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The Association Between Socioeconomic Status and Academic Achievement Mediated by Psychological Factors

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Abstract. This narrative literature review proposes an integrative dual-pathway model to explain how socioeconomic status (SES) shapes academic achievement through interacting psychological mechanisms. Drawing on allostatic load theory, central executive functioning, self-efficacy, and learned helplessness, the model identifies two interconnected routes: a cognitive depletion pathway, in which allostatic load overburdens the prefrontal cortex and constrains limited working memory resources; and a motivational pathway in which low self-efficacy and repeated failures develop into learned helplessness that undermines motivation for learning. Crucially, these pathways do not operate independently but dynamically reinforce each other. Cognitive depletion undermines motivational beliefs, while diminished motivation reduces cognitive engagement, forming a self-reinforcing downward cycle. This integrated framework offers a more ecologically valid understanding of educational inequality than single-factor explanations. Practical implications suggest that educators should implement integrated interventions that simultaneously reduce extraneous cognitive load (e.g., scaffolded instructional sequences) and foster self-efficacy (e.g., process-oriented feedback) to break this bidirectional cycle. As the proposed model remains theoretical, future empirical research using longitudinal and experimental designs is required to validate its causal pathways and inform evidence-based educational policies.

Keywords: socioeconomic status, academic achievement, mediator, cognitive depletion, motivation

1. Introduction

In the field of educational psychology, socioeconomic status (SES) plays a significant role in children's development, particularly in academic contexts. In the recent literature, Thomas defines individual SES as an index of one's overall social status and prestige, while family SES, which is more closely related to children's development, refers to access to resources as a composite measure, including economic, human, and social capital [1]. In empirical research, family SES is typically operationalized through household income, parental occupational attainment, and parental educational level [2].

With the global improvement in material living standards, recent studies have begun to place more focus on closing the academic achievement gaps associated with SES. Specifically, this may involve examining how SES impacts children's academic outcomes. A meta-analysis by Sirin,

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replicated and extended White's work, suggests a medium-to-strong positive correlation between SES and academic achievement [3, 4]. A more recent study by Munir et al. confirms this positive SES-achievement association, showing that higher-SES students fare better academically, and adds the potential role of parental participation and school resources in buffering the negative impact brought by relatively low SES [5].

There are various psychological theories that can offer explanations for how SES affects academic performance; these include allostatic load (AL), cognitive capacity, self-efficacy, and learned helplessness (LH). However, most published research has studied single factors in isolation, which ignores the possible interactions between individual models and neglects the potential for multiple pathways to explain this correlation.

Hence, this narrative review aims to explore the mechanisms by which SES impacts academic achievement through cognitive and motivational pathways and to propose an integrative dual-pathway model that provides an interactive framework integrating these independent theories. Provided that the reviewed research is valid and the proposed integrative dual-pathway model is well-grounded, this paper expands the understanding of multilevel mediators linking SES to academic outcomes and offers potential insights into educational policies and interventions.

2. Theoretical background

2.1. Early AL accumulation undermines academic achievement

Although the concept of AL originally arose from research on chronic physiological dysregulation as evidence of cumulative stress and an indicator of poor health outcomes, an increasing body of literature has recently reported that the impacts of AL on development can be found as early as in childhood and adolescence. AL accumulation refers to the cumulative physiological dysregulation resulting from adverse childhood experiences and chronic stress, which may further hinder neural development and brain activity, especially during critical periods [6]. AL is closely associated with sociodemographic variables including poverty, perceived discrimination, separation from parents, and adverse childhood experiences [6]. In that sense, children from lower-SES backgrounds may be more prone to accumulate AL at an earlier age, and its impact on both physical and psychological functioning may be reflected in students' academic performance.

Research has shown that AL can negatively impact students' academic performance. In a study conducted by Lamb et al., students experiencing higher allostatic load were found to require greater behavioral, cognitive, and emotional effort to tackle problems of the same difficulty level [7]. As a result, these students are more likely to underperform academically. This phenomenon can be explained by the negative association between allostatic load and executive functioning, as highlighted in a meta-analysis [8].

2.2. Impaired executive functioning disadvantages academic achievement

The central executive is one subcomponent of Baddeley's working memory model, which is an attentional system with limited capacity that functions to select and manage complex thinking and strategies. AL resulting from chronic adversity directly impairs executive functioning by diminishing the efficiency of the prefrontal cortex [9].

Recent studies focusing on low socioeconomic status (SES) groups reveal that individuals exposed to environmental instability, resource scarcity, and low social status are more prone to the downregulation of cognitive skills. In the younger school-age population, working memory (WM) is

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a key predictor of students' academic performance, and cognitive capacity is especially crucial in academic learning involving mathematical reasoning, problem solving, and reading comprehension [10]. In this regard, students from low family SES backgrounds may be at a disadvantage in academic achievement due to their limited central executive capacity, which hinders problem-solving and comprehension skills in academic learning.

2.3. Low self-efficacy indirectly impacts academic achievement

Another aspect of studying the impact of SES on academic achievement concerns self-efficacy, which refers to one's expectation or belief in successfully performing a given task; hence, self-efficacy can be one of the major factors that determine academic outcomes. Tan et al. investigated the extent of SES's impact through stratified sampling and measured academic self-efficacy via students' self-reports on scales, concluding that there is a positive correlation between SES, self-efficacy, and academic performance [11]. Specifically, students' learning motivation in certain subjects, such as self-efficacy in science, is largely influenced by social origins, namely family SES. In this regard, SES could have a larger impact on students' academic performance than expected, as it not only serves as an external factor in learning but also accounts for an indirect influence on student achievement via self-efficacy.

2.4. Learned helplessness as a further outcome negatively predicts academic achievement

Learned helplessness (LH) can be viewed as a further outcome of students persistently experiencing low self-efficacy and repetitive failures. Maier and Seligman hypothesized that a comprehensive feeling of uncontrollability arises from motivational, cognitive, and emotional aspects when an organism is exposed to aversive events beyond its own control [12]. This theory can be applied to explain students' deficit in motivation and withdrawal of effort from academic tasks. In a study conducted by Filippello et al., results indicated that LH can negatively predict academic achievement as a mediating factor [13]. This predictive role was further confirmed in a regression study by Sorrenti et al., which reported that LH acts as a strong incremental predictor of academic achievement, particularly in relation to one of the functions of school refusal, namely escape [14].

3. Integrative dual-pathway model

A comprehensive understanding of how SES shapes academic performance can be framed through two distinct yet complementary pathways: cognitive depletion via chronic stress and motivational deficits via low self-efficacy. Together, they constitute an *A-B-C* framework, where A refers to SES, B to the dual pathways, and C to academic achievement.

The cognitive depletion route is well explained by the allostatic load theory, which posits that the persistent, uncontrollable stressors associated with low SES, such as housing instability, food insecurity, and neighborhood violence, create a repeated pattern of physiological stress responses that eventually dysregulate neural systems [15]. This chronic activation further burdens the prefrontal cortex and overloads the limited capacity of Baddeley's central executive in working memory, reducing the cognitive resources available for attention, problem-solving, and information storage when performing academic tasks [16]. According to research by Booth and colleagues, AL was significantly inversely associated with measured brain and white matter volumes, and was negatively correlated with general cognitive ability and memory when examined using structural equation modelling, suggesting that the neurological consequences may be substantial and difficult

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to reverse [17]. In summary, AL accumulation dysregulates the central executive functions mediated by the prefrontal cortex, overloading the limited capacity and leading to cognitive depletion, which ultimately undermines the cognitive reasoning and analytical capabilities that underpin effective academic performance.

In parallel, the motivational route operates through low academic self-efficacy, as articulated in Bandura's social cognitive theory: children from lower SES backgrounds often experience fewer opportunities for individual decision-making and less high-quality modeling of academic persistence, leading them to doubt their capability to succeed [18]. When these repeated failure experiences become internalized, low self-efficacy solidifies into a self-denying mindset and lowers one's expectations of achieving academic excellence. Brown and Inouye manipulated students' perceived efficacy in an experimental setting, by having participants observe a failed model and providing them with feedback that indicated their level of competence relative to the model (more competent, similarly competent, or no feedback) [19]. Brown and Inouye's experiment well demonstrates a developmental route from multiple failures (including their own and those of a similarly competent model) and low self-efficacy to, eventually, learned helplessness and avoidance at both behavioral and mental levels [19]. This circumstance can be well explained by Seligman's learned helplessness model, which describes the condition in which the child perceives a non-contingency between their effort and outcomes, fostering a tendency toward passive attitudes and withdrawal of effort, and ultimately resulting in academic failure [12]. This response to repetitive uncontrollable failure can exert pressure on the individual, and in the long run, may deplete neurochemical resources necessary for mediating motivation and action, resulting in avoidant and withdrawal behaviour. In short, lower SES leads to low self-efficacy, and prolonged academic failure can develop into learned helplessness, which eventually undermines learning through a lack of motivation.

It is worth mentioning that in real-life cases, cognitive depletion and low motivation do not operate as independent, additive risk factors for academic performance through dual pathways; on the contrary, the two factors tend to interact dynamically. Yang et al. found that high-intensity motivational emotions significantly narrow attention breadth, prompting individuals to favour simple distraction strategies over effortful reappraisal and to engage in the most basic reasoning that demands the least cognitive cost [20]. Although their study focused on high intensity rather than low motivational states, the finding that shifts in motivational intensity alter the depth of cognitive processing is relevant here: when students are trapped in chronic low motivation, their cognitive engagement may similarly contract, making them more prone to superficial processing and less likely to attempt deep analysis or creative problem-solving, which further entrenches the cycle of disengagement and underperformance.

From one direction, cognitive depletion can exacerbate low motivation, thereby amplifying academic disengagement and leading to underperformance. In the other direction, low motivation hinders cognitive investment, as students who experience less motivation tend to resist exerting effort and maintaining persistence in learning. In academic learning, students with low SES can fall into a vicious cycle in which "the less they work, the more they fail," under the pressure of cognitive depletion and motivational deficiency. Existing cognitive depletion can create obstacles to attentional concentration, creating an avoidance motivation that further imposes restrictions on their attention breadth. In cases of learning that require complex strategies, they tend to chronically forgo deep thinking, such as skipping challenging questions, choosing randomly, or even giving up.

Cognitive depletion can exacerbate low motivation for learning when students encounter difficult problems, especially on cognitively demanding tasks. This effect was evident in Serki and Bolkan's

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controlled experiment, in which students exposed to a clear lesson experienced lower cognitive load, which led to an increase in students' self-efficacy and motivation, and resulted in a higher examination score [21]. Another study conducted by Evans et al. further confirms this finding, corroborating previous research on the negative effects on motivation brought by extraneous cognitive load, and moreover arguing for the benefits of load reduction on autonomous motivation for learning [22].

Conversely, a low motivational belief can largely determine students' attributions and self-efficacy regarding learning, and may further influence their choice of academic tasks and level of engagement. As stated in Garcia and Pintrich's published article, motivational and cognitive factors operate simultaneously to influence students' learning [23].

In summary, cognitive depletion and low motivation dynamically reinforce each other in academic settings: depletion weakens motivation, while low motivation hampers higher-level cognition.

4. Discussion

4.1. Findings

This literature review has discussed four major theories mediating the relationship between SES and academic achievement: AL accumulation, central executive dysfunction, lack of self-efficacy, and perceived learned helplessness. In addition to each individual mediator, this paper has proposed an integrative dual-pathway model to explain how SES shapes academic achievement, by combining the impact of cognitive depletion and motivational deficits and addressing the interaction between these factors. In one direction, cognitive depletion can exacerbate low motivation in a negative cycle; in the other direction, low motivation imposes restrictions on students' cognitive engagement. This integrated approach provides a more comprehensive and holistic analysis of the association between SES and academic achievement in a more realistic and practical setting, suggesting that cognitive depletion and lack of motivation do not operate as independent mediators, but rather interact in a bidirectional dynamic way.

4.2. Implications

Based on the current understanding of the negative impact of low SES on academic achievement, community members and education policymakers may consider allocating extra resources to low-SES communities to counteract these disadvantages, such as extracurricular tutoring, mentorship programs, and community libraries.

In addition, educators such as principals and teachers should be well-trained to recognize SES-related barriers and equipped with tools to help students in need. During teaching and school hours, educators may implement interventions that focus on boosting students' motivation and reducing cognitive load. For instance, educators may place more emphasis on students' self-exploration in learning while providing professional assistance. Self-directed learning benefits students' cognitive development, and the sense of accomplishment in conquering complex problems adds to their self-efficacy and motivation in learning, though care should be taken not to overwhelm students with cognitively demanding conditions.

In terms of changes to lesson format, teachers may implement a scaffolding approach: breaking complex tasks into manageable steps, providing worked examples, and maintaining consistent, predictable classroom routines in order to reduce extraneous cognitive load. This not only protects

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students' limited central executive capacity, but also indirectly boosts their self-efficacy by making academic content more approachable. Concurrently, teachers may offer process-oriented feedback and emphasize students' effort and improvement, directly countering learned helplessness by rebuilding their perceived contingency between actions and outcomes. This motivational restoration, in turn, alleviates cognitive stress and frees up mental resources for the cognitive tasks involved in learning.

4.3. Limitations and future directions

However, several limitations should be acknowledged. First, the proposed integrative dual-pathway model remains theoretical and requires empirical testing using longitudinal and controlled experimental designs to ensure validity and reliability. Second, some potential moderating factors exist and may serve as confounding variables, such as school quality, peer effects, and neighborhood characteristics; these variables should be systematically examined and controlled in future research.

Future research should aim to validate the integrative dual-pathway model through large-scale quantitative studies, explore the developmental trajectories of how the effects of SES accumulate over time, and design intervention studies that target both cognitive and motivational pathways in low-SES student populations. By moving beyond single-factor explanations, researchers and practitioners can better understand and address the multifaceted nature of educational inequality and mitigate the disadvantages associated with low-SES backgrounds.

5. Conclusion

This literature review proposes an integrative dual-pathway model that explains how socioeconomic status (SES) shapes academic achievement through two interacting pathways: cognitive depletion via allostatic load and motivational deficits via low self-efficacy and learned helplessness. As noted in recent literature, rather than treating cognitive and motivational factors as independent mediators, the present model emphasizes their dynamic interaction: cognitive depletion exacerbates low motivation, while low motivation hampers higher-level cognitive investment. In both pathways, this bidirectional association puts low-SES students at a disadvantage academically.

The theoretical synthesis suggests that closing the SES-related academic achievement gap requires interventions that address both cognitive and motivational mechanisms simultaneously. Practical implications include allocating additional educational resources to disadvantaged communities, training educators to recognize SES-related barriers, and implementing scaffolding strategies that reduce extraneous cognitive load while fostering self-efficacy and intrinsic motivation for learning.

Nevertheless, the proposed model currently lacks empirical validation and requires testing via longitudinal and experimental designs, with controls for potential confounds such as school quality, peer effects, and neighborhood characteristics. Future research should validate the model, track how the effects of SES accumulate over time, and design interventions that address both cognitive and motivational pathways. Adopting this multi-dimensional approach is essential to understanding educational inequality and mitigating disadvantages for low-SES students.

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