

# The Relationship between Cognitive and Emotional Intelligence and High School Academic Achievement

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## ABSTRACT

*The study investigated the relationship between intelligence, emotional intelligence and academic achievement in high school. The study was conducted within the standardization of two instruments for Croatian samples. A total of 369 high school students from the Republic of Croatia participated in the study. They completed the Naglieri Nonverbal Ability Test (NNAT) – a test of cognitive intelligence and the BarOn Emotional Quotient Inventory: Youth Version (EQ-i:YV). Academic achievement criteria were general school achievement, Croatian language and mathematics. Several regression analyses were conducted on the results. The results show that cognitive intelligence and the adaptability scale to be consistent predictors of academic achievement. Emotional intelligence was not shown to be a significant predictor of school success.*

**Key words:** *intelligence, IQ, emotional intelligence, EI, school success*

## Introduction

Academic achievement, measured by the mean of all school grades, is connected with many domains of life success and well-being during adolescence and adulthood<sup>1</sup>. It directly influences vocational choices, which, in turn, affect a person's life. High average grades are associated with better employment opportunities<sup>2</sup>. However, some studies have shown that high grades in University are a poor predictor of scientific productivity.

Research on the relationship of intelligence and school success generally yield the same results where the correlation between intelligence and school success is 0.5 in elementary school, falling to approximately 0.2 in high school<sup>3,4</sup>. Intelligence tests highly saturated with the g-factor are the best predictors of academic achievement<sup>4</sup>.

Due to the increasing significance of school success, it comes as no surprise that researchers have focused on other potential predictors of academic achievement in elementary and high schools in the last few decades, including socio-economic status<sup>5</sup>, personality<sup>4</sup> and emotional intelligence<sup>6</sup>. The research was also carried out on University students, where a significant relationship between intelligence and personality and average grades was determined<sup>7</sup>, despite the fact that some studies have sug-

gested that University grades are not a good predictor of scientific proliferation during their careers<sup>9</sup>. Socio-economic status has been confirmed as a significant predictor of academic success in several studies<sup>5,9</sup>. An interest in emotional intelligence (EI) as an influence on academic success emerged in the last two and a half decades, following the publication of Daniel Goleman's book *Emotional Intelligence*. Several studies confirmed the relationship between EI and school success<sup>9,10</sup>. A study conducted by Downey et al<sup>11</sup> on 209 Australian adolescents, determined that emotional intelligence is related to mathematics, the natural sciences, art and geography. Another study conducted by Canadian researchers<sup>10</sup> explained 8-10% of variance in grades of first year university students through EI.

A longitudinal study by Parker et al.<sup>12</sup> followed the transition of students from high school to university and determined that EI dimensions were predictors of academic achievement. The BarOn EI model was used, consisting of four abilities: Intrapersonal Abilities, Interpersonal Abilities, Adaptability and Stress Management. The students were divided into two groups, one more successful and the other less successful, which was determined by their average grades. The group of more successful students had significantly better results on several dimen-

sions, Intrapersonal Abilities, Adaptability and Stress Management.

The aim of this study was to determine the predictability of cognitive intelligence and emotional intelligence for the criteria variable – school grades and to supplement existing results in this field. Cognitive intelligence was operationalized by the NNAT results, while emotional intelligence was operationalized by scales from the BarOn Emotional Quotient Inventory: Youth Version. We propose, based on previous research, that cognitive intelligence and measures of emotional intelligence: Intrapersonal Abilities, Adaptability and Stress Management would be significant predictors.

## Methods

### Subjects

The sample consisted of 369 students (152 males and 217 females) from high schools in Croatia. They completed the BarOn Emotional Quotient Inventory: Youth Version – BarOn EQ-i:YV<sup>13</sup> and the NNAT<sup>14</sup> levels F or G, depending on age. The age of the participants ranged from 14 to 18 years ( $\bar{X}=16.52$ ;  $SD=1.08$ ).

### Procedure

The study was conducted within the Croatian standardization of the NNAT and the BarOn Emotional Quotient Inventory: Youth Version. All students were required to provide parental consent forms. The participants completed both instruments during two school periods. The grades used in the study were the average grades for the first semester and the final grades for Croatian and mathematics.

### Instruments

#### BarOn EQ-i:YV

The BarOn Emotional Quotient Inventory: Youth Version<sup>13</sup> is a self-report measure consisting of 60 items, lasting about 15 minutes. It is intended for children and adolescents aged 7 to 18. The BarOn EQ-i:YV is based on BarOn's model of emotional and social intelligence, which makes up the theoretical basis of the BarOn Emotional Quotient Inventory (EQ-I, Bar-On, 1997), the most widely used emotional intelligence measure for adults. According to the BarOn model, emotional intelligence refers to the emotional, personal and social dimensions of intelligence. Emotional intelligence includes the ability to understand the self and others, relationships with other people, to adapt to environmental demands and manage emotions. The BarOn EQ-i: YV consists of 60 items distributed into 7 scales. These are: Interpersonal, Intrapersonal, Adaptability, Stress Management, General Mood, Positive Impression and overall Emotional Intelligence. This instrument contains an additional scale measuring the consistency of replies (Inconsistency Index) which

identifies random replies. The scale reliability is between 0.73 for the Interpersonal scale to 0.90 for General Mood.

#### NNAT

The Naglieri Nonverbal Ability Test (NNAT<sup>14</sup>) is a short, culturally independent nonverbal measure of school capability. The NNAT is based on a testing method (i.e. illustrated matrices) supported by over half a century of testing. It is suitable as a measure of general abilities and as a predictor of school success of children of all ages. It can be used for the identification of children whose poor nonverbal reasoning can suggest potential problems in school as well as the identification of talented students with highly developed reasoning and problem solving abilities. The NNAT is suitable for students from various cultures, speaking different languages as well as for students with poor school success due to a lack of Croatian language skills and for those learning the language. The NNAT assesses those students coming from socially or economically neglected settings.

The NNAT is organized into seven levels (A, B, C, D, E, F and G) which are aimed at children from kindergarten age to year 12. Each level contains 38 items carefully chosen for students in each grade or grades for which the level is intended. This study used level F for first year high school students and level G for the remaining three years. Reliability coefficients were calculated using the Kuder-Richardson formula #21 which are presented in the Manual and equal 0.82 for level F and 0.82 for level G.

### Statistical analysis

In order to determine the significance of the relationship between variables, Pearson correlation coefficients were calculated between all variables. This was followed by regression analysis in order to determine the predictability of cognitive and emotional intelligence for school success. In view of the fact that this study used results for participants of different ages, T-values were used for all statistical analyses in order to nullify the influence of age and gender on the results. The predictors were the NAI result (Naglieri Nonverbal Index, which is equivalent to the deviation IQ), the Interpersonal scale (EQ-i: YV), the Intrapersonal scale (EQ-i: YV), Adaptability (EQ-i: YV), Stress Management (EQ-i: YV) and total EQ-i (EQ-i: YV), while the criteria were average grades and final grades for Croatian and mathematics.

The level of significance was set at  $p < 0.05$ . The SPSS 20 programme package was used for data calculation.

## Results

Table 1. shows the arithmetic means, standard deviations and t-tests (according to gender) for all variables. Male participants in this sample achieved significantly higher results on cognitive intelligence measures ( $t=3.56$ ,  $p < 0.001$ ). Measures of emotional intelligence did not show differences between male and female participants.

**TABLE 1**  
DESCRIPTIVE STATISTICS FOR PREDICTOR VARIABLES, T-TEST FOR GENDER

Variable/scale	Male participants (N=152)		Female participants (N=217)		Differences	
	$\bar{X}$	SD	$\bar{X}$	SD	t	p
Intrapersonal	99.78	14.75	98.84	14.84	0.60	0.55
Interpersonal	99.63	13.37	99.56	14.75	0.05	0.96
Stress Management	101.24	14.97	99.59	14.83	1.05	0.29
Adaptability	99.34	13.91	99.15	14.60	0.13	0.90
Total EQ	100.03	14.40	98.79	14.57	0.80	0.42
General Mood	98.65	14.57	98.70	14.83	-0.03	0.98
Positive Impression	98.70	14.30	98.86	14.99	-0.10	0.92
NAI result	106.08	17.25	100.57	12.42	3.57	0.00

**TABLE 2**  
CORRELATIONS BETWEEN PREDICTOR AND CRITERIA VARIABLES

Variables/scales	1	2	3	4	5	6	7	8	9	10	11
1 Intrapersonal	–										
2 Interpersonal	0.24**	–									
3 Stress Management	0.08	0.11*	–								
4 Adaptability	0.12*	0.38**	0.18**	–							
5 Total EQ	0.69**	0.58**	0.58**	0.59**	–						
6 General mood	0.30**	0.35**	0.16**	0.41**	0.48**	–					
7 Positive Impression	0.18**	0.36**	0.25**	0.34**	0.41**	0.49**	–				
8 NNAT	-0.10	-0.02	0.19**	0.20**	0.10*	-0.01	-0.01	–			
9 Grade average	-0.13*	-0.08	0.06	0.20**	0.01	-0.03	-0.07	0.28**	–		
10 Croatian	-0.09	-0.06	0.07	0.22**	0.04	-0.01	0.01	0.25**	0.60**	–	
11 Mathematics	-0.15**	-0.10*	0.05	0.13*	-0.05	-0.06	-0.03	0.34**	0.65**	0.54**	–

\* p&lt;0.05

\*\* p&lt;0.01

**TABLE 3**  
RESULTS OF DEGREED REGRESSION ANALYSIS FOR THE CRITERIA OF GRADES FOR CROATIAN, MATHEMATICS AND GRADE AVERAGE

Criterion	Predictor	p of $\beta$	Multiple correlation coefficient	Corrected coefficient of multiple determination
Croatian	NNAT (0.20)	0.001	0.35	0.10
	Adaptability (0.49)	0.001		
Mathematics	NNAT (0.31)	0.001	0.40	0.14
	Adaptability (0.39)	0.01		
Grade average	NNAT (0.22)	0.001	0.38	0.12
	Adaptability (0.43)	0.001		

Table 2 presents the correlations between predictor and criteria variables. NNAT (cognitive intelligence) is related to all three measures of school success: the gen-

eral average ( $r=0.28$ ,  $p<0.01$ ), Croatian ( $r = 0.25$ ,  $p<0.01$ ) and most closely with mathematics ( $r = 0.34$ ,  $p<0.01$ ). The Adaptability scale is the only scale of emotional intelli-

gence related to all three measures of school success: general average ( $r = 0.20$ ,  $p < 0.01$ ), Croatian ( $r = 0.22$ ,  $p < 0.01$ ) and mathematics ( $r = 0.13$ ,  $p < 0.05$ ).

Further analysis of results included 3 simple regression analyses. The aim was to study the predictability of intelligence and EQ-i:YV scales for achievement in Croatian, mathematics and grade average. Namely, since the predictor variables are in mutually significant correlations, we wanted to determine which predictors have a significant independent role for success in individual measures of academic achievement. Table 3. presents regression analysis results for all three measures of school success.

The results of regression analyses in Table 3 show that Adaptability and intelligence are significant predictors of school success in all three cases. The Adaptability scale was shown to be the most significant predictor for grades in Croatian ( $\beta = 0.49$ ,  $p < 0.001$ ), mathematics ( $\beta = 0.39$ ,  $p < 0.01$ ) and grade average ( $\beta = 0.43$ ,  $p < 0.001$ ). The NNAT has proven a significant predictor for grades in Croatian ( $\beta = 0.20$ ,  $p < 0.001$ ), mathematics ( $\beta = 0.31$ ,  $p < 0.001$ ) and grade average ( $\beta = 0.22$ ,  $p < 0.001$ ). The regression analyses explained 10%, 14% and 12% for Croatian, Mathematics and Grade average respectively.

## Discussion

Cognitive intelligence has proven to be a significant predictor for all three measures of academic success in high school<sup>4</sup>. The highest level of explained variance was achieved for mathematics grades. This finding confirms the fact that mathematics is a subject with objective grading criteria, as opposed to other school subjects such as the mother tongue, where grading style and curriculum can differ from teacher to teacher.

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Of the scales in the EQ-i: YV, Adaptability was the only significant predictor of all three school success measures. According to the EQ-i: YV manual, a high result on the Adaptability scale is achieved by persons who are flexible, realistic, capable of recognizing and defining problems and efficient in seeking and applying solutions. It is obvious that persons who are adaptable are able to adapt to the school system.

The results also show that cognitive intelligence, operationalized by the NNAT, had a significant positive correlation with Stress Management scales (0.19) and Adaptability (0.20).

Unlike previous studies<sup>11,12</sup>, the total EQ, which is comprised of the Interpersonal and Intrapersonal scales, the Adaptability scale and the Stress Management scale, was not shown to be a significant predictor of any measure of school success used in this study. Earlier studies have also determined a significant connection between the Intrapersonal scale and school success<sup>10</sup>. However, the results of previous studies were not confirmed in the present investigation.

## Conclusion

This study examined the predictability of cognitive and emotional intelligence for academic achievement. The obtained results showed that emotional intelligence was not a predictor of school success in our sample. The only composite EQ-i:YV scale, Adaptability, was shown to be a significant predictor of the grade average and final grades for mathematics and Croatian in the first semester. Intelligence was shown to be significantly related to measures of academic achievement, which is in accordance with previous research showing the relationship between intelligence and academic achievement.

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## **POVEZANOST KOGNITIVNE I EMOCIONALNE INTELIGENCIJE SA ŠKOLSKIM USPJEHOM U SREDNJOJ ŠKOLI**

### **SAŽETAK**

U ovom istraživanju smo ispitali povezanost između inteligencije, emocionalne inteligencije i školskog postignuća u srednjoj školi. Istraživanje je bilo provedeno u sklopu standardizacije ova dva instrumenta na hrvatskim uzorcima. U ovom istraživanju sudjelovalo je ukupno 369 učenika srednjih škola u Republici Hrvatskoj. Ispitanici su ispunjavali Naglierijev test neverbalne sposobnosti (NNAT) – test kognitivne inteligencije te BarOnov inventar emocionalne inteligencije: verzija za mladež (EQ-i:YV). Kriteriji koje smo uzeli u obzir za uspjeh u školi su: opći školski uspjeh, hrvatski i matematika. Proveli smo više regresijskih analiza na rezultatima. Rezultati demonstriraju kognitivnu inteligenciju te ljestvicu prilagodljivosti kao konzistentne prediktore školskog uspjeha. EQ se nije pokazao kao značajan prediktor u predviđanju školskog uspjeha.