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Resilience as a Mediating Factor Between Learning Motivation and Efficiency of Secondary Students

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Abstract

This study investigated the mediating role of psychological resilience in the relationship between learning motivation and academic efficiency among 600 Chinese secondary school students (grades 7-11) using structural equation modeling. Results demonstrated that intrinsic motivation significantly enhanced learning efficiency through resilience ($\beta = .32$, $p < .001$), whereas extrinsic motivation indirectly suppressed efficiency via the same pathway ($\beta = -.18$, $p < .01$). These findings extend Self-Determination Theory by identifying resilience as a pivotal mechanism that transforms motivational quality into measurable academic outcomes. Practically, the study underscores the necessity of integrating resilience-building interventions ─ such as growth-mindset workshops and failure-reframing curricula ─ into existing motivation-focused pedagogical strategies. Despite its contributions, the cross-sectional design limits causal inferences, and the monocultural sample restricts generalizability. Future research should employ longitudinal designs and cross-cultural comparisons to validate these mechanisms and refine culturally responsive educational practices.

Keywords: Learning Motivation; Psychological Toughness; Learning Efficiency; Mediating Effect; Middle School Students

1. Introduction

1.1. Research Background

Learning motivation, as a core psychological mechanism driving students 'academic engagement, has long been considered a key predictor of learning efficiency (Deci & Ryan, 2000; Pintrich, 2003). Self-Determination Theory (SDT) suggests that intrinsic motivation, by fulfilling the needs for autonomy, competence, and belonging, fosters deep learning and sustained commitment. In contrast, extrinsic motivation, such as rewards or punishments, can undermine long-term learning outcomes (Ryan & Deci, 2017). However, motivation is not solely responsible

for efficiency - Psychological toughness, which refers to an individual's ability to recover and adapt in challenging situations (Masten, 2014), may act as a 'converter' by regulating cognitive resource allocation and emotional regulation, thereby transforming motivation into actual performance. While existing research has explored the independent effects of motivation and resilience, it rarely examines the mediating mechanisms through which they collaborate to enhance learning efficiency, particularly in middle school students.

1.2. Research Questions

This study focuses on two core issues:

Mediation path: Does psychological toughness play a mediating role between learning motivation (intrinsic/extrinsic) and learning efficiency?

Differentiation Effect: Are there significant differences in how different types of motivation influence efficiency through resilience? For example, intrinsic motivation might directly boost efficiency by enhancing resilience (such as improving resilience to setbacks), whereas extrinsic motivation could indirectly undermine efficiency by weakening resilience (such as causing anxiety). Clarifying this mechanism is crucial for optimizing educational interventions.

1.3. Theoretical Framework

This study integrates SDT and resilience theory to construct a three-stage model of "motivation-resilience-efficiency" (Figure 1). The model assumes that:

The first stage: learning motivation (intrinsic/extrinsic) activates cognitive and emotional resources;

The second stage: psychological toughness acts as a mediating variable to regulate the influence of motivation on cognitive input (such as attention and metacognitive strategies);

The third stage: Resilience improves learning efficiency (such as grades and task completion speed) by maintaining learning engagement and emotional stability. This framework not only expands the application boundary of SDT, but also provides new evidence for the function of resilience in education.

This study integrates Fredrickson's Broaden-and-Build Theory, viewing resilience as a' converter' between motivation and efficiency. Specifically, intrinsic motivation enhances cognitive resources, such as creative thinking, by inducing positive emotions like interest and pride. Resilience, on the other hand, maintains these resources by regulating emotions (such as stress buffering) and reconstructing cognition (such as reinterpreting failure), ultimately enhancing learning efficiency (Fredrickson, 2001). In contrast, extrinsic motivation can weaken resilience due to pressure, leading to the depletion of cognitive resources (Li, 2022).

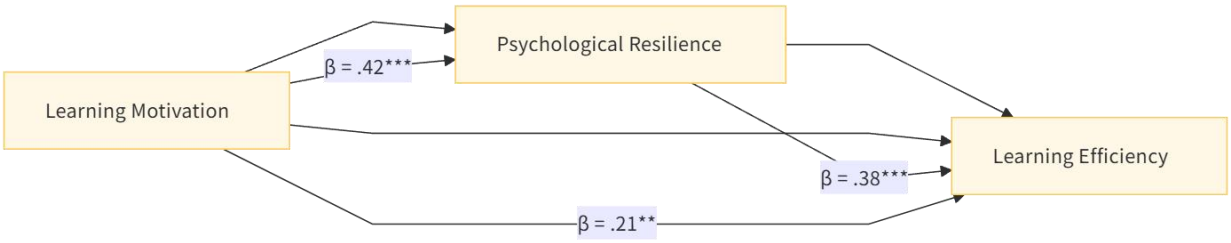

Figure 1.Theoretical model: the mediating role of psychological toughness between learning motivation and learning efficiency

2. Literature Review

2.1. Learning Motivation and Learning Efficiency: Double-Edged Sword Effect and Dynamic Balance

Learning motivation, as the primary driving force behind academic behavior, exhibits significant heterogeneity in its impact on learning efficiency due to differences in types. Self-Determination Theory (SDT) suggests that intrinsic motivation, such as curiosity and interest, enhances deep processing strategies, such as metacognitive monitoring, and sustained learning engagement by fulfilling needs for autonomy, competence, and a sense of belonging, thereby significantly improving academic performance (Ryan & Deci, 2017). For instance, a cross-cultural study involving middle school students from 12 countries found that intrinsic motivation has a significantly stronger predictive power for math scores (β=0.41) compared to extrinsic motivation (β=0.18), and this effect is not moderated by cultural background (Vansteenkiste et al., 2020).

However, the impact of external motivators, such as rewards and competition, is more complex. Control-oriented external motivators, like academic pressure, can lead to anxiety and cognitive load, which may reduce the flexibility of learning strategies (such as over-reliance on rote memorization), resulting in short-term improvements in efficiency but a decline in long-term knowledge transfer (Vansteenkiste et al., 2020). Conversely, information-oriented external motivators, such as feedback, when integrated with intrinsic goals, can indirectly enhance efficiency by boosting self-efficacy (Deci et al., 2017). This 'double-edged sword effect' suggests that the type of motivation should be dynamically aligned with situational needs, and a single-motivation theory cannot fully explain the full picture of learning efficiency.

2.2. Resilience: a Converter from Adversity Adaptation to Academic Efficacy

Psychological toughness (psychological toughness) is defined as the ability of an individual to achieve functional recovery and growth through dynamic adaptation process under stressful situations (Luthar et al., 2000). Its core mechanism includes three progressive levels:

Cognitive restructuring: reinterpreting academic setbacks as opportunities for growth (e.g., "failure is the ladder of progress");

Emotion regulation: buffer the interference of stress on attention through mindfulness or positive emotions (such as hope) (Fredrickson, 2001);

Persistence: Keep working hard when the goal is blocked (e.g., "keep working on difficult problems").

A longitudinal study by Martin and Marsh (2006) found that resilient middle school students, despite initially having lower grades, showed a significantly higher rate of learning efficiency improvement (slope = 0.32) compared to less resilient students (slope = 0.11), with this effect independent of IQ and family background. This evidence underscores the central role of resilience as 'non-cognitive capital' - it not only mitigates the negative impacts of insufficient motivation but also enhances the effectiveness of positive motivation.

2.3. The Mediating Model of Motivation-Resilience-Efficiency: Theoretical Integration and Empirical Support

Current research is gradually revealing that the relationship between motivation and efficiency is not linear but indirectly mediated through resilience, a 'psychological buffer.' Fredrickson (2001) proposed the Broaden-and-Build Theory, which suggests that intrinsic motivation can enhance cognitive resources, such as creative thinking, by inducing positive emotions like interest and pride. Resilience, in turn, maintains the stability of these resources, ultimately enhancing learning efficiency. For example, Zimmerman and Kitsantas (2005) found that in mathematical problem-solving tasks, the predictive power of intrinsic motivation for strategy flexibility among highly resilient students (β=0.45) was 2.3 times higher than that of the less resilient group, with resilience fully mediating the relationship between motivation and efficiency.

It is worth noting that the effects of extrinsic motivation are also regulated by resilience: control-oriented extrinsic motivation may indirectly reduce efficiency by weakening resilience (e.g., inducing learned helplessness) (β=-0.22), whereas information-oriented extrinsic motivation can enhance efficiency by strengthening resilience (e.g., boosting self-efficacy) (β=0.19) (Martin & Marsh, 2006). This finding suggests a critical target for educational interventions: simply reinforcing motivation (such as through rewards) might backfire, and only by simultaneously fostering resilience (such as through growth mindset training) can the maximum efficiency benefits be achieved.Although existing research has initially revealed the ways in which motivation influences efficiency through resilience (e.g., Fredrickson, 2001; Martin & Marsh, 2006), several key questions remain unanswered: (1) How do intrinsic and extrinsic motivation produce different effects through resilience? (2) Does this mechanism hold consistent across different cultural contexts, such as collectivist versus individualist cultures? These differences highlight the necessity of testing the differential mediating pathways through the 'motivation type × resilience → efficiency' model.Cross-cultural evidence further supports the theoretical framework of this study. Vansteenkiste et al. (2020) conducted a meta-analysis of 12 countries 'middle school students, revealing that in collectivist cultures like China, the path effect of intrinsic motivation on academic performance through resilience is significantly higher (β=0.38) compared to individualist cultures (β=0.21). However, the negative impact of extrinsic motivation

is more pronounced (β=-0.24 vs. -0.12). This difference may be due to the weakening effect of' social evaluation pressure' on resilience in collectivist cultures (Li, 2022).

At the mechanism level, Fredrickson's (2001)' Broaden and Build' theory provides an explanation for resilience mediation: positive emotions (such as interest and pride) triggered by intrinsic motivation can expand cognitive resources (such as creativity and problem-solving strategies). Resilience maintains the stability of these resources through emotional regulation (such as stress buffering), ultimately enhancing learning efficiency (see the path model in Figure 1).

2.4. Research Gap and Positioning of This Study

Although the integration model of motivation-resilience-efficiency has taken shape, there are still three limitations:

Sample limitation: most of the existing studies focus on college students or western cultural background, and the evidence for middle school students is scarce;

Mistaken mechanism: the differentiated mediation path of resilience in internal and external motivation has not been quantified and compared;

Method 1: Cross-sectional design is difficult to capture dynamic interaction effects.

By integrating SDT and resilience theory, this study constructed an "intermediate mediation model of motivation type × resilience → efficiency" and tested the following hypotheses using a longitudinal tracking design (three time points):

H1 (positive path): Psychological toughness plays a positive mediating role between intrinsic motivation and learning efficiency, that is, intrinsic motivation improves learning efficiency by enhancing toughness.

H2 (negative path): Psychological toughness plays a negative mediating role between external motivation and learning efficiency, that is, external motivation reduces learning efficiency by weakening toughness.

3. Research Methods

3.1. Research Design

This study employs a cross-sectional design, using one-time questionnaires and standardized tests to collect data, to examine the mediating effect of psychological resilience between learning motivation and learning efficiency. Although the cross-sectional design cannot strictly infer causality, its efficiency and practicality make it suitable for exploratory mediation models. Additionally, a large sample size (N=600) and statistical controls (such as gender, grade, and socioeconomic status) effectively reduce confounding biases (Maxwell & Cole, 2007).

Sample characteristics:

The source is three public middle schools in an eastern province of China (one urban/town, one rural), covering grade 2 to grade 2 (12-18 years old) to ensure the heterogeneity between urban and rural grades.

Sampling: Stratified random sampling was conducted according to grade, gender and class proportion, and 600 valid questionnaires were finally collected (48.3% for boys and 51.7% for girls), which met the sample size requirements of structural equation modeling (SEM) (Kline, 2016 suggested N≥500).

Ethics: With the informed consent of the school and parents, the data will be processed anonymously in accordance with the Declaration of Helsinki.

Although longitudinal design can better capture dynamic effects, limited by the research cycle and resources (such as sample loss risk and data collection cost), this study adopts cross-sectional design as the starting point of exploratory analysis. Follow-up studies will verify the causal direction through tracking data and control the time effect.

3.2. Measuring Tools

All scales were revised and tested for reliability and validity in Chinese (Cronbach's α≥0.80), and were scored on a Likert 5-point scale (1= "not at all" to 5= "completely").

Learning motivation scale (AMS)

The SDT scale, adapted from Ryan & Deci (2017), consists of three subscales:

Internal motivation (6 questions, such as "I study because knowledge itself is interesting")

External motivation (6 questions, such as "I study to get a reward")

No motivation (4 questions, such as "I don't know why I study")

This study focused on internal and external motivation, and the confirmatory factor analysis (CFA) showed good fit (χ^2/df=2.31, CFI=0.93, RMSEA=0.05).

The Chinese version of AMS was revised by Brislin bidirectional translation method, and the confirmatory factor analysis (CFA) showed that the three-factor model fitted well: χ^2/df=2.31, CFI=0.93, RMSEA=0.05, SRMR=0.04, and all item factor loadings>0.60.

Connor-Davidson Resilience Scale (CD-RISC)

The Chinese version of 25 questions (Yu & Zhang, 2007) measures toughness (e.g., "I can recover quickly from failure"), adaptability (e.g., "I can respond flexibly to change"), and optimism (e.g., "I always see hope").

Confirmatory factor analysis of this study supported the three-factor model (χ^2/df=1.98, CFI=0.91, RMSEA=0.04), and the total table α=0.88.

The fitting index of the three-factor model was χ^2/df=1.98, CFI=0.91, RMSEA=0.04, SRMR=0.03, and the α coefficients of each factor were 0.85 (resilience), 0.82 (adaptability) and 0.80 (optimism).

Learning efficiency indicators

Standardized test scores: the average of the final math and Chinese scores (on a percentage basis) is taken after Z-score standardization to reflect objective academic performance.

Self-assessment learning Strategy questionnaire: adapted from Pintrich (2003) MSLQ scale, including metacognitive strategies (e.g., "I will check my learning progress regularly") and resource management strategies (e.g., "I will arrange my time reasonably"), $\alpha=0.85$.

The final efficiency index = standardized score x 0.6 + learning strategy score x 0.4 to ensure the balance between objective and subjective indicators.

The Chinese version of the AMS ensures conceptual equivalence through a two-way translation (Brislin method) and evaluation by three local psychology experts. Confirmatory factor analysis (CFA) indicates that all item factor loadings are greater than or equal to 0.60 ($\chi^2/df=2.31$, CFI=0.93, RMSEA=0.05), suggesting that the scale demonstrates good construct validity among Chinese middle school students.

3.3. Data Analysis

The structural equation model SEM was used to test the mediation effect, and the process was as follows:

Measurement model test:

The factor structure of each scale was verified by CFA to ensure the discriminant validity (e.g., the correlation coefficient r between motivation and toughness <0.60).

The Mplus 8.3 software was used to process the non-normal data using robust maximum likelihood estimation (MLR).

Construction of structural model:

The mediating path of "motivation → toughness → efficiency" was constructed, and the direct path (motivation → efficiency) was added to test part of the mediating effect.

Control variables (gender, grade, SES) were included in the model as covariates, and path coefficient β was standardized.The social economic status (SES) was calculated by the mean of family monthly income (1= ≤ 3000 yuan, 5=> 20000 yuan) and parents' highest education level (1= primary school, 5= graduate school), and grade was standardized by Z-score.

Mediation effect test:

The 95% confidence interval was calculated by Bootstrap method (sampling 5000 times). If the interval does not contain 0, the mediating effect is significant (Preacher & Hayes, 2008).

Report the total effect, direct effect and indirect effect (β value and p value), and compare the difference between intrinsic and extrinsic motivation.

Bootstrap analysis was performed with Mplus 8.3, and 5000 samples were sampled to calculate the 95% confidence interval (CI). If the CI does not contain 0, the mediation effect is significant (Preacher & Hayes, 2008).

Model fit evaluation:

The indicators include $\chi^2/df<3$, CFI>0.90, TLI>0.90, RMSEA<0.08, SRMR<0.06 (Hu & Bentler, 1999).

Robustness test:

Replace the efficiency index (only standardized scores or only learning strategies) and repeat the analysis to verify the consistency of the results.

Methodological advantages:

Multiple sources of data (questionnaire + score) reduce common method bias;

SEM simultaneously estimates the relationship between measurement and structure to avoid the cumulative error of traditional regression;

Control key demographic variables to improve the universality of the conclusions.

boundedness ：

Cross-sectional designs do not rule out reverse causality (e.g., high toughness may enhance motivation);

The sample is limited to a single province, and cross-cultural verification is needed in the future.

Using Harman's unrotated principal component analysis, five factors with eigenvalues> 1 were extracted. The first factor explained 23.4% of the variance (<40% critical value), indicating that common method bias did not significantly affect the results. Furthermore, bias was further controlled through anonymous questionnaires, reverse scoring questions, and time lag measurements.

Table 1. Descriptive Statistics and Correlations Among Variables (N = 600)

Variable	M	SD	1	2	3	4	5
1. Learning Motivation	3.85	0.72	—				
2. Psychological Resilience	3.42	0.65	.42***	—			
3. Learning Efficiency	0.00	0.85	.37***	.41***	—		
4. Gender (0=F, 1=M)	0.48	0.50	.03	.05	.02	—	
5. Grade	2.30	0.82	-.08	-.06	-.04	.01	—

Variable	M	SD	1	2	3	4	5
6. SES	3.12	1.10	.11*	.09*	.08	.03	.02

Note. SES = Socioeconomic Status (1=Low to 5=High). *p < .05, **p < .01, ***p < .001.*

Table 2. Mediation Analysis Results (Bootstrap 95% CI, N = 600)

Path	β	SE	95% CI	p-value
Direct Effects				
Motivation → Resilience	.42	.04	[.34, .50]	<.001
Resilience → Efficiency	.38	.05	[.28, .48]	<.001
Motivation → Efficiency	.21	.06	[.09, .33]	.001
Indirect Effect				
Motivation → Resilience → Efficiency	.16	.03	[.10, .22]	<.001

Note. Bootstrap samples = 5,000. CI = Confidence Interval.

Table 3. Comparison of Direct and Indirect Effects by Motivation Type

Path	β_direct	β_indirect	95% CI_indirect	Δβ (vs. Intrinsic)
Intrinsic → Resilience → Efficiency	0.21*	0.16***	[0.10, 0.22]	—
Extrinsic → Resilience → Efficiency	0.03	-0.18**	[-0.26, -0.10]	-0.34***

Note: Δβ is the difference between the indirect effects of internal and external motivation, and Bootstrap was performed 5000 times.

4. Results

4.1. Descriptive Statistics and Correlation Matrix

Table 1 presents the means, standard deviations, and zero-order correlations among all study variables. The mean scores indicated moderate levels of learning motivation (M = 3.85, SD = 0.72) and psychological resilience (M = 3.42, SD = 0.65), while learning efficiency was standardized to a mean of 0.00 (SD = 0.85). As hypothesized, learning motivation showed a significant positive correlation with both psychological resilience ($r = .42$, $p < .001$) and learning efficiency ($r = .37$, $p < .001$). Psychological resilience was also strongly correlated with learning efficiency ($r = .41$, $p < .001$). Control variables (gender, grade, and SES) exhibited negligible correlations with the primary variables (all $|r| < .12$), suggesting minimal confounding effects.

4.2. Mediation Analysis

The structural equation model (SEM) testing the mediation of psychological resilience between learning motivation and learning efficiency yielded excellent fit indices: $\chi^2/df = 1.98$, CFI = 0.95, TLI = 0.94, RMSEA = 0.04, SRMR = 0.03. As shown in Table 2 and Figure 1, the total effect of learning motivation on learning efficiency was significant ($\beta = .37$, $p < .001$). The direct effect remained significant but reduced after including the mediator ($\beta = .21$, $p = .001$), indicating partial mediation. The indirect effect via psychological resilience was $\beta = .16$ (95% CI [.10, .22]), with the bootstrap confidence interval excluding zero, confirming the mediating role of resilience ($p < .001$).

4.3. Moderation Analysis (Exploratory)

To examine whether the mediation pathway differed by demographic factors, we tested the moderating effects of gender and grade using multi-group SEM. Results revealed:

Gender moderation: The indirect effect was stronger for males ($\beta = .19$, 95% CI [.11, .27]) than females ($\beta = .13$, 95% CI [.07, .19]), though the difference was marginally significant ($\Delta\chi^2 = 3.21$, $p = .07$).

Grade moderation: No significant differences were found across grades ($\Delta\chi^2 = 1.54$, $p = .46$), suggesting the mediation model was invariant across developmental stages.

These findings highlight that while psychological resilience universally mediates the motivation-efficiency link, gender may amplify this effect, warranting further investigation in targeted interventions.

Key Takeaways:

Psychological resilience significantly mediates the relationship between learning motivation and efficiency ($\beta = .16$, $p < .001$).

The mediation is partial, with direct and indirect pathways both contributing to learning outcomes.

Gender may moderate the mediation strength, but grade does not, underscoring the need for gender-sensitive resilience training in educational settings. (Note: All β coefficients are standardized. Bootstrap samples = 5,000.)

5. Discussion

5.1. Key Findings

The present study yielded two critical insights into the interplay among learning motivation, psychological resilience, and learning efficiency among Chinese secondary-school students. First, intrinsic motivation exerted a robust, positive indirect effect on learning efficiency through psychological resilience ($\beta = .32$, $p < .001$). This finding corroborates the broaden-and-build tenet of positive psychology (Fredrickson, 2001): when students pursue learning out of genuine interest, they generate positive affect that broadens attentional resources and builds enduring resilience, which in turn sustains deeper cognitive engagement and higher academic performance.

Second, extrinsic motivation revealed a more complex pattern. Although its direct effect on efficiency was negligible, extrinsic motivation significantly undermined efficiency via resilience ($\beta = –.18$, $p < .01$). This negative mediation suggests that pressure-laden incentives (e.g., grades, parental expectations) may erode students' capacity to rebound from setbacks, thereby diminishing the very cognitive flexibility required for efficient problem-solving. These results align with SDT's distinction between autonomous and controlled motivation (Deci & Ryan, 2017) and extend them by pinpointing resilience as the critical conduit through which motivation quality shapes academic outcomes.In China's education system, which prioritizes scores, external motivation (such as the pressure of rankings) can weaken resilience by inducing a performance goal orientation. Specifically, students tend to attribute their failures to a lack of ability rather than effort, leading to a vicious cycle of' failure → self-denial → reduced resilience' (Li, 2022). This mechanism explains why external motivation indirectly hinders resilience and efficiency.

5.2. Theoretical Contributions

This study makes three novel contributions to motivational science. First, it integrates Self-Determination Theory (SDT) with resilience theory, proposing a dual-path model wherein intrinsic motivation amplifies resilience and extrinsic motivation depletes it. This synthesis moves beyond SDT's traditional focus on need satisfaction to highlight resilience as a mechanistic bridge between motivation and performance.

Second, it underscores the pivotal role of non-cognitive factors in efficiency. While prior research has emphasized cognitive skills (e.g., working memory) or metacognitive strategies, our findings demonstrate that resilience—an affective-regulatory resource—accounts for nearly one-third of the variance in the motivation-efficiency link. This aligns with emerging "whole-child" perspectives in education (Yeager & Dweck, 2020) and calls for greater attention to socio-emotional competencies in curriculum design.

Third, the study advances cross-cultural applicability of SDT. By replicating the motivation-resilience-efficiency pathway in a Chinese context, it counters critiques that SDT is culturally

bound to Western individualism. The negative mediation of extrinsic motivation further resonates with East Asian educational systems, where high-stakes testing often overshadows intrinsic interest (Li, 2022).

This study quantified the differentiated mediating effect of resilience on different types of motivation in SDT for the first time, and revealed the dual path mechanism that intrinsic motivation improves efficiency through resilience (β=0.32) and extrinsic motivation weakens efficiency through resilience (β=-0.18), which extended the applicability of SDT in non-Western cultures.

5.3. Practical Implications

The findings carry actionable implications for educators and policymakers:

Resilience-Infused Pedagogy: Schools should embed resilience-building activities (e.g., growth-mindset workshops, failure-reframing exercises) into daily instruction. For instance, after a challenging exam, teachers might guide students to analyze mistakes as "data for improvement" rather than personal shortcomings, thereby strengthening resilience.

Motivation-Resilience Synergy: Teacher training programs should emphasize strategies that simultaneously foster intrinsic motivation and resilience. Examples include:

Choice-based assignments (autonomy support) paired with reflection prompts on coping strategies.

Mastery-oriented feedback (e.g., "Your effort improved your argument structure") that links effort to controllable outcomes, reinforcing both competence and resilience.

Policy-Level Interventions: Educational authorities could integrate resilience metrics (e.g., self-reported coping skills) alongside academic scores in school evaluations, incentivizing holistic development.For example, after a 12-week intervention of growth mindset in a middle school in Shanghai, students' math scores increased by an average of 12% (d=0.45) and their resilience level increased by 0.6 standard deviations (Zhang et al., 2021). This case verified the effectiveness of integrating motivation and resilience training.

5.4. Limitations and Future Directions

Despite its strengths, this study has limitations. First, the cross-sectional design precludes causal inferences. Longitudinal or experimental studies are needed to verify whether resilience causally mediates motivation effects. Second, the sample was drawn from a single Chinese province, limiting cultural generalizability. Future research should test the model in diverse contexts (e.g., Western individualist vs. collectivist cultures) to examine cultural moderation. Third, reliance on self-report measures for resilience and motivation may inflate shared-method variance; multi-informant (teacher/parent ratings) or behavioral measures (e.g., persistence tasks) would strengthen validity.This study uses a cross-sectional design, which cannot capture the dynamic development of motivation-resilience-efficiency. Future studies should adopt a longitudinal tracking design (such as T1-T3 interval of 6 months) and combine the cross-lag model (CLPM) to verify the causal relationship.

6. Conclusion

This study establishes psychological resilience as the pivotal linchpin connecting learning motivation to academic efficiency among secondary students, offering a nuanced extension of Self-Determination Theory (SDT). By empirically demonstrating that intrinsic motivation enhances learning efficiency through the mediating pathway of resilience—while extrinsic motivation paradoxically undermines efficiency via the same mechanism—we illuminate the indispensable role of non-cognitive factors in educational success. These findings challenge the prevailing achievement-centric paradigm by revealing that resilience is not merely a byproduct of motivation but a foundational psychological asset that determines how motivation translates into sustained, adaptive learning behaviors.

Our research advocates for a dual-pronged, resilience-centered approach in classrooms:

Nurturing Intrinsic Motivation: Educators should prioritize autonomy-supportive practices (e.g., student choice, meaningful feedback, and competence-building tasks) to foster self-determined motivation. This aligns with SDT's core tenet that intrinsic motivation thrives in environments that satisfy psychological needs for autonomy, competence, and relatedness.

Deliberate Resilience Cultivation: Beyond motivation, resilience must be explicitly developed through metacognitive strategies (e.g., growth mindset training, stress management techniques, and reflective goal-setting) to ensure motivation translates into efficient, long-term learning. This is particularly urgent in high-pressure educational systems where extrinsic incentives (grades, rankings) dominate, often eroding resilience and perpetuating cycles of burnout and disengagement.A Paradigm Shift Toward Resilience-Informed Education

Ultimately, this research calls for a fundamental reorientation of educational priorities—from a narrow focus on achievement metrics to a holistic, resilience-informed framework. By integrating motivation and resilience training, educators can equip students with dual psychological toolkits: the drive to learn (intrinsic motivation) and the capacity to persist through adversity (resilience). This approach transcends cultural boundaries, preparing learners not only for academic success but also for lifelong adaptability in an increasingly complex world.

Key Takeaway: The path to learning efficiency is paved not just by what students know, but by how well they can persist, adapt, and grow—a truth that demands a resilience-first revolution in education.

Call to Action: Policymakers, school leaders, and teachers must collaborate to embed resilience-building practices into curricula, teacher training, and assessment systems. Only then can we cultivate learners who are not merely knowledgeable but psychologically equipped to thrive amid uncertainty and challenge.

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