

Comparison of the Effectiveness of Motivational Interviewing and Mindset Intervention on Academic Self-Efficacy among Female Secondary School Students

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ABSTRACT

Purpose: The present study aimed to compare the effectiveness of motivational interviewing and a mindset intervention in improving academic self-efficacy among female secondary school students.

Methods and Materials: This study employed a quasi-experimental design with pretest, posttest, two-month follow-up, and control-group assessments. The statistical population consisted of female ninth-grade students enrolled in lower secondary schools in District 5 of Tehran during the 2024–2025 academic year. A total of 58 female students were randomly assigned to three groups: motivational interviewing (n = 19), mindset intervention (n = 19), and control (n = 20).

Findings: The results indicated that the effects of motivational interviewing and the mindset intervention differed significantly in relation to the aptitude component ($p = .033$) and the total academic self-efficacy score ($p = .001$). Specifically, the mindset intervention produced greater increases in the mean aptitude-component score and the total academic self-efficacy score than motivational interviewing. Accordingly, it was concluded that there was a significant difference between the effectiveness of motivational interviewing and the mindset intervention in improving academic self-efficacy among female secondary school students, with the mindset intervention being more effective.

Conclusion: The mindset intervention was more effective than motivational interviewing in enhancing academic self-efficacy among female secondary school students and may therefore be used as a more efficient intervention for this population.

Keywords: Academic self-efficacy, mindset, motivational interviewing

1. Introduction

Academic success during secondary education is shaped not only by students' cognitive abilities and access to educational resources but also by their beliefs about their capacity to learn, manage academic demands, and attain desired outcomes. Among the motivational constructs associated with educational functioning, academic self-efficacy has received particular attention because it influences how students interpret academic challenges, select learning activities, invest effort, and respond to failure. Academic self-efficacy refers to students' judgments regarding their ability to organize and perform the actions required to accomplish specific educational tasks. These judgments affect whether students approach difficult assignments with confidence or avoidance, how much effort they expend, and how long they persist when initial attempts are unsuccessful. From a social cognitive perspective, students are active agents whose behaviors are influenced by reciprocal interactions among personal beliefs, environmental conditions, and prior experiences. Self-efficacy occupies a central position in this process because it connects students' interpretations of previous performance with their future goals, expectations, emotional responses, and learning behaviors (Schunk & DiBenedetto, 2020). Accordingly, students who believe that they can successfully perform academic tasks are more likely to adopt challenging goals, sustain attention, use effective learning strategies, and recover after setbacks, whereas those with weak self-efficacy may interpret difficulty as evidence of limited ability and discontinue their efforts prematurely.

Academic self-efficacy develops through students' cumulative interactions with educational tasks, teachers, peers, families, and broader sociocultural environments. Successful mastery experiences generally strengthen beliefs in personal capability, whereas repeated failure, particularly when interpreted as a sign of stable inability, can undermine such beliefs. Observing competent peers, receiving realistic encouragement, and learning to interpret anxiety or fatigue as manageable experiences may also contribute to self-efficacy development. Therefore, self-efficacy should not be regarded as a fixed personal characteristic; rather, it is a context-sensitive belief system that can be strengthened through appropriate instructional and psychological interventions. Educators can promote its development by creating opportunities for achievable success, modeling effective strategies, providing process-oriented feedback, and helping students attribute improvement to controllable

factors such as effort, planning, and strategy use (Usher et al., 2023). Moreover, contemporary analyses emphasize that the antecedents and consequences of self-efficacy may differ across educational contexts and student populations, making it necessary to examine how supportive practices operate within specific cultural, developmental, and institutional settings (Usher, 2024). Evidence from Iranian educational contexts has similarly shown that academic self-efficacy is associated with students' academic success and that personal, educational, and contextual factors contribute to differences in perceived academic capability (Jamali et al., 2013).

The importance of academic self-efficacy becomes especially apparent during early adolescence and the transition through lower secondary education. At this developmental stage, students encounter increasingly complex curricula, more competitive evaluation systems, greater expectations for independent learning, and heightened sensitivity to peer and teacher judgments. Ninth-grade students are also required to make consequential educational decisions that may influence their later academic trajectories. Students with low academic self-efficacy may respond to these demands through procrastination, avoidance, reduced class participation, fear of evaluation, and withdrawal from challenging activities. They may also underestimate their capacity to improve and depend excessively on external reassurance. In contrast, students with stronger self-efficacy are more likely to regulate their learning, set realistic goals, monitor progress, and remain engaged despite temporary failure. Self-efficacy is also closely related to motivation regulation, because students must believe that they can influence not only their academic performance but also their willingness and readiness to begin and continue demanding tasks. Research integrating self-efficacy with motivation regulation suggests that students' beliefs about their ability to regulate motivation can predict successful self-regulation, particularly when tasks become difficult, uninteresting, or emotionally demanding (Trautner & Schwinger, 2020). Consequently, interventions designed to improve academic self-efficacy should address both beliefs about competence and the motivational processes required to convert those beliefs into persistent academic action.

Self-determination theory provides an additional framework for understanding why some students engage actively in academic tasks while others participate only under pressure or avoid engagement altogether. According to this theory, high-quality motivation is supported when the

psychological needs for autonomy, competence, and relatedness are satisfied. Students are more likely to internalize educational goals when they experience a sense of choice, perceive themselves as capable, and feel respected and supported by significant others (Deci & Ryan, 2015). Academic self-efficacy is closely connected to the need for competence, but it is also affected by autonomy-supportive environments that allow students to identify personally meaningful reasons for change. When students perceive academic goals as externally imposed, they may comply temporarily without developing sustained commitment. In contrast, when they explore their own values, identify discrepancies between present behaviors and desired outcomes, and formulate self-endorsed goals, motivation may become more autonomous and durable. This distinction is particularly relevant when designing interventions for adolescents, because direct advice, criticism, or coercive instruction may elicit resistance. Effective interventions should therefore strengthen competence beliefs while respecting students' agency and encouraging them to articulate their own reasons for academic change.

Motivational interviewing is one approach that may address these needs. It is a collaborative, person-centered method of communication intended to strengthen motivation and commitment to change by eliciting individuals' own arguments for change rather than imposing external reasons upon them. Its central processes include establishing an empathic relationship, focusing on a target behavior, evoking change-oriented language, and planning feasible actions. The approach uses open-ended questions, reflective listening, affirmations, summaries, and exploration of ambivalence to help individuals recognize discrepancies between their current behavior and personally valued goals (Miller & Rollnick, 2023). Although motivational interviewing was initially applied primarily in health and addiction contexts, its principles have increasingly been used in educational and behavioral settings because many academic problems involve ambivalence rather than a simple absence of knowledge. A student may understand the importance of studying but simultaneously avoid schoolwork because of anxiety, low confidence, fear of failure, or preference for immediate rewards. Motivational interviewing allows these conflicting motives to be examined without judgment and may help students identify realistic reasons for changing ineffective academic patterns.

The effectiveness of motivational interviewing depends partly on its capacity to enhance perceived autonomy and activate personal resources. By emphasizing choice and

avoiding confrontation, the method can reduce defensiveness and help students assume greater ownership of their academic goals. Its focus on previous successes, individual strengths, attainable objectives, and self-generated strategies may also provide experiences that strengthen self-efficacy. Early Iranian research demonstrated that motivational interviewing could facilitate behavioral change in noneducational contexts, such as adherence to weight-management behaviors, indicating that the approach could influence motivation and sustained action across different target behaviors (Navidian et al., 2010). Within education, motivational interviewing has been reported to reduce academic procrastination among adolescents, suggesting that it can help students overcome avoidance and translate intentions into academic action (Hosseini et al., 2020). More recent work has shown that motivational interviewing can also be applied to educational professionals to promote teacher efficacy, autonomy-supportive teaching, and students' academic motivation, illustrating its potential to influence both individual beliefs and the interpersonal climate of learning (Jordan et al., 2023). Furthermore, a study conducted among female lower-secondary students reported that motivational interviewing increased academic self-efficacy, providing direct support for its application to the population addressed in the present study (Firouzi Boroujeni, 2025). Nevertheless, motivational interviewing primarily modifies motivation through dialogue, self-reflection, and commitment to change and may not directly restructure students' underlying theories about intelligence and ability.

Growth mindset training offers a complementary but conceptually distinct approach. A growth mindset refers to the belief that intellectual capacities and academic abilities can be developed through effective effort, practice, strategy modification, feedback, and support. In contrast, a fixed mindset involves the belief that ability is largely stable and that difficulty or failure reveals an enduring lack of competence. These implicit beliefs influence how students interpret academic events. Students with a fixed mindset may view mistakes as threats to self-worth, avoid demanding tasks, and withdraw effort when success is uncertain. Students with a growth mindset are more likely to interpret difficulty as information about the need for further learning and to view effort as a mechanism of development rather than proof of inadequate ability. Dweck's broader motivational framework proposes that individuals' needs, goals, and mental representations jointly organize their responses to challenges and guide patterns of persistence,

avoidance, and self-evaluation (Dweck, 2017). Thus, mindset interventions attempt to alter the meaning students assign to struggle, feedback, mistakes, and improvement.

The theoretical connection between growth mindset and academic self-efficacy is substantial but not redundant. Growth mindset concerns whether ability can change, whereas self-efficacy concerns whether an individual believes that she can perform a particular task or achieve a particular outcome. A student may theoretically believe that abilities are improvable while still doubting her immediate capacity to succeed in mathematics or language learning. Nevertheless, a growth mindset can create a cognitive framework within which self-efficacy is more likely to develop. When students believe that competence can be strengthened, they may interpret initial failure as temporary, attribute progress to controllable strategies, and remain engaged long enough to experience mastery. These experiences can subsequently increase task-specific self-efficacy. Studies of self-regulated learning have shown that growth mindset, self-efficacy, and task value jointly contribute to students' use of planning, monitoring, persistence, and strategic learning behaviors. Among students learning English, self-efficacy and intrinsic value have been found to operate alongside growth mindset in predicting self-regulated learning and academic achievement (Bai & Wang, 2023). Similarly, research in an Asian Confucian educational context found that growth mindset, self-efficacy, and task values were associated with self-regulated English writing and writing competence, although the predictive strength of these constructs differed (Bai et al., 2021).

Students' implicit theories about their own learning regulation may also shape achievement goals, strategy use, and metacognitive functioning. Students who believe that self-regulatory competence can be developed are more likely to engage in adaptive goal pursuit and use strategies designed to improve learning, whereas those who regard regulatory abilities as fixed may disengage when self-management becomes difficult (Hertel & Karlen, 2021). A recent review of growth mindset and self-regulated learning similarly concluded that growth mindset is associated with several adaptive self-regulatory processes, although the magnitude and consistency of relationships depend on measurement, context, age, and the learning domain (Xu et al., 2025). These findings suggest that growth mindset training may improve academic self-efficacy indirectly by changing students' interpretations of difficulty and directly by encouraging repeated practice, strategy revision, help-

seeking, and persistence. For students with low self-efficacy, learning about brain plasticity and the developmental nature of ability may weaken deterministic interpretations of previous failure and provide a more constructive explanation for improvement.

Empirical evidence nevertheless indicates that growth mindset interventions do not produce uniform effects for all students or in all educational environments. A large-scale national experiment showed that a brief growth mindset intervention improved achievement particularly among lower-achieving students and in school contexts where peer norms supported challenge seeking, demonstrating that intervention outcomes depend on both individual vulnerability and contextual affordances (Yeager et al., 2019). In response to controversies concerning the size and reliability of growth mindset effects, it has been argued that mindset theory should not be evaluated through simplistic assumptions that a brief message will transform achievement universally. Rather, intervention effects should be understood in relation to population characteristics, implementation quality, outcome selection, and the extent to which educational environments provide genuine opportunities to act on growth-oriented beliefs (Yeager & Dweck, 2020). A systematic review and meta-analysis likewise found that growth mindset interventions generally produce modest effects and that their effectiveness varies according to intervention design, participant characteristics, and proposed mechanisms of change (Burnette et al., 2023). Therefore, it is important to test such programs in clearly defined populations and to examine proximal psychological outcomes, such as academic self-efficacy, that may change before broader indicators such as grades.

Research conducted among female lower-secondary students has shown that growth mindset training can reduce academic procrastination and may be more effective than some alternative motivational programs for specific outcomes (Zadshir et al., 2022). This finding is relevant because procrastination often reflects low confidence, avoidance of anticipated failure, and difficulty maintaining effort. By teaching students that mistakes are part of learning and that ability can improve through strategic practice, growth mindset interventions may reduce the threat associated with demanding tasks. However, evidence that growth mindset training improves procrastination or self-regulated learning does not automatically establish that it is superior to motivational interviewing in strengthening academic self-efficacy. The two approaches operate through partially different mechanisms. Motivational interviewing

emphasizes personal values, ambivalence resolution, autonomous motivation, and commitment to behavioral change, whereas growth mindset training emphasizes malleability beliefs, adaptive interpretations of effort, learning from errors, persistence, and brain development. Both approaches may strengthen academic self-efficacy, but growth mindset training may exert a stronger effect on students' beliefs about academic talent because it directly challenges the assumption that ability is fixed. Motivational interviewing, in contrast, may be especially useful for students whose primary difficulty is lack of commitment or unresolved ambivalence regarding academic behavior.

Despite growing research on both interventions, direct comparisons of motivational interviewing and growth mindset training remain limited, particularly among female ninth-grade students in Iranian lower secondary schools. Much of the existing literature has examined the interventions separately, focused on outcomes such as procrastination, motivation, self-regulated learning, teacher efficacy, health behavior, or academic achievement, or been conducted in sociocultural settings with different educational expectations. It therefore remains unclear whether the conversational and autonomy-supportive processes of motivational interviewing or the cognitive and attributional processes of growth mindset training are more effective in improving academic self-efficacy and its dimensions. Comparing these interventions under similar conditions, with equivalent assessment occasions and a control group, can clarify whether their effects are general or component-specific and whether improvements persist after the conclusion of training. Such evidence can assist school counselors, educational psychologists, and teachers in selecting interventions suited to students who perceive themselves as academically incapable and are at risk of disengaging from learning.

Accordingly, the present study aimed to compare the effectiveness of motivational interviewing and growth mindset training in improving academic self-efficacy among female lower-secondary school students.

2. Methods and Materials

2.1. Study Design and Participants

The present study was applied in purpose and employed a quasi-experimental pretest–posttest design with a three-month follow-up assessment and a control group. The statistical population consisted of all female ninth-grade students enrolled in lower secondary schools in District 5 of

Tehran during the 2024–2025 academic year. Cluster random sampling was initially used to select three schools from the eligible lower secondary schools in the district. Subsequently, all 300 ninth-grade female students attending the selected schools were invited to complete the Morgan–Jinks Student Efficacy Scale for the initial screening of academic self-efficacy. Students whose academic self-efficacy scores were at least one standard deviation below the population mean were identified as potentially eligible for participation. Following assessment of the inclusion and exclusion criteria and acquisition of the required informed consent, 58 students were enrolled in the study and randomly assigned to the motivational interviewing group ($n = 19$), growth mindset intervention group ($n = 19$), or control group ($n = 20$). The inclusion criteria were enrollment in the ninth grade at one of the selected schools, an academic self-efficacy score at least one standard deviation below the screening-sample mean, willingness to participate in the study, written informed consent from the student and her parents, authorization from the school principal, and no concurrent participation in another educational program or psychological intervention. The exclusion criteria were absence from more than one intervention session, withdrawal of consent, unwillingness to continue participating, or failure to complete the assessments administered during the study. Participants in the two experimental groups received their respective interventions, whereas the control group received no study-specific psychological or educational intervention during the research period. Academic self-efficacy was assessed in all three groups at the pretest, immediately after completion of the interventions, and at the three-month follow-up. The study was conducted in accordance with established ethical principles for research involving human participants. Participation was voluntary, students and their parents were informed about the study objectives and procedures, confidentiality of personal information and responses was ensured, and participants were informed that they could withdraw from the study at any time without academic or administrative consequences.

2.2. Data Collection Tools

Morgan–Jinks Student Efficacy Scale. Academic self-efficacy was assessed using the Morgan–Jinks Student Efficacy Scale developed by Jinks and Morgan (1999). This self-report instrument consists of 30 items and measures students' perceptions of their academic capabilities across

three dimensions: talent, effort, and context. Each subscale contains 10 items. The talent subscale evaluates students' beliefs regarding their intellectual and academic abilities, the effort subscale measures their perceived capacity to achieve educational goals through persistence and sustained academic effort, and the context subscale assesses perceptions of the environmental and interpersonal conditions that may facilitate or impede academic performance. Items are rated on a four-point Likert scale ranging from 1 to 4, with response options reflecting different levels of agreement, from strongly disagree to strongly agree. Negatively worded items are reverse-scored before calculating the subscale and total scores. The total score can range from 30 to 120, while each subscale score can range from 10 to 40. Higher scores indicate greater perceived academic self-efficacy. In the original psychometric evaluation, reliability coefficients ranging from .70 to .82 were reported for the instrument, and Cronbach's alpha coefficients for the talent, effort, and context subscales were .78, .66, and .70, respectively (Jinks & Morgan, 1999). In Iran, Jamali et al. (2013) reported a Cronbach's alpha coefficient of .76 for the total academic self-efficacy score and coefficients of .79, .59, and .62 for the talent, effort, and context subscales, respectively. Karimzadeh and Mohseni (2006) also examined the construct validity of the scale through factor analysis. Their findings supported the proposed three-factor structure and demonstrated that the items loaded adequately on the talent, effort, and context dimensions, providing evidence of satisfactory construct validity. In the present study, Cronbach's alpha was .76 for the total academic self-efficacy score. The corresponding coefficients were .65 for effort, .66 for talent, and .60 for context.

2.3. Interventions

Motivational Interviewing Protocol. The motivational interviewing intervention was implemented in six weekly group sessions, each lasting approximately 90 minutes. The protocol was organized around the stages of behavioral change, including precontemplation, contemplation, preparation, action, planning, and maintenance of change. Barriers to academic behavioral change were identified and examined throughout the sessions. The first session focused on establishing rapport, conducting structured introductions, identifying each participant's target academic behavior, determining the participant's stage of change based on the transtheoretical model, introducing the concepts of academic

self-efficacy, motivation, and determination, and teaching self-monitoring skills. Participants were asked to record their target behavior for three consecutive days and describe how successful change could influence their academic lives. The second session aimed to strengthen intrinsic motivation and identify emotional and behavioral barriers to studying. Participants reviewed their self-monitoring records, discussed feelings such as anxiety, fear, boredom, and discouragement that interfered with academic engagement, and visualized a successful future academic self. Their homework was to describe this future self and identify one major academic barrier and a possible solution. The third session addressed goal setting and functional analysis. Participants learned to formulate specific, measurable, achievable, relevant, and time-bound academic goals and practiced using the antecedent-behavior-consequence model to analyze behaviors such as delaying assignments. They subsequently completed an individual functional analysis of a recent target behavior and revised their academic goals based on group feedback. The fourth session sought to establish greater consistency between academic behavior and personally meaningful values while strengthening beliefs in the capacity for change. Participants identified and prioritized values such as educational success, family, health, autonomy, and independence, examined whether their current behavior moved them toward or away from those values, and recalled a previous success to identify the personal resources that had contributed to it. The fifth session focused on strengthening commitment to change through motivational interviewing techniques. Participants learned to distinguish judgmental questions from exploratory questions, observed a modeled motivational interview, practiced asking exploratory questions through role-playing, and developed alternative strategies for managing academic barriers. They were instructed to implement at least one alternative strategy during the following week. The sixth session consolidated learning, reviewed the concepts and skills covered in the previous sessions, clarified remaining questions, assessed progress, and developed individualized plans for maintaining academic behavioral change. Participants reflected on the most important lessons they had learned and specified how they would continue applying the acquired strategies in their daily academic activities. The immediate posttest was administered following the completion of this session.

Growth Mindset Intervention Protocol. The growth mindset intervention was adapted from the educational package developed by Khan Academy in collaboration with

Stanford University and the Project for Education Research That Scales, based on Dweck's growth mindset framework. The original program was designed for lower secondary school students and included five main instructional sessions (Khan Academy, 2018; Yeager et al., 2019). For the present study, the content was adapted and expanded into six sessions, each lasting approximately 60–90 minutes and generally delivered once per week. Before implementation, the content validity of the adapted protocol was evaluated by a panel of 10 psychologists, including six educational psychologists, two clinical psychologists, and two general psychologists. Using Lawshe's content validity ratio method, a coefficient of .80 was obtained for each session, indicating satisfactory content validity (Lawshe, 1975). The first session focused on establishing rapport, introducing academic self-efficacy and determination, explaining the principal differences between fixed and growth mindsets, and providing a basic understanding of brain plasticity. Each student introduced herself by describing an academic interest and a personal strength, and participants discussed whether the brain and intellectual abilities could develop through practice. As homework, students identified a challenging school subject and proposed strategies, such as additional practice or requesting assistance from a teacher, that could help them improve. The second session sought to change students' perceptions of errors from signs of inability to opportunities for learning. Students completed a deliberately challenging problem, discussed their emotional reactions to making mistakes, examined what could be learned from errors, and began maintaining a "mistake notebook" in which they documented mistakes and the lessons derived from them. The third session addressed perseverance and resistance to academic difficulties. Participants discussed factors that caused them to become tired, disengage, or abandon academic tasks and generated strategies for continuing when they felt inclined to give up. They were asked to select an incomplete or postponed academic assignment, develop a plan for completing it, implement the plan, and report the outcome. The fourth session explained how learning and repeated practice contribute to the development and strengthening of neural pathways. Participants recalled skills that had initially been difficult but had become easier through practice, learned a brief new skill during the session, and reflected on the relationship between repetition and mastery. For homework, they selected previously learned material that they had partially forgotten, reviewed it for 20 minutes, and recorded their feelings before and after the review activity. The fifth

session required students to apply growth mindset principles, including viewing mistakes as informative, persisting in the face of difficulty, and believing in the potential for cognitive development, while solving challenging academic problems. Students first completed a difficult problem individually, after which common errors were presented anonymously and discussed as sources of information about reasoning processes. They then completed a second problem collaboratively and examined the strategies, unsuccessful approaches, and revisions used by their groups. Students were encouraged to apply the same approach when encountering difficult questions in future examinations. The sixth session consolidated the acquired concepts and skills, evaluated participants' learning, and formally concluded the intervention. Students discussed the most influential activities and ideas presented during the program, identified the most important lesson they had learned, and wrote an individual goal for continuing their academic development. The facilitator emphasized the continued application of growth mindset strategies in students' everyday academic lives, and the immediate posttest was administered after completion of the session.

2.4. Data Analysis

The data were analyzed using descriptive and inferential statistical procedures. Means and standard deviations were calculated to describe the academic self-efficacy total and subscale scores for the motivational interviewing, growth mindset, and control groups at the pretest, posttest, and three-month follow-up assessments. A mixed-design repeated-measures analysis of variance was used to examine changes in academic self-efficacy over time and compare the effects of the two interventions. In this analysis, assessment time, comprising the pretest, posttest, and follow-up measurements, was treated as the within-subject factor, whereas group membership, comprising motivational interviewing, growth mindset intervention, and control groups, was treated as the between-subject factor. The principal effects of time and group and the time-by-group interaction were examined separately for the total academic self-efficacy score and the talent, effort, and context subscale scores. Before conducting the primary analysis, the relevant statistical assumptions, including the normality of score distributions, homogeneity of variances, and sphericity of repeated measurements, were evaluated. When significant omnibus effects were identified, Bonferroni-adjusted pairwise comparisons were used to determine the specific

differences between assessment occasions and intervention groups. The statistical significance level was set at $p < .05$ for all analyses.

3. Findings and Results

A total of 58 female ninth-grade students participated in the study and were assigned to the motivational interviewing group ($n = 19$), growth mindset group ($n = 19$), or control group ($n = 20$). The mean age of the participants was 15.21 years ($SD = 0.69$) in the motivational interviewing group, 14.96 years ($SD = 0.87$) in the growth mindset group, and 15.10 years ($SD = 0.85$) in the control group. In the motivational interviewing group, the fathers of 4 participants had less than a high school diploma, 6 had a high school diploma, 6 had a bachelor's degree, and 3 had a postgraduate

degree. In the growth mindset group, 6 fathers had a high school diploma, 2 had an associate degree, 5 had a bachelor's degree, and 6 had a postgraduate degree. In the control group, 6 fathers had a high school diploma, 3 had an associate degree, 6 had a bachelor's degree, and 5 had a postgraduate degree. Regarding maternal education in the motivational interviewing group, 2 mothers had less than a high school diploma, 9 had a high school diploma, 6 had a bachelor's degree, and 2 had a postgraduate degree. In the growth mindset group, 1 mother had less than a high school diploma, 8 had a high school diploma, 2 had an associate degree, 4 had a bachelor's degree, and 4 had a postgraduate degree. In the control group, 1 mother had less than a high school diploma, 9 had a high school diploma, 2 had an associate degree, 6 had a bachelor's degree, and 2 had a postgraduate degree.

Table 1

Descriptive Statistics for Academic Self-Efficacy Scores by Group and Assessment Time

Variable	Group	Pretest M (SD)	Posttest M (SD)	Follow-Up M (SD)
Talent	Motivational interviewing	37.52 (6.08)	44.53 (6.50)	43.26 (6.97)
	Growth mindset	38.68 (5.06)	49.42 (6.16)	47.79 (6.50)
	Control	36.75 (5.57)	35.80 (6.47)	34.60 (6.24)
Context	Motivational interviewing	34.42 (5.28)	41.31 (6.60)	40.63 (6.97)
	Growth mindset	35.57 (6.44)	43.74 (7.16)	42.00 (7.36)
	Control	35.95 (6.00)	34.65 (5.11)	33.90 (5.67)
Effort	Motivational interviewing	9.04 (2.43)	13.47 (2.67)	12.42 (2.45)
	Growth mindset	9.26 (2.57)	14.00 (2.42)	13.47 (2.32)
	Control	9.10 (2.44)	10.30 (2.21)	10.03 (2.61)
Total academic self-efficacy	Motivational interviewing	81.00 (8.05)	99.31 (10.74)	96.29 (9.23)
	Growth mindset	83.52 (8.90)	107.16 (9.98)	103.26 (10.22)
	Control	81.80 (6.12)	80.75 (8.35)	78.50 (10.13)

As shown in Table 1, the mean scores for the talent, context, and effort components and the total academic self-efficacy score increased from pretest to posttest in both intervention groups. Although slight reductions were observed from posttest to follow-up, the follow-up means remained substantially higher than the corresponding pretest means. The growth mindset group demonstrated the greatest increases, particularly in the talent component and total academic self-efficacy. In contrast, the control group showed no comparable improvement across the three assessment occasions, and the mean scores for talent, context, and total academic self-efficacy declined slightly over time.

The assumptions underlying repeated-measures analysis of variance were examined before conducting the primary analyses. The Shapiro–Wilk test indicated that the score distributions were approximately normal across the groups

and assessment occasions, with the exception of the posttest talent score in the control group, $W = .898$, $p = .038$. Given the relatively balanced group sizes and the robustness of repeated-measures analysis of variance to minor deviations from normality, this isolated violation was not considered sufficiently substantial to invalidate the analysis. Levene's test was nonsignificant for the dependent variables at the three assessment occasions, supporting the assumption of homogeneity of error variances. Box's M test was also nonsignificant for talent, Box's $M = 10.97$, $F = 0.84$, $p = .607$; context, Box's $M = 14.64$, $F = 1.12$, $p = .336$; effort, Box's $M = 6.94$, $F = 0.53$, $p = .895$; and total academic self-efficacy, Box's $M = 15.53$, $F = 1.19$, $p = .282$. These findings supported the homogeneity of the variance–covariance matrices. Mauchly's test of sphericity was nonsignificant for context, $W = .993$, $\chi^2 = 0.39$, $p = .821$; effort, $W = .985$, $\chi^2 = 0.82$, $p = .663$; and total academic self-efficacy, $W = .923$, χ^2

= 4.33, $p = .115$. However, the assumption of sphericity was violated for talent, $W = .892$, $\chi^2 = 6.19$, $p = .045$. Therefore,

the Greenhouse–Geisser correction was applied to the within-subject effects involving the talent component.

Table 2

Results of Repeated-Measures Analysis of Variance for Academic Self-Efficacy

Variable	Effect	Effect SS	Error SS	F	p	Partial η^2
Talent	Group	2,757.35	2,804.82	27.04	.001	.496
	Time	518.76	1,704.01	16.74	.001	.233
	Group $\times$ Time	902.02	3,523.98	7.04	.001	.204
Context	Group	975.95	2,193.18	12.24	.001	.308
	Time	360.58	2,038.37	9.73	.003	.150
	Group $\times$ Time	655.59	4,411.60	4.09	.005	.129
Effort	Group	191.41	368.48	14.29	.001	.342
	Time	231.52	322.69	39.46	.001	.418
	Group $\times$ Time	90.82	634.26	3.94	.007	.125
Total academic self-efficacy	Group	9,497.87	5,464.11	47.80	.001	.635
	Time	3,246.84	3,931.99	45.42	.001	.452
	Group $\times$ Time	4,173.23	8,375.00	13.70	.001	.334

The results presented in Table 2 indicated significant main effects of group on talent, $F = 27.04$, $p = .001$, partial $\eta^2 = .496$; context, $F = 12.24$, $p = .001$, partial $\eta^2 = .308$; effort, $F = 14.29$, $p = .001$, partial $\eta^2 = .342$; and total academic self-efficacy, $F = 47.80$, $p = .001$, partial $\eta^2 = .635$. The main effect of time was also significant for talent, $F = 16.74$, $p = .001$, partial $\eta^2 = .233$; context, $F = 9.73$, $p = .003$, partial $\eta^2 = .150$; effort, $F = 39.46$, $p = .001$, partial $\eta^2 = .418$; and total academic self-efficacy, $F = 45.42$, $p = .001$, partial $\eta^2 = .452$. More importantly, the group-by-time interaction

was significant for talent, $F = 7.04$, $p = .001$, partial $\eta^2 = .204$; context, $F = 4.09$, $p = .005$, partial $\eta^2 = .129$; effort, $F = 3.94$, $p = .007$, partial $\eta^2 = .125$; and total academic self-efficacy, $F = 13.70$, $p = .001$, partial $\eta^2 = .334$. These significant interaction effects demonstrated that changes in academic self-efficacy across the three assessment occasions differed according to group membership, indicating that the observed improvements were attributable to the intervention conditions rather than merely to the passage of time.

Table 3

Bonferroni-Adjusted Pairwise Comparisons for Assessment Time and Study Group

Variable	Comparison	Mean Difference	SE	p
Pairwise comparisons across time				
Talent	Pretest – Posttest	–5.60	0.90	.001
	Pretest – Follow-up	–4.23	1.03	.001
	Posttest – Follow-up	1.36	1.20	.779
Context	Pretest – Posttest	–4.58	1.18	.001
	Pretest – Follow-up	–3.53	1.13	.009
	Posttest – Follow-up	1.06	1.22	1.000
Effort	Pretest – Posttest	–3.45	0.47	.001
	Pretest – Follow-up	–2.83	0.45	.001
	Posttest – Follow-up	0.63	0.42	.424
Total academic self-efficacy	Pretest – Posttest	–13.63	1.57	.001
	Pretest – Follow-up	–10.58	1.57	.001
	Posttest – Follow-up	3.05	1.72	.244
Pairwise comparisons across groups				
Talent	Motivational interviewing – Growth mindset	–3.53	1.34	.033
	Motivational interviewing – Control	6.06	1.32	.001
	Growth mindset – Control	9.58	1.32	.001
Context	Motivational interviewing – Growth mindset	–1.65	1.18	.507
	Motivational interviewing – Control	3.96	1.17	.004
	Growth mindset – Control	5.61	1.17	.001
Effort	Motivational interviewing – Growth mindset	–0.60	0.49	.671

Total academic self-efficacy	Motivational interviewing – Control	1.85	0.48	.001
	Growth mindset – Control	2.45	0.48	.001
	Motivational interviewing – Growth mindset	-5.77	1.87	.009
	Motivational interviewing – Control	11.86	1.84	.001
	Growth mindset – Control	17.63	1.84	.001

The Bonferroni-adjusted comparisons presented in Table 3 showed that the talent, context, and effort scores and the total academic self-efficacy score increased significantly from pretest to posttest and from pretest to follow-up. In contrast, none of the differences between posttest and follow-up were statistically significant, indicating that the improvements achieved by the intervention groups were maintained during the three-month follow-up period. Comparisons between groups showed that both the motivational interviewing and growth mindset groups obtained significantly higher scores than the control group on all three components and the total academic self-efficacy score. Direct comparisons between the two intervention groups revealed no significant differences in context, $p = .507$, or effort, $p = .671$. However, the growth mindset group achieved significantly higher scores than the motivational interviewing group on talent, mean difference = 3.53, $p = .033$, and total academic self-efficacy, mean difference = 5.77, $p = .009$. Therefore, although both interventions effectively improved and maintained academic self-efficacy, the growth mindset intervention was more effective than motivational interviewing in enhancing students' perceived academic talent and overall academic self-efficacy.

4. Discussion and Conclusion

The present study compared the effectiveness of motivational interviewing and growth mindset training in improving academic self-efficacy among female lower-secondary school students. The results showed significant effects of group, time, and the group-by-time interaction on the talent, context, and effort components and on the total academic self-efficacy score. Both motivational interviewing and growth mindset training increased academic self-efficacy from pretest to posttest, whereas no comparable improvement was observed in the control group. The significant group-by-time interactions indicated that the pattern of change differed across the three groups and that the improvements observed in the intervention groups could not be explained merely by repeated assessment or the passage of time. The interaction effect was particularly notable for total academic self-efficacy, with a partial eta squared of .334, indicating that a substantial proportion of

the variance in changes over time was associated with group membership. The Bonferroni comparisons further showed that improvements from pretest to posttest and from pretest to the three-month follow-up were statistically significant, whereas the differences between posttest and follow-up were nonsignificant. Thus, the effects of both interventions were maintained after completion of the programs. Direct comparisons also indicated that growth mindset training produced significantly greater improvement than motivational interviewing in the talent component and total academic self-efficacy, although the two interventions did not differ significantly in their effects on the effort and context components.

The finding that motivational interviewing improved all components of academic self-efficacy is consistent with the central principles of motivational interviewing. This intervention is designed to strengthen commitment to change by helping individuals identify personally meaningful reasons for modifying their behavior, explore ambivalence, and formulate realistic plans for action (Miller & Rollnick, 2023). The students in the motivational interviewing group were encouraged to identify problematic academic behaviors, monitor their actions, connect educational goals with personal values, recognize barriers to studying, and generate their own strategies for overcoming those barriers. These processes may have increased students' sense of agency and reduced the perception that academic demands were imposed externally. When students independently articulate reasons for change and select feasible strategies, they are more likely to experience ownership of their academic goals, which can strengthen confidence in their ability to regulate learning behavior.

This interpretation is also compatible with self-determination theory, according to which autonomous motivation is enhanced when individuals experience choice, competence, and interpersonal support (Deci & Ryan, 2015). The nonjudgmental and collaborative style of motivational interviewing may have satisfied students' need for autonomy by allowing them to determine the direction of behavioral change rather than passively receiving prescriptive advice. The intervention may also have supported competence through the identification of previous successes, the development of achievable goals, and the implementation of

small behavioral changes. These experiences can provide concrete evidence that academic behavior is controllable, thereby increasing academic self-efficacy. From a social cognitive perspective, self-efficacy develops partly through successful performance experiences and constructive interpretations of those experiences (Schunk & DiBenedetto, 2020). Therefore, the combination of goal setting, self-monitoring, functional analysis, and gradual behavior change used in motivational interviewing may have enabled participants to experience mastery and reinterpret academic difficulties as manageable.

The effectiveness of motivational interviewing found in the present study is aligned with previous educational research. Firouzi Boroujeni reported that motivational interviewing increased academic self-efficacy among female lower-secondary school students, directly supporting the current finding in a closely related population (Firouzi Boroujeni, 2025). Hosseini et al. also found that motivational interviewing reduced academic procrastination among adolescents (Hosseini et al., 2020). Because procrastination frequently involves avoidance of tasks that students perceive as difficult or threatening, reducing procrastination may provide more opportunities for task completion and mastery, which can subsequently increase self-efficacy. Jordan et al. further demonstrated that motivational interviewing could promote teacher efficacy, autonomy-supportive teaching, and students' academic motivation (Jordan et al., 2023). Although that study focused partly on teachers, it supports the broader proposition that motivational interviewing can influence educational motivation by encouraging autonomy-supportive interactions. Earlier evidence from behavioral health contexts also showed that motivational interviewing could support sustained behavioral change, indicating that its mechanisms may operate across diverse domains in which individuals experience ambivalence about changing established habits (Navidian et al., 2010).

The results further demonstrated that growth mindset training significantly improved the talent, context, and effort components and the total academic self-efficacy score. This finding can be explained by the intervention's direct focus on students' beliefs about the malleability of ability. Students with low academic self-efficacy may interpret poor performance as evidence that they lack sufficient intelligence or talent. Such interpretations can reduce effort, increase avoidance, and reinforce perceptions of inability. Growth mindset training challenges this pattern by teaching that academic competencies can be developed through

practice, feedback, strategy adjustment, and persistence. Dweck's motivational framework suggests that beliefs about personal attributes shape individuals' goals, interpretations, and reactions to setbacks (Dweck, 2017). When students regard ability as developable, errors become indicators of what must be learned rather than definitive evidence of incapacity. This change in interpretation may reduce the psychological threat associated with difficult tasks and encourage continued engagement.

The intervention activities used in the present study may have strengthened self-efficacy through several mechanisms. Learning about brain plasticity may have provided students with a scientific rationale for believing that improvement was possible. Maintaining a mistake notebook may have helped them examine errors as learning opportunities rather than sources of shame. Completing previously postponed tasks and practicing persistence strategies may have produced mastery experiences. Collaborative problem-solving may also have provided vicarious experiences through which students observed peers overcoming similar difficulties. These mechanisms correspond to major sources of self-efficacy, including mastery experiences, observational learning, social encouragement, and the interpretation of emotional responses (Usher et al., 2023). Usher has also emphasized that the development and consequences of self-efficacy are embedded within diverse academic contexts and that interventions should help students interpret educational experiences in ways that support competence beliefs (Usher, 2024). The growth mindset program may therefore have improved self-efficacy not simply by communicating a positive message but by changing how students interpreted effort, mistakes, feedback, and gradual progress.

The present findings are consistent with research linking growth mindset to self-regulated learning and academic competence. Bai and Wang found that growth mindset, self-efficacy, and intrinsic value jointly contributed to self-regulated learning and English language achievement (Bai & Wang, 2023). Bai et al. similarly showed that self-efficacy, task values, and growth mindset predicted self-regulated English writing and writing competence, although their relative contributions varied (Bai et al., 2021). These findings suggest that growth mindset may support academic functioning by increasing students' willingness to use learning strategies and persist long enough to observe improvement. Hertel and Karlen also found that students' implicit theories of self-regulated learning were associated with achievement goals, strategy use, and metacognition

(Hertel & Karlen, 2021). Students who believe that their self-regulatory capacities can improve may be more likely to plan, monitor, and revise their learning behavior rather than interpret ineffective regulation as unchangeable. The review by Xu et al. similarly identified a meaningful relationship between growth mindset and self-regulated learning while emphasizing that the strength of this relationship depends on contextual and methodological factors (Xu et al., 2025).

The significant improvement in effort may also be understood through the relationship between self-efficacy and motivation regulation. Students do not merely need confidence that they can perform an academic task; they also need confidence that they can initiate and sustain motivation when the task becomes difficult or uninteresting. Trautner and Schwinger showed that self-efficacy beliefs concerning motivation regulation are associated with self-regulatory success (Trautner & Schwinger, 2020). By teaching students strategies for continuing after mistakes, completing postponed assignments, and interpreting effort as productive, growth mindset training may have increased their perceived ability to regulate persistence. Zadshir et al. found that growth mindset training reduced academic procrastination among female lower-secondary school students (Zadshir et al., 2022). This result supports the present finding because decreased procrastination can increase behavioral engagement and provide more frequent experiences of successful task completion, thereby reinforcing self-efficacy.

The maintenance of the intervention effects at the three-month follow-up is an important finding. Although the mean scores in both intervention groups declined slightly between posttest and follow-up, these reductions were not statistically significant, and follow-up scores remained significantly higher than pretest scores. This pattern suggests that students continued to use at least some of the motivational and cognitive strategies after the formal sessions ended. In the motivational interviewing group, maintenance may have been facilitated by individualized plans for continuing change, the identification of personal values, and the use of self-monitoring. In the growth mindset group, maintenance may have resulted from durable changes in the interpretation of challenges and errors. Once students begin to attribute progress to strategy use and sustained effort, subsequent academic difficulties may become less threatening and more manageable. However, the modest reduction in scores after posttest also indicates that the effects were not entirely immune to attenuation and that periodic reinforcement may be beneficial.

The results regarding growth mindset should nevertheless be interpreted in light of the broader literature showing that mindset interventions do not affect all students or outcomes equally. Yeager et al. found that growth mindset interventions were especially beneficial for lower-achieving students and in school environments where challenge-seeking norms supported the intervention message (Yeager et al., 2019). The participants in the current study were selected because they scored at least one standard deviation below the mean in academic self-efficacy, which may have made them particularly responsive to an intervention addressing beliefs about academic capability. Yeager and Dweck further argued that growth mindset interventions should not be expected to produce uniform changes across all populations and contexts, because their effectiveness depends on the relevance of the intervention message and the opportunities available for students to act on it (Yeager & Dweck, 2020). Burnette et al. similarly concluded that the average effects of growth mindset interventions are generally modest and vary according to participant characteristics, intervention content, and mechanisms of implementation (Burnette et al., 2023). The relatively strong changes observed in the present study may therefore reflect the targeted selection of students with low self-efficacy, the multi-session format, and the inclusion of applied exercises rather than reliance on a single brief message.

The superiority of growth mindset training over motivational interviewing in the talent component is theoretically meaningful. The talent component reflects students' beliefs about their inherent or developed academic capacities. Growth mindset training directly addresses whether talent and intelligence are fixed or malleable, whereas motivational interviewing primarily addresses willingness, ambivalence, values, and commitment to behavioral change. Therefore, the stronger effect of growth mindset training on talent may have resulted from its direct restructuring of beliefs about ability. Students learned that the brain can change through practice, that mistakes contribute to learning, and that difficult tasks do not necessarily indicate low intelligence. These messages may have modified the meaning of prior failure and strengthened students' confidence that they could improve academically. By contrast, motivational interviewing may have encouraged students to work toward academic goals without directly challenging their assumptions about the stability of talent.

Growth mindset training also produced a greater increase in total academic self-efficacy than motivational

interviewing. This difference may reflect the cumulative influence of the intervention on beliefs about ability, persistence, errors, strategy use, and learning potential. Growth mindset training provided a coherent explanatory framework for why effort and practice can produce improvement. In comparison, motivational interviewing helped students identify reasons for change and develop plans but may have been less intensive in altering the cognitive beliefs underlying low self-efficacy. Nevertheless, the absence of significant differences between the two interventions for effort and context indicates that motivational interviewing was not uniformly less effective. Both interventions may have influenced effort through goal setting, persistence, and behavioral engagement, while both may have improved perceptions of context by encouraging students to use support, feedback, and available academic resources. The findings therefore suggest that the comparative advantage of growth mindset training was concentrated in beliefs about academic capacity and the overall integration of self-efficacy beliefs rather than in every component.

The results are also consistent with evidence that academic self-efficacy is shaped by multiple personal and contextual determinants and is closely associated with academic success (Jamali et al., 2013). The significant improvement in the context component suggests that the interventions may have changed not only students' self-perceptions but also how they interpreted environmental opportunities and constraints. Students may have become more willing to seek assistance, use teacher feedback, cooperate with peers, and view academic resources as accessible. Because self-efficacy develops through reciprocal interactions between personal beliefs and environmental experiences, changes in students' behavior may also elicit more supportive responses from teachers and classmates. Overall, the findings indicate that both motivational interviewing and growth mindset training are effective approaches for strengthening academic self-efficacy among female lower-secondary school students, while growth mindset training appears to be particularly advantageous for improving perceived academic talent and total self-efficacy.

The present study had several limitations. The participants were female ninth-grade students selected from three schools in one educational district of Tehran, which limits the generalizability of the findings to male students, other grade levels, different geographical regions, and educational systems with distinct sociocultural

characteristics. Academic self-efficacy was measured through a self-report questionnaire, and the results may therefore have been influenced by social desirability, response style, or participants' temporary emotional states. The sample size was relatively limited, particularly for examining whether student characteristics moderated intervention effectiveness. The control group did not receive an active comparison intervention, making it difficult to determine the extent to which nonspecific factors such as attention from the facilitator, group interaction, and expectations of improvement contributed to the observed effects. Furthermore, the follow-up period was restricted to three months, and the study did not include objective educational outcomes such as grade point average, examination performance, attendance, or teacher ratings of academic engagement.

Future studies should replicate the research with larger and more diverse samples that include male students, students from different grade levels, and participants from urban and rural educational settings. Researchers should use multisite randomized controlled designs and include an active control condition to distinguish the specific effects of motivational interviewing and growth mindset content from general group participation and facilitator attention. Longer follow-up assessments at six months or one academic year would provide clearer evidence regarding the durability of treatment effects. Future research should also incorporate objective indicators of academic functioning, including grades, assignment completion, attendance, classroom participation, and teacher evaluations. Examining potential mediators such as autonomous motivation, attributional style, perceived brain malleability, academic persistence, and self-regulated learning could clarify how each intervention improves self-efficacy. Moderator analyses should also assess whether baseline achievement, socioeconomic status, parental education, school climate, or initial mindset determines which intervention is most beneficial for particular students.

School counselors, educational psychologists, and teachers may use both motivational interviewing and growth mindset training to support students with low academic self-efficacy. Growth mindset training may be especially appropriate when students interpret academic difficulties as evidence of fixed inability, avoid challenging tasks, or become discouraged by mistakes. Motivational interviewing may be particularly useful when students recognize the importance of academic engagement but remain ambivalent, uncommitted, or resistant to direct advice. Schools can

integrate brief sessions on brain plasticity, productive responses to errors, strategic effort, goal setting, self-monitoring, and persistence into counseling and academic support programs. Combining growth mindset content with motivational interviewing techniques may provide a particularly useful intervention by simultaneously addressing beliefs about ability and autonomous commitment to behavioral change. Periodic booster sessions and collaboration with teachers and parents may further support the continued application of these skills in students' everyday educational activities.

Authors' Contributions

Authors equally contributed to this article.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in studies involving human participants were under the ethical standards of the institutional and, or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study protocol was approved under the ethics code IR.IAU.TNB.REC.1403.240.

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