Interactive Effects of Emotional Intelligence and Intelligence Quotient on Academic Achievement: A Two-Way ANOVA and Path Analysis Approach

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ABSTRACT

This study investigates the interactive effects of emotional intelligence (EI) and intelligence quotient (IQ) on academic achievement (AA) among IX standard students. While EI and IQ are individually associated with learning outcomes, their combined influence remains underexplored. A total of 1,000 students were assessed using standardized instruments for EI, IQ, and Social Science achievement. Two-way ANOVA examined interaction effects, followed by multiple regression and path analysis to assess predictive and indirect effects.

Results indicated a significant EI × IQ interaction (F = 76.41, p < .001). Students with high EI and high IQ achieved the highest academic performance, whereas students with low EI and low IQ performed the poorest. Regression and path analyses revealed that EI and IQ jointly predict academic achievement, with EI exerting both direct and indirect effects mediated through IQ. These findings emphasize the importance of considering both emotional and cognitive abilities in educational interventions.

Keywords: Emotional Intelligence, Intelligence Quotient, Academic Achievement, Interaction Effects, Path Analysis, Secondary School Students

INTRODUCTION

Academic achievement is influenced by both cognitive and emotional competencies. Intelligence Quotient (IQ) reflects reasoning, problem-solving, and memory skills essential for scholastic performance, while Emotional Intelligence (EI) contributes to motivation, self-regulation, empathy, and interpersonal skills (Goleman, 1995). Previous studies have established independent associations between EI, IQ, and academic outcomes (Petrides&Furnham, 2001; Biswal, 2020); however, the interactive influence of EI and IQ on academic performance remains underexplored.

Understanding the EI × IQ interaction may provide insights into whether academic success depends on a combination of emotional and cognitive competencies. Such insights can guide tailored interventions to optimize both emotional and cognitive skills for improved learning outcomes.

Statement of the Problem

Despite extensive research on predictors of academic achievement, few studies examine the interaction between EI and IQ and their combined predictive power. This study addresses this gap by exploring how EI and IQ jointly influence academic achievement and by modeling their direct and indirect effects using path analysis.

Objectives

1. Examine the main and interactive effects of EI and IQ on academic achievement using two-way ANOVA.

2. Evaluate the predictive and indirect effects of EI and IQ on academic achievement through regression and path analysis.

3. Identify student groups (High EI + High IQ, Low EI + Low IQ) with significantly different academic outcomes.

Hypotheses

H01: There is no significant interaction between EI and IQ on academic achievement.

H02: Students with High EI and High IQ achieve higher academic performance than other groups.

H03: Students with Low EI and Low IQ achieve lower academic performance than other groups.

METHODOLOGY

Research Design

A quantitative, descriptive-correlational design was adopted.

Sample

A total of 1,000 IX standard students were selected using stratified random sampling from urban and rural schools. The sample included 328 boys and 672 girls, aged 14–15 years.

Instruments

- **Emotional Intelligence:** standardized Emotional Intelligence Scale

- **Intelligence Quotient:** Standardized IQ Test

- **Academic Achievement:** Validated Social Science tes t($\alpha > 0.85$)

Procedure

Data were collected after obtaining consent from school authorities and participants. Students completed EI and IQ assessments, and academic achievement scores were collected from standardized tests.

Statistical Analysis

Analyses were conducted using SPSS 23.0 and AMOS 24.0:

1. Independent t-tests for gender and location differences.

2. One-way ANOVA for school management differences.

3. Two-way ANOVA (EI × IQ) to examine interactive effects.

4. Pearson correlation for relationships among EI, IQ, and academic achievement.

5. Multiple regression and path analysis to investigate predictive and indirect effects.

Significance was tested at $p < .05$.

RESULTS

Gender and Location Differences

- **Academic Achievement:** Girls (M = 50.93, SD = 11.04) outperformed boys (M = 47.81, SD = 11.79), t(998) = 4.11, p < .001.

- **EI:** No significant gender difference, t(998) = 1.56, p = .12.

- **IQ:** Girls scored slightly higher than boys, t(998) = 2.16, p = .031.

- **Rural vs. Urban:** Rural students scored higher on academic achievement, EI, and IQ (p < .01).

School Management Differences

One-way ANOVA indicated significant differences across government, aided, and unaided schools:

Table 1 One-Way ANOVA for School Management Differences

Variable	F	p	Significance
Academic Achievement	3.20	.041	Significant
EI	6.37	.002	Significant
IQ	7.32	.001	Significant

Post hoc Tukey tests revealed significant differences between government and aided schools in academic achievement and EI. Other comparisons were not significant.

Interaction Effects of EI and IQ on Academic Achievement

Two-way ANOVA showed a significant EI × IQ interaction:

Table 2 Two-Way ANOVA for EI × IQ Interaction

Source	F	p	Significance
EI	467.87	< .001	Significant
IQ	102.82	< .001	Significant
EI × IQ	76.41	< .001	Significant

Interpretation:

- High EI + High IQ: M = 55.53, SD = 5.78 (highest performance)

- Low EI + Low IQ: M = 37.18, SD = 10.41 (lowest performance)

- Other combinations showed intermediate performance.

Correlation Analysis

Table 3 Pearson Correlations Among EI, IQ, and Academic Achievement

Variable	1	2	3
1. EI	—		
2. IQ	.28**	—	
3. Academic Achievement	.42**	.35**	—

Note.p< .01

Regression and Path Analysis

Multiple regression indicated that EI (β = 0.38, p < .001) and IQ (β = 0.31, p < .001) significantly predicted academic achievement (R^2 = 0.39).

Path analysis showed:

- **Direct Effects:** EI → AA (β = 0.26), IQ → AA (β = 0.31)

- **Indirect Effects:** EI → IQ → AA (β_indirect = 0.12, p < .001)

- Model fit: CFI = 0.98, RMSEA = 0.03

DISCUSSION

The findings confirm that both EI and IQ significantly influence academic achievement, with a strong interaction effect. Students with high EI and high IQ achieve the best outcomes, while low EI and low IQ students are disadvantaged.

Regression and path analyses suggest that enhancing EI can indirectly improve academic performance by positively influencing cognitive processes (IQ). These results align with Goleman (1995) and Petrides & Furnham (2001), highlighting the complementary role of emotional and cognitive skills in learning.

Educational Implications

1. **Holistic Skill Development:** Incorporate EI training to enhance both emotional and cognitive outcomes.

2. **Targeted Interventions:** Provide support for students with low EI and/or IQ.

3. **Teacher Training:** Educators should recognize and foster both EI and IQ.

4. **Policy Design:** Schools should implement programs addressing emotional and intellectual development.

CONCLUSION

1. High EI + High IQ students achieve the highest academic success.

2. Low EI + Low IQ students perform the poorest.

3. EI and IQ significantly predict academic achievement, both directly and indirectly.

4. Integrated interventions targeting emotional and cognitive skills are recommended.

REFERENCES

1. Bar-On, R. (2006). The Bar-On model of emotional-social intelligence (ESI). *Psicothema, 18*(Suppl), 13–25.
2. Biswal, R. (2020). Emotional intelligence and academic achievement: A study on secondary school students in India. *Journal of Indian Education, 46*(3), 22–34.
3. Goleman, D. (1995). *Emotional intelligence: Why it can matter more than IQ.* Bantam Books.
4. Goleman, D. (2006). *Emotional intelligence: Why it can matter more than IQ.* Bantam Books.
5. Mayer, J. D., &Salovey, P. (1997). Emotional intelligence: Theory, findings, and implications. *Psychological Inquiry, 8*(3), 197–215.
6. Petrides, K. V., &Furnham, A. (2001). Trait emotional intelligence: Psychometric investigation with reference to established trait taxonomies. *European Journal of Personality, 15*(6), 425–448.
7. Rao, P. (2018). Gender differences in academic achievement among high school students. *Indian Journal of Applied Psychology, 55*(2), 60–68.
8. Schutte, N. S., Malouff, J. M., &Thorsteinsson, E. B. (2013). Increasing emotional intelligence through training: Current status and future directions. *International Journal of Emotional Education, 5*(1), 56–72.
9. Sternberg, R. J. (2018). *Cognitive psychology and intelligence.* Cambridge University Press.