and Urdu (0.43 SD) over the medium to long term. In contrast, Platte et al. found that neither growth mindset reading and writing assignments nor effort based praise individually or combined had a significant impact on learning outcomes in terms of retention and transfer within the domain of probability calculations. Similarly, Fang et al. reported improvements in the persistence dimension measured by the Social Emotional Health Survey Primary (SEHS-P); however, gains were not statistically significant for fifth grade students, potentially due to the relative simplicity of intervention activities for older children.

Psychological well being

Evidence for the effects of growth mindset interventions on psychological well being was most robust for the reduction of mental health symptoms. Cassidy et al.'s meta analysis reported medium effects of single session interventions on depressive symptoms ($g = -0.44$, 95% CI -0.93 to 0.05) and anxiety symptoms ($g = -0.62$, 95% CI -1.35 to 0.11). Similarly, the systematic review by Jiang et al. concluded that growth mindset interventions hold promise in alleviating depressive symptoms and mitigating aggressive responses to perceived social exclusion (Table 5).

Table 5. Effects on psychological well being

Study	Well being Measures	Positive Outcomes	Effect Size
Min-Lin Fang et al., 2021	Covitality (SEHS-P), school belonging (PSSM), bullying victimization (DBVS)	Increased covitality, increased school belonging, reduced bullying victimization	Large ($d > 0.80$) for 3rd grade; moderate-high ($d > 0.50$) for 5th grade
Joseph Cassidy et al., 2020	Depressive symptoms, anxiety symptoms	Reduced depressive and anxiety symptoms	Depressive: $g = -0.44$ (95% CI -0.93 to 0.05); Anxiety: $g = -0.62$ (95% CI -1.35 to 0.11)
François-Xavier Cécillon et al., 2024	Motivation, satisfaction, classroom climate, sense of belonging	No quantitative changes in motivation/satisfaction; qualitative improvements in climate, belonging, positive emotions	Not specified
Xu Jiang et al., 2023	Depressive symptoms, aggressive reactions	Reduced depressive symptoms, reduced aggressive reactions to social exclusion	Not specified
Fatima Jamal Khan et al., 2022	Well being measures (unspecified)	Limited evidence of impact	Not specified

Fang et al.'s Growth Psychoeducation Intervention yielded significant improvements across multiple well being domains. Covitality increased, with large effect sizes observed for third grade students, school belonging improved, and bullying victimization decreased, with these gains maintained at the five month follow up. Covitality was assessed using the Social Emotional Health Survey Primary (SEHS-P), which includes gratitude, zest, optimism, and persistence, while school belonging was measured via the Psychological Sense of School Membership Scale (PSSM). In contrast, Cécillon et al. found no significant quantitative changes in motivation, satisfaction, or classroom climate; however, qualitative data indicated enhancements in classroom climate, motivation, positive school related emotions, sense of belonging, perceptions of intelligence, and the framing of mistakes as learning opportunities. Similarly, Khan et al. reported limited evidence for the impact of interventions on well being measures.

Moderating factors

Two studies highlighted parental factors as critical moderators of intervention effectiveness. Zhao et al. reported that the positive effects of growth mindset interventions were maintained only when students perceived their parents as holding supportive beliefs about failure. Similarly, Khan et al. found that parental investment preferences influenced the impact of classroom based interventions, indicating that children require a supportive home environment to maximize academic benefits.

Age and grade level also emerged as significant moderators. Fang et al. observed that the persistence component of their intervention was not significant for fifth grade students, possibly due to the relative simplicity of the activities for older children. Zhang et al.'s systematic review further indicated that interventions were generally more

effective for secondary school students than for elementary school students, with particular benefits for female students and boys subject to negative stereotypes.

Contextual factors were found to substantially influence intervention outcomes. Zhang et al. reported that interventions were more effective in adequately resourced settings and less effective in contexts marked by entrenched racial bias. Additionally, community unrest and other contextual disruptions could hinder intervention success. Effective implementation therefore requires a supportive learning environment, sufficient resources, and culturally adapted materials and formats tailored to local contexts.

Discussion

The apparent heterogeneity in findings across studies can be largely explained by examining intervention dosage, outcome measurement specificity, and contextual support factors. Intervention dosage and learning performance effects. The discrepancy between studies showing academic benefits [32], [33], [34] versus null effects on learning performance [35] aligns with intervention intensity. Studies demonstrating academic improvements employed multi session interventions over extended periods or measured outcomes over medium to long term follow up periods. In contrast, Platte et al.'s null findings on learning performance emerged from brief interventions (reading/writing assignment and effort based praise) without extended follow up [35]. This pattern suggests that while growth mindset beliefs can shift following brief interventions, translation to measurable academic performance changes may require sustained engagement or longer observation periods.

Specificity of psychological well being effects. The stronger evidence for mental health symptom reduction (depression, anxiety) compared to broader well being constructs (motivation, satisfaction) may reflect measurement sensitivity. The meta analytic findings by Cassidy et al. with medium effect sizes for depressive ($g = -0.44$) and anxiety ($g = -0.62$) symptoms represent pooled effects across multiple studies using validated clinical instruments [36]. Studies finding limited effects on broader well being measures or discrepancies between quantitative null findings and qualitative improvements suggest that standardized measures may not capture the nuanced changes students experience in classroom climate, sense of belonging, and attitudes toward mistakes [34], [37].

The parental support mechanism. The consistent finding that parental factors moderate intervention effectiveness provides a mechanistic explanation for variable outcomes across studies. Growth mindset messages delivered at school may conflict with fixed mindset messages received at home, particularly regarding beliefs about failure [32], [33]. This suggests that intervention effectiveness should be interpreted within the context of home environment alignment, and that school-based interventions alone may be insufficient without complementary family engagement.

Age dependent effects. The larger effect sizes observed for younger (third grade) versus older (fifth grade) students, combined with the finding that some intervention activities were too simple for older primary students, indicates that intervention design must be developmentally calibrated [37]. Paradoxically, the systematic review by Zhang et al. found interventions more effective for secondary than primary students, which may reflect the greater availability of age-appropriate materials for adolescents or the larger proportion of secondary focused studies (65.79% secondary vs. 2.63% primary) creating sampling bias in observed effectiveness [38].

The effectiveness of interventions appears contingent on adequate environmental resources. Studies conducted in well-resourced settings showed more consistent positive effects, while the systematic review noted reduced effectiveness in contexts with deep seated bias or community disruption [38]. This suggests that growth mindset interventions function as amplifiers of existing educational quality rather than compensatory mechanisms for resource deficits.

Conclusion

In summary, growth mindset interventions consistently promote beliefs in the malleability of intelligence among elementary school students aged 8–12 across diverse cultural contexts. Evidence indicates that these interventions can effectively enhance students' adaptive responses to academic challenges, improve persistence, and foster more positive attitudes toward effort and learning. Interventions that employ interactive activities, metacognitive strategies, and structured psychoeducation have been particularly effective in shaping students' growth-oriented beliefs and facilitating lasting cognitive and behavioral changes.

The magnitude of effects on academic resilience and psychological well being appears to depend on several moderating factors. Interventions are most effective when delivered across multiple sessions rather than as single, brief exposures, ensuring sustained engagement and reinforcement of growth mindset principles. Additionally, alignment with supportive parental beliefs, developmental appropriateness of activities, and implementation in educational contexts with sufficient resources significantly enhance intervention outcomes. Collectively, these findings suggest that growth mindset programs function optimally when embedded within a broader ecological framework that integrates home, school, and contextual supports.

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