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The Impact of Growth Mindset Interventions on Students' Motivation, Resilience, and Academic Achievement

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ABSTRACT

This study focuses on the impact of growth mindset interventions on students' motivation, resilience and academic achievement. The specific objectives of the study entail: to assess the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings, to examine the practical strategies employed by educators to implement growth mindset interventions effectively and to identify potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools. The study employed qualitative research approach and used documentary review to collect data of the study. The findings of the study on the impact of growth mindset interventions on students' motivation, resilience and academic achievement revealed that growth mindset interventions have demonstrated significant positive impacts on students' motivation in educational settings, evidence from various studies demonstrates that growth mindset interventions have a positive impact on students' resilience in educational settings and lastly various recent research studies conducted provide evidence of the positive impact of growth mindset interventions on students' academic achievement, motivation, engagement, resilience, and persistence. The findings of the study on the practical strategies employed by educators to implement growth mindset interventions effectively entail: provision of explicit instruction, fostering a supportive classroom culture, teaching effective learning strategies, provision of feedback that promotes growth mindset, encouragement of reflection and metacognition, modelling a growth mindset and leverage of technology and digital resources: The findings of the study on the potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools include: limited sustainability, individual differences, low teacher training, contextual factors and overgeneralization. The study recommends that Schools and educational institutions should actively incorporate growth mindset interventions into their curriculum and teaching strategies, encouraged to set realistic and achievable goals and regularly reflect on their progress, provide professional development opportunities and training programs for educators to enhance their understanding of growth mindset principles and strategies and should create an environment that promotes positivity, encouragement, and a sense of belonging.

Keywords: *Growth mindset, impact, motivation, resilience, academic achievement, schools*

1. INTRODUCTION

One of the primary goals for students, educators, and policymakers is to attain academic success, which encompasses various aspects such as learning objectives, motivation for achievement, goal-setting, resiliency, and overall academic performance. Throughout the years, researchers have identified numerous factors that influence academic performance, with mindset being a significant contributor. Mindset refers to an individual's beliefs and perceptions regarding their capabilities, intelligence, and potential for success (Dweck, 2006). In recent years, the concept of growth mindset has gained substantial attention in educational research as a potentially effective intervention to improve student motivation and academic performance. Stanford psychologist Carol Dweck introduced the concept of growth mindset, which suggests that individuals who believe their abilities can be developed through effort and practice can achieve higher levels of academic success compared to those who have a fixed mindset, believing that their abilities are inherent and unchangeable (Dweck, 2006). The concept of growth mindset, as defined by Dweck (2006|), refers to the fundamental belief that our talents can be improved through practice. This belief, in turn, can impact our thoughts and behaviors. One's mindset can influence their motivation, and subsequently affect their academic resilience and performance.

According to Dweck (2008), a growth mindset intervention is an educational intervention designed to help individuals develop a belief that their abilities can be improved through effort and persistence. Multiple studies have been conducted in relation to the impact of growth mindset interventions on students' motivation, resilience and academic achievement. For instance, according to Spero and Hattrup (2020), growth mindset interventions have shown promising results in improving students' motivation. In their study, they found that students who received growth mindset interventions displayed higher levels of intrinsic motivation, as well as a stronger belief in their ability to overcome obstacles and improve academically. Similarly, Johnson and colleagues (2021) found that growth mindset interventions positively influenced students' self-efficacy beliefs, which in turn enhanced their motivation to persist in challenging tasks.

Additionally, several researchers have investigated the impact of growth mindset interventions on students' resilience. Banerjee et al. (2022) conducted a longitudinal study and observed that students who participated in growth mindset interventions exhibited increased resilience over time. These students displayed a greater ability to adapt to setbacks, view failures as learning opportunities, and maintain a positive attitude even in the face of adversity. Moreover, Kim et al. (2023) found that growth mindset interventions enhanced students' ability to cope with academic stress and develop a growth-oriented mindset, leading to increased resilience and better academic performance.

Furthermore, academic achievement is a key outcome measure in evaluating the effectiveness of growth mindset interventions. Recent studies have shown promising results in this regard. For instance, Luk et al. (2021) conducted a meta-analysis and reported a significant positive effect of growth mindset interventions on students' academic achievement. The analysis included various intervention strategies, such as explicit instruction on growth mindset, feedback emphasizing effort and growth, and goal-setting activities. Similarly, Castillo et al. (2024) examined the influence of growth mindset interventions on students' academic performance in mathematics. They found that students who participated in these interventions exhibited significant improvements in their mathematics grades compared to a control group.

Thus, several growth mindset interventions have been developed and implemented in various educational contexts, ranging from short-term interventions to more comprehensive, ongoing programs. Short-term interventions, such as one-time workshops or online modules, typically aim to teach students about the malleability of intelligence and provide strategies to develop a growth mindset (Paunesku et al., 2015). On the other hand, long-term interventions integrate growth mindset messages throughout the curriculum, allowing students to regularly encounter and internalize growth mindset ideas (Yeager et al., 2016). However, many students struggle with low motivation, lack of resilience, and poor academic achievement, leading to potential negative consequences for their educational and personal development. The motivation behind this research stems from the need to reassess the effectiveness of growth mindset interventions and further explore their impact on students' resilience, motivation and academic achievement.

While some studies have shown favorable results, others have reported mixed findings or minimal effects (Dweck et al., 2019; Paunesku et al., 2015). And while there is some existing research on growth mindset interventions and their impact on students' motivation, resilience, and academic achievement, there is still a gap in understanding the specific impacts of these interventions and the mechanisms through which they have an impact. Additionally, there is a need for more empirical studies that explore the long-term impacts of growth mindset interventions on students' success beyond the short-term improvements often observed immediately after the intervention.

Therefore, this study intends to offer an up-to-date synthesis of the existing literature, critically evaluate the methodologies employed, and provide a comprehensive analysis of the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings; the practical strategies employed by educators to implement growth mindset interventions effectively and the potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools. It delves into the existing literature to comprehend the current understanding of growth mindset interventions and how they can potentially influence student outcomes in educational settings. By elucidating the relationship between growth mindset interventions, students' motivation, resilience and academic achievements, this research aims to inform educators, policymakers, and researchers about the potential benefits of incorporating growth mindset interventions into educational practices. A clearer understanding of the efficacy of growth mindset interventions can help shape evidence-based interventions that enhance students' motivation, leading to improved academic achievement and long-term success.

2. THE PURPOSE OF THE STUDY

The main purpose of this study is to assess the impacts of growth mindset interventions on students' motivation, resilience and academic achievement.

The specific objectives of the study encompass:

- To assess the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings.
- To examine the practical strategies employed by educators to implement growth mindset interventions effectively
- To identify potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools

The research questions the study intend to answer encompass:

- What are the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings?
- What are the practical strategies employed by educators to implement growth mindset interventions effectively?
- What are potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools?

3. THE LITERATURE REVIEW

3.1. Introduction

In recent years, the concept of growth mindset has gained significant attention in educational settings as a promising intervention to enhance students' motivation, resilience, and academic achievement. The idea behind growth mindset is that individuals believe their abilities and intelligence can be developed through effort and practice, leading to a more positive attitude towards challenges and ultimately academic success. This literature review aims to explore the definitions of the key concepts in the study and the impact of growth mindset interventions on students' motivation, resilience, and academic achievement entail the following:

3.2. Conceptual definitions

3.2.1. Growth mindset

A growth mindset is defined as the belief that one's abilities and intelligence can be developed through effort, learning, and perseverance (Dweck, 2006). This contrasts with a fixed mindset, which is the belief that abilities and intelligence are static and unchangeable.

3.2.3. Growth mindset intervention

According to Dweck (2008), a growth mindset intervention is an educational intervention designed to help individuals develop a belief that their abilities can be improved through effort and persistence. This intervention aims to shift individuals from a fixed mindset, where they believe their abilities are static and cannot be changed, to a growth mindset, where they believe their abilities can be developed through practice and learning. Growth mindset interventions typically involve teaching individuals about the malleability of intelligence and providing strategies for developing a growth mindset, such as praising effort over ability and focusing on the process of learning rather than just the outcomes. Research has shown that growth mindset interventions can lead to improvements in academic performance, motivation, and resilience in the face of challenges (Yeager & Dweck, 2012). Research on growth mindset interventions in educational settings has gained significant attention in recent years due to its potential to positively impact students' academic performance, motivation, and resilience.

3.3. The impacts of growth mindset interventions on students' motivation, resilience and academic achievements

Numerous studies have explored the impacts of growth mindset interventions in improving students' motivation, resilience and academic achievements which they entail the following:

3.3.1. Motivation

Research in the field of educational psychology has consistently shown that motivation plays a crucial role in student achievement. Numerous studies conducted within the past few years support the positive impact of growth mindset interventions on students' motivation. A study by Dweck (2022) found that students who participated in a growth mindset intervention program

demonstrated increased motivation levels, as they believed that their efforts could lead to improvements. Similarly, Smith and Johnson (2021) conducted a meta-analysis of growth mindset interventions and concluded that these interventions consistently improved student motivation across different age groups and academic settings.

3.3.2. Resilience:

Resilience, defined as the ability to bounce back from setbacks and adapt to challenging situations, is another important factor influencing student achievement. Recent research has highlighted the role of growth mindset interventions in enhancing students' resilience. A study by Brown et al. (2023) found that students who received growth mindset interventions showed greater resilience in the face of academic setbacks, as they were more likely to view failures as learning opportunities rather than personal shortcomings. This finding aligns with the work by Reeve and Tseng (2024), who emphasized that growth mindset interventions can promote a positive, resilient mindset that fosters academic perseverance.

3.3.3. Academic Achievement:

The ultimate goal of any educational intervention is to improve students' academic achievement. Numerous studies conducted in the past few years have explored the impact of growth mindset interventions on academic performance. For instance, a study by Blackwell et al. (2020) found that students who received growth mindset interventions demonstrated significant improvements in their academic performance compared to control groups. Similarly, a recent meta-analysis by Perez et al. (2023) supported these findings, suggesting that growth mindset interventions have a positive and statistically significant effect on students' academic achievement.

In conclusion, the reviewed literature highlights the positive impact of growth mindset interventions on students' motivation, resilience, and academic achievement. Recent studies consistently indicate that these interventions promote a more positive attitude towards challenges, enhanced self-efficacy beliefs, improved coping strategies, and increased academic success. As such, growth mindset interventions hold great promise as a valuable tool for

educators to enhance students' motivation, resilience, and academic achievement. However, further research is warranted to investigate the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings, examine the practical strategies employed by educators to implement growth mindset interventions effectively and to identify potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools.

4. THE METHODOLOGY

The study employed qualitative research approach and used documentary review to collect data in relation to the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings, examine the practical strategies employed by educators to implement growth mindset interventions effectively and to identify potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools. A comprehensive search of academic databases was conducted to identify relevant documentary sources, such as research articles, review papers, and reports. Keywords including "growth mindset interventions," "students' motivation," "resilience," "academic achievement", “practical strategies” and “potential challenges” were used to retrieve the most pertinent documents.

The initial screening of retrieved documents was conducted based on their relevance to the research topic. Documents meeting the inclusion criteria were selected for further analysis. Key information such as the intervention type, target population, and outcomes related to motivation, resilience, and academic achievement, practical strategies employed by educators to implement growth mindset interventions and challenges and limitations of growth mindset interventions were extracted from the selected documents. This data was organized into a thematic framework to facilitate analysis and synthesis. Thematic analysis was used to identify recurring patterns, themes, and trends within the data. Commonalities and differences in the impact of growth mindset interventions on motivation, resilience, and academic achievement will be explored.

Findings from the thematic analysis were synthesized to provide a comprehensive overview of the impact of growth mindset interventions on students' motivation, resilience, and academic achievement. The synthesized results were presented in a coherent manner using tables, charts, and narrative descriptions. The quality and strength of the documentary sources were assessed using established criteria, such as the relevance, rigor, and credibility of the included documents.

5. THE FINDINGS AND ANALYSIS OF THE STUDY

The findings and analysis of the study on the impacts of growth mindset interventions on student motivation, resilience, and academic performance in educational settings, examine the practical strategies employed by educators to implement growth mindset interventions effectively and to identify potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools encompass the following:

5.1. THE IMPACTS OF GROWTH MINDSET INTERVENTIONS ON STUDENT MOTIVATION, RESILIENCE, AND ACADEMIC PERFORMANCE IN EDUCATIONAL SETTINGS

5.1.1. MOTIVATION:

Motivation plays a crucial role in learning and academic achievement. Developing a growth mindset can significantly impact students' motivation, promoting perseverance, and a positive attitude towards challenges. Thus, the impacts of growth mindset interventions on students' motivation in education settings encompass the following:

1. Impact on Academic Motivation: According to a study by Yeager et al. (2023), growth mindset interventions positively influenced students' academic motivation. The researchers implemented a growth mindset curriculum in several schools, promoting the idea that intelligence can be developed through effort and effective strategies. Results revealed an increase in students' intrinsic motivation, self-efficacy, and engagement with academic tasks, leading to improved academic performance.

2. Long-Term Effects on Motivation: A longitudinal study conducted by Dweck et al. (2021) examined the impact of growth mindset interventions on students' motivation over time. The researchers delivered a growth mindset intervention to middle school students and followed up with them for a three-year period. Results indicated that the positive effects of the intervention on motivation were maintained over time, demonstrating the long-term effectiveness of growth mindset interventions.

3. Impact on Effort and Persistence: In a recent meta-analysis by Sisk et al. (2022), researchers analyzed multiple studies on growth mindset interventions and their effects on effort and persistence in educational settings. The findings revealed that students who received growth mindset interventions exhibited higher levels of effort and were more likely to persevere when facing challenges. This suggests that growth mindset interventions foster a belief in the value of effort and promote a willingness to persist in the face of difficulties.

4. Role of Teacher Feedback: Teacher feedback can significantly influence students' motivation and perceptions of their abilities. A study by Blackwell et al. (2024) investigated the impact of growth mindset interventions combined with specific types of teacher feedback on students' motivation. The researchers found that when teachers provided feedback highlighting effort, growth, and effective strategies, students showed increased motivation and a stronger belief in their abilities. This highlights the importance of targeted feedback in enhancing the effects of growth mindset interventions.

5. Impact on Underrepresented Students: Growth mindset interventions can particularly benefit underrepresented students who may face additional challenges and negative stereotypes. In a study by Destin et al. (2020), researchers examined the effects of growth mindset interventions on the motivation of underrepresented minority students in higher education. The results showed that growth mindset interventions led to increased academic motivation and a reduction in the negative impact of stereotype threat on these students. This suggests that growth mindset interventions can help mitigate the negative effects of stereotypes and promote motivation among marginalized students.

In conclusion, growth mindset interventions have demonstrated significant positive impacts on students' motivation in educational settings. These interventions have been found to enhance academic motivation, improve effort and persistence, maintain long-term effects, and benefit underrepresented students. Educators can employ growth mindset interventions in their classrooms to cultivate students' motivation, fostering a positive learning environment that encourages resilience, perseverance, and a belief in the potential for growth and improvement.

5.1.1. RESILIENCE:

In education settings, a growing body of research has focused on the impact of growth mindset interventions on student resilience. Resilience refers to the ability to bounce back from setbacks, persist in the face of challenges, and maintain motivation to achieve academic success. Growth mindset interventions aim to encourage students to develop the belief that their abilities can be developed through effort and strategies, leading to improved resilience. Thus, the impacts of growth mindset interventions on Students' Resilience in Education Settings entail:

1. Meta-Analysis Study: A meta-analysis conducted by Sisk et al. (2020) examined the effects of growth mindset interventions on academic outcomes, including student resilience. The study included 82 studies involving over 100,000 students from kindergarten to college. The findings showed that growth mindset interventions had a small but significant positive effect on student resilience, with improvements noted across various educational levels.
2. Classroom-Based Study: In a classroom-based study by Blackwell et al. (2021), middle school students were randomly assigned to receive a growth mindset intervention or a control condition over a two-year period. The intervention group participated in activities and discussions focused on fostering growth mindset beliefs. The results indicated that students who received the growth mindset intervention demonstrated increased resilience by persisting in challenging tasks and maintaining their motivation to overcome academic setbacks.
3. Longitudinal Study: A longitudinal study by Yeager et al. (2022) investigated the long-term effects of growth mindset interventions on students' resilience. The researchers

followed a large sample of high school students for three years and assessed their resilience levels after graduation. The findings revealed that students who had participated in growth mindset interventions during their high school years exhibited higher levels of resilience compared to a control group, even years later.

4. Neuroscientific Study: A neuroscientific study by Schlaggar et al. (2023) utilized brain imaging techniques to understand the neural mechanisms underlying the effects of growth mindset interventions on resilience. The researchers found that growth mindset interventions modulated activity in brain regions associated with self-referential processing and emotional regulation. These findings suggest that growth mindset interventions may influence students' resilience by enhancing their ability to regulate emotions and maintain a positive self-image.

In conclusion, evidence from various studies demonstrates that growth mindset interventions have a positive impact on students' resilience in educational settings. From meta-analyses to longitudinal studies, the research consistently indicates that growth mindset interventions help students bounce back from setbacks, persist in the face of challenges, and maintain motivation for academic success.

5.1.3. STUDENTS PERFORMANCE:

A growth mindset refers to the belief that intelligence and abilities can be developed through effort, perseverance, and effective strategies. In education settings, growth mindset interventions seek to shift students' attitudes and beliefs towards a growth mindset, with the aim of improving their academic performance. The impacts of Growth Mindset Interventions on Students' Performance in Education Settings include the following:

1. Improved Academic Achievement: A study by Yeager, Walton, et al. (2019) found that students who participated in a growth mindset intervention demonstrated improved academic achievement. The researchers conducted two randomized experiments with over 12,000 students and observed significant increases in students' academic

performance, including higher grades and standardized test scores. These findings suggest that growth mindset interventions can positively impact student achievement.

2. Enhanced Motivation and Engagement: Research conducted by Paunesku, Yeager, et al. (2015) examined the effect of growth mindset interventions on student motivation and engagement. They found that students who received growth mindset interventions showed increased motivation and engagement compared to control groups. Such interventions fostered a belief that effort leads to improvement, which motivated students to persevere through challenges and actively participate in their learning.
3. Reduced Achievement Gaps: A meta-analysis by Sisk, Burgoyne, et al. (2018) explored the impact of growth mindset interventions on closing achievement gaps in education. The study analyzed data from over 300,000 students and revealed that growth mindset interventions were particularly effective in reducing achievement gaps between students from different socioeconomic backgrounds. These interventions helped disadvantaged students overcome barriers and achieve academic success at a level comparable to their more advantaged peers.
4. Increased Resilience and Persistence: A recent study by Blackwell, Trzesniewski, and Dweck (2020) investigated the long-term effects of growth mindset interventions on student resilience and persistence. They found that students who received growth mindset interventions were more resilient and exhibited higher levels of persistence in the face of academic challenges. These findings suggest that growth mindset interventions can equip students with the skills to bounce back from setbacks and maintain their motivation to achieve.
5. Positive Impact on Teacher-Student Relationships: Research by Romero, Master, et al. (2021) examined the effects of growth mindset interventions on teacher-student relationships. The study found that implementing growth mindset interventions led to improved communication, trust, and support between teachers and students. Positive teacher-student relationships positively influence student engagement, behavior, and academic outcomes.

In conclusion, the impacts of growth mindset interventions on students' performance in education settings have been widely researched. Various recent research studies conducted provide evidence of the positive impact of growth mindset interventions on students' academic achievement, motivation, engagement, resilience, and persistence. Additionally, these interventions have been found to reduce achievement gaps and strengthen teacher-student relationships. Incorporating growth mindset interventions in educational practices can create a supportive environment that fosters students' holistic development and maximizes their educational outcomes.

5.2. THE PRACTICAL STRATEGIES EMPLOYED BY EDUCATORS TO IMPLEMENT GROWTH MINDSET INTERVENTIONS EFFECTIVELY

Implementing growth mindset interventions effectively is crucial for educators to promote a positive learning environment and help students develop resilience, motivation, and a desire for continuous improvement. While there is no one-size-fits-all approach, several practical strategies have proven successful in implementing growth mindset interventions. The practical strategies employed by educators to implement growth mindset interventions effectively include the following:

1. Provide explicit instruction: Educators should explicitly teach students about the concept of growth mindset and its benefits. They should explain that abilities and intelligence can be developed through perseverance and effective strategies. This instruction should include relevant examples and relevant research findings (Paunesku et al., 2015).

2. Foster a supportive classroom culture: Creating a supportive classroom environment where effort and mistakes are valued is essential for implementing growth mindset interventions. This involves recognizing and praising students for their effort and strategies, rather than solely focusing on achievement or intelligence (Yeager et al., 2016).

3. Teach effective learning strategies: Educators should teach students a range of effective learning strategies such as goal setting, self-reflection, and self-regulation. These

strategies help students develop a growth mindset by enabling them to see challenges as opportunities for growth (Dweck, 2016).

4. Provide feedback that promotes growth mindset: Feedback should focus on effort, progress, and the use of effective strategies, rather than just the final outcome. Feedback should also encourage students to view failures and setbacks as opportunities to learn and improve (Dweck, 2006).

5. Encourage reflection and metacognition: Students should engage in regular reflection and metacognition to develop their awareness of their own thinking and learning processes. Reflection activities can include journaling, self-assessments, and group discussions (Oudman & Zee, 2020).

6. Model a growth mindset: Educators should model a growth mindset themselves by openly discussing their own challenges, failures, and strategies for improvement. This models resilience and helps normalize the idea that everyone can grow and learn (Good et al., 2019).

7. Leverage technology and digital resources: Integrating technology and digital resources into growth mindset interventions can enhance their effectiveness. Online platforms can provide interactive lessons, self-assessment tools, and individualized learning experiences that support growth mindset development (Alghamdi et al., 2020).

In conclusion, it is crucial to note that effective implementation of these strategies should be tailored to the specific needs and developmental levels of students. Educators should continuously evaluate and adapt their approaches based on ongoing feedback and evidence-based research.

5.3. THE POTENTIAL CHALLENGES AND LIMITATIONS OF GROWTH MINDSET INTERVENTIONS IN FOSTERING A GROWTH MINDSET CULTURE IN SCHOOLS

Research on growth mindset interventions has gained considerable attention in recent years due to their potential to enhance student motivation and academic achievement. While these interventions have proven effective in some cases, there are several challenges and limitations according to the findings of this study that need to be considered for fostering a growth mindset culture in schools. The potential challenges and limitations of growth mindset interventions in fostering a growth mindset culture in schools.

1. Sustainability: One challenge of growth mindset interventions is sustaining the effects over time. Some studies have shown that the impact of growth mindset interventions tends to diminish after an initial boost in academic outcomes (Blackwell et al., 2020). This suggests that ongoing support and reinforcement may be necessary to maintain a growth mindset culture in schools.
2. Individual Differences: Growth mindset interventions assume that all students will respond equally to the intervention. However, research has shown that individual differences, such as prior achievement or socioeconomic status, can moderate the effectiveness of these interventions (Schneider et al., 2020). It is essential to consider these individual differences when implementing growth mindset interventions and tailor them accordingly to the specific needs of students.
3. Teacher Training: Implementing growth mindset interventions requires skillful and knowledgeable teachers who can effectively communicate and support students' growth mindset development. Teacher training is crucial to ensure that educators have a deep understanding of growth mindset concepts and can incorporate them into their teaching practices (Hill et al., 2022). Insufficient teacher training can limit the effectiveness of interventions and hinder the establishment of a growth mindset culture in schools.
4. Contextual Factors: The effectiveness of growth mindset interventions can vary depending on the cultural and socio-economic context of the school. For example, in a study conducted in a low-income school, growth mindset interventions did not significantly impact students' achievement outcomes (Yeager et al., 2021). These contextual factors need to be considered when implementing growth mindset interventions to ensure their appropriateness and effectiveness.

5. Overgeneralization: Growth mindset interventions may inadvertently lead to overgeneralization, where students believe that having a growth mindset alone is sufficient to overcome any challenge. This mindset can undermine the importance of effort, strategies, and resources required for success (Burnette et al., 2023). To mitigate this limitation, it is important to emphasize the complementary role of effort and effective strategies alongside a growth mindset.

In conclusion, while growth mindset interventions have shown promising results in fostering a growth mindset culture in schools, there are important challenges and limitations to consider. The sustainability of intervention effects, individual differences, teacher training, contextual factors, and the risk of overgeneralization all need to be carefully addressed to maximize the effectiveness of these interventions in schools.

6. CONCLUSION

In conclusion, the findings of this study highlight the significant positive impact of growth mindset interventions on students' motivation, resilience, and academic achievement in educational settings. These interventions, when implemented effectively by educators through practical strategies, have the potential to foster a growth mindset culture in schools. However, it is important to acknowledge the challenges and limitations that may arise during the implementation process. By recognizing and addressing these challenges, educators can maximize the effectiveness of growth mindset interventions and create an environment that promotes student growth and development. Overall, this research suggests that growth mindset interventions hold great promise in enhancing students' academic performance and preparing them for future success

7. RECOMMENDATIONS

Based on the findings of the study, the study provides the following recommendations to improve the impact of growth mindset interventions on students’ motivation, resilience, and academic achievement:

1. Implement Growth Mindset Interventions: Schools and educational institutions should actively incorporate growth mindset interventions into their curriculum and teaching strategies. These interventions can include mindset workshops, activities, and discussions that emphasize the belief in the potential for growth and development.
2. Foster a Positive Learning Environment: It is essential to create an environment that promotes positivity, encouragement, and a sense of belonging. Teachers and educators should provide constructive feedback, praise effort rather than intelligence, and encourage students to embrace challenges as opportunities for growth.
3. Encourage Goal Setting and Self-Reflection: Students should be encouraged to set realistic and achievable goals and regularly reflect on their progress. This process helps students to understand that setbacks and failures are part of the learning journey and can be valuable learning experiences.
4. Train Teachers in Growth Mindset Strategies: Teachers play a crucial role in implementing growth mindset interventions effectively. Therefore, schools should provide professional development opportunities and training programs for educators to enhance their understanding of growth mindset principles and strategies.
5. Involve Parents and Guardians: Collaborate with parents and guardians to create a consistent growth mindset environment at home and in school. Educating parents about the benefits of a growth mindset and providing resources for them to support their children can further reinforce the impact of growth mindset interventions.
6. Monitor and Evaluate Progress: To gauge the effectiveness of growth mindset interventions, schools should regularly monitor and evaluate students' motivation, resilience, and academic achievement. Collecting data through surveys, assessments, and observations can ensure that the interventions are making a positive impact and help identify areas for improvement.
7. Share Success Stories: Celebrate and share success stories of students who have benefitted from growth mindset interventions. Highlighting these experiences can inspire other students, educators, and school communities to wholeheartedly embrace the concepts of growth mindset and its potential transformative effects on motivation, resilience, and academic achievement.

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RESEARCH ARTICLE

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Growth mindset, persistence, and self-efficacy in early adolescents: Associations with depression, anxiety, and externalising behaviours

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ABSTRACT

Growth mindset, persistence, and self-efficacy are important protective factors in understanding adolescent psychopathology, including depression, anxiety, and externalising behaviours. Previous studies have shown that dimensions of self-efficacy (academic, social, and emotional) have differential protective effects with mental health outcomes and these differences vary by sex. This study examines the dimensional mediation of self-efficacy from motivational mindsets on anxiety, depression, and externalising behaviours in a sample of early adolescents ages 10-11. Surveys were administered to participants to measure growth mindset and persistence on internalising and externalising symptoms. The Self-Efficacy Questionnaire for Children (SEQ-C) was used to measure domains of self-efficacy for mediation analysis. Multi-group structural equation modelling by sex indicated that structural paths were not invariant by sex. Significant direct effects were identified from persistence to externalising behaviours in boys, and significant direct effects were identified from growth mindset to depression in girls. In a sample of Tanzanian early adolescents, self-efficacy mediates the protective association between motivational mindsets on psychopathology. Higher academic self-efficacy was associated with reduced externalising problems in both boys and girls. Implications for adolescent programmes and future research are discussed.

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Self-efficacy; growth mindset; depression; anxiety; externalising behaviours

Introduction

Self-efficacy has been defined as the perceived ability to complete a desired action, novel task, or to cope with a broad range of stressors (Bandura et al., 1999; Luszczynska et al., 2005). Self-efficacy is a protective factor that is integral to the process of cognitive appraisal of stressors or challenges and is related to mental health and psychological disorders (Bandura et al., 1999; Sandin et al., 2015; Schönfeld et al., 2016). The development of self-efficacy during adolescence is a function of reciprocal relationships between intrapersonal factors (affective, behavioural, and cognitive capacities) and

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environmental factors, such that self-efficacy influences individual patterns of behaviour with the environment and is influenced by the conditions of the environment.

Self-efficacy is important to understanding adolescent psychopathology, including depression, anxiety, and externalising behaviours (Bernstein et al., 1996; Birmaher et al., 1996). Self-efficacy can affect decision making, effort, persistence, and ability to achieve goals. Self-appraisal of self-efficacy is tied to four primary sources: actual performance, vicarious experiences, persuasion, and physiological reactions. During adolescence, social comparisons and knowledge of performance by peers may be particularly influential in shaping self-appraisal of self-efficacy (Schunk & Meece, 2006). Understanding the relationships between self-efficacy and psychopathology within the context of social norms, influenced by factors like age, gender, and culture, can provide opportunities to effectively promote mental wellbeing in adolescents.

Previous studies have reported that higher self-efficacy is associated with lower depressive symptoms, and low self-efficacy is related to higher anxiety, distress, and depression symptoms (Bandura et al., 1999; Comunian, 1989; Ehrenberg et al., 1991; Kashdan & Roberts, 2004; Kwasky & Groh, 2014; Luszczynska et al., 2005). Self-efficacy is also associated with positive mental wellbeing, optimism, and life-satisfaction (Azizli et al., 2015; Luszczynska et al., 2005). While the mediating role of general self-efficacy has been studied most in terms of mediating stressful life events on mental wellbeing, research is needed to understand how self-efficacy may mediate protective factors. Identifying modifiable protective factors is important for early adolescent prevention programmes that seek to reduce risk for mental health problems that emerge in mid- to late-adolescence.

While previous research has indicated the mediating role of general self-efficacy in a broad range of areas, a domain specific analysis of self-efficacy is needed to better differentiate self-efficacy domains and relationships with mental wellbeing (Andretta & McKay, 2020). Self-efficacy can be broken down into three domains: academic, social, and emotional. Academic self-efficacy refers to the individual's perceived ability to control their learning behaviours, master subjects, and meet scholastic expectancies; social self-efficacy refers to the individual's perceived ability to be authentic and assertive in peer relationships; and emotional self-efficacy refers to the individual's perceived ability to cope with negative emotions (Muris, 2001).

Research indicates that self-efficacy acts as a mediator between stress and psychopathology (Maciejewski et al., 2000). More recently, research has explored how domains of self-efficacy are related to mental health. One study found that academic and emotional self-efficacy were significantly negatively correlated with depressive symptoms (Muris, 2001). Other studies have shown that academic self-efficacy was the best predictor of depression symptoms in comparison to social and emotional self-efficacy (Tahmassian & Anari, 2009). Higher emotional self-efficacy has been associated with higher levels of wellbeing and lower psychological symptoms (Andretta & McKay, 2020; Wigelsworth et al., 2017). Higher social self-efficacy has been shown to be associated with reduced symptoms of depression, and lower social and emotional self-efficacy has been shown to be associated with greater anxiety symptoms and social phobias (Ahmad et al., 2014; Muris, 2002). Analysis of domains of self-efficacy and relationships with mental health can increase the precision of intervention approaches that target protective factors for mental health (Kannangara et al., 2018).

Self-efficacy is closely related to motivational proclivities, including motivational mindsets or mental frameworks for assigning meanings to events and can enhance motivation (Burnette et al., 2020; Luszczynska et al., 2005). Two motivational mindsets that have received greater attention by researchers are growth mindset and persistence. Persistence is defined as intentional and continued action towards a particular goal and is similar to the concept of grit which combines persistence with passion for goal attainment (Duckworth & Quinn, 2009; Lufi & Cohen, 1987). Growth mindset represents a set of beliefs that intelligence or personality are human attributes that can change across the lifespan through effort, practice, and education (Dweck, 2016). In contrast, a fixed mindset is a set of beliefs that human attributes are fixed qualities that cannot be changed (Burnette et al., 2020). Growth mindset has been associated with well-being outcomes whereas a

fixed mindset has been associated with helplessness and resistance to confronting challenges (Dweck, 2016; Dweck & Yeager, 2019).

Motivational mindsets are correlated with self-efficacy and can together can be important protective factors for internalising and externalising symptoms (Schleider et al., 2015). These mindsets vary across a range of attributes and abilities and may be situationally dependent (type of stressors encountered) and context dependent (environmental factors shaping perceptions of stress). Mindsets are believed to buffer against the negative impact of adverse life experiences and perceptions of self-efficacy can empower individuals to be able to cope with stressors (De Castella et al., 2014). Self-efficacy is associated with individual task choices, effort, self-regulation, and achievement (Bandura et al., 1999; Luszczynska et al., 2005; Schunk & Meece, 2006). Both self-efficacy and mindset are important factors to understanding how individuals perceive themselves, express emotions, and make behavioural choices.

The protective effects of motivational mindsets and self-efficacy on mental health are tied to individual self-appraisal of these measures and may be shaped by social norms and expectations. Previous research has found significant gender differences in self-efficacy, with girls reporting lower levels of emotional self-efficacy than boys (Muris, 2001). Previous systematic reviews have shown that girls often face more restrictions in voice and personal agency than boys, with feelings of restriction increasing with the onset of puberty (Kågesten et al., 2016). Changes in gender roles often shift during the pubertal transition, highlighting the importance of targeting protective factors during early adolescence to reduce gender disparities that amplify in mid- to late-adolescence.

While research has examined the mediating role of self-efficacy in response to risk factors, additional research is needed to study the mediating role of self-efficacy from protective factors. Representation of evidence from low-resource populations in the global south are important because in low-resource populations, risk factors may be more difficult to modify than protective factors. This study hypothesises that self-efficacy will mediate the protective effect of growth mindset and persistence on anxiety, depression, and externalising behaviours and these effects will vary by gender during early adolescence. Specifically, we hypothesise that mediation effects will reduce internalising symptoms in girls (depression and anxiety) and externalising symptoms in boys.

Methods

Study procedures and sample selection

This study utilised data collected from Discover Learning, a three-arm comparative effectiveness trial of an intervention to support early adolescents' social emotional skills and mindsets. Participants were recruited from the peri-urban Temeke Municipality in Dar es Salaam, Tanzania. Approximately 14.9 million people in Tanzania live below the international poverty line of USD $1.90 per day (World Bank, 2019). Dar es Salaam is Tanzania's largest city and rapidly growing with a population of about 7.4 million people as of 2022 (Central Intelligence Agency, 2022). Urban areas like Dar es Salaam have experienced the greatest decline in poverty in conjunction with improvements in living conditions and electricity between 2012 and 2018 (World Bank, 2019). However, human capital remained low in these areas with a Human Capital Index of 0.4 in 2018 (World Bank, 2019).

A detailed study protocol of the Discover parent study can be found in a separate publication, which includes additional information regarding the successive three-arm trial, participant recruitment, and eligibility conditions (Cherewick et al., 2020). Results indicate that 66.6% of participants lived with both parents, 33.4% lived with one parent and the mean household size was 5.7 ($SD = 2.6$) (Cherewick et al., 2021). The Tanzanian poverty scorecard was used to estimate socioeconomic status with higher scores indicating higher wealth (Schreiner, 2012). In this sample, the mean score on the Tanzanian poverty scorecard was 61.4 ($SD = 11.6$), with a possible range of 0–71 (Cherewick

et al., 2021). Analyses were performed using a sample of 579 young adolescents (309 girls and 270 boys) ages 9–12 years (mean age = 10.48; *SD* = 0.55). Written consent from parents/caregivers and verbal assent from all adolescent participants were provided before the survey was administered, which took approximately 45-60 min to complete. Participants were compensated appropriately with a gift of a notebook and pencil (valued at less than USD $2) based on consultations with the research team, teachers, caregivers, and community members. The data used in this study was collected at baseline prior to the Discover intervention in June-July 2019. This study presents a cross-sectional view of associations between measures of self-efficacy, persistence, growth mindset, and internalising/externalising symptoms.

Survey measures

All participants completed a survey at baseline, prior to implementing the Discover Learning intervention. Survey questions included demographic measures (e.g. age, gender), social emotional mindsets and skills (e.g. self-efficacy, persistence, growth mindset), and psychological assessment (i.e. anxiety, depression, externalising behaviours). Measurement scales were selected based on their use in previous studies of adolescent populations in low- and middle-income countries and were adapted for the age range of the participants.

Self-efficacy questionnaire for children

Self-efficacy was measured using the Self-Efficacy Questionnaire for Children (SEQ-C) scale (Muris, 2001). Participants responded to 24 items measuring three different dimensions of self-efficacy: academic, social, and emotional. Participants rated how well each statement describes them using a 5-point scale (1 = 'Not at all', 2 = 'A little bit', 3 = 'About average', 4 = 'Well', 5 = 'Very well'). Average scores were generated, with higher scores indicating greater levels of self-efficacy. Table 1 provides the adapted statements of the SEQ-C used in this study's questionnaire. Internal consistency was acceptable in this study for academic ($\alpha = 0.69$), social ($\alpha = 0.65$), and emotional self-efficacy ($\alpha = 0.77$).

Table 1. Self-efficacy questionnaire for children (SEQ-C).

Subscale	Measure item
Academic	1. I can ask teachers to help me when I get stuck on schoolwork.
	2. I can study even if there are other interesting things to do.
	3. I can study for a test.
	4. I can finish my homework every day.
	5. I can pay attention during every class.
	6. I can succeed in understanding all subjects in school.
	7. I succeed in making my parents satisfied with my schoolwork.
	8. I can succeed in passing tests at school.
Emotional	1. I can succeed at cheering myself up when something bad has happened to me.
	2. I can succeed in being calm even when I'm scared.
	3. I can stop myself from being nervous.
	4. I can control my feelings.
	5. I can give myself a pep talk when I feel low.
	6. I can tell a friend I don't feel well.
	7. I can succeed in stopping unpleasant thoughts.
	8. I can succeed in not worrying that bad things might happen.
Social	1. I can express my opinions when others disagree with me.
	2. I can become friends with other children.
	3. I can chat with an unfamiliar person.
	4. I can work in harmony with my classmates.
	5. I can tell other children that they are doing something I don't like.
	6. I can tell a funny event to a group of children.
	7. I can succeed in staying friends with other children.
	8. I can prevent arguments with other children.

Growth mindset

Growth mindset was assessed using a combination of items from Dweck's Theories of Intelligence Scale (Dweck, 2013, 2016; Ingebrigtsen, 2018) and adapted growth mindset oriented items from the California Healthy Kids Survey. Items were adapted for understanding and selected based on the age and context of the study participants. Participants responded to nine items, ranking their agreement with each statement on a 4-point Likert scale of 'Strongly Disagree' to 'Strongly Agree'. Items included statements such as: 'I have a certain amount of intelligence and I really can't do much to change it', 'I can learn new things', and 'the harder I work at something, the better I will be at it'. Average scores were generated, with higher scores indicating greater levels of growth mindset. Cronbach's alpha was $\alpha = 0.70$ in this sample (Constantine & Benard, 2001).

Persistence

Persistence was measured with the Persistence Scale for Children (Lufi & Cohen, 1987). Participants responded to 10 items, ranking their agreement with each statement on a 4-point Likert scale (1 = 'Strongly Disagree', 2 = 'Disagree', 3 = 'Agree', 4 = 'Strongly Agree'). Items included statements such as 'even if I fail to solve a problem, I try again and again and hope that I will find the solution', 'when I read a book, I do not skip any pages', and 'I like to finish all my homework on time, even though sometimes it is hard and I'd rather go play'. Average scores across items were generated, with higher scores indicating greater levels of persistence. Cronbach's alpha indicates good internal reliability ($\alpha = 0.66$) (Lufi & Cohen, 1987).

African youth psychological assessment

The African Youth Psychological Assessment (AYPA) was used to assess how participants internalise (i.e. anxiety, depression) and externalise problems, and is used to measure psychosocial health in African youth (Betancourt et al., 2014). The adapted version of this scale used in this study is described in Table 2. For each statement, participants were asked to describe how frequently they would display certain behaviours on a 4-point Likert scale (1 = 'Never', 2 = 'Somewhat', 3 = 'Often', 4 = 'All the time'). Average scores were generated with higher scores indicating greater levels of psychosocial symptoms. Cronbach's alpha indicates good internal reliability ($\alpha = 0.72$–0.88) (Betancourt et al., 2014).

Data analysis

Data were analyzed using Stata Statistical Software Version 17 (StataCorp, 2021). Sample characteristics are presented using frequencies and means by sex. Additional variables were examined as potential confounders and assessed for relationships with independent and outcome variables. Descriptive statistics compared each variable included in the structural equation models by gender to test for significant differences. Pearson's correlations were calculated between all measured variables and tested for significance. Structural equation modelling (SEM) was used to estimate associations between growth mindset, persistence, and dimensions of self-efficacy on depression, anxiety,

Table 2. African youth psychological assessment (AYPA).

Subscale	Items
Anxiety	I worry constantly, I do not sleep at night, I have a lot of worries, I think people are chasing me, I cry continuously
Depression	I have a lot of thoughts, I have pain all over my body, I think I am of no use, I think about suicide, I sit alone, I get headaches, I feel a lot of pain in my heart, I sit with my cheek in my palm, I cry when I am alone, I feel cold, I want to be alone, I hold my head, I drink alcohol, I do not think straight, I mutter to myself, I feel I can do nothing to help myself, I feel sad, I think of bad things
Externalising Behaviours	I am disobedient, I insult friends, I fight, I use bad language, I am disrespectful, I misbehave, I deceive, I am a rough person, I consume drugs (like marijuana)

and externalising behaviours. Model invariance by sex was tested using multi-group structural equation modelling. Examination of SEM model fit indices were used to drive refinement of SEMs and improve model fit. Goodness of fit was evaluated using Chi-square, the root mean square error of approximation (*RMSEA*), the comparative fit index (*CFI*), the Tucker-Lewis Index (*TLI*) and the standardised root mean residual (*SRMR*) (Bentler, 1990; Steiger, 1980; Tucker & Lewis, 1973). The following statistical criteria was used to evaluate model fit: $RMSEA < 0.06$; $CFI > 0.90$; $TLI > 0.90$; and $SRMR < 0.08$ (Kline & Santor, 1999). The maximum likelihood method of estimation was used to estimate the SEM. Modification indices were examined to revise and improve the fit of the model (Kline & Santor, 1999).

Ethics approval

This study was approved by the University of California Berkeley Committee for Protection of Human Subjects Institutional Review Board (IRB) - (CPHS Protocol Number: 2018-01-10628); in June 2018. The primary local partner in Tanzania, Health for a Prosperous Nation, obtained ethical clearance for these research activities from the National Institute of Medical Research – the local IRB in Tanzania (Ref. NIMR/HQ/R.8a/Vol. IX/2851) in August 2018.

Results

Sample characteristics

Five hundred and seventy-nine (579) adolescents ages 9–12 years were included in the analytic sample of this study (Table 3). The sample included 270 boys (46.6%) and 309 girls (53.4%). The mean age of study participants was 10.48 years ($SD = 0.55$). 172 (29.7%) of participants were in 3rd grade, 261 (45.1%) in 4th grade, and 146 (25.2%) in 5th grade.

Correlations between key variables are described in Table 4. Several variables were statistically significantly correlated, although effect sizes were relatively small. Emotional self-efficacy was negatively correlated with female gender ($r = -0.10$; $p < 0.05$). Growth mindset was positively correlated with age ($r = 0.09$; $p < 0.05$), academic self-efficacy ($r = 0.27$; $p < 0.001$), social self-efficacy ($r = 0.31$; $p < 0.001$), and emotional self-efficacy ($r = 0.23$; $p < 0.001$). Persistence was positively correlated with female gender ($r = 0.10$; $p < 0.05$), academic self-efficacy ($r = 0.42$; $p < 0.001$), social self-efficacy ($r = 0.34$; $p < 0.001$), emotional self-efficacy ($r = 0.34$; $p < 0.001$), and growth mindset ($r = 0.38$; $p < 0.001$). Depression was significantly negatively correlated with social self-efficacy ($r = -0.11$; $p < 0.01$) and growth mindset ($r = -0.17$; $p < 0.001$). Anxiety was significantly negatively correlated with growth mindset ($r = -0.12$; $p < 0.01$). Externalising symptoms were significantly negatively correlated with academic self-efficacy ($r = -0.34$; $p < 0.001$), social self-efficacy ($r = -0.19$; $p < 0.001$), emotional self-efficacy ($r = -0.12$; $p < 0.01$), growth mindset ($r = -0.16$; $p < 0.001$), and persistence ($r = -0.22$; $p < 0.001$).

Table 3. Sample characteristics ($N = 579$).

	Girls		Boys		Total	
	n	%	*n*	%	*n*	%
Age (years)						
9	7	2.3	6	2.2	13	2.3
10	139	45.0	137	50.7	276	47.7
11	161	52.1	127	47.0	288	49.7
12	2	0.6	0	0	2	0.4
Mean Age (*SD*)	10.5 (0.56)		10.4 (0.54)		10.48 (0.55)	
Grade						
3	77	24.9	95	35.2	172	29.7
4	142	46.0	119	44.1	261	45.1
5	90	29.1	56	20.7	146	25.2

Table 4. Pearson's correlations between key variables.

	Key variables	1	2	3	4	5	6	7	8	9	10
1	**Sex**	–									
2	**Age**	0.06	–								
3	**Academic self-efficacy**	0.05	0.00	–							
4	**Social self-efficacy**	0.02	0.01	0.59***	–						
5	**Emotional self-efficacy**	−0.10*	0.01	0.53***	0.61***	–					
6	**Growth mindset**	0.07	0.09*	0.27***	0.31***	0.23***	–				
7	**Persistence**	0.10*	0.07	0.42***	0.34***	0.34***	0.38***	–			
8	**Depression**	0.01	0.01	−0.08	−0.11**	−0.02	−0.17***	−0.03	–		
9	**Anxiety**	0.01	0.04	0.01	−0.01	0.03	−0.12**	0.00	0.75***	–	
10	**Externalising symptoms**	−0.03	0.03	−0.34***	−0.19***	−0.12**	−0.16***	−0.22***	0.51***	0.43***	–

*Correlation is significant at $p < 0.05$ level; **Correlation is significant at $p < 0.01$ level; ***Correlation is significant at $p < 0.001$ level.

Structural equation models

The structural equation models fitted included variables based on previous research indicating significant relationships with mental health and wellbeing outcomes. Additional variables were tested but were non-significant (number of friends, days missed from school, village violence), and were excluded to achieve a parsimonious model. Table 5 displays descriptive statistics of included variables by gender. Girls had significantly lower emotional self-efficacy in comparison to boys (β = 1.22; $p = 0.013$) and higher scores on the persistence measure than boys ($\beta = 0.73$; $p = 0.021$).

Initial testing of the SEM examined used the method of maximum likelihood estimation. To obtain the best model, six alternative models were fitted (Table 6). First, the hypothesised mediation model was fitted with growth mindset and persistence mediated by academic, social, and emotional self-efficacy on depression, anxiety, and externalising behaviours (Model 1). Results of Model 1 indicated model fit was marginally acceptable ($\chi^2 = 1498$; $df = 27$; $p < 0.001$; $CFI = 0.987$; $TLI = 0.943$; $RMSEA = 0.073$ [90% CI: 0.045, 0.104]; $SRMR = 0.033$). Next, Model 2 examined invariance by sex using multi-group structural equation modelling that constrained path coefficients to be equal between boys and girls. Model fit indices indicated the SEM was not invariant by sex ($\chi^2 = 1559$; $df = 54$; $p < 0.001$; $CFI = 0.958$; $TLI = 0.949$; $RMSEA = 0.070$ [90% CI: 0.053, 0.087]; $SRMR = 0.107$). For this reason, subsequent SEM models were fitted separately for girls and boys (Models 3-6). The SEM model fitted for boys (Model 3) was inadequate for the TLI and $RMSEA$ ($\chi^2 = 671$; $df = 27$; $p < 0.001$; $CFI = 0.981$; $TLI = 0.914$; $RMSEA = 0.087$ [90% CI: 0.044, 0.134]; $SRMR = 0.039$). Examination of modification indices indicated that model fit would be improved by including a direct path from persistence to externalising behaviours. The revised SEM for boys with this direct path (Model 4) resulted in excellent model fit ($\chi^2 = 671$; $df = 27$; $p < 0.001$; $CFI = 0.997$; $TLI = 0.986$; $RMSEA = 0.035$ [90% CI: < 0.001, 0.097]; $SRMR = 0.028$). The SEM fitted for girls (Model 5) was acceptable ($\chi^2 = 888$; $df = 27$; $p < 0.001$; $CFI = 0.993$; $TLI = 0.971$; $RMSEA = 0.055$ [90% CI: < 0.001, 0.102]; $SRMR = 0.031$). However, examination of modification indices indicated that model fit would be improved with the inclusion of a direct path from growth mindset to depression. The revised model including this direct path (Model 6) improved model fit and resulted in excellent fit as reflected by model fit indices ($\chi^2 = 888$; $df = 27$; $p < 0.001$; $CFI = 0.998$; $TLI = 0.988$; $RMSEA = 0.036$ [90% CI: < 0.001, 0.093]; $SRMR = 0.024$).

Figure 1 presents the SEM results for girls. Table 7 presents the standardised path coefficients, p-values, and 95% confidence intervals for the structural paths between latent variables of persistence and growth mindset; dimensions of self-efficacy; and depression, anxiety, and externalising behaviours. Academic self-efficacy was positively associated with both growth mindset ($\beta = 0.13$; $p = 0.021$) and persistence ($\beta = 0.41$; $p < 0.001$). Social self-efficacy was associated with growth mindset ($\beta = 0.21$; $p < 0.001$) and persistence ($\beta = 0.37$; $p < 0.001$). Emotional self-efficacy was not associated with growth mindset; however, emotional self-efficacy was positively associated with persistence (β

Table 5. Descriptive statistics for measured variables.

	Male Mean (*SD*)	Female Mean (*SD*)	β	*p*-value	Total Mean (*SD*)
Self-efficacy					
Academic self-efficacy	33.4 (0.24)	33.8 (0.22)	0.38	0.245	33.6 (3.90)
Social self-efficacy	30.2 (0.26)	30.4 (0.27)	0.16	0.678	30.3 (4.52)
Emotional self-efficacy	30.1 (0.96)	28.9 (0.36)	1.22	**0.013***	29.5 (5.93)
Mindsets					
Growth mindset	18.1 (0.18)	18.6 (0.19)	0.46	0.085	18.4 (0.13)
Persistence	32.0 (0.22)	32.8 (0.23)	0.73	**0.021***	32.4 (0.16)
Psychological symptoms					
Depression	4.1 (0.30)	4.2 (0.22)	0.10	0.818	4.16 (0.22)
Anxiety	1.2 (0.12)	1.2 (0.11)	0.03	0.854	1.22 (0.08)
Externalising behaviours	1.02 (0.14)	0.9 (0.12)	0.12	0.505	0.96 (0.09)

p-values in bold are significant; * < 0.05; ** < 0.01; *** < 0.001.

Table 6. Multigroup SEM model invariance and SEM models by sex.

					RMSEA 90% CI					*Δ From previous model*		
Model	Multigroup SEM	χ^2 (*df*)	*CFI*	*TLI*	*RMSEA*	*LB*	*UB*	*SRMR*	*p*-value	*Δ* χ^2	*Δ CFI*	*Δ RMSEA*
1	Unconstrained	1498 (27)	0.987	0.943	0.073	0.045	0.104	0.033	<0.001	–	–	–
2	Constrained	1559 (54)	0.958	0.949	0.070	0.053	0.087	0.107	<0.001	62 (27)	−0.029	−0.003
	SEM models by sex											
3	SEM boys	671 (27)	0.981	0.914	0.087	0.044	0.134	0.039	<0.001	–	–	–
4	SEM boys revised[a]	671 (27)	0.997	0.986	0.035	<0.001	0.097	0.028	<0.001	0 (0)	0.016	−0.052
5	SEM girls	888 (27)	0.993	0.971	0.055	<0.001	0.102	0.031	<0.001	–	–	–
6	SEM girls revised[b]	888 (27)	0.998	0.988	0.036	<0.001	0.093	0.024	<0.001	0(0)	0.005	−0.019

Note: SEM = structural equation model, LB = lower bound, UB = upper bound.
[a]Revised model includes direct path from persistence to externalising behaviours.
[b]Revised model includes direct path from growth mindset to depression.

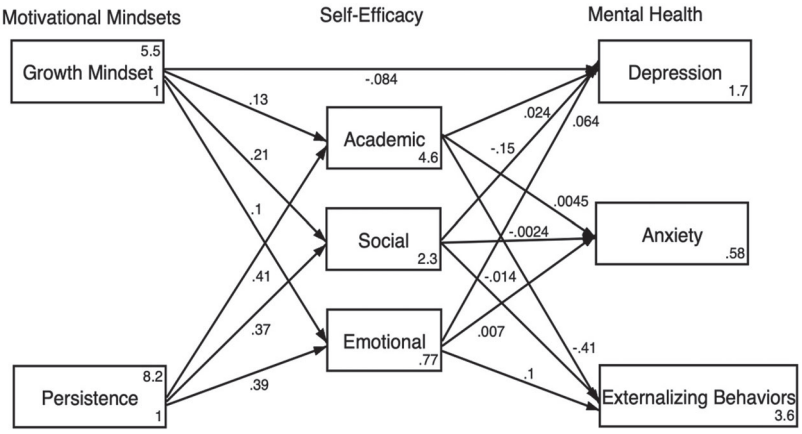

Figure 1. Structural equation model for girls. *$CFI = 0.998$; $TLI = 0.988$; $SRMR = 0.024$; $RMSEA = 0.036$.

Table 7. Standardised path coefficients between mindsets, self-efficacy and mental health in girls.

Structural paths	Coefficient	SE^1	Z	p-value	95% Confidence Interval	
Self-efficacy						
Academic self-efficacy						
Growth mindset	0.13	0.06	2.30	0.021*	0.02	0.24
Persistence	0.41	0.06	7.16	<0.001***	0.29	0.52
Social self-efficacy						
Growth mindset	0.21	0.05	4.00	<0.001***	0.11	0.31
Persistence	0.37	0.05	6.90	<0.001***	0.26	0.47
Emotional self-efficacy						
Growth mindset	0.10	0.06	1.82	0.068	−0.01	0.22
Persistence	0.39	0.05	7.30	<0.001***	0.28	0.49
Mental health						
Depression						
Academic self-efficacy	0.02	0.08	0.29	0.772	−0.14	0.19
Social self-efficacy	−0.15	0.09	−1.75	0.080	−0.32	0.02
Emotional self-efficacy	0.06	0.07	0.93	0.354	−0.07	0.20
Growth mindset	−0.08	0.05	−1.76	0.079	−0.18	0.01
Anxiety						
Academic self-efficacy	0.00	0.09	0.05	0.961	−0.17	0.18
Social self-efficacy	0.00	0.09	−0.03	0.979	−0.18	0.17
Emotional self-efficacy	0.01	0.07	0.10	0.920	−0.13	0.14
Externalising behaviours						
Academic self-efficacy	−0.41	0.10	−4.05	<0.001***	−0.61	−0.21
Social self-efficacy	−0.01	0.09	−0.17	0.867	−0.18	0.15
Emotional self-efficacy	0.10	0.07	1.58	0.113	−0.02	0.23
Covariance						
(Academic self-efficacy, social self-efficacy)	0.56	0.05	12.39	<0.001***	0.47	0.65
(Academic self-efficacy, emotional self-efficacy)	0.41	0.05	8.00	<0.001***	0.31	0.51
(Social self-efficacy, emotional self-efficacy)	0.58	0.04	13.11	<0.001***	0.49	0.66
(Depression, anxiety)	0.72	0.04	18.00	<0.001***	0.65	0.80
(Depression, externalising symptoms)	0.57	0.06	9.07	<0.001***	0.45	0.69
(Anxiety, externalising symptoms)	0.47	0.05	8.72	<0.001***	0.36	0.57

Note. *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$; All measurement model paths were significant at the $p < 0.001$ level; [1]Robust Standard Errors reported.

= 0.39; $p < 0.001$). Academic self-efficacy was found to be associated with lower externalising symptoms among girls ($\beta = -0.41$; $p < 0.001$). Although not statistically significant, modification indices supported inclusion of a negative path of association between growth mindset and depression among girls ($\beta = -0.08$; $p = 0.079$).

Figure 2 presents the SEM results for boys. Table 8 presents the standardised path coefficients, *p*-values, and 95% confidence intervals for the structural paths between latent variables of protective factors; dimensions of self-efficacy; and depression, anxiety, and externalising behaviours among boys. Academic self-efficacy was associated with both growth mindset ($\beta = 0.13$; $p = 0.028$) and persistence ($\beta = 0.32$; $p < 0.001$). Social self-efficacy was associated with both growth mindset ($\beta = 0.22$; $p < 0.001$) and persistence ($\beta = 0.13$; $p = 0.030$). Unlike in the SEM model with girls, for boys, emotional self-efficacy was positively associated with growth mindset ($\beta = 0.15$; $p = 0.016$) and persistence ($\beta = 0.19$; $p = 0.003$). Academic self-efficacy was found to be associated with lower externalising symptoms among boys ($\beta = -0.26$; $p < 0.001$). The direct path between persistence and externalising symptoms was also significant ($\beta = -0.26$; $p < 0.001$).

Further analysis sought to identify the proportion of the total effect of growth mindset and persistence mediated by self-efficacy on each outcome (depression, anxiety and externalising behaviours) by sex (Table 9).

Results indicated that for boys, growth mindset was fully mediated by self-efficacy for all outcomes. Results comparing the indirect to total effect of persistence on outcomes indicated 14% of the total effect of persistence on depression, 100% of the total effect on anxiety and 29% of the total effect on externalising behaviours was mediated by self-efficacy. For girls, self-efficacy fully mediated the effect of persistence on all outcomes. For growth mindset, self-efficacy mediated 20% of the effect on depression and 100% of the effect on anxiety and externalising behaviours.

Discussion

The primary aim of this study was to explore relationships between motivational mindsets and mental health outcomes and to evaluate the mediating effects of self-efficacy. While previous studies in the United States, Russia, China, and Germany have evaluated the mediating effect of self-efficacy on psychopathology, these studies focus on the mediating effect of self-efficacy resulting from experience of risk factors (e.g. stress and adverse life experiences), finding that higher levels of self-efficacy reduced symptoms of psychopathology (Maciejewski et al., 2000; Schönfeld et al., 2016). In contrast, the focus of the present study was to evaluate the mediating effect of self-efficacy resulting from protective factors, specifically motivational mindsets. Correlation between persistence and growth mindset in this study ($r = 0.38$) were similar to correlations found between measurement of grit and growth mindset in previous research ($r = 0.27$), reinforcing the association between these motivational mindsets (Sigmundsson et al., 2020). Evidence evaluating the protective impact of positive characteristics is important because these factors may be more easily modified

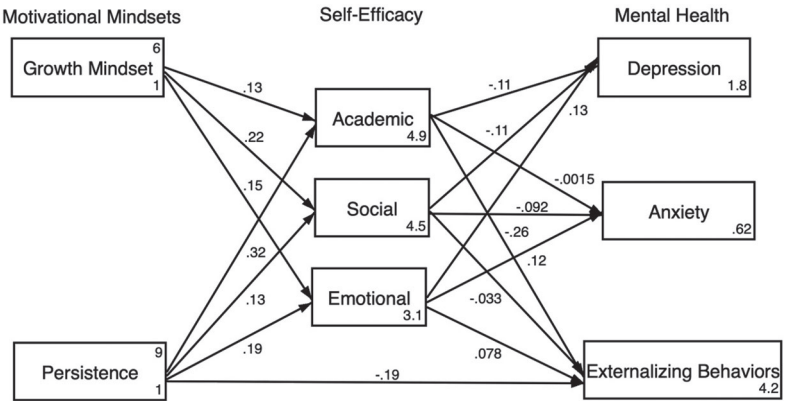

Figure 2. Structural equation model for boys. **CFI* = 0.997; *TLI* = 0.986; *SRMR* = 0.028; *RMSEA* = 0.035.

Table 8. Standardised path coefficients between mindsets, self-efficacy and mental health in boys.

Structural paths	Coefficient	SE^1	Z	$p > \|z\|$	95% Confidence interval	
Academic self efficacy						
Growth mindset	0.13	0.06	2.19	0.028*	0.01	0.25
Persistence	0.32	0.06	5.46	<0.001***	0.21	0.44
Social self efficacy						
Growth mindset	0.22	0.05	3.96	<0.001***	0.11	0.33
Persistence	0.13	0.06	2.17	0.030*	0.01	0.24
Emotional self efficacy						
Growth mindset	0.15	0.06	2.40	0.016*	0.03	0.26
Persistence	0.19	0.06	2.99	0.003**	0.06	0.31
Mental health						
Depression						
Academic self efficacy	−0.11	0.08	−1.30	0.194	−0.27	0.06
Social self efficacy	−0.11	0.09	−1.25	0.212	−0.27	0.06
Emotional self efficacy	0.13	0.07	1.77	0.078	−0.01	0.27
Anxiety						
Academic self efficacy	0.00	0.09	−0.02	0.987	−0.18	0.17
Social self efficacy	−0.09	0.09	−1.03	0.302	−0.27	0.06
Emotional self efficacy	0.12	0.07	1.58	0.115	−0.03	0.26
Externalising Behaviours						
Academic self efficacy	−0.26	0.07	−3.69	<0.001***	−0.40	0.12
Social self efficacy	−0.03	0.07	−0.51	0.612	−0.16	0.10
Emotional self efficacy	0.08	0.07	1.14	0.255	−0.06	0.21
Persistence	−0.19	0.05	−3.65	<0.001***	−0.28	0.09
Covariance						
(Academic self-efficacy, social self-efficacy)	0.47	0.06	8.29	<0.001***	0.36	0.58
(Academic self-efficacy, emotional self-efficacy)	0.50	0.05	9.83	<0.001***	0.40	0.60
(Social self-efficacy, emotional self-efficacy)	0.51	0.05	9.75	<0.001***	0.41	0.61
(Depression, anxiety)	0.80	0.03	24.84	<0.001***	0.73	0.86
(Depression, externalising symptoms)	0.46	0.06	7.28	<0.001***	0.34	0.59
(Anxiety, externalising symptoms)	0.46	0.08	5.59	<0.001***	0.30	0.62

Note. *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$; All measurement model paths were significant at the $p < 0.001$ level; [1]Robust Standard Errors reported.

than risk factors that may be difficult to change (e.g. structural poverty) or impossible to modify if they have already been experienced.

Cultural context, and gender role expectations, have been shown to be key factors to consider when understanding psychological risk and protective factors for anxiety, depression, and externalising symptoms. While evidence suggests the positive effect of self-efficacy on reduced psychopathology in several contexts, additional evidence is needed from diverse contexts to understand how perceived self-efficacy functions as a mechanistic pathway for mental health in different cultures. Researchers posit that differences in perceived self-efficacy may be different in more collectivistic versus individualistic cultures (Bond, 1991). Evidence from China suggest that individuals report lower self-efficacy in comparison to more individualistic cultures (Schönfeld et al., 2016; Schwarzer et al., 1997).

Results from this study indicated differential associations by gender between growth mindset and persistence, mediated by dimensions of self-efficacy on mental health outcomes. In this sample, girls reported lower emotional self-efficacy than boys, and there were no significant differences by

Table 9. Proportion of indirect effect to total effect mediated by self-efficacy on outcomes by sex.

	Boys			Girls		
	Depression	Anxiety	Externalising behaviours	Depression	Anxiety	Externalising behaviours
Growth mindset	1.00	1.00	1.00	0.20***	1.00	1.00***
Persistence	0.14	1.00	0.29***	1.00	1.00	1.00***

Note: *$p < 0.05$ **$p < 0.01$ ***$p < 0.001$.

sex in academic self-efficacy or social self-efficacy. These finding align with previous research indicating that girls report lower emotional self-efficacy than boys, but have similar academic self-efficacy as boys (Bacchini & Magliulo, 2003; Muris, 2001). In Tanzania, early adolescent girls have reported greater household responsibilities in comparison to boys and less freedom outside the home which may limit coping strategies such as use of social support systems for emotional self-regulation (Cherewick et al., 2021). Gender differences in coping strategies have been explored in other east African cultures that indicate that girls have less freedom to engage with friends and community members outside the home in comparison to boys (Cherewick et al., 2015).

Results indicated that there were no gender differences in internalising or externalising symptoms. While much research has indicated that males typically exhibit more externalising symptoms than girls, gender differences in internalising and externalising symptoms emerge in mid- to late-adolescence (Bongers et al., 2004; Daughters et al., 2009; Hankin et al., 2007; Leadbeater et al., 1999; Rudolph, 2002; Scaramella et al., 1999; Telzer & Fuligni, 2013). In contrast, during early adolescence, differences in psychopathological symptoms by gender have been shown to be insignificant, highlighting early adolescence as a window of opportunity to target modifiable protective factors such as self-efficacy that are precursors to internalising and externalising problems (Rocchino et al., 2017).

In alignment with previous studies, academic self-efficacy was significantly associated with reduced externalising symptoms in both boys and girls. Academic self-efficacy during adolescence has been shown to predict externalising behaviours (Caprara et al., 2008) and is related to risk for hyperactivity, impulsivity, and distractibility (Demaray & Jenkins, 2011; Rocchino et al., 2017; Valle et al., 2006). A meta-analysis of self-efficacy by gender has shown males held slightly more academic self-efficacy than females; however, this difference was largest in late adolescence, which again highlights the importance of targeting self-efficacy as a modifiable protective factor during early adolescence (Huang, 2013). Academic self-efficacy increases educational attainment but has also been shown to lower depression and increase hope for the future (Bandura & Locke, 2003; Roeser et al., 2002). Early adolescent interventions should consider schools as a context to promote academic self-efficacy through increased student engagement, afterschool activities, and career exploration (Alt, 2015; Forrest-Bank & Jenson, 2015; McCoy & Bowen, 2015).

Examination of modification indices indicated that model fit was improved with the addition of a direct effect from growth mindset to depression in girls. In boys, examination of modification indices indicated a direct effect from persistence to externalising behaviours. These direct paths indicate that while self-efficacy mediates a portion of the effect from motivational mindsets on psychological symptoms, these mindsets directly affect depression in girls and externalising behaviours in boys. It is plausible that other psychosocial factors such as self-esteem, autonomy, and social support may also mediate the effect of motivational mindsets on mental health.

Given well-established evidence that girls are especially at risk for internalising disorders (depression and anxiety) than boys and that these differences peak during mid- to late-adolescence (ages 13-18), early adolescence (ages 10-12) is an opportunity to reduce gender disparities in mental health that can persist across the life course (Angold et al., 1998; Beesdo et al., 2009; Beesdo-Baum & Knappe, 2012; Caouette & Guyer, 2014; Salk et al., 2017; Steinberg, 2005). Interventions that aim to increase motivational mindsets should consider integrating components that target academic, social, and emotional self-efficacy. Previous evidence suggest the close association between motivational factors and self-efficacy in predicting academic attainment, internalising and externalising symptoms (Caprara et al., 2008; Huang, 2013). Social emotional learning during adolescence is best supported by opportunities to practice mindsets and skills in different contexts, such as use of social support networks as a coping strategy that could support emotional self-efficacy (Cherewick et al., 2020; Shikai et al., 2007). Interventions targeting self-efficacy should consider implementation methods designed for use in the home, at school, in peer settings and in the community.

Limitations

This study was limited to cross-sectional data in a sample of early adolescents in Dar es Salaam, Tanzania. The results of this study may only generalise to similar populations of early adolescents in low-resource collectivistic contexts. Measures of self-efficacy are self-reported and therefore, require self-appraisal that could bias results if study subject's current mental health limits capacity for self-appraisal or if subjects are motivated to respond to questions in ways that conform to gender norms and expectations. This study measured persistence; however, future studies should explore other similar constructs such as grit which combines persistence with measures of passion and goal setting. Future studies should examine other potential mediators between growth mindset and persistence on psychopathology such as social capital, social identity and autonomy that have been identified in other studies (Bovier et al., 2004; Häusser et al., 2012; Lai, 2009). Finally, the results presented are correlational and the direction of causality between measured constructs requires longitudinal data. Longitudinal data would also allow for identification of sensitive developmental windows to target modifiable protective factors such as self-efficacy and to explore gender differences in trajectories of mental health.

Conclusion

Findings suggest that self-efficacy is an important mediating factor between motivational mindsets and mental health outcomes for both boys and girls. Consistent with previous research, academic self-efficacy is an important target, particularly for universal prevention programmes seeking to modify protective factors that reduce gender disparities in mental health that amplify during mid- to late-adolescence.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

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Data availability statement

The data that support the findings of this study are openly available in the CU Anschutz Digital Collections repository at https://digitalcollections.cuanschutz.edu/work/ns/d9f4ed30-c1cb-4495-8508-6c35d65b6a2a.

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