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Developing a Structural Model for Predicting Students' Academic Performance: The Role of the Intelligence Trap Mediated by Grit and Self-Discipline

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ABSTRACT

Objective: The present study sought to develop and test a structural equation model predicting students' academic performance based on the intelligence trap, with grit and self-discipline as mediating variables.

Methods: This descriptive–correlational research was conducted using structural equation modeling. The statistical population comprised all students enrolled at Bu-Ali Sina University during the 2023–2024 academic year, from which a random cluster sample of 396 students was selected. Data were collected using the Intelligence Trap Questionnaire (2024), the Academic Performance Questionnaire by Pham and Taylor (1999), the Grit Scale by Duckworth and Quinn (2009), and the Self-Discipline Questionnaire by Zand Karimi et al. (2012). Data analysis was performed using Pearson correlation, regression, and path analysis in SPSS v.27 and LISREL v.8.8.

Results: The findings revealed a significant negative relationship between intelligence trap, academic performance, grit, and self-discipline ($p < 0.01$). The proposed structural model demonstrated acceptable fit indices, indicating that intelligence trap both directly and indirectly, through grit and self-discipline, predicts lower academic performance.

Conclusions: The results highlight that the intelligence trap can undermine students' academic performance by weakening essential traits such as grit and self-discipline. These findings underscore the importance of identifying and addressing the intelligence trap within educational contexts to enhance students' success.

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Introduction

Educational systems worldwide are of great importance, which has prompted efforts to improve both the quantitative and qualitative aspects of education. The academic performance of students is a key concern for education systems and those responsible for teaching and training. In this regard, schools and universities are rapidly evolving to produce graduates with optimal academic performance in today's competitive world (Arabzadeh et al., 2018; Francis & Babu, 2019). Academic performance has long been a subject of interest for education specialists, leading to diverse definitions of the concept. Academic performance can be defined as the extent to which an institution of learning, a teacher, or a student meets both long-term and short-term educational goals. The evaluation of academic performance is typically done through continuous assessments and the overall cumulative grade point average (CGPA) obtained by the student (Al-Tameemi et al., 2023).

Additionally, it is a critical factor that significantly influences the individual and social development of members of a society (Azam Rajabian & Asghari Ebrahimabad, 2020). Academic performance and the factors influencing it remain central topics in educational and psychological research, as academic achievement not only reflects students' accomplishments and failures but also shapes their future choices and engagement in subsequent activities. This indicates that academic performance extends beyond grades and GPAs, influencing an individual's overall life trajectory (Suleiman et al., 2024)

Recent research in education on predictors of academic performance has focused on intelligence and cognitive abilities (Ritchie & Tucker-Drob, 2018). Numerous studies have reported a strong correlation between intelligence levels and academic performance, ranging from 0.50 to 0.70 (Lynn & Vanhanen, 2012; Weber et al., 2013). In a meta-analysis summarizing 74 studies that examined the predictive power of intelligence on academic achievement, the average correlation between intelligence and academic performance was reported as 0.44 (Kriegbaum et al., 2018). Other research utilizing modeling as a statistical tool to predict academic performance has identified intelligence as a significant predictor of academic success (Colom & Flores-Mendoza, 2007; Karbach et al., 2013; Laidra et al., 2007).

Neglecting the value of these findings and the critical role that intelligence plays in life and academic success is irrational. However, problems arise when intelligence is assumed to represent

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the entirety of an individual's intellectual abilities (Higgins & Xiang, 2009). In this context, intelligence also has its drawbacks, as highlighted by Robson (2019) with the introduction of the concept of the "intelligence trap." The intelligence trap arises when individuals fail to see beyond their expectations and predictions, struggle to view the world from different perspectives, or underestimate the possibility that their decisions could be wrong. Intelligent individuals, like others, may believe they are less prone to errors or biases, often overestimating their immunity to mistakes. These individuals may be unable to move beyond their current mental frameworks to find new ways to tackle challenges, becoming accustomed to familiar approaches. Additionally, intelligent individuals may use their high cognitive abilities opportunistically, prioritizing the protection of their core beliefs and identity rather than pursuing fairness (Kahan et al., 2017). Some studies suggest that when a mindset of self-perceived intellectual superiority develops, such individuals may struggle to understand opposing perspectives. Their reliance on their own beliefs is what Ottati describes as acquired rigidity (Ottati et al., 2015). This overconfidence, combined with blind faith in their talents, can create an intelligence trap with potentially adverse outcomes (Robson, 2019).

Moreover, there are other personal skills distinct from traditional cognitive intelligence that can impact academic success. Currently, several lines of research are analyzing non-cognitive abilities as predictors of academic performance (Sánchez-Álvarez et al., 2020).

Grit, a key non-cognitive variable in positive psychology, reflects an individual's perseverance in pursuing long-term goals despite challenges, along with sustained dedication, effort, and diligence toward achieving meaningful objectives. (Duckworth et al., 2007). Grit comprises two core dimensions: (1) Perseverance of Effort – the sustained determination to overcome obstacles while pursuing goals, and (2) Consistency of Interest – the focused commitment to long-term objectives despite distractions or challenges. (Hosseni et al., 2018). Recent research findings indicate that grit is linked to positive outcomes for students, suggesting that interventions aimed at enhancing grit among students should be developed (Clark & Malecki, 2019).

Self-discipline and grit are individual difference variables associated with persistent effort in goal-directed tasks. In scientific literature, self-discipline is recognized as a sub facet of the personality trait conscientiousness. (Hagger & Hamilton, 2019). Self-discipline is defined as the ability to control or suppress strong impulses in favor of strategic actions that contribute to higher or long-

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term goals (Allom et al., 2016). Disciplinary issues have existed since the formation of educational institutions, but increasing student indiscipline has become a major concern for authorities, disrupting administration and hindering learning. Self-discipline, as a key self-regulatory strategy, plays a vital role in sustaining motivation and effort, making it essential for long-term academic success (Gelles et al., 2020). The absence of discipline in students concerning learning objectives remains a significant challenge for educators. This issue has been a subject of international research for a long time, with researchers identifying self-discipline as a key factor for achieving acceptable levels of academic success (Kagoiya & Kagema, 2018). Moreover, there is a meaningful relationship between self-discipline and study habits (McMahon et al., 2020). This interrelationship impacts educators' effectiveness, disrupting their lesson planning and efforts to promote academic progress among students (Ostovar et al., 2020).

Research highlights that intelligence, grit, and self-discipline differentially predict academic performance, with grit often surpassing intelligence in impact. For instance, Hosseni et al. (2018) found grit explains 43% of achievement variance, nearly 2.5 times intelligence's predictive power (18%), suggesting grittier students persist better through challenges. However, He et al. (2021) revealed grit's limitations: while it enhances outcomes for students with average/high IQs, it shows no significant benefit for those with cognitive delays or low IQ, indicating that cognitive ability moderates grit's effectiveness. Thus, grit is pivotal for academic success but operates within cognitive constraints.

In another study, Minnigh et al. (2024) found that grit and its aspects are not sufficiently distinct from conscientiousness. This may imply that these two traits could overlap in some aspects and, on their own, may not effectively predict academic performance. Furthermore, it was suggested that when using grit and conscientiousness to predict academic performance, these traits cannot compensate for differences in cognitive ability. This means that students with different cognitive abilities may be influenced by other factors that are unrelated to grit and conscientiousness in their academic performance. Additionally, Duckworth and Seligman (2005) found that self-discipline accounts for more than twice the variance of IQ in final grades, high school selection, school attendance, hours spent on homework, hours spent watching television, and time spent starting assignments each day. These findings highlight the main reason why students fall short of their intellectual potential: lack of self-discipline.

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Previous research has extensively explored the individual effects of cognitive abilities, such as intelligence, and personality traits, including grit and self-discipline, on academic performance. However, a significant gap remains in understanding the potential negative consequences of high intelligence. The concept of the "intelligence trap", as a potential barrier to academic success, has been largely overlooked in educational psychology. While the positive roles of grit and self-discipline are well-documented, the literature lacks a comprehensive, integrative model that explores how these traits mediate the relationship between intellectual vulnerability and academic outcomes. This study addresses this gap by proposing and testing a structural model that examines the direct and indirect pathways through which the intelligence trap impacts academic performance, with the mediating roles of grit and self-discipline. By moving beyond isolated analyses, this research provides a more nuanced understanding of the complex interplay between cognitive pitfalls, non-cognitive strengths, and student achievement. This approach is novel and offers a more complete framework for developing targeted interventions to improve academic success.

Material and Methods

The Intelligence Trap Questionnaire was developed by Esmaeili Sedeh (2024) and was validated for use with students aged 18 to 38 years. The questionnaire includes 28 items and covers four domains of the intelligence trap, including Cognitive Miserliness (items 1–8), Motivated Reasoning (items 9–15), the curse of knowledge/expertise (items 16–21), and the Too Much Talent Effect (items 22–28). The items are measured on a 5-point Likert scale (5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree). All items are scored based on this scale, and there are no reverse-scoring items. Esmaeili Sedeh (2024) utilized factor analysis and content validity to assess the construct validity of the questionnaire, confirming its validity. The overall reliability, as measured by Cronbach's alpha, was found to be 0.91. The reliability for the subscales, as measured by Cronbach's alpha, is as follows: Cognitive Miserliness 0.92, Motivated Reasoning 0.89, Curse of knowledge/Expertise 0.84, The Too much talent Effect 0.86.

The Academic Performance Questionnaire (EPT) was developed by Pham and Taylor (1999) and validated for the Iranian population by Dortaj and Delavar (2005). The questionnaire consists

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of 48 items across five areas related to academic performance, including self-efficacy (items 29, 30, 31, 32, 33, 34, 35, 36), emotional influences (items 12, 13, 14, 15, 16, 17, 18, 19), lack of control over outcomes (items 5, 6, 37, 38), planning (items 1, 2, 3, 4, 8, 9, 10, 11, 40, 43, 44, 45, 46, 48), and motivation (items 20, 21, 22, 23, 24, 25, 26, 27, 28, 39, 41, 42, 47). The items are measured on a 5-point Likert scale (1 = Not at all, 2 = A little, 3 = Somewhat, 4 = Mostly, 5 = Very much). Scoring for items 8, 23, 26, and 33 is reversed, and no score is assigned to item 7. The minimum possible score is 48, and the maximum score is 240. Dortaj and Delavar (2005) reported the overall validity of the instrument through factor analysis as 0.81 and the overall reliability using Cronbach's alpha as 0.74. Additionally, the validity of each subscale was reported as follows: self-efficacy 0.92, emotional influences 0.93, planning 0.73, lack of control over outcomes 0.64, and motivation 0.72. In the current study, the overall reliability using Cronbach's alpha was 0.79, with the reliability for the subscales being: self-efficacy 0.81, emotional influences 0.77, planning 0.90, lack of control over outcomes 0.70, and motivation 0.73.

The Grit-S Questionnaire (Short Form) was developed by Duckworth and Quinn (2009). This questionnaire consists of 12 items, measuring two dimensions: consistency of interest (items 1, 2, 3, 4, 5, 6) and perseverance of effort (items 7, 8, 9, 10, 11, 12), using a 5-point Likert scale (1 = Not at all like me, 2 = Not much like me, 3 = Somewhat like me, 4 = Almost like me, 5 = Very much like me). The scoring for items 1, 2, 3, 4, 5, and 6 is reversed. The minimum possible score is 12, and the maximum score is 60. Duckworth and Quinn (2009) validated the scale's construct validity using factor analysis. The reliability of the scale, assessed using Cronbach's alpha, was 0.73. In the study by Hosseni et al. (2018), the reliability of the questionnaire, based on Cronbach's alpha, was calculated as 0.836, with subscale reliabilities as follows: consistency of interest, 0.814, and perseverance of effort, 0.803. Additionally, in the current study, the overall reliability using Cronbach's alpha was 0.88, with the subscale reliabilities being: consistency of interest, 0.85, and perseverance of effort, 0.82.

The Self-Discipline Questionnaire was developed by Zand Karimi et al. (2012). This questionnaire consists of 50 items across 5 domains related to levels of self-discipline, including Unethical behavior (items 3, 4, 11, 15, 16, 18, 19, 27, 28, 30, 31, 32, 40, 46), Adherence to rules (items 1, 2, 8, 9, 24, 25, 26, 33, 42, 47, 49), Identity formation (items 6, 7, 10, 13, 14, 21, 36, 37, 39, 45, 48, 50), and Internalization (items 5, 12, 17, 20, 22, 23, 29, 34, 35, 38, 41, 43, 44), measured

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using a 5-point Likert scale (5 = Strongly agree, 4 = Agree, 3 = Neutral, 2 = Disagree, 1 = Strongly disagree). The scoring for items 2, 3, 4, 11, 15, 16, 18, 19, 24, 25, 26, 27, 29, 31, 32, 33, 34, 41, 43, 46, and 47 is reversed. The minimum possible score is 50, and the maximum score is 250. Zand Karimi et al. (2012) confirmed the validity of the scale and reported a reliability coefficient of 0.83 using Cronbach's alpha, and a test-retest reliability of 0.74 after two weeks with 300 participants. The reliability using Cronbach's alpha for the subscales was as follows: Internalization 0.73, Identity formation 0.71, Adherence to rules 0.76, and Unethical behavior 0.70. In this study, the overall reliability was 0.82, with subscale reliabilities as follows: Internalization 0.77, Identity formation 0.86, Adherence to rules 0.79, and Unethical behavior 0.74.

Results

Sociodemographic Information questionnaire was employed to collect data such as age, gender, educational level, and faculty affiliation. The results of the demographic characteristics section revealed that out of the total 396 participants in the present study, 236 individuals (59.6%) were female, and 160 individuals (40.4%) were male. Additionally, 265 participants (66.9%) were undergraduate students, 91 participants (23%) were master's students, and 40 participants (10.1%) were doctoral students. Among the participants, 96 individuals (24.2%) were from the Faculty of Economic and Social Sciences, 71 individuals (17.9%) from the Faculty of Humanities and Sports Sciences, 80 individuals (20.2%) from the Faculty of Basic Sciences, 90 individuals (22.7%) from the Faculty of Agriculture, and 59 individuals (14.9%) from the Faculty of Engineering. The mean and standard deviation of the age of male participants were 23.35 and 3.99, respectively, while the mean and standard deviation of the age of female participants were 23.53 and 4.77. The overall mean and standard deviation of the age of all participants were 23.42 and 4.32, respectively. The mean and standard deviation of the main variables are presented in Table 1.

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Table 1. The mean, standard deviation, skewness, kurtosis, tolerance, and variance inflation factor of research variables

Variable	Mean	SD	Skewness	Kurtosis	Tolerance	VIF
intelligence trap	67.52	16.31	0.26	-0.24	0.76	1.31
grit	40.75	9.29	-0.15	0.28	0.75	1.32
self-discipline	175.45	18.46	0.20	-0.26	0.78	1.27
academic performance	142.21	19.23	-0.29	0.45	-	-

The mean and standard deviation of the intelligence trap were 67.52 and 16.31, respectively. The mean and standard deviation of grit were 40.75 and 9.29, respectively. The mean and standard deviation of self-discipline were 175.45 and 18.46, respectively. The mean and standard deviation of academic performance were 142.21 and 19.23, respectively. Before conducting this analysis, the assumptions for path analysis are examined, including the linear relationship between variables using Pearson's correlation, the normality of the distribution of scores using skewness and kurtosis statistics, the absence of multicollinearity among independent variables using tolerance and variance inflation factor (VIF), and the independence of errors using the Durbin-Watson (DW) statistic. Additionally, the skewness and kurtosis values for the distribution of scores on the examined variables range from +1 to -1, suggesting that the scores of the research variables follow a normal distribution. Furthermore, the variance inflation factor (VIF) values are below 10, and the tolerance values are above 0.1, which are acceptable. Based on the statistics presented in Table 2, the absence of multicollinearity among the independent variables is confirmed. The Durbin-Watson statistic for this test is 2.02, which supports the assumption of error independence, as the acceptable range for this statistic is between 1.5 and 2.5.

Table 2. Correlation matrix of research variables

Variable	1	2	3	4
Intelligence trap	-			
Grit	-0.42 **	-		
Self-discipline	-0.38 **	0.39 **	-	
academic performance	-0.36 **	0.34 **	0.37 **	-

** p < 0.05; **p < 0.01*

Next, the path diagrams for the model predicting students' academic performance, along with the coefficients in standardized form and significance (t values), are presented (Fig. 1 and Fig. 2).

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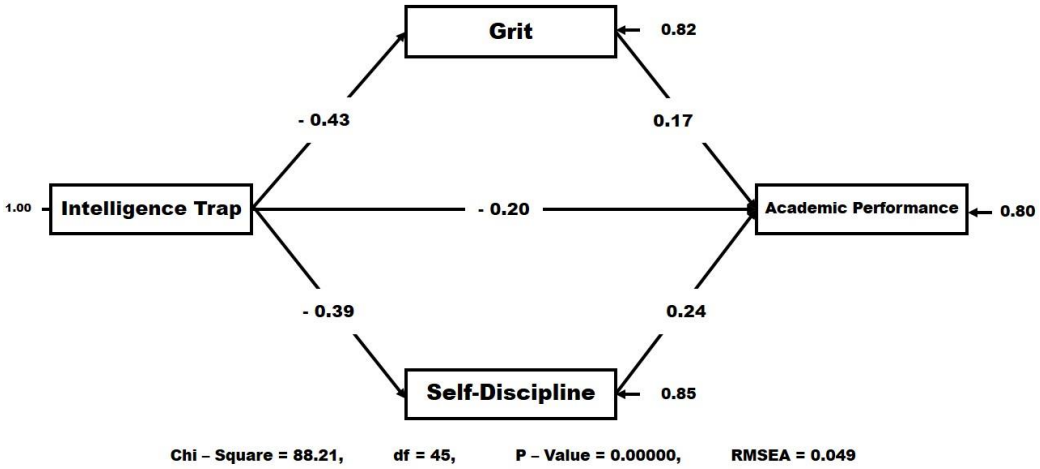


Fig. 1. Model with standardized coefficients of the proposed relationships

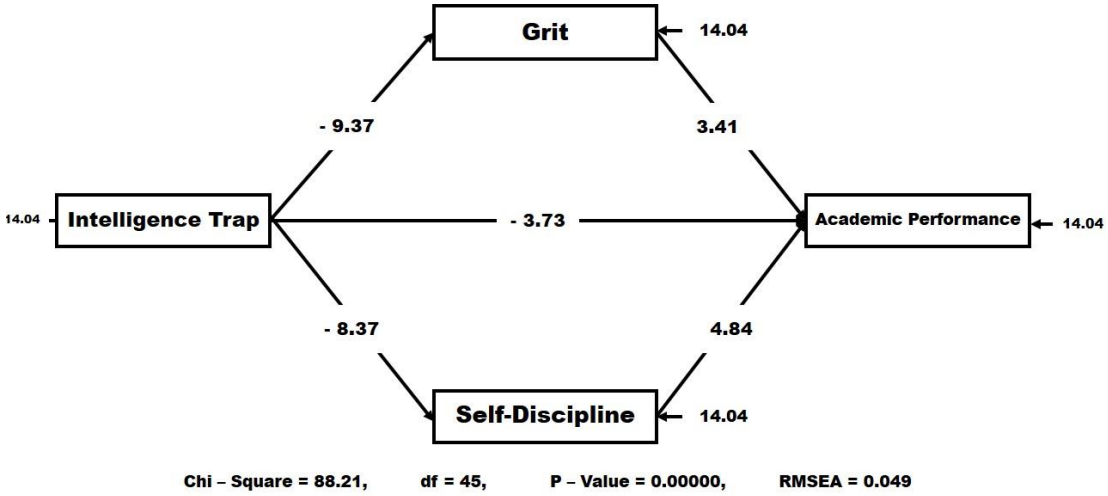


Fig. 2. The proposed model of relationships between variables

The results in Table 2 indicate a significant negative relationship between the intelligence trap and grit, self-discipline, and academic performance ($p < 0.01$), confirming the linear relationship between the research variables.

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Table 3. Fit indices for the model

Fit indices	X^2	df	X^2 /df	GFI	IFI	NFI	CFI	RMSEA
values	88.21	45	1.96	0.95	0.92	0.94	0.95	0.049

The ratio of chi-square to degrees of freedom (X^2/df) for model fit should be less than 2. The Goodness-of-Fit Index (GFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI), and Normed Fit Index (NFI) for models with good fit are equal to or greater than 0.90. Additionally, the Root Mean Square Error of Approximation (RMSEA) for models with good fit should be equal to or less than 0.05, and values between 0.05 and 0.08 indicate a reasonable error in the population. Based on the goodness-of-fit indices reported in Table 3, the model fit is at a good level.

Table 4. Bootstrap method analysis

	direct effect	Standard error	t	
intelligence trap → academic performance	-0.20	0.014	-3.73	
Direction	Indirect effect	Standard error	95% CI	
			(Lower)	(Upper)
intelligence trap → grit → academic performance	-0.07	0.034	-0.051	-0.137
intelligence trap → self-discipline → academic performance	-0.09	0.018	-0.107	-0.192

The results in Table 4 indicate a significant negative direct relationship between the grit and academic performance ($\beta = -0.20$, $p < 0.01$). Additionally, to examine the mediating role of grit and self-discipline in the relationship between grit and academic performance, the bootstrap method was used. In the bootstrap method, a 95% confidence level and 5000 resampling iterations were considered. If the upper and lower bounds of the confidence intervals do not include zero, the mediating effect of the variable is considered significant. Based on the bootstrap results (95% confidence interval) presented in Table 4, the indirect relationship between grit and academic performance through grit ($\beta = -0.07$) is significant with a confidence interval of -0.051 to -0.137, and the indirect relationship between grit and academic performance through self-discipline ($\beta = -0.09$) is significant with a confidence interval of -0.107 to -0.192.

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Discussion

The present study aimed to develop a structural model predicting the academic performance of students based on grit, with the mediating role of self-discipline and self-regulation. The results of this research validated the hypothesized structural model, which showed a good fit. The analysis showed that there was a significant negative direct impact of the intelligence trap on academic performance. The model also showed there were significant indirect impacts, in which the intelligence trap has a negative effect on academic performance through decreasing students' grit and self-discipline. These results highlight the intricate relationship between cognitive risk factors and non-cognitive personality traits in the prediction of academic achievement.

Although past studies have shown a positive correlation between intelligence and academic success, our results add an important twist by showing that the adverse impact of the intelligence trap idea aligns with Robson (2019) theory, which contends that over-reliance on intelligence can lead to cognitive rigidity and poor decision-making. This then suggests that the beneficial effect of intelligence on performance may be reduced or even nullified once a person falls into this trap, a situation that is usually ignored by traditional correlational research focusing solely on IQ scores. The fact that grit and self-discipline act as mediators in the relation between the intelligence trap and academic success is also in line with the findings of (Duckworth & Seligman, 2005), who showed that self-discipline often accounts for more variance in academic success than does IQ. The mediational role we found suggests a mechanism by which this influence occurs: the intelligence trap erodes the very non-cognitive traits (grit and self-discipline) that are crucial for sustained effort and goal pursuit.

Instructors who can successfully predict what their students know are better able to adjust their teaching effectively and support students' learning (Sadler et al., 2013). In contrast, instructors who fail to accurately understand students' perspectives may struggle to establish effective communication (Wieman, 2007). Therefore, it is essential for instructors to have an accurate understanding of students' knowledge and needs to plan lessons and engage in effective communication. However, individuals' personal knowledge consistently influences their estimates of others' knowledge. When making predictions about others' knowledge, estimators tend to rely less on their own experiences, which can lead to inaccurate judgments. In other words, more knowledge might impair judgment accuracy regarding others' knowledge, not because estimators

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heavily rely on their own experiences, but because they lack diagnostic cues about others' knowledge (Tullis & Feder, 2023). This possible explanation might indicate the impact of another component of grit, namely the curse of knowledge, on students' academic performance. Understanding how personal knowledge affects judgments and educational interactions can help improve teaching and communication strategies.

People generally believe that there is a linear and almost uniform relationship between talent and performance, meaning that more talent leads to better performance, and this relationship never turns negative. However, research has shown that talent can only facilitate performance up to a certain point, after which further increases in talent may lead to a decrease in performance (Swaab et al., 2014). This mindset that talent is an inherent trait can lead people to give up on efforts to improve their abilities. In other words, having a fixed mindset about talent can negatively impact students' academic performance (Limeri et al., 2020). Therefore, the Too Much Talent Effect could be a potential explanation for the impact of another component of grit on students' academic performance. Understanding how an over-talent mindset can affect effort and academic progress can help in developing more effective educational strategies.

Additionally, another finding in this study revealed that grit has a negative and significant indirect effect on academic performance through perseverance. To explain this finding, it can be argued that individuals with grit tend to adopt the principle of least effort during decision-making processes. These individuals are not inclined to deeply analyze issues and instead, act based on minimal cues, choosing the easiest solution. This behavior is reflected in the acceptance of intuition and heuristic exploration in information processing (Changbao & Peishan, 2018). In their research, Stigler and Hiebert (2017) showed that when an instructor begins a lesson with a problem without providing a specific method for solving it beforehand, some students, who seek easy solutions, become confused, which they are trying to avoid, and this may affect their performance. In contrast, others enjoy the challenge and deeply think about its fundamental characteristics. This can be explained through the concept of perseverance. Since talented individuals often learn things easily at a young age, they may become accustomed to succeeding without much effort and fail to develop the habit of perseverance. This concept plays a significant role in long-term success, as these individuals may not develop a habit of trying hard when faced with new challenges, and when they encounter situations that require sustained effort, they give up and quit.

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The findings of this study also revealed that grit has a negative and significant indirect effect on students' academic performance through self-discipline. To explain this finding, it can be argued that individuals with grit tend to collect evidence to support a desired conclusion. This behavior often leads to reinforcing an individual's beliefs by constructing a biased or incorrect narrative, essentially stemming from a person's desire for self-affirmation (Bai, 2023). The findings of this study revealed that the intelligence trap can serve as a negative and influential factor affecting students' academic performance. This influence is explained through the reduction of perseverance and self-discipline, identified as key mediators in the proposed model. The results indicate that students with an intelligence trap, due to their tendency to use ineffective cognitive strategies, lack of persistence when facing challenges, and the collection of evidence to confirm their preconceived beliefs, face significant challenges in achieving desirable academic outcomes. This research also highlights the importance of cognitive and behavioral factors such as cognitive stinginess, the curse of knowledge, and the over-talent mindset in academic performance. It demonstrates how these factors can impact decision-making, learning, and academic growth. Based on the study's findings, it is recommended to design educational and counseling programs aimed at strengthening self-regulation skills, improving learning strategies, and fostering a growth mindset in students. Additionally, emphasizing the training of instructors to better understand students' needs and abilities and adopting effective teaching approaches can play a crucial role in enhancing academic performance. Ultimately, the results of this study can inform the development of educational policies and programs to counteract the negative effects of the intelligence trap and pave the way for sustainable academic success for students.

Overall, considering the cognitive thriftiness component of grit, it is recommended that instructors challenge students when solving problems and avoid providing ready-made solutions. This approach can help strengthen critical thinking and creativity among students. Instructors can create an environment where students are encouraged to think more deeply and analyze problems more carefully by posing challenging questions and encouraging innovative methods of problem-solving. This process not only contributes to better learning but also serves as a model for addressing future challenges. This approach can also help create a culture of active and collaborative learning in the classroom, where students engage in discussions and collaborate with each other.

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In light of the Motivated Reasoning component of grit, instructors are advised to challenge students' foundational beliefs and encourage them to engage in discussions. This process can help students think more deeply about their beliefs and provide opportunities to build new and more effective beliefs. By asking challenging questions and creating space for open discussions, instructors can encourage students to reflect on their reasons and arguments. This approach can help them enhance their reasoning and critical thinking skills and become more familiar with analyzing and evaluating their own and others' views and beliefs. Additionally, promoting discussion and group communication can lead to a supportive and positive learning environment where students feel more confident in expressing their new opinions and beliefs. Through this method, students can gain a deeper understanding of topics and concepts and become more motivated to engage in active learning.

In sum, this research presents a novel approach to understanding the intricate correlation between intelligence and academic achievement through the introduction of the intelligence trap. Our results provide strong evidence that the intelligence trap can powerfully detract from academic achievement, not only directly but also by compromising key personality characteristics like grit and self-discipline. This study highlights the necessity of adopting a comprehensive strategy to education that not only develops cognitive faculties but also mitigates possible intellectual frailties and promotes non-cognitive competencies. By synthesizing these findings, educational systems can more effectively prepare students to overcome academic difficulties and realize long-term success.

These findings have big implications for education; an exclusive focus on cognitive ability might be counterproductive and reinforce the intelligence trap. Educational programs should include strategies to grow mindset, effort, and persistence alongside ability. Counsellors can help students recognize and overcome intelligence trap behaviors like motivated reasoning, and faculty training should address the curse of knowledge so that teaching is aligned with student understanding. Instructors should promote collaborative learning through group work and diverse problem-solving approaches, which increases creativity, social skills, and perspective taking and reduces reliance on individual expertise. And encouraging continuous learning through interdisciplinary courses and skill-building workshops helps students avoid the too much talent effect of overspecialization and broadens their problem-solving capacity and motivation. These combined

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approaches, balancing cognitive development with mindset training, collaborative learning, and skill diversification, aim to get the best of grit (perseverance and discipline) and mitigate the worst of it, and ultimately lead to better academic outcomes through more holistic student development. Future research should address the limitations of this study. Longitudinal designs are needed to show causality between the intelligence trap, grit, self-discipline, and academic performance. Researchers could also use a mixed methods approach, combining quantitative data from questionnaires with qualitative data from interviews to get a deeper understanding of students' experiences of the intelligence trap. Replication of this study in different cultural and educational settings is key to testing the generalizability of our model. Finally, future research could look at the effectiveness of specific interventions, such as mindfulness training or metacognitive strategy instruction, to reduce the intelligence trap and boost non-cognitive skills.

This study, while offering valuable insights, is subject to several important limitations that warrant a cautious interpretation of the findings. A primary methodological limitation is the use of a cross-sectional, self-report design. The correlational nature of the data, while suitable for structural equation modeling, precludes the establishment of causal relationships between the intelligence trap, grit, self-discipline, and academic performance. This means we can describe associations but cannot definitively state that the intelligence trap causes a decline in academic performance. Future research should employ longitudinal designs to track changes over time and establish a more robust causal inference. Furthermore, the reliance on self-report questionnaires for all variables may have introduced a social desirability bias. Participants might have provided answers they perceived as socially acceptable or desirable, rather than reflecting their true behaviors or beliefs. For instance, some students may have overestimated their level of grit or self-discipline. Future studies could mitigate this by incorporating objective measures of academic performance, such as official grade point averages (CGPA), and using a combination of self-report data with behavioral or observational measures to triangulate findings.

The use of a convenience sample of students from a single university in Iran also limits the generalizability of our findings. The results may not apply to students in different educational systems, cultural contexts, or at varying academic levels. To address this, future research should aim for a larger and more diverse sample population, including students from different universities and countries. Another limitation stems from the limited response rate due to the lengthy

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questionnaires. This may have led to a selection bias, potentially overrepresenting more motivated or conscientious students who were more likely to complete the survey. This could have inflated the correlations between some of the variables. Future studies could use shorter, validated versions of the scales or offer incentives to increase the response rate and ensure a more representative sample. Finally, a notable limitation is the scarcity of theoretical foundations and empirical studies specifically on the intelligence trap. This new construct requires further validation and exploration, particularly in diverse populations. Future research is needed to replicate this study and further validate the Intelligence Trap Questionnaire (2024) across different cohorts, which would strengthen the theoretical basis of this important concept and its role in academic outcomes. This would also involve additional psychometric analysis of the grit and self-discipline scales to ensure their validity and reliability within the specific cultural and educational context of the study.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Bu-Ali Sina University.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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