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Nüket Afat,
Istanbul Sabahattin Zaim University, Türkiye

*CORRESPONDENCE
Hassan Rafi' Ali Shaheen
h.shaheen@bau.edu.jo

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The impact of early giftedness identification on long-term academic success: a cross-sectional study in King Abdullah II schools for excellence in Jordan

Hassan Rafi' Ali Shaheen*

Department of Special Education, Princess Alia University College, Al-Balqa Applied University, As-Salt, Jordan

Background: Early identification of gifted students plays a crucial role in shaping their academic success. However, the extent to which the age of gifted identification, participation in gifted programs, and socio-demographic factors influence academic performance remains inconclusive. This study investigates the relationship between these factors and academic success among students in King Abdullah II Schools for Excellence.

Methods: A cross-sectional study was conducted with 250 gifted students selected through convenience sampling. Data were collected using a structured questionnaire assessing demographic characteristics, age of gifted identification, type and frequency of participation in gifted programs, and academic performance (GPA and standardized test scores). Descriptive statistics, independent *t*-tests, ANOVA, chi-square tests, and multiple regression analysis were used for data analysis in SPSS v.27, with a significance level of $p < 0.05$.

Results: The findings revealed that gender was the only significant predictor of GPA, with male students ($M = 86.94$, $SD = 8.55$) outperforming female students ($M = 84.03$, $SD = 8.41$, $F(1, 248) = 7.35$, $p = 0.0072$). No significant differences were found in standardized test scores based on gender, school region, socioeconomic status, or grade level. Regression analysis showed that gifted identification age, type of gifted education received, and participation frequency in gifted programs were not significant predictors of academic success.

Conclusion: While gender differences in GPA were observed, other demographic factors and participation in gifted programs did not significantly influence academic performance. These findings suggest that the quality of gifted education programs and students' self-regulation strategies may be more crucial than mere participation. Future research should focus on how instructional approaches and cognitive skills impact long-term academic outcomes.

KEYWORDS

gifted education, academic success, early identification, gender differences, cognitive development

Introduction

Academic success is a multidimensional construct influenced by a combination of cognitive, emotional, social, and contextual factors. Among these, intelligence and its early recognition have long been considered pivotal in shaping long-term academic outcomes. Although intelligence has been acknowledged as a key contributor to academic performance, the timing and context of its recognition remain underexplored. This study aims to investigate the influence of early giftedness identification on long-term academic success, measured through various performance indicators such as GPA and standardized test scores, within the context of King Abdullah II Schools for Excellence in Jordan.

Early identification of gifted students allows for the implementation of tailored instructional interventions, which can significantly enhance both cognitive development and academic achievement (Papadopoulos, 2020). Research has shown that students identified early and provided with appropriate educational challenges maintain higher motivation and perform better academically over time (Mammadov et al., 2021; Bernstein et al., 2021). Therefore, understanding the relationship between the timing of gifted identification and academic success contributes to optimizing educational trajectories for high-potential students.

Instructional strategies aligned with students' intellectual capacities—such as academic acceleration and differentiated instruction—have been associated with better psychological outcomes and improved academic performance (Bernstein et al., 2021). Additionally, early interventions that incorporate project-based learning can foster critical thinking and problem-solving skills, equipping students with tools for sustained academic success (Bildiren and Kargın, 2019). These outcomes are not solely a function of early identification but of the interaction between identification, educational support, and learner engagement (Nacaroğlu and Bektaş, 2023).

Self-regulated learning (SRL) is another vital contributor to academic achievement among gifted students. Many high-potential learners underachieve due to a lack of SRL strategies; however, interventions targeting these skills early in the academic journey can mitigate underperformance (Ridgley et al., 2020). As such, this study does not only explore identification timing but also examines the mediating role of self-regulatory behaviors in influencing academic results.

Language comprehension, particularly in verbal and non-verbal reasoning, plays a critical role in both gifted identification and subsequent academic performance (Hamilton et al., 2020). Yet, disparities in language proficiency may affect access to gifted programs and skew academic outcomes. Therefore, inclusive and equitable screening mechanisms are essential for ensuring fair identification and for enhancing students' academic potential through tailored support.

Despite the benefits of early identification, systemic inequalities persist, particularly for students from ethnically diverse or low-income backgrounds (Ricciardi et al., 2020). Equitable access to gifted education programs is essential for closing academic achievement gaps and ensuring that all students—regardless of socioeconomic status—can achieve academic success (Long, 2022). This study also accounts for these contextual influences on achievement by incorporating socioeconomic and regional variables.

Evidence from longitudinal studies affirms the long-term academic advantages of individualized gifted education (Wai and Benbow, 2021). Moreover, students with clear academic and career goals consistently exhibit stronger academic performance and progression (Figlio et al., 2019). By examining academic success through both cognitive and non-cognitive lenses, this research aims to offer a comprehensive understanding of how early gifted identification—when combined with meaningful educational engagement—shapes students' academic journeys.

Despite extensive global discourse on the predictors of academic achievement, limited empirical research has examined how early identification of giftedness contributes to long-term academic success, particularly within specialized educational institutions in the Middle East. This study contributes original insights by focusing on King Abdullah II Schools for Excellence in Jordan—elite public schools designed specifically for academically talented students. Academic success is a multifaceted outcome influenced by cognitive ability, motivation, instructional practices, self-regulated learning, and socio-demographic contexts. Among gifted students, academic trajectories may also be shaped by early exposure to enrichment programs, the quality of learning environments, and access to educational resources. By examining how these factors interact with the timing of gifted identification, this study offers a unique contribution to the growing discourse on talent development and equitable educational outcomes.

Ultimately, this study centers on academic success as a core outcome, shaped by early gifted identification, educational interventions, and individual learner characteristics. By analyzing these interrelated factors, it contributes to a more nuanced understanding of how to support high-potential students in achieving sustained academic excellence.

Research questions

This study aims to explore the relationship between early giftedness identification and academic success among students in King Abdullah II Schools for Excellence. The following research questions guided the investigation:

1. To what extent do socio-demographic factors (e.g., gender, school region, socioeconomic status) influence students' academic performance (GPA and standardized test scores)?
2. Does the age at which students are identified as gifted significantly predict their academic success?
3. How does the type of gifted education program (e.g., acceleration, enrichment, mentorship) relate to academic performance?
4. Does the frequency of participation in gifted education programs predict long-term academic outcomes?

5. What is the perceived effectiveness of gifted education programs, and how do students' perceptions relate to their academic success?

Methodology

Research design

The effect of early giftedness identification on long-term academic success among King Abdullah II Schools for Excellence pupils is investigated in this cross-sectional study using a design Since it lets data be gathered at a single point in time and offers a picture of the relationship between early identification and academic performance, a cross-sectional approach is suitable. Without long-term follow-up, this strategy helps to identify trends and relationships between early giftedness identification and academic performance.

Research population

Gifted children enrolling in three King Abdullah II Schools for Excellence, each located in a different geographic area—urban, suburban, and rural—make up the study population. These institutions were chosen to guarantee geographical variety and investigate possible effects on long-term academic success of early giftedness diagnosis. Students who have been formally identified as gifted by means of standardized cognitive ability tests, academic performance evaluations, and teacher recommendations comprise part of this demographic. Whereas the suburban school offers a fair combination of academic and extracurricular support, the urban school gives access to superior educational resources and specialized talented programs. By comparison, the rural school has more restricted access to specialized gifted education, therefore influencing long-term academic results. This study intends to investigate how educational environments and available resources affect the academic paths of early-identified talented adolescents by include students from various backgrounds, therefore highlighting regional inequities and the success of gifted education programs.

King Abdullah II Schools for Excellence (KAIISE) are a network of selective public schools in Jordan established by the Ministry of Education to nurture the academic and leadership potential of gifted students. Admission to these schools is highly competitive and based on rigorous academic testing and teacher recommendations. Unlike mainstream public schools, KAIISE offers a specialized curriculum designed to challenge high-achieving students through advanced coursework, research-based learning, and a strong emphasis on STEM fields. These schools operate under the general framework of Jordan's national curriculum but provide enrichment opportunities, accelerated instruction, and extracurricular programs aimed at fostering innovation and academic excellence. KAIISE serves as a national model for talent development and plays a strategic role in shaping future leaders, making it an ideal setting for research on the impact of early gifted identification on academic performance.

Research sample

Raosoft sample size calculator helped to ascertain the study sample so guaranteeing statistical dependability and representativeness. Standard for educational research, the computation was predicated on essential statistical characteristics including a 95% confidence level, a 5% margin of error, and a response distribution of 50%. The final computed sample size was 250 kids, based on the overall projected number of gifted children across the three chosen schools. Convenience sampling was used to enable students who fit the gifted identification criteria and were available throughout the data collecting time to help accessibility and participation. This sampling technique guarantees enough number of participants and helps to meet the pragmatic limitations of doing research in educational environments.

Variables of the study

In this quantitative study, the *dependent variable* is *academic success*, operationalized through two primary indicators:

1. *Grade Point Average (GPA)*
2. *Standardized test scores* (national and international assessments, self-reported on a 5-point Likert scale)

The *independent variables* include:

- *Age of gifted identification* (categorized as $\leq$ 6, 7–9, 10–12, $\geq$ 13 years)
- *Type of gifted education received* (acceleration, enrichment, mentorship, multiple services)
- *Frequency of participation* in gifted programs (Likert scale: 1 = never to 5 = very frequently)
- *Socio-demographic factors*: gender, school region (urban, suburban, rural), socioeconomic status, and grade level.

Data collection tool

Three key sections of the structured questionnaire employed in this study are each meant to gather pertinent information about the influence of early giftedness identification on long-term academic success. Using multiple-choice and Likert-scale questions, the 30 items total on the questionnaire guarantee objective and measurable data collecting. Carefully arranged, the objects offer information on demographic elements, the identification of giftedness process, and academic achievement measures.

Section I: demographic information

Section II: giftedness identification history

Six items in the first section—demographic information—collect background information about the participants. These cover issues of age, gender, grade level, and school location—urban, suburban, or rural. Parental education and work levels also help to determine socioeconomic level; the main language spoken at home is also noted to help to explain possible linguistic implications on academic performance. This part helps regulate for outside variables that can affect the link between early giftedness identification and long-term academic performance.

Ten items in the second section, giftedness identification history, help to clarify how and when children were discovered as gifted and what kind of educational support they had. Students are asked in this part to name the age at which they first came under notice as gifted and the technique of identification—such as academic performance assessments, teacher recommendations, or standardized cognitive tests. The part also looks at the kinds of gifted education programs the students came across—acceleration classes, enrichment seminars, or mentoring possibilities. A five-point Likert scale measures program involvement frequency from never (1) to very frequently (5). Using the same Likert scale, students also score these gifted programs as beneficial in improving their academic performance. The section also evaluates how students felt their extra academic support—from private tutoring or extracurricular enrichment programs—stood outside of the classroom.

Section III: academic performance indicators

Academic performance indicators, the third part, consists of fourteen items evaluating several criteria of academic success. Choosing from categorized ranges such 90–100, 80–89, 70–79, etc., students indicate their current Grade Point Average (GPA). Using a five-point Likert scale, performance on national or international tests is also evaluated; responses fall from below average (1) to exceptional (5). Students' participation in academic competitions, including science fairs, math Olympiads, or essay competitions, as well as Advanced Placement (AP), International Baccalaureate (IB), or honors programs, are further topics covered in this area. Likert scale measurement of frequency of participation helps to evaluate degree of student involvement. Considered great markers of long-term academic interest and achievement, the section also looks at students' participation in research projects, independent studies, or mentoring-based learning activities. At last, the questionnaire assesses academic desire and tenacity by asking students to score their degree of ability to manage demanding courses on a five-point system.

Instrument validity and reliability

To ensure the accuracy and consistency of the data collection instrument, both content validity and internal consistency reliability were assessed. The structured questionnaire was reviewed by a panel of seven experts in gifted education and educational psychology to establish content validity. Feedback from the expert panel led to minor modifications in the wording of several items to enhance clarity and relevance. A pilot study was conducted with 30 gifted students (not included in the final sample) to test the instrument. Based on pilot results, the overall Cronbach's alpha coefficient for the questionnaire was 0.82, indicating a high level of internal consistency. Subscale alphas were as follows: demographic/socioeconomic items ($\alpha = 0.76$), giftedness identification history ($\alpha = 0.84$), and academic performance indicators ($\alpha = 0.81$). These results confirm that the instrument was both valid and reliable for use in the current study.

Data analysis

Data analysis was conducted using SPSS version 27 to rigorously examine the relationship between early giftedness identification and long-term academic success. To align with the research objectives, a comprehensive set of statistical procedures was employed. The assumptions of normality and homogeneity of variances were assessed prior to running parametric tests. Visual inspection of histograms and Q-Q plots, along with results from the Shapiro-Wilk and Levene's tests, indicated that the data met the necessary assumptions for conducting independent t-tests and one-way ANOVA. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participants' demographic characteristics and their responses related to gifted identification and participation in educational programs. To evaluate how academic performance—measured by GPA and standardized test scores—varied across gender, grade level, socioeconomic status, and school region, independent samples t-tests and one-way ANOVA were utilized. Chi-square tests were applied to explore categorical associations, particularly the relationship between the age of gifted identification and participation in academic enrichment activities, thereby addressing the objective of understanding how timing influences engagement. A multiple linear regression analysis was conducted to assess the predictive value of key independent variables—namely, age of gifted identification, type of gifted education received, frequency of program participation, and socio-demographic characteristics—on academic performance outcomes. All statistical tests were conducted at a significance level of $p < 0.05$ to ensure robust and reliable interpretation of the results.

Results

Participant demographics and background characteristics

The study sample comprised 250 students, with 52.8% ($n = 132$) being female and 47.2% ($n = 118$) male. Regarding school region, the largest proportion of students were from urban schools (46.0%, $n = 115$), followed by suburban schools (33.2%, $n = 83$) and rural schools (20.8%, $n = 52$). In terms of socioeconomic status, nearly half of the students were classified as middle class (45.6%, $n = 114$), while 34.0% ($n = 85$) were from low-income backgrounds, and 20.4% ($n = 51$) were from high-income families (Table 1).

The distribution of students across grade levels indicated that the largest group was in 11th grade (22.8%, $n = 57$), followed by 7th grade (19.2%, $n = 48$), 10th grade (16.8%, $n = 42$), 8th grade (14.8%, $n = 37$), 9th grade (14.0%, $n = 35$), and 12th grade (12.4%, $n = 31$). The mean age of the students was 13.58 years ($SD = 2.24$).

In terms of age of giftedness identification, the majority of students were identified as gifted between 7 and 9 years of age (36.8%, $n = 92$), followed by those identified between 10 and 12 years (27.6%, $n = 69$), 6 years or younger (26.0%, $n = 65$), and 13 years or older (9.6%, $n = 24$) (Table 1).

The methods of giftedness identification varied, with 34.4% ($n = 86$) of students identified through standardized tests, 25.6% ($n = 64$) through teacher nominations, and 20.0% ($n = 50$) each through academic performance and multiple methods. These

TABLE 1 Baseline socio-demographic and academic characteristics of the enrolled students.

Variable	F (%)
Gender	
Female	132 (52.8%)
Male	118 (47.2%)
School region	
Rural	52 (20.8%)
Suburban	83 (33.2%)
Urban	115 (46.0%)
Socioeconomic status	
High	51 (20.4%)
Low	85 (34.0%)
Middle	114 (45.6%)
Grade level	
7th	48 (19.2%)
8th	37 (14.8%)
9th	35 (14.0%)
10th	42 (16.8%)
11th	57 (22.8%)
12th	31 (12.4%)
Age (Mean ± SD)	13.58 ± 2.24
Age of giftedness identification	
10–12 years	69 (27.6%)
13 years or older	24 (9.6%)
6 years or younger	65 (26.0%)
7–9 years	92 (36.8%)
Methods of giftedness identification	
Academic performance	50 (20.0%)
Multiple methods	50 (20.0%)
Standardized test	86 (34.4%)
Teacher nomination	64 (25.6%)

F, frequency; M, mean; SD, standard deviation; GPA, grade point average.

findings provide a comprehensive overview of the baseline socio-demographic and academic characteristics of the enrolled students (Table 1).

Gifted education services and participation patterns

Among the enrolled students, the most common type of gifted education service received was acceleration, with 31.6% (n = 79) of students participating in accelerated learning programs. This was followed by enrichment programs, in which 26.4% (n = 66) of students were involved. Mentorship programs were utilized by 24.8% (n = 62) of students, while 17.2% (n = 43) of students received multiple forms of gifted education services (Table 2).

Regarding participation in gifted programs, students reported a mean participation frequency of 2.94 (SD = 1.37) on a Likert scale, indicating moderate engagement in these programs. Additionally, students rated the perceived effectiveness of gifted education programs with a mean score of 3.06 (SD = 1.46), suggesting a generally positive perception of these interventions in supporting their academic development (Table 2).

TABLE 2 Gifted education services and participation.

Variable	F (%)/Mean ± SD
Types of gifted education services received	
Acceleration	79 (31.6%)
Enrichment programs	66 (26.4%)
Mentorship	62 (24.8%)
Multiple services	43 (17.2%)
Frequency of participation in gifted programs	2.94 ± 1.37
Perceived effectiveness of gifted education programs	3.06 ± 1.46

F, frequency; M, mean; SD, standard deviation; GPA, grade point average.

Academic performance by socio-demographic variables

The results revealed significant differences in GPA based on gender, with male students (M = 86.94, SD = 8.55) having a higher GPA compared to female students (M = 84.03, SD = 8.41). This difference was statistically significant, $F(1, 248) = 7.35$, $p = 0.0072$, indicating that male students performed better academically in terms of GPA. However, no significant differences were found between males and females in standardized test scores, $F(1, 248) = 1.25$, $p = 0.2646$ (Table 3).

Regarding school region, students from urban schools had the highest GPA (M = 86.50, SD = 8.50), followed by rural students (M = 85.00, SD = 8.84) and suburban students (M = 84.13, SD = 8.44). Similarly, standardized test scores were highest among urban students (M = 80.79, SD = 12.00), compared to suburban (M = 79.42, SD = 12.12) and rural students (M = 77.58, SD = 12.12). However, these differences were not statistically significant for either GPA, F(2, 247) = 1.93, p = 0.1477, or standardized test scores, $F(2, 247) = 1.30$, $p = 0.2751$ (Table 3).

When comparing socioeconomic status, students from low-income backgrounds had the highest GPA (M = 86.79, SD = 8.92), followed by those from high-income (M = 84.73, SD = 8.53) and middle-income families (M = 84.67, SD = 8.30). In standardized test scores, middle-income students had the highest mean (M = 80.20, SD = 11.94), followed by high-income students (M = 79.58, SD = 11.92) and low-income students (M = 79.00, SD = 12.46). These differences were not statistically significant for GPA, $F(2, 247) = 1.69$, $p = 0.1858$, or standardized test scores, $F(2, 247) = 0.97$, $p = 0.4355$ (Table 3).

Finally, the analysis across grade levels showed slight variations in GPA, with the highest mean GPA observed among 10th-grade students (M = 86.51, SD = 8.14), followed closely by 9th-grade students (M = 86.60, SD = 7.54), 12th-grade students (M = 86.16, SD = 7.87), and 11th-grade students (M = 85.18, SD = 8.80). The lowest GPA was among 8th-grade students (M = 82.89, SD = 9.47). Standardized test scores were highest in 12th grade (M = 82.44,

TABLE 3 Academic performance differences by socio-demographic variables.

Socio-demographic variable	GPA (Mean ± SD)	Standardized test scores (Mean ± SD)	*F*-value	*P*-value
Gender				
Female	84.03 ± 8.41	78.86 ± 11.55	7.35	0.0072
Male	86.94 ± 8.55	80.57 ± 12.64		
School region				
Rural	85.00 ± 8.84	77.58 ± 12.12	1.93	0.1477
Suburban	84.13 ± 8.44	79.42 ± 12.12		
Urban	86.50 ± 8.50	80.79 ± 12.00		
Socioeconomic status				
High	84.73 ± 8.53	79.58 ± 11.92	1.69	0.1858
Low	86.79 ± 8.92	79.00 ± 12.46		
Middle	84.67 ± 8.30	80.20 ± 11.94		
Grade level				
10th	86.51 ± 8.14	77.85 ± 12.70	0.97	0.4355
11th	85.18 ± 8.80	80.15 ± 11.80		
12th	86.16 ± 7.87	82.44 ± 12.97		
7th	85.27 ± 9.13	79.87 ± 12.27		
8th	82.89 ± 9.47	79.11 ± 11.68		
9th	86.60 ± 7.54	78.93 ± 11.48		

SD = 12.97) and lowest in 10th grade (M = 77.85, SD = 12.70). However, differences in GPA [$F(5, 244) = 0.97$, $p = 0.4355$] and standardized test scores [$F(5, 244) = 0.85$, $p = 0.5196$] were not statistically significant (Table 3).

Overall, the findings suggest that gender had a significant impact on GPA, favoring male students, whereas school region, socioeconomic status, and grade level did not yield statistically significant differences in either GPA or standardized test performance.

Predictors of academic success: regression analysis

A multiple linear regression analysis was conducted to examine the effect of gifted identification age, type of gifted education, and participation frequency on academic success (measured by GPA). The overall model was not statistically significant, $F(3, 246) = 0.53$, $p = 0.6628$, explaining only 0.6% of the variance in academic success ($R^2 = 0.006$, Adjusted $R^2 = -0.006$).

The intercept of the model was $\beta = 83.613$, SE = 1.598, $t(246) = 52.33$, $p < 0.001$, indicating that, on average, students had a baseline GPA of 83.61 when all predictor variables were at zero. Gifted identification age was not a significant predictor of academic success [$\beta = 0.397$, SE = 0.447, $t(246) = 0.89$, $p = 0.3753$], suggesting that the age at which students were identified as gifted did not have a meaningful impact on GPA. Similarly, type of gifted education received was not significantly associated with academic success [$\beta = 0.320$, SE = 0.506, $t(246) = 0.63$, $p = 0.5276$], indicating that different types of gifted education services (e.g., acceleration, enrichment, mentorship) did not significantly predict GPA outcomes.

Additionally, participation frequency in gifted programs showed no significant effect on GPA [$\beta = 0.237$, SE = 0.400, $t(246) = 0.59$, $p = 0.5532$], suggesting that higher participation in gifted education programs did not correspond to notable differences in academic performance. The 95% confidence intervals for all predictors included zero, further confirming the absence of statistically significant effects.

Table 4 presents the results of the multiple regression analysis examining the predictive power of gifted identification age, type of gifted education, and participation frequency on students' GPA. None of the predictors demonstrated statistical significance, as all p-values exceeded the 0.05 threshold. Additionally, the confidence intervals for all predictors included zero, reinforcing the conclusion that these factors do not meaningfully influence academic performance in this context.

Table 5 provides the overall model summary. The model accounted for only 0.6% of the variance in GPA ($R^2 = 0.006$), with an adjusted R^2 of –0.006, indicating negligible explanatory power. The non-significant F-statistic ($F = 0.53$, $p = 0.6628$) further confirms that the independent variables included in the model did not collectively predict academic success among the sampled students.

Discussion

This study aimed to investigate the extent to which early giftedness identification, participation in gifted education programs, and socio-demographic characteristics influence academic success among students in King Abdullah II Schools for Excellence. The findings offer nuanced insights that partially support and, in some cases, challenge prior assumptions about

TABLE 4 Summary of regression analysis predicting academic success regression coefficients.

Predictor	Coefficient (β)	Standard error	*t*-value	*P*-value	95% CI Lower	95% CI upper
Intercept	83.613	1.598	52.33	0.0	80.466	86.761
Gifted identification age	0.397	0.447	0.89	0.3753	−0.483	1.276
Gifted education type	0.32	0.506	0.63	0.5276	−0.677	1.317
Participation frequency	0.237	0.4	0.59	0.5532	−0.55	1.025

TABLE 5 Model summary.

Statistic	Value
R-squared	0.006
Adjusted R-squared	−0.006
F-statistic	0.53
p-value (F)	0.6628

predictors of long-term academic achievement. A central objective of the study was to examine whether gender, as a socio-demographic variable, has an impact on academic outcomes. The results revealed that gender significantly predicted GPA, with male students outperforming their female peers. This finding is consistent with previous research by Bernstein et al. (2021), who found that gender-based performance differences among gifted students, particularly in STEM-related domains, can be linked to motivational and learning style differences. Interestingly, standardized test performance did not vary significantly by gender, suggesting that GPA may be more sensitive to school-based factors or assessment styles.

Another objective of this study was to evaluate whether school region, socioeconomic status, or grade level influenced academic success. The findings indicated no statistically significant differences in GPA or standardized test scores based on these demographic variables. Although urban students had marginally higher academic outcomes, these trends were not significant, possibly due to the uniform provision of resources across the King Abdullah II Schools for Excellence. This finding contrasts with Ricciardi et al. (2020), who highlighted disparities in gifted education access as barriers to success in low-resource settings. The relative equity of resources within the study's context may have minimized the impact of environmental variables, allowing individual factors like motivation and self-regulation to play a greater role.

A third objective centered on the age of giftedness identification and its predictive value for academic success. Contrary to expectations and the findings of Figlio et al. (2019), our results showed that earlier identification did not significantly affect GPA or standardized test scores. This suggests that identification alone is insufficient unless accompanied by sustained, high-quality educational support. Ridgley et al. (2020) similarly argued that the benefits of early identification depend on the extent to which students receive ongoing, personalized instruction that meets their cognitive needs. Therefore, even if identified early, students who lack enrichment opportunities may not realize the anticipated academic advantages.

Furthermore, the frequency of participation in gifted education programs was explored as a predictor of academic success, but no significant relationship was found. This indicates that the number of times a student participates may be less important than the structure and content of the program itself. Wai and Benbow (2021) and Tibken et al. (2022) emphasize the importance of aligning educational strategies with the cognitive and metacognitive profiles of gifted students. Participation alone, without targeted instruction that promotes metacognitive awareness, may fail to produce measurable academic gains.

In addressing the study's fourth objective—evaluating the effect of the type of gifted education (acceleration, enrichment, mentoring) on academic performance—the analysis showed no significant impact. This finding challenges conventional assumptions that acceleration or enrichment automatically lead to improved outcomes. Instead, as Bildiren and Kargın (2019) noted, project-based and inquiry-driven learning approaches may better foster the problem-solving and critical thinking skills that are essential for long-term achievement. Similarly, Chen and Wu (2021) highlighted the role of self-regulated learning in determining the efficacy of gifted education programs. It is plausible that program quality, implementation fidelity, and student engagement mediate the relationship between program type and academic results.

Students' perceptions of the effectiveness of gifted programs—while moderately positive—did not translate into significant performance differences. The mean perception score of 3.06 suggests a neutral to mildly favorable view, but prior literature cautions against relying solely on perception as an indicator of program success. Ozkan and Kettler (2022) showed that measurable academic and socio-emotional improvements were only evident when gifted students were actively engaged in self-directed learning tasks. This underscores the need for gifted programs to move beyond structure and participation metrics to focus on learner agency and instructional depth.

Recent research underscores the persistent inequities in the identification of gifted students, particularly among minority populations. Chenier (2024) argues that the current identification processes often marginalize gifted students from underrepresented backgrounds, resulting in systemic under-identification. This concern is echoed by Peters et al. (2024), who found that teacher perceptions and training play a significant role in equitable gifted identification, particularly for Black and Hispanic students. Integrating culturally responsive frameworks and positive psychology principles—such as those proposed by Mo et al. (2024)—may facilitate a more holistic and inclusive approach to identifying talent. These findings align with the broader concern raised in this study, which suggests that age of identification and program type alone are insufficient predictors of academic success. Rather, equitable identification processes and culturally competent educational strategies are critical to ensuring that high-potential students are not overlooked due to biases embedded in traditional assessment tools.

Furthermore, the psychological wellbeing and stress levels of gifted students warrant greater consideration in discussions about program effectiveness. Helsper et al. (2025) emphasize that students in high-performing academic settings often face heightened stress and vulnerability due to constant performance pressure. This insight is particularly relevant given the study's findings that program participation frequency and type did not significantly predict GPA, suggesting that the emotional and cognitive environments in which students learn may carry more weight than structural program elements. Ford and Moore (2024) advocate for specialized training for educators of gifted students, emphasizing that effective instruction in this domain requires an understanding of identity, cultural context, and psychological support mechanisms. These perspectives suggest that future interventions should be tailored not only to cognitive strengths but also to emotional resilience and student wellbeing.

Taken together, these findings suggest that while gender differences in GPA are noteworthy, other variables—such as age of identification, program participation, and socio-demographics—did not significantly influence academic performance. This outcome aligns with Long (2022), who argued that achieving equity in gifted education requires personalized interventions that address learners' psychological and academic development rather than mere access to standardized programs. The study emphasizes that predictors of academic success are multifactorial, with internal attributes like motivation and self-regulation playing a more prominent role than structural variables alone.

To sum up, this study contributes to a deeper understanding of the complex interactions between early identification, gifted education experiences, and academic achievement. While traditional markers such as early identification or program frequency may have limited predictive power on their own, their effectiveness appears to depend heavily on the quality of implementation and individual learner characteristics. These findings support Papadopoulos (2020), who advocated for integrating cognitive and socio-emotional development into gifted education design. Future research should further explore how instructional models, learner engagement, and non-cognitive skills collectively shape long-term academic trajectories for gifted students.

This study has several limitations that should be considered when interpreting the findings. First, the use of convenience sampling may introduce selection bias and limit the generalizability of the results beyond King Abdullah II Schools for Excellence, which cater to high-achieving students in well-resourced environments. Second, there was a demographic imbalance, with urban students making up 46% of the sample compared to only 20.8% from rural areas. This reflects the geographic distribution of the participating schools, which are predominantly situated in urban and suburban areas, potentially limiting insights into the experiences of rural gifted students. Third, some of the key data—including GPA and perceptions of program effectiveness—were collected through self-reported questionnaires. Although the instrument was reviewed by experts and pilot-tested for clarity, self-reported measures are inherently susceptible to recall bias and subjectivity. Fourth, the cross-sectional design restricts the ability to establish causal relationships between early gifted identification and academic outcomes. Fifth, the regression model produced a low explained variance (R^2 = 0.006), indicating that other influential variables—such as teacher quality, parental involvement, cognitive ability, or motivational factors—were not included in the analysis. Sixth, although self-regulated learning (SRL) was discussed as a critical factor in academic success, it was not directly measured in this study. Seventh, while equity in gifted education was highlighted as an important theme, the study's focus on elite institutions may unintentionally exclude the perspectives of marginalized or underserved gifted students. Future research should adopt longitudinal designs, utilize stratified random sampling across diverse educational contexts, include objective academic data, directly assess SRL, and incorporate a broader set of predictors to enhance explanatory power, inclusivity, and external validity.

Conclusion

The effects of early gifted identification, involvement in gifted education programs, and socioeconomic elements on academic performance among students in King Abdullah II Schools for Excellence were investigated in this paper. While school region, socioeconomic level, grade level, gifted identification age, and involvement in gifted programs showed no significant impacts, gender was the sole significant predictor of GPA; male students outperformed female students. Furthermore, the kind of gifted education service one received—acceleration, enrichment, or mentoring—did not much affect academic performance, implying that program quality and student involvement rather than simple participation may be more important for the success of gifted education. These findings complement other studies stressing the part metacognitive skills, self-regulation, and motivation play in determining long-term academic performance among gifted students. The study emphasizes the need of more specialized and intellectually stimulating treatments to maximize the potential of outstanding students. Future studies should look at how individualized learning strategies, non-cognitive capabilities, and instructional methodologies combine with gifted education to create significant academic results.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Institutional Review Board at Al-Balqa Applied University. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

HS: Supervision, Resources, Investigation, Software, Visualization, Conceptualization, Funding acquisition, Writing – review and editing, Validation, Formal Analysis, Methodology, Project administration, Writing – original draft, Data curation.

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