

# Norm Study of the Raven Standard Progressive Matrices Test in TRNC High School Students

## *Raven Standart Progresif Matrisler Testinin KKTC Lise Öğrencilerinde Norm Çalışması*

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### ABSTRACT

**Objective:** The purpose of this study is to determine the norm values of the Raven Standard Progressive Matrices Test (RSPM) for high school students aged 15-18 in the Turkish Republic of Northern Cyprus (TRNC).

**Method:** The research was conducted within the framework of a correlational survey model. The population consists of high school students residing in the TRNC. The sample consisted of 613 students from Lefkoşa Turkish High School, selected using quota sampling and aged between 15 and 18. During the data collection process, the "Socio-Demographic Information Form" was used to determine the participants' demographic characteristics, and RSPM was used to measure their cognitive levels.

**Results:** According to the research findings, students' RSPM scores did not show significant differences according to demographic variables. The average scores for the minimum wage income groups 1, 2, and 3 are 30.41, 30.94, and 30.57, respectively. The average scores based on the number of siblings ranged from 29.69 to 31.04. The averages based on age groups were close to each other (30.05-30.76). The scores based on the mother's education level ranged from 30.41 to 32.68, while those based on the father's education level ranged from 30.40 to 31.86.

**Conclusion:** The findings reveal that the demographic variables examined do not have a significant impact on cognitive performance. This suggests that cognitive abilities cannot be explained solely by socio-demographic characteristics. Future studies are recommended to develop multidimensional models that consider psychological, environmental, and neurological factors that may influence cognitive performance, as well as research designs supported by qualitative data.

**Keywords:** Raven Standard Progressive Matrices Test, TRNC, norm

### ÖZ

**Amaç:** Bu çalışmanın amacı, Raven Standart Progresif Matrisler Testi'nin (RSPM) 15-18 yaş arası Kuzey Kıbrıs Türk Cumhuriyeti (KKTC) lise öğrencileri için norm değerlerini belirlemektir.

**Yöntem:** Araştırma, ilişkisel tarama modeli çerçevesinde yürütülmüştür. Evreni KKTC'de ikamet eden lise öğrencileri oluşturmaktadır. Örneklem, kota örnekleme yöntemiyle seçilen ve 15-18 yaş aralığında yer alan 613 Lefkoşa Türk Lisesi öğrencisinden oluşmaktadır. Veri toplama sürecinde, katılımcıların demografik özelliklerini belirlemek amacıyla "Sosyo-Demografik Bilgi Formu" ve bilişsel düzeylerini ölçmek amacıyla RSPM kullanılmıştır.

**Bulgular:** Araştırma bulgularına göre, öğrencilerin RSPM puanları demografik değişkenlere göre anlamlı fark göstermemiştir. 1, 2 ve 3 asgari ücret gelir gruplarının puan ortalamaları sırasıyla 30,41; 30,94 ve 30,57'dir. Kardeş sayısına göre puan ortalamaları 29,69 ile 31,04 arasında değişmektedir. Yaş gruplarına göre ortalamalar birbirine yakındır (30,05-30,76). Anne eğitim düzeyine göre puanlar 30,41 ile 32,68 arasında, baba eğitim düzeyine göre ise 30,40 ile 31,86 arasında değişmektedir.

**Sonuç:** Elde edilen bulgular, incelenen demografik değişkenlerin bilişsel performans üzerinde anlamlı bir fark yaratmadığını ortaya koymaktadır. Bu durum, bilişsel yeteneklerin yalnızca sosyo-demografik özelliklerle sınırlı şekilde açıklanamayacağını düşündürmektedir. Gelecek çalışmalarda, bilişsel performans etkileyebilecek psikolojik, çevresel ve nörolojik etmenlerin de dikkate alındığı çok boyutlu modellerin geliştirilmesi ve niteliksel verilerle desteklenen araştırma desenlerinin kullanılması önerilmektedir.

**Anahtar sözcükler:** Raven Standart Progresif Matrisler Testi, KKTC, norm

## Introduction

Intelligence is one of the main focuses of psychological research aimed at measuring individuals' cognitive abilities (Sternberg 2017). One of the most widely used tools for assessing intelligence, the Raven Standard Progressive Matrices Test (RSPM), is recognized as a culture-independent measurement tool and plays an effective role in measuring abstract reasoning and problem-solving skills (Burgoyne et al. 2016). The test was developed by John C. Raven in 1938 and is still used today as a tool whose validity and reliability are supported by numerous studies (Raven 2000). The test demonstrates high validity and reliability, particularly in measuring abstract reasoning, pattern completion, and spatial logic skills (Langener et al. 2022). Updating norm studies is critical for the RSPM to provide valid results across different cultures and age groups (Mackintosh 2000). Since adolescence is a period of rapid development and change in cognitive functions, it is necessary to re-examine normative data for individuals aged 15-18 (Ferrer et al., 2009).

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The RSPM is one of the most widely used tests for measuring general intelligence (g factor) and has gained widespread international acceptance due to its structure, which is free from cultural and linguistic biases (Bors and Stokes 1998). However, determining the norm values of the test in different cultures and age groups is of great importance for the valid and reliable application of the test. Norm studies are necessary to understand how the test performs in a specific population and to evaluate individuals' cognitive abilities more accurately (Anastasi and Urbina 1997).

A review of the literature reveals that norm studies for the RSPM have been conducted in different countries and age groups. For example, norm studies conducted in the UK by Raven (2000) demonstrated the test's applicability across a wide age range. Similarly, norm studies conducted in Turkey have shown that the test is a valid and reliable tool for the local population (Karakas and Eski 1996). However, no comprehensive study has been found to determine the norm values of the RSPM specifically for the Turkish Republic of Northern Cyprus (TRNC). This deficiency creates a gap in the assessment of the cognitive abilities of high school students in the TRNC.

The TRNC is a region that stands out for its unique sociocultural structure and education system. Understanding the cognitive profiles of high school students in the TRNC is important for shaping education policies and developing individualized education strategies for students. In this context, determining the norm values of the RSPM for 15-18-year-old high school students in the TRNC will contribute significantly to both local and international literature. The aim of this study is to examine the norm study of the RSPM for high school students aged 15-18 in the TRNC.

In this study, it was investigated whether the RSPM levels of high school students aged 15-18 in the TRNC differ according to various socio-demographic variables. It has been observed whether RSPMs are affected by factors such as gender, age, grade level, parents' education level, household income, number of siblings and sibling status, birth order, difficulties encountered in life, history of neurological diseases in the individual or family, history of mental illness, history of serious illnesses, history of surgery, history of traffic accidents, history of traumatic events, and history of head trauma. Additionally, it was attempted to determine how RSPM norm values are shaped according to the variables of age, gender, and educational status. Since there are a limited number of norm studies in the literature for this age group, the findings contribute to the literature by providing a basis for comparison for future similar norm studies, as well as for the validity of the test.

H1: Students' RSPM levels show significant differences according to socio-demographic variables (gender, age, grade level, parental education status, household income, sibling status and number, birth order, health history, etc.).

H0: There are no significant differences between RSPM levels and socio-demographic variables.

## Method

In this study, quantitative data were collected to measure visual-spatial perception, visualization, category switching, working memory, reasoning, and general ability in high school students aged 15-18. This study was conducted based on the correlational survey model, one of the quantitative research methods. This model aims to examine the existence of relationships between multiple variables and how these variables interact with each other (Büyüköztürk et al. 2014).

## Sample

The population of the study consists of state high school students aged 15-18 studying in the TRNC. A quota sampling method was used to select the sample from this population. The Lefkoşa region was found to be suitable in terms of representation due to its population density and central location, and Lefkoşa Turkish High School was determined as the research area in this regard. Within the quota sampling framework, the number of students to be included in the sample was determined based on age and gender distributions.

In determining the participants to be included in the study, individuals residing in the TRNC, studying at Lefkoşa Turkish High School, aged between 15-18, who signed the informed voluntary consent form and fully completed the data collection scales were considered as the inclusion criteria. Some students were excluded from the study due to the following exclusion criteria: incompletely or invalidly filled out scale forms, not providing voluntary consent for participation, and being outside the target age range (15-18). -Of the 650 students studying at Lefkoşa Turkish High School in the TRNC, 13 students who incompletely or invalidly filled out the scale forms, 24 students who did not provide voluntary consent for participation, and those outside the 15-18 age range were

excluded from the study due to the exclusion criteria. For these reasons, a total of 37 participants were excluded from the study, and the analyses were conducted on 613 valid participants.

A power analysis was performed using the G\*Power 3.2.9.2 program to assess whether the sample size was statistically sufficient. In this analysis based on multiple regression analysis, the effect size was set to  $f^2 = 0.05$ , the significance level to  $\alpha = 0.05$ , and the power value ( $1-\beta$ ) to 0.95, resulting in a minimum sample size of 263. In this regard, the data collected from 613 participants provides a statistically sufficient and highly representative sample.

## Procedure

Ethical approval was obtained from the Near East University Ethics Committee on July 8, 2024, with the number YDÜ/SB/2024/1807, in order to conduct the research. Prior to the application, participants were provided with detailed information about the study, the principles of confidentiality and anonymity were explained, and it was emphasized that participation was entirely voluntary. Written consent was obtained from the participants. The questionnaire forms were administered in groups in the classroom environment. Researchers were present to provide necessary explanations and support in answering the questions to ensure that participants did not experience difficulty in understanding the questions. The questionnaire administration took approximately 45 minutes per class, and students were asked to provide complete and careful answers. Forms from participants who provided incomplete or inconsistent responses were excluded from evaluation. During the data collection process, care was taken to ensure the psychological and physical well-being of participants, and coordination with the school counseling service was maintained as needed. The data collection process lasted approximately two months (September-October 2024).

## Measures

In this study, the RSPM was used to collect participants' demographic information using the "Socio-Demographic Information Form."

### *Socio-Demographic Information Form*

The socio-demographic information form created by the researcher was used to collect information about individuals' gender, age, education levels, where and with whom they live, whether they have any psychological, neurological, or physical disorders, and whether they have suffered head trauma. The socio-demographic information form consists of a total of 18 questions, including 12 closed-ended and 6 open-ended questions.

### *Raven Standard Progressive Matrices Test (RSPM)*

The RSPM Test, which was first developed by Raven in 1936, was first published in 1938 (Cronbach 1970). The RSPM has been revised several times. One reason for this revision was to prevent negative consequences arising from individuals who had previously taken the test being able to learn others' responses and share them with others. Another reason was to increase the selectivity of the RSPM Test (Kaplan 2008). The RSPM, which has been adapted and used in many parts of the world, is a socioculturally neutral test designed to prevent negative effects on individuals from different cultures and socioeconomic backgrounds. In this way, students are given the opportunity to demonstrate their mental abilities without their cultural values being taken into account. The RSPM consists of 12 items, each labeled with the letters A, B, C, D, or E. The individual taking the test selects the missing piece from among 6 or 8 options in each pattern. The RSPM aims to measure different types of abilities (Çetinkaya 2007). The original version of the test consists of 5 sections, each containing 12 items. In the RSPM, which is administered individually to participants by the person administering the test, a score is given for each item. The total score is calculated by adding up the scores. The internal consistency coefficient of the original form of the test was found to be .89. Karakaş et al. (1996) administered the RSPM Test they developed to 59 participants at 4-week intervals. As a result of this application, the internal consistency coefficient of the scale was found to be .79. Each set contains items of increasing difficulty within itself (Zaaiman 2001). The reason for this is to provide the participant with practice from a working approach perspective. Each set is designed to require the participant to understand the relationships between meaningless shapes, identify appropriate shapes to complete the specified relationship pattern, and develop a logical analytical approach. This test is evaluated using five different sets and five separate tasks for each set; this variety is used to measure the participant's ability to comprehend valid principles and appropriate methods. Accordingly, the RSPM test requires the test taker to create different and new ways of thinking or adopt new working approaches. Many validity and reliability studies have been conducted on the RSPM test. As a result of these studies, it has been divided into five groups in percentage terms (Zaaiman 2001).

**Table 1. Normality tests of participants' Raven Standard Progressive Matrices (RSPM) Test scores**

|      | Kolmogorov-Smirnov |     |        | Skewness | Kurtosis |
|------|--------------------|-----|--------|----------|----------|
|      | Statistics         | sd  | p      |          |          |
| RSPM | 0.100              | 613 | 0.000* | -0.968   | 1.216    |

**Table 2. Distribution of participants according to their socio-demographic characteristics**

| Variable                        | Number (n) | Percentage (%) |
|---------------------------------|------------|----------------|
| Gender                          |            |                |
| Female                          | 320        | 52.20          |
| Male                            | 293        | 47.80          |
| Age                             |            |                |
| 15 years old                    | 158        | 25.77          |
| 16 years old                    | 149        | 24.31          |
| 17 years old                    | 160        | 26.10          |
| 18 years old                    | 146        | 23.82          |
| Grade                           |            |                |
| First                           | 154        | 25.12          |
| Second                          | 150        | 24.47          |
| Third                           | 148        | 24.14          |
| Fourth                          | 161        | 26.26          |
| Who they live together          |            |                |
| Family                          | 611        | 99.67          |
| Other                           | 2          | 0.33           |
| Mother's educational background |            |                |
| Uneducated                      | 30         | 4.89           |
| Elementary School               | 198        | 32.30          |
| Secondary School                | 122        | 19.90          |
| High school                     | 200        | 32.63          |
| University                      | 63         | 10.28          |
| Father's educational background |            |                |
| Uneducated                      | 28         | 4.57           |
| Elementary School               | 149        | 24.31          |
| Secondary School                | 151        | 24.63          |
| High school                     | 208        | 33.93          |
| University                      | 77         | 12.56          |
| Household income                |            |                |
| 1 minimum wage                  | 182        | 29.69          |
| 2 minimum wage                  | 300        | 48.94          |
| 3 minimum wage                  | 131        | 21.37          |
| Number of siblings              |            |                |
| Only child                      | 54         | 8.81           |
| One                             | 239        | 38.99          |
| Two                             | 196        | 31.97          |

## Statistical Analysis

The Statistical Package for Social Sciences (SPSS) 27.0 software was used to analyze the data in the study. The Cronbach's alpha coefficient calculated for the participants' RSPM Test responses was 0.849. The distribution of participants according to their sociodemographic characteristics was performed using frequency analyses, and descriptive statistics were provided for the RSPM.

In Table 1, the normality of the participants' RSPM test scores was evaluated using the Kolmogorov-Smirnov test and skewness-kurtosis values. The fact that the skewness and kurtosis values of the RSPM scores are within the  $\pm 1.5$  range indicates that the scores follow a normal distribution. Tabachnick and Fidell (2013) state that skewness and kurtosis values within the  $\pm 1.5$  range indicate that the data set follows a normal distribution. Since the RSPM scores conform to a normal distribution, parametric hypothesis tests were preferred in the study. In this context, the independent samples t-test was used for comparisons between two groups, ANOVA was used for comparisons between more than two groups, and the Tukey test was used for advanced analyses.

## Results

Table 2 shows the socio-demographic distribution of participants, with 52.2% being female and 47.8% male. Their ages range from 15 to 18, with the most common age being 17 (26.1%). In terms of grade level, 4th graders make up the largest group (26.26%). 99.67% of participants live with their families. Most mothers have an elementary school (32.30%) or high school (32.63%) education, while 33.93% of fathers have a high school education. 48.94% of household income is at the level of two minimum wages. Most participants have one sibling (38.99%) or two siblings (31.97%); 40.29% are the first child in their family.

**Table 3. Participants' Raven Standard Progressive Matrices Test scores by gender and age 1**

| Age          | Gender |           |      |      |           |      | Total |           |      |
|--------------|--------|-----------|------|------|-----------|------|-------|-----------|------|
|              | Female |           |      | Male |           |      |       |           |      |
|              | n      | $\bar{x}$ | s    | n    | $\bar{x}$ | s    | n     | $\bar{x}$ | s    |
| 15 years old | 84     | 30.81     | 7.25 | 74   | 30.53     | 6.63 | 158   | 30.68     | 6.95 |
| 16 years old | 77     | 31.43     | 6.83 | 72   | 30.04     | 6.93 | 149   | 30.76     | 6.89 |
| 17 years old | 77     | 30.43     | 8.08 | 83   | 30.34     | 7.82 | 160   | 30.38     | 7.92 |
| 18 years old | 82     | 29.99     | 6.84 | 64   | 32.17     | 7.43 | 146   | 30.95     | 7.16 |
| Total        | 320    | 30.66     | 7.25 | 293  | 30.71     | 7.24 | 613   | 30.68     | 7.24 |

Table 3 shows the RSPM scores of participants by gender and age. According to Table 3, female participants aged 15 scored an average of  $30.81 \pm 7.25$  points on the Raven Standard Progressive Matrices Test, those aged 16 scored  $31.43 \pm 6.83$  points, 17-year-olds scored  $30.43 \pm 8.08$  points, and 18-year-olds scored  $29.99 \pm 6.84$  points. When examining the Raven Standard Progressive Matrices Test scores of male participants, 15-year-olds scored  $30.53 \pm 6.93$  points, 16-year-olds scored  $30.04 \pm 6.93$  points, 17-year-olds scored  $30.34 \pm 7.82$  points, and 18-year-olds scored  $32.17 \pm 7.43$  points.

**Table 4. Comparison of Raven Standard Progressive Matrices Test scores according to participants' class, mother, and father education levels**

| Variable                        | n   | $\bar{x}$ | s    | Min | Max | F     | p     |
|---------------------------------|-----|-----------|------|-----|-----|-------|-------|
| Grade                           |     |           |      |     |     |       |       |
| First                           | 154 | 30.47     | 7.04 | 6   | 44  |       |       |
| Second                          | 150 | 30.96     | 6.98 | 7   | 45  |       |       |
| Third                           | 148 | 30.49     | 7.88 | 6   | 43  | 0.172 | 0.915 |
| Fourth                          | 161 | 30.81     | 7.09 | 8   | 45  |       |       |
| Mother's educational background |     |           |      |     |     |       |       |
| Uneducated                      | 30  | 30.33     | 6.28 | 16  | 39  |       |       |
| Elementary School               | 198 | 30.14     | 7.52 | 6   | 44  |       |       |
| Secondary School                | 122 | 30.69     | 7.01 | 8   | 42  | 1.504 | 0.200 |
| High school                     | 200 | 30.64     | 7.48 | 6   | 45  |       |       |
| University                      | 63  | 32.68     | 6.21 | 7   | 44  |       |       |
| Father's educational background |     |           |      |     |     |       |       |
| Uneducated                      | 28  | 31.86     | 6.4  | 17  | 45  |       |       |
| Elementary School               | 149 | 30.4      | 6.84 | 7   | 42  |       |       |
| Secondary School                | 151 | 30.44     | 7.75 | 6   | 44  | 0.330 | 0.858 |
| High school                     | 208 | 30.89     | 7.18 | 6   | 45  |       |       |
| University                      | 77  | 30.73     | 7.48 | 7   | 44  |       |       |

Table 4 presents the results of the ANOVA analysis conducted to compare RSPM scores according to participants' grades. According to the findings, there was no significant difference in RSPM scores based on the participants' grades ( $p > 0.05$ ). The results of the ANOVA analysis comparing RSPM test scores according to the participants' mothers' education levels are presented. The findings show that there is no statistically significant difference in RSPM scores based on the educational level of participants' mothers ( $p > 0.05$ ). When examining RSPM test scores based on the educational level of participants' fathers, there was no statistically significant difference between the father's educational status and RSPM scores. ( $p > 0.05$ ).

Table 5 shows the results of the ANOVA analysis conducted to compare RSPM scores according to participants' household income; no relationship was found between household income and RSPM scores ( $p > 0.05$ ). The results of the independent sample t-test conducted to compare RSPM scores according to the participants' sibling status revealed that there was no statistically significant difference between RSPM scores and whether or not they had siblings ( $p > 0.05$ ). It was found that the participants' RSPM scores did not differ according to the number of siblings ( $p > 0.05$ ).

The RSPM test scores of participants with a family history of neurological disease were similar ( $p > 0.05$ ). There

was no statistically significant difference in RSPM scores between participants who verbally expressed having a mental illness and those who did not ( $p>0.05$ ). There was no statistically significant difference in RSPM test scores based on whether participants had undergone surgery in the past ( $p>0.05$ ). There was no statistically significant difference in RSPM scores between participants who had been in a traffic accident and those who had not ( $p>0.05$ ). When examining RSPM test scores based on whether participants had experienced a traumatic event in the past, there was no statistically significant difference in RSPM scores between those who had experienced a traumatic event and those who had not ( $p>0.05$ ).

**Table 5. Comparison of Raven Standard Progressive Matrices Test scores according to participants' several other variables**

| Variable                                            | n   | $\bar{x}$ | s    | Min | Max | F/t    | p     |
|-----------------------------------------------------|-----|-----------|------|-----|-----|--------|-------|
| Household Income                                    |     |           |      |     |     |        |       |
| 1 minimum wage                                      | 182 | 30.41     | 7.3  | 7   | 45  | 0.204  | 0.816 |
| 2 minimum wage                                      | 300 | 30.84     | 7.57 | 6   | 45  |        |       |
| 3 minimum wage                                      | 131 | 30.71     | 6.37 | 8   | 44  |        |       |
| Having a sibling                                    |     |           |      |     |     |        |       |
| Yes                                                 | 559 | 30.78     | 7.32 | 6   | 45  | 1.062  | 0.289 |
| No                                                  | 54  | 29.69     | 6.35 | 7   | 39  |        |       |
| Number of siblings                                  |     |           |      |     |     |        |       |
| Only child                                          | 54  | 29.69     | 6.35 | 7   | 39  | 1.800  | 0.146 |
| One                                                 | 239 | 31.01     | 7.24 | 6   | 45  |        |       |
| Two                                                 | 196 | 31.24     | 6.69 | 6   | 44  |        |       |
| Three and more                                      | 124 | 29.61     | 8.29 | 7   | 43  |        |       |
| Having a family member with a neurological disorder |     |           |      |     |     |        |       |
| Yes                                                 | 35  | 29.8      | 7.56 | 11  | 44  | -0.743 | 0.457 |
| No                                                  | 578 | 30.74     | 7.22 | 6   | 45  |        |       |
| Having a mental illness                             |     |           |      |     |     |        |       |
| Yes                                                 | 48  | 31.56     | 6.12 | 17  | 41  | 0.876  | 0.381 |
| No                                                  | 565 | 30.61     | 7.32 | 6   | 45  |        |       |
| Previous surgery                                    |     |           |      |     |     |        |       |
| Yes                                                 | 105 | 31.06     | 7.5  | 7   | 45  | 0.581  | 0.562 |
| No                                                  | 508 | 30.61     | 7.19 | 6   | 45  |        |       |
| Previous traffic accident                           |     |           |      |     |     |        |       |
| Yes                                                 | 105 | 30.05     | 8.63 | 6   | 44  | -0.989 | 0.323 |
| No                                                  | 508 | 30.81     | 6.92 | 6   | 45  |        |       |
| Having experienced a traumatic event in the past    |     |           |      |     |     |        |       |
| Yes                                                 | 117 | 31.2      | 6.71 | 11  | 43  | 0.852  | 0.394 |
| No                                                  | 496 | 30.56     | 7.36 | 6   | 45  |        |       |

## Discussion

In this study, the suitability of the RSPM Test for norming was evaluated among high school students aged 15-18 in the TRNC. In this study conducted on high school students aged 15-18, it was found that RSPM scores did not vary across variables such as age distribution, gender, family characteristics, family education level, income, siblings, presence or absence of neurological or mental disorders, and previous surgery history.

No difference was found between RSPM scores according to the participants' grade levels. This situation shows that students' grade levels do not create a significant difference in their mental abilities. This finding is consistent with the existing literature, which suggests that students' cognitive performance does not vary according to their grade levels. Watkins (2010) found in his study that students' grade levels did not have a significant effect on RSPM performance. In another study by Deary and colleagues (2007), no significant relationship was found between students' grade levels and RSPM performance. In the study, no significant difference was found in RSPM scores based on participants' mothers' educational status. This finding suggests that maternal education does not have a significant effect on test performance. The findings are consistent with the existing literature. A meta-analysis study by Strenze (2007) found that the effect of parental education on children's cognitive abilities is limited. This study suggests that parental education does not have a direct effect on children's academic achievement and cognitive performance, but rather that socioeconomic and environmental factors are more decisive. Another study by Fergusson and colleagues (2005) found that parental

education has no significant effect on children's cognitive abilities. This finding indicates that individual differences and environmental factors play a more important role in children's cognitive development.

The research findings show no significant difference in RSPM scores based on the father's educational status. This suggests that the father's educational level does not have a decisive effect on the cognitive abilities of the participants. This finding is consistent with the existing literature, which suggests that parental education has a minimal or insignificant effect on children's cognitive performance (Fergusson et al. 2005, Strenze 2007). Another finding of the study was that there was no significant difference in RSPM scores based on household income. This finding suggests that family income does not affect individuals' cognitive performance and that socioeconomic status is not a decisive factor in mental abilities. In the literature, another study by Bradley and Corwyn (2002) found that socioeconomic status does not have a significant effect on children's cognitive abilities. This finding suggests that environmental factors and individual differences play a more important role in children's cognitive development than socioeconomic status.

The results of the study showed no significant difference in RSPM scores between participants based on their sibling status. This finding indicates that being an only child or having siblings does not create a difference in cognitive abilities. This finding is consistent with the existing literature examining the effect of sibling number on cognitive performance. A study conducted by Blake (1989) found that the number of siblings has a limited effect on children's academic and cognitive performance. Another study by Downey (2001) found that the number of siblings had no significant effect on children's cognitive development. This finding suggests that individual differences and environmental factors play a more important role in the development of children's cognitive abilities.

The research findings showed no significant difference in RSPM scores based on whether participants had a neurological disorder. This result indicates that neurological disorders do not have a significant effect on participants' test performance. Many studies emphasize that neurological disorders can affect cognitive performance, but this effect may vary from person to person. For example, neurological disorders such as Parkinson's disease, Alzheimer's disease, and other neurological diseases are associated with a decline in general cognitive abilities and, in particular, impairments in attention, memory, and executive functions (McKhann et al. 2011, Ding et al. 2015). However, some studies have found the effect of neurological diseases on intelligence tests to be less pronounced. Especially in individuals in the early stages of such diseases, cognitive functions may generally remain intact (Lichter et al. 1988).

No significant difference was found between the RSPM scores of participants with and without mental illness. This result suggests that mental illnesses do not create a significant difference in cognitive performance. However, the effects of mental illnesses on cognitive performance reflect a complex relationship, and previous studies on this topic have sometimes yielded conflicting results. Some studies have suggested that depression, anxiety, and other mental illnesses may negatively affect cognitive performance. For example, it is known that depression can have negative effects on cognitive functions, particularly attention, memory, and executive functions (Eaton et al. 2008, Rock et al. 2014). These disorders have been found to affect cognitive performance, particularly mental processing speed and problem-solving skills (Bagby et al. 2008). Additionally, no significant difference was found between RSPM scores based on whether participants had previously undergone surgery. This result indicates that surgical history does not affect participants' cognitive abilities and that surgery does not have a lasting effect on mental performance. The literature indicates that minor and routine surgeries generally do not cause long-term impairment in cognitive functions. For example, it has been reported that anesthetic effects may temporarily affect memory, attention, and processing speed in the short term, but these effects are mostly transient (Ritchie et al. 1997).

Within the scope of the study, no significant difference was found between participants' history of traffic accidents and their RSPM scores. This finding suggests that traffic accidents do not cause permanent impairment in cognitive functions and that participants' cognitive performance remains at similar levels regardless of such events. In the literature, traffic accidents, especially serious ones that may cause brain injuries, can lead to temporary or permanent changes in cognitive functions (Corrigan et al. 2023). Particularly in cases of traumatic brain injury, impairments in memory, attention, processing speed, and problem-solving abilities may be observed (Gosselin et al. 2012). However, it has been reported that cognitive impairments do not become permanent in individuals involved in less severe traffic accidents or those who undergo effective treatment following an accident, with cognitive performance typically returning to normal (McCrea et al. 2003). Therefore, these findings suggest that traffic accidents generally do not have permanent effects on cognitive performance, though temporary effects may be observed in some cases.

The study found no significant difference between participants' history of traumatic events and their RSPM scores. This finding suggests that traumatic experiences do not have a lasting effect on participants' cognitive abilities and that their mental performance remains at similar levels regardless of their history of trauma. Some studies have indicated that traumatic experiences may affect individuals' memory, attention, and decision-making abilities (Brewin et al. 2000). However, there are mixed results in the literature regarding whether cognitive impairments that develop after trauma are permanent. Some studies suggest that cognitive impairments following trauma can be improved through treatment and psychotherapy, and that such effects diminish over time (Bremner 2005). On the other hand, it has been shown that mild traumas generally do not have long-term effects on cognitive performance (Yehuda et al. 1995).

This study has some limitations. First, the study is limited to 613 individuals aged 15-18, and the findings are generalizable to this age group. Second, the data for the study are limited to the results obtained from the Socio-Demographic Information Form and RSPM; therefore, other psychometric measures that could affect cognitive performance were excluded from the evaluation. Additionally, due to the limited number of recent studies on the subject in the literature, the sources used in the study were not as up-to-date or diverse as desired. This situation limited the ability to compare the findings on a broader scale.

## Conclusion

In this study, a norm study was conducted on the RSPM administered to high school students aged 15-18 in the TRNC, and the effects of various socio-demographic variables on cognitive performance were examined. The findings revealed that numerous variables, including age, gender, grade level, parental education, family income, sibling status, history of neurological and mental health conditions, surgical history, traffic accidents, and traumatic life experiences, did not significantly impact RSPM performance. These results suggest that individuals' cognitive abilities are largely independent of the aforementioned socio-demographic and health-related variables and may be more closely linked to individual differences and environmental factors.

In this context, some recommendations can be made for future studies: First, it is important to include tests that measure different cognitive domains such as attention, memory, executive functions, and processing speed in addition to the RSPM test in order to evaluate cognitive performance from a broader perspective. Second, monitoring age-related cognitive changes using longitudinal designs will contribute to a deeper understanding of developmental processes. Third, conducting multi-center studies that include individuals from different regional and socio-cultural groups, rather than limiting the participant sample to high schools, will increase the generalizability of the norms obtained. Finally, the use of neuropsychological test batteries and clinical diagnostic criteria that can more sensitively reveal the cognitive effects of trauma, mental illness, and neurological disorders will enable more in-depth assessments in these areas.

This study provides an important normative basis for the assessment of cognitive performance in young individuals in the context of the TRNC and contributes to the fields of cognitive psychology, educational sciences, and psychometric assessment. Based on the research findings, it is recommended that a norm determination study be conducted for the Color Progressive Matrices (CPM) in the TRNC sample and that norms be developed for the Advanced Progressive Matrices (APM) test for gifted individuals. Since this study showed that different demographic and health conditions do not have a significant effect on RSPM results, establishing norms for CPM and APM in a similar manner will provide important contributions to the validity and reliability of these tests.

## References

- Anastasi A, Urbina S (1997) *Psychological Testing*, 7th ed. Upper Saddle River, NJ, Prentice Hall,
- Bagby RM, Psych C, Quilty LC, Ryder AC (2008) Personality and depression. *Can J Psychiatry*, 53:14-25.
- Blake J (1989) *Family Size and Achievement*. Berkeley, CA , University of California Press,.
- Bors DA, Stokes TL (1998) Raven's Advanced Progressive Matrices norms for first year university students and the development of a short form. *Educ Psychol Meas*, 58:382-398.
- Bradley RH, Corwyn RF (2002) Socioeconomic status and child development. *Annu Rev Psychol*, 53:371-399.
- Bremner JD (2005) Effects of traumatic stress on brain structure and function: relevance to early responses to trauma. *J Trauma Dissociation*, 6:51-68.
- Brewin CR, Andrews B, Valentine JD (2000) Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol*, 68:748-766.
- Burgoyne AP, Sala G, Gobet F, Macnamara BN, Campitelli G, Hambrick DZ (2016) The relationship between cognitive ability and chess skill: a comprehensive meta-analysis. *Intelligence*, 59:72-83.

- Büyüköztürk Ş, Çakmak EK, Akgün ÖE, Karadeniz Ş, Demirel F (2014) Bilimsel Araştırma Yöntemleri. Ankara, Pegem Akademi.
- Corrigan F, Wee IC, Collins-Praino LE (2023) Chronic motor performance following different traumatic brain injury severity: A systematic review. *Front Neurol*, 14:1180353.
- Cronbach JL (1970) *Essentials of Psychological Testing*. New York, NY, Harper.
- Çetinkaya Ç (2007) Raven'in İlerleyen Matrisler Plus Testi'nin 6,5–8 yaş çocukları üzerinde geçerlilik, güvenilirlik, ön norm çalışmaları ve motivasyon stilleri tespiti ile ilişkisinin incelenmesi (Yüksek lisans tezi). İstanbul, İstanbul Üniversitesi
- Deary IJ, Strand S, Smith P, Fernandes C (2007) Intelligence and educational achievement. *Intelligence*, 35:13–21.
- Ding W, Ding LJ, Li FF, Han Y, Mu L (2015) Neurodegeneration and cognition in Parkinson's disease: a review. *Eur Rev Med Pharmacol Sci*, 19:2275–2281.
- Downey DB (2001) Number of siblings and intellectual development: the resource dilution explanation. *Am Psychol*, 56:497–504.
- Eaton WW, Martins SS, Nestadt G, Bienvenu OJ, Clarke D, Alexandre P (2008) The burden of mental disorders. *Epidemiol Rev*, 30:1–14.
- Fergusson DM, Horwood LJ, Ridder EM (2005) Show me the child at seven: the consequences of conduct problems in childhood for psychosocial functioning in adulthood. *J Child Psychol Psychiatry*, 46:837–849.
- Ferrer E, O'Hare ED, Bunge SA (2009) Fluid reasoning and the developing brain. *Front Neurosci*, 3:46–51.
- Gosselin N, Bottari C, Chen JK, Huntgeburth SC, De Beaumont L, Petrides M et al. (2012) Evaluating the cognitive consequences of mild traumatic brain injury and concussion by using electrophysiology. *Neurosurg Focus*, 33:1–7.
- Kaplan A (2008) Raven'in İlerleyen Matrisler Plus Testinin 12–13 yaş çocukları üzerinde geçerlik, güvenilirlik ve ön norm çalışmalarına göre üstün zekalı olan ve olmayan öğrencilerin mantıksal düşünme yeteneklerinin karşılaştırılması. [Yayınlanmamış yüksek lisans tezi]. İstanbul Üniversitesi.
- Karakaş S, Eski R, Başar E (1996) Türk kültürü için standardizasyonu yapılmış nöropsikolojik testler topluluğu: BİLNOT bataryası. In: 32. Ulusal Nöroloji Kongresi Kitabı. s. 43–70. İstanbul, Türk Nöroloji Dergisi ve Bakırköy Ruh ve Sinir Hastalıkları Hastanesi. İstanbul.
- Langener AM, Kramer AW, van den Bos W, Huizenga HM (2022) A shortened version of Raven's standard progressive matrices for children and adolescents. *Br J Dev Psychol*, 40:35–45.
- Lichter DG, Corbett AJ, Fitzgibbon GM, Davidson OR, Hope JK, Goddard GV et al. (1988) Cognitive and motor dysfunction in Parkinson's disease. *Clin Perform Comput Tomogr Correlations*, 45:854–860.
- Mackintosh NJ (2000) *IQ and Human Intelligence*. Oxford, UK, Oxford University Press.
- McCrea M, Guskiewicz KM, Marshall SW, Barr W, Randolph C, Cantu RC et al. (2003) Acute effects and recovery time following concussion in collegiate football players: The NCAA Concussion Study. *JAMA*, 290:2556–2563.
- McKhann GM, Knopman DS, Chertkow H, Hyman BT, Jack CR, Kawas CH et al. (2011) The diagnosis of dementia due to Alzheimer's disease: Recommendations from the NIA-AA workgroups. *Alzheimers Dement*, 7:263–269.
- Raven J (2000) The Raven's Progressive Matrices: change and stability over culture and time. *Cogn Psychol*, 41:1–48.
- Raven J, Raven JC, Court JH (1998) *Manual for Raven's Progressive Matrices and Vocabulary Scales. Section 1: General Overview*. Oxford, UK, Oxford Psychologists Press.
- Raven JC (1989) The Raven Progressive Matrices: a review of national norming studies and ethnic and socioeconomic influences. *J Educ Meas*, 26:1–16.
- Ritchie K, Polge C, de Roquefeuil G, Djakovic M, Ledesert B (1997) Impact of anesthesia on the cognitive functioning of the elderly. *Int Psychogeriatr*, 9:309–326.
- Rock PL, Roiser JP, Riedel WJ, Blackwell AD (2014) Cognitive impairment in depression: a systematic review and meta-analysis. *Psychol Med*, 44:2029–2040.
- Sternberg RJ (2017) *Intelligence: A New Look*. Cambridge, UK, Cambridge University Press,.
- Strenze T (2007) Intelligence and socioeconomic success: A meta-analytic review of longitudinal research. *Intelligence*, 35:401–426.
- Watkins C (2010) Learning, performance and improvement. *INSI Research Matters*, 43:1–15.
- Yehuda R, McFarlane AC (1995) Conflict between current knowledge about posttraumatic stress disorder and its original conceptual basis. *Am J Psychiatry*, 152:1705–1711.
- Zaaiman HH (2001) Dynamic testing in selection for an educational programme: assessing South African performance on the Raven Progressive Matrices. *Int J Select Assess*, 9:258–269.

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