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Determinants of Grade Repetition in Spain. Analysis of Cognitive and Socio-Economic, Mediated by Ethnic Factors

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Abstract

Grade repetition is an issue with important educational implications. This study analyzes the effect of cognitive variables, socio-economic status, as well as the interaction of socio-economic status with ethnic origin, on the probability of not repeating. Data were collected to calculate socioeconomic status using the Hollingshead Socioeconomic Index, and the following tests were administered to collect information on cognitive variables: the Primary Mental Aptitude Test (PMA), the Raven's Progressive Matrices Test, and the Wechsler Intelligence for Children Information Scale (WISC IV). The sample consisted of 664 students of Compulsory Secondary Education (ESO), Baccalaureate and intermediate and higher vocational training. The results confirm the predictive power of socioeconomic status. With regard to cognitive variables, significant results were only obtained when the WISC-IV Information Scale was taken as a predictor, this measure being related to crystallized intelligence. The influence of the origin of the students did not yield significant results. There is a clear need for a debate and a rethinking of the issue leading to the identification of new strategies to reduce grade repetition and its negative effects.

Keywords

Grade repetition, crystallised intelligence, Hollingshead index, ethnic origin, WISC-IV.

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Determinantes de la Repetición de Curso en España. Análisis de los Factores Cognitivos y Socioeconómicos, Mediados por el Origen de los Estudiantes

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Resumen

La repetición de curso es una cuestión con importantes implicaciones educativas. El objetivo de este estudio es analizar el efecto de las variables cognitivas, el nivel socioeconómico, así como la interacción de éste con el origen, sobre la probabilidad de no repetir. Se recopilaron datos que permitieron calcular el nivel socioeconómico mediante el Índice socioeconómico de Hollingshead, y se administraron las siguientes pruebas para recoger información sobre las variables cognitivas: el Test de Aptitudes Mentales Primarias (PMA), el Test de Matrices progresivas de Raven, y la Escala de Información del Wechsler Intelligence for Children (WISC IV). La muestra estaba compuesta por 664 estudiantes de Educación Secundaria Obligatoria (ESO), Bachillerato y ciclos formativos de grado medio y superior. Los resultados confirman el poder predictivo del nivel socioeconómico. Respecto a las variables cognitivas, solamente se obtuvieron resultados significativos cuando se tomó la Escala de Información del WISC-IV como predictor, estando esta medida relacionada con la inteligencia cristalizada. La influencia del origen de los estudiantes no arrojó resultados determinantes. Es evidente la necesidad de un debate y de un replanteamiento de la cuestión que lleve a la identificación de nuevas estrategias que permitan reducir la repetición de curso y sus efectos negativos.

Palabras clave

Repetición de curso, inteligencia cristalizada, índice de Hollingshead, origen étnico, WISC-IV.

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Grade repetition is the practice of keeping a student in the same academic year despite having been in school for a full year (López-Rupérez et al., 2021). This practice is an issue widely addressed in the literature due to its academic and social implications for students and its economic repercussions (Salza, 2022; Manacorda, 2012).

In Spain, according to the report of the Organisation for Economic Co-operation and Development (OECD, 2021), in 2019, in the first stage of Compulsory Secondary Education (Educación Secundaria Obligatoria, ESO, in Spain), 8.7% of students repeated an academic year. This was the highest rate of all OECD countries, where the average was 1.9%. In the second stage of ESO, Baccalaureate, Basic Vocational Training (Formación Profesional Básica, in Spain) and Intermediate Vocational Training (Formación Profesional de Grado Medio, in Spain), 7.9% of students repeated, compared to 3% in the rest of the countries.

In this case, Spain was the country with the second highest number of repeaters. According to this report, it is also worth noting that grade repetition affected boys more than girls, socio-economically disadvantaged pupils and pupils from immigrant backgrounds.

These data mean that the reduction of grade repetition rates remains one of the priority issues in education policy. Traditionally, this measure has been seen as a necessary practice to provide more time for students who have difficulties in mastering the specific content of one year before moving on to the next. However, several studies have confirmed its ineffectiveness in improving the academic performance of affected students and even exacerbating educational inequality (Contini & Salza, 2022). Specifically, different studies show that being a repeater is identified as one of the main predictors of school failure (Arregi-Martínez et al., 2009; Ou & Reynolds, 2010).

This situation has generated some debate in the literature about the appropriateness of this measure (Reschly & Christenson, 2013). Few studies identify the positive effects of repetition. Some authors argue that repeating a grade may lead students to increase their effort and, consequently, their academic performance (Alexander et al., 2003). In this regard, Nunes et al. (2018) developed a study whose results indicated that only in some cases, grade repetition had a relatively small positive impact on students´ academic performance. Even so, most of the evidence calls into question the effectiveness of this educational practice. In this line, some studies add that grade repetition is associated with adaptive or self-esteem problems (Peixoto et al., 2016; Mathys et al., 2019), higher rates of absenteeism (Fine & Davis, 2003; Martin, 2011) and, in the long term, higher dropout rates (Eren et al., 2017). In the Spanish educational context, it is considered relevant to study the factors that influence grade repetition because there is evidence that it is an ineffective measure that also favors social inequality (Choi & Calero, 2019).

The studies described above refer to the evaluation of the effectiveness of this educational practice in terms of the consequences it has for pupils. However, it is also necessary to consider that there is another line of research whose studies are aimed at identifying possible determinants of grade repetition.

The main determinant of grade repetition is academic performance, i.e. the failure of a student to achieve the learning objectives set for a given grade (Jimerson & Ferguson, 2007). According to some specific research findings, literacy proficiency has been found to be one of the main predictors of grade repetition, both in the first year of primary school (Willson &

Hughes, 2009) and in the fourth year (Carabaña, 2015). In addition, there are also studies indicating that repeaters do not score lower than non-repeaters on intelligence tests (Jimerson et al., 1997).

Studies that consider various contextual variables of a socio-economic nature as determinants of grade repetition are also noteworthy. White (1982), in a meta-analysis, relates family income level, occupation and parents' level of education to students' academic performance. The study by Herrnstein and Murray (1994) indicates that the number of years of schooling a young person manages to complete is correlated, to a large extent, with both the socio-economic status of his or her parents and his or her own academic ability. Von Stumm (2017) links a lower socio-economic index with lower academic achievement. In his case, it is worth noting that the socio-economic index predicts between 2% and 8% of the differences in academic performance. Therefore, following the above, the main causes of grade repetition would be, academic performance, literacy proficiency and variables of a socioeconomic nature, such as family income level, occupation and parents level of education and academic ability.

While some variables correlated with the determinants of grade repetition have been identified, there are limitations in the literature to establish a causal relationship.

Flecha and Soler (2013) analyze the educational attention received by students and warn of the assimilationist, reproductive and social exclusion function that educational institutions can have. Valls and Kyriakides (2013) point out that segregation does not lead to better results for all. Not only that, while higher achievers do not benefit significantly from homogeneous groupings, those who are placed in lower-level groups are subject to low expectations, offered fewer resources and less challenging activities, less instruction and at a slower pace, more repetitive and mechanical tasks, and less encouragement to think critically and use higher order thinking skills.

In Spain, the results obtained by Cordero et al. (2014) show that immigrant status, non-attendance at preschool, family structure or the absence of books at home are the main predictors of grade repetition during primary school. In this study, most of the school variables referring to the type of school and school resources available had a minimal impact, with only the level of concentration of pupils of immigrant origin in the classrooms of certain schools standing out as a predictor. On the other hand, López-Rupérez et al. (2021) indicate that the higher the socio-economic level of the students, the lower the repetition rate at 15 years of age. Furthermore, the higher the socio-economic and cultural level of students, the higher the graduation rate in Compulsory Secondary Education.

Choi et al. (2018) study the evolution of inequalities in academic achievement between the early years of schooling and lower secondary school in Spain. Their results highlight the importance of early intervention to ensure an improvement in reading literacy, which seems to predict both academic outcomes at 10 and 16 years of age already in early childhood education. Furthermore, they find that differences between native and first-generation immigrant students are mainly generated in the first years of schooling and tend to be maintained or accentuated as schooling progresses. Finally, they note that grade repetition during lower secondary school has a negative impact on students' subsequent academic performance. Therefore, they warn, it is necessary to consider alternatives to grade repetition as it does not contribute to improved academic performance.

From an evolutionary perspective, Cattell (1963) developed one of the most influential psychometric models in the study of intelligence, which is based on the existence of two basic factors: fluid intelligence (Gf) and crystallized intelligence (Gc). Gc refers to knowledge acquired through culture, so it is based on education or schooling and experience, strongly influenced by learning. Gf is a cognitive ability that allows humans to adapt to the environment, which is often variable and unpredictable, so it implies the ability to cope with novel and unexpected situations (Ardila, 2011; Haavisto & Lehto, 2005; Horn & Cattell, 1967). Crystallised intelligence would be more associated with reading performance (Almeida et al. 2008; Ramírez-Benítez et al., 2016) and language comprehension (Carroll, 1993), while fluid intelligence would be more related to mathematical performance. In general, crystallized intelligence has been shown to be a better predictor of academic success than fluid intelligence (Postlethwaite, 2011). Crystallised intelligence is usually assessed by vocabulary and general information tests (Sternberg, 2008). In view of the above, it can be considered that early literacy problems may hinder the development of crystallized intelligence.

This paper analyzes the effect of cognitive ability, socio-economic status and the interaction of socio-economic status with student ethnic origin on the probability of repeating a grade during compulsory secondary education. Previous literature focuses on establishing correlations between different variables and grade repetition. The present study aims to provide data on the causal relationships between repetition and grade repetition.

Method

Participants

The study sample consisted of students enrolled in compulsory secondary education (Educación secundaria Secondary Education ESO), Baccalaureate, and Intermediate and Higher-Level vocational Training Cycles in the province of Tarragona, Spain. After removing outliers, which included questionnaires with multiple responses to a single item, incomplete questionnaires, and questionnaires that were clearly answered at random, the final sample consisted of 664 participants. The sample was evenly divided between females (50.5%) and males (49.5%). The participants' ages ranged from 11 to 24 years old (mean = 14.4; SD = 2.32). In terms of nationality, 77% of the students identified as Spanish, 5.9% as Arab, 9.4% as Latin American, 5.9% as Eastern European, and 1.8% as belonging to other nationalities. Regarding the participants' ethnic origin, data was collected on the nationality of their parents. The results showed that 71.7% of the students were of Spanish origin, 10% of Arab origin, 10.2% of Latin American origin, 5.9% of Eastern European origin, and 2.1% of other nationalities.

Finally, students were asked whether they had repeated a grade in their school career. A significant majority (78%) reported never having repeated a grade, while a smaller proportion (20.9%) indicated having repeated at least one grade.

Instruments

Socioeconomic Status

The Hollingshead Four Factor Index of Social Status (SES; Hollingshead, 1975) was used to assess the family socioeconomic status of each individual. This index recognizes that social status is a multidimensional concept and is based on three key assumptions:

1. The society is structured unequally.
2. The primary indicators of an individual's status are occupation and years of schooling completed. These factors are calculated considering the marital status of the parents: if only one parent is employed, their score is considered; if both are employed, their scores are combined. This rule applies in all cases, including situations where the household head is a divorced parent who is not working but receives financial support from the former spouse. In such cases, the index is calculated using the supporting spouse's data.
3. These factors can be combined in a way that allows researchers to quickly, reliably, and meaningfully estimate the status positions of individuals and their nuclear family members within the society.

Therefore, the four variables considered for the index calculation are educational level, occupation, gender, and marital status of both parents. Of these variables, gender and marital status are used solely to determine the most appropriate method for calculating the index. Education is assigned a score from 1 to 7 (with 7 being the highest level of education), and occupation is assigned a score from 1 to 9 (with 9 being the highest executive, military, or political positions). These scores are then weighted: occupation is multiplied by 5, while education is multiplied by 3. The final score is obtained by summing the weighted scores, if only one of the parents is taken into account. The final score is divided by 2 if both parents are considered.

General Intelligence (G), Crystallized Intelligence (Gc), Fluid Intelligence (Gf):

- General intelligence (g) is a complex construct that encompasses an individual's overall cognitive ability. It is often measured by intelligence tests that assess diverse cognitive skills, including verbal reasoning, numerical reasoning, and spatial reasoning (Quílez & Lozano, 2020).

The aim is to investigate the extent to which individual cognitive abilities predict a student's likelihood of promotion. To achieve this, it is utilized general intelligence batteries to gain insights into distinct cognitive skills, which will later be evaluated to assess their impact on promotion prospects.

One of the most widely used batteries in Spain is the Primary Mental Abilities (PMA; Thurstone, 1938). This comprehensive tool comprises five tests: Verbal comprehension (Factor V), Spatial conception (Factor E), Reasoning (Factor R), Numeracy (Factor N), and Verbal Fluency (Factor V). The results of this test appear to serve as a reliable indicator of general intelligence for the general population in Spain.

However, one caveat exists with using this test: it relies heavily on language and questions that necessitate specific knowledge and information. These characteristics prompted concerns about potential cultural bias in the test's results.

To address this concern, it is incorporated Raven's Progressive Matrices Test (Raven, 1975) into the assessment. This test utilizes images to evaluate general intelligence, denoted as the G factor in this test, while minimizing cultural influences. The standard scale consisting of 60 problems was employed.

Crystallized intelligence refers to knowledge acquired through cultural exposure, typically through education or schooling and experience. It is significantly influenced by learning. Fluid intelligence, on the other hand, is a cognitive ability that enables humans to adapt to their ever-changing and unpredictable environment. It involves the ability to tackle novel and unexpected situations (Ardila, 2011; Haavisto & Lehto, 2005; Horn & Cattell, 1967).

Crystallized intelligence has been shown to be more closely related to reading performance (Almeida et al., 2008; Ramírez-Benítez et al., 2016) and language comprehension (Carroll, 1993), while fluid intelligence is more strongly correlated with mathematical performance. In general, crystallized intelligence has been found to be a more reliable predictor of academic success than fluid intelligence (Postlethwaite, 2011). Crystallized intelligence is typically assessed through vocabulary and general knowledge tests (Sternberg, 2008).

To assess crystallized intelligence, the Information Subtest from the Wechsler Intelligence Scale for Children was administered (WISC-IV; Wechsler, 2003), using the Spanish adaptation made by Corral et al. (2005). Participants were asked a series of questions covering a wide range of general cultural topics. This scale is linked to crystallized intelligence (Horn & Cattell, 1967), namely, long-term memory and the ability to recall information gained from education or the environment. It measures an individual's ability to acquire, retain, and retrieve knowledge of general facts. This process may involve various skills, such as perception, listening comprehension, and verbal expression (Kaufman, 1994; Sattler, 2001). The test comprises 33 items, out of which 21 were administered based on age criteria.

Procedure

The directors and/or coordinators of various High Schools (Instituto de Educación Secundaria (IES) in Spain) were contacted in order to obtain their collaboration in the study.

Families were asked for authorisation for the participation of underage students. Specifically, they were asked to sign an informed consent form so that their children could participate in the research. In the case of adult participants, they signed their own consent.

Subsequently, the research psychologist administered the questionnaires in the classroom group (approximately 25 pupils per class) using tutoring hours.

Finally, it should be noted that participation in the study was completely voluntary. Moreover, both the instructions and the conditions of application and data management guaranteed the confidentiality and anonymity of the data.

Statistical Analysis

The main purpose is to study the effect of the socio-economic variables of the students, operationalised by the Hollingshead Four Factor Index of Social Status, (SES); and the individual cognitive variables, operationalised by the Raven's Progressive Matrices Test, (RAVEN), the Primary Mental Aptitudes, (PMA), and the Information Subtest from Wechsler Intelligence Scale for Children (WISC-IV) on grade repetition. In addition, the aim is to clarify whether the effect of the Hollingshead Four Factor Index can be influenced by the ethnic origin of the students, understood as the nationality of the parents.

Due to the dichotomous nature of the dependent variable, grade repetition, logistic regression is the most appropriate statistical technique for its analysis. Unlike traditional regression, which predicts the value of the dependent variable based on the independent variable, logistic regression estimates the probability of the dependent variable occurring. This makes logistic regression a more suitable choice for analyzing binary outcomes like grade repetition. Moreover, logistic regression is a robust technique, meaning it can effectively handle data with non-normal distributions and outliers. This robustness further enhances its suitability for the analysis of grade repetition data.

The regression coefficients (β) are called logits and, in this case, if they are significant, they show how much the probability of being in the non-repeating group changes as a function of the scores obtained on the predictor. The logit is estimated as the ratio of two probabilities: the probability of not repeating (p) divided by the probability of repeating (1-p).

Figure 1

Binomial Probability Logit in the logistic Regression Model

$$\left[\frac{p_{ij}}{(1-p_{ij})}\right] = \beta_{0j} + \sum_{k=1}^{n} \beta_{1i} X_{ki}$$

This ratio is transformed into interpretable values using the odds ratio. The odds ratio, equivalent to the exponential of the logit, standardizes the effects and enables comparison of predictors. When the odds ratio is less than 1, the independent variable has a negative relationship with the dependent variable. If it equals 1, it means that individuals have equal chances of the dependent variable occurring regardless of the independent variable's value. If the odds ratio is greater than 1, it indicates that those with higher values in the independent variable are more likely to experience the dependent variable.

In order to further study the determinants or predictors of grade repetition during the ESO mentioned above, several models have been estimated that assess the effect of different predictors on the dependent variable. The relationship between the hypotheses put forward and the different predictors can be seen in Table 1.

Table 1

Hypotheses and Predictors

	Theoretical hypothesis	Predictor/s
1	Socio-economic variables influence the probability of not repeating.	The Hollingshead Four Factor Index of Social Status
2	Individual cognitive variables influence the probability of not repeating.	Primary Mental Aptitudes (PMA), Raven's Progressive Matrices Test, Information Subtest of Wechsler Intelligence Scale for Children (WISC-IV)
3	Socio-economic variables mediated by ethnic origin, as well as an individual cognitive variable, linked to crystallized intelligence, which measures the ability to acquire, retain and retrieve acquired knowledge, jointly influence the likelihood of repeating.	The Hollingshead Four Factor Index of Social Status, differentiating by pupil ethnic origin. Information Subtest of Wechsler Intelligence Scale for Children (WISC-IV)

The following section presents the results obtained. First, a descriptive analysis will be presented showing the differences between the two groups (repeaters and non-repeaters) according to the different predictors. Subsequently, an analysis will be carried out, using Spearman's correlations, to find out how the predictors correlate with each other. Finally, an analysis of the fit of each of the models will be carried out using the following statistics: deviance, the three R2 statistics and chi-square. In addition, an analysis of the regression coefficients will be performed for each model.

Results

Descriptive Analysis

Table 2 shows the results of the descriptive analysis. As can be seen there are clear differences in the dispersion of students between the two groups on the Hollingshead Index and the WISC-IV scale. The differences are much more subtle in the PMA and RAVEN tests.

Table 2

Descriptives Differentiating between Repeaters and Non-Repeaters

	Repeat	N	Mean	Median	SD	Mín.	Máx.
Hollingshead	No	385	45.44	41.50	22.52	0.0	99.0
	Yes	86	37.91	31.25	21.93	0.0	97.5
IS WISC_IV	No	483	11.16	11	4.30	0	22
	Yes	130	9.60	9.00	4.38	0	20
PMA	No	472	116.12	116.00	33.47	0.0	211.5

	Repeat	N	Mean	Median	SD	Mín.	Máx.
	Yes	117	106.03	103.50	37.27	33.0	209.5
RAVEN	No	435	45.72	47.00	7.59	0.0	60.0
	Yes	108	44.10	44.00	7.95	12.0	58.0

Correlations

The calculation of Spearman correlations allows us to know how the variables correlate with each other. In this case, all the variables correlate with each other. These correlations can be seen in table 3.

Table 3

Correlations Matrix

	IS WISC-IV	PMA	RAVEN	Hollingshead Index
IS WISC-IV				
PMA	0.458			
	< .001			
RAVEN				
	0.336	0.481		
	< .001	< .001		
Hollingshead				
	0.246	0.222	0.173	
	< .001	< .001	< .001	

Logistic Regression Models

Analysis of model 1. Effect of the Hollingshead Four Factor Index of Social Status on grade repetition. Table 4 is the fit table for Model 1

The results of the logistic regression are presented in a similar way for each model. The first table shows the fit statistics:

- Deviance (global fit) is a statistic that summarizes the residuals of the model, the unexplained portion. Smaller values indicate a better fit, so it is used to compare models with one another. AIC is similar.
- Three R2 statistics are interpreted together and, when multiplied by 100, represent the percentage of variance explained. Values of 0.01 or higher are considered to be noteworthy.

- Chi-square is an index that identifies the contribution of the predictor to the model. If it is significant, as in this case, it means that the predictor has a significant effect.

Table 4
Fit Table for Model 1

Model	Deviance	R^2_{McF}	R^2_{CS}	R^2_N	χ^2	p
1	389	0.0115	0.0105	0.0175	4.51	0.034

A significant result is observed that explains only a small part of the variance (around 1%). Hattie (2009) suggests that, in education, this is a small effect, but it already determines a part of educational outcomes that deserves to be studied. And, in this case, where the dependent variable is grade repetition, providing evidence that it can be avoided in a small percentage of cases is important at the educational level. It is considered average effects from values of R2=0.04 or more, and above R2=0.14, very important effects.

Table 5 presents the regression coefficients for Model 1. The estimate column shows the logit, which is a measure of the change in the log odds of the outcome for a one-unit increase in the predictor variable. The odds ratio column shows the exponentiated version of the estimate, which represents the multiplicative change in the odds of the outcome for a one-unit increase in the predictor variable. Odds ratios are easier to interpret than logits, as they represent the relative change in the odds of the outcome rather than the change in the log odds.

Table 5
Regression Coefficients Model 1

Predictor	Estimate	SE	Z	p	Odds ratio
Intercept	1.0219	0.27920	3.66	<0.01	2.78
Hollingshead	0.0127	0.00615	2.07	0.039	1.01

As can be seen, when analyzing the regression coefficients, by introducing the Hollingshead Index as a predictor, a significant effect is obtained (p=0.039), but with a small effect. For each point in the index, the logit changes by 0.0127 and the odds ratio by 1.01. This indicates that each additional point in the Hollingshead Index grants 0,01 times more odds of promotion.

The maximum value that the index can reach is 100. If this maximum value were reached, the odds ratio would increase from 1.01 to 2. Therefore, whoever has the highest index value is twice as likely to pass school level.

Analysis of Model 2. Effects of Individual Cognitive Variables on Grade Repetition. WISC IV, RAVEN, PMA

Following the same structure as in model 1, the fit table of model 2 is presented again (table 6). The inclusion of the three cognitive predictors together revealed a significant association between these variables and the probability of grade repetition. However, the explanatory power of these predictors was not strong. Only WISC IV Information Subtest comes close (p=0.055). This suggests that individual cognitive variables play a small role in grade repetition, but further research is needed.

Table 6

Fit Table for Model 2

Model	Deviance	R^2_{McF}	R^2_{CS}	R^2_N	χ^2	p
2	507	0.0184	0.0182	0.0288	9.51	0.023

Table 7 presents the regression coefficients of model 2.

Table 7

Regression Coefficients of Model 2

Predictor	Estimate	SE	Z	p	Odds ratio
Intercept	-0.12536	0.61908	-0.202	0.840	0.882
IS WISC_IV	0.05557	0.02896	1.919	0.055	1.057
RAVEN	0.01725	0.01506	1.145	0.252	1.017
PMA	0.00139	0.00396	0.351	0.726	1.001

Analysis of model 3. Effect of the WISC-IV Information Subtest

Model 3 focuses solely on the WISC IV Information Subtest predictor, as it is the only cognitive variable that effectively enhances the model's predictive power. By excluding the other two cognitive variables, the WISC demonstrates a significant impact on repetition rates. The model fit table (Table 8) reveals that eliminating the other two cognitive variables yields a model that explains approximately 2% of the variance (R^2= 0.0209). Comparing the R^2 values between models indicates that the WISC Information Subtest in isolation accounts for approximately 1% more variance than in Model 2.

The model fit table is presented below.

Table 8

Fit Table for Model 3

Model	Deviance	R^2_{McF}	R^2_{CS}	R^2_N	χ^2	p
3	620	0.0209	0.0214	0.0332	13.2	< .001

Table 9 presents the regression coefficients for Model 3. The effect of the WISC IV Information Subtest is positive: the odds ratio of not repeating increases by 0.09 for each point on the predictor. This implies that a one-point increase in WISC IV Information Subtest score is associated with a 9% increase in the likelihood of not repeating a grade.

Table 9

Regression Coefficients of Model 3

Predictor	Estimate	SE	Z	p	Odds ratio
Intercept	0.4462	0.2520	1.77	0.077	1.56
IS WISC IV	0.0834	0.0233	3.59	< .001	1.09

Analysis of model 4. Joint study of the effect of the the Hollingshead Four Factor Index of Social Status and the WISC-IV Information Subtest

Finally, the aim is to clarify whether the score obtained on the WISC Information Subtest (individual cognitive variables) and the Hollingshead Index score (socio-economic variables), the latter one mediated by the students' origin, jointly influence the probability of repeating.

The model is estimated in steps, which can be observed in table 10, which is the fit table for model 4. First, in step 1, the Hollingshead Index is included since it is the predictor that, according to theory, is expected to have the largest effect on the probability of repeating. Second, in step 2, the WISC IV subtest is included since it is the only cognitive variable that could significantly explain a change in the odds of repeating. Finally, in step 3, it is explored whether ethnic origin (considering students of Spanish origin as a reference group) interacts with the Hollingshead Index acting as a double barrier. This differential effect of origin is analyzed as differences with respect to Spanish origin sample. The analysis of the fit statistics, which can be seen in table 10, confirms the significance in all 3 steps (P1: p=0.031; P2: p=0.014; P3: p=0.033).

Table 10

Fit Table for Model 4

Steps	Deviance	R^2_{McF}	R^2_{CS}	R^2_N	χ^2	p
1	388	0.0118	0.0109	0.0180	4.63	0.031
2	384	0.0216	0.0198	0.0328	8.48	0.014
3	379	0.0348	0.0318	0.0526	13.68	0.033

Table 10 shows an increase in the variance explained as the steps of the model progress, as well as a decrease in Deviance. However, these changes that occur when including the variables

in three consecutive steps must be proven to be significant. For this purpose, table 11, which reports the adjustment of the changes between the different steps, is presented. It can be observed that the change from step 2 to step 3 does not produce significant changes (p=0.268) that help to better explain the probabilities of not repeating, therefore, step 2 is considered to be the most parsimonious one (Field, 2013).

Table 11
Fit Table of Changes Between the Different Steps of the Model 4

Steps	χ^2	p
1-2	3.86	0.050
2-3	5.20	0.268

Regression Coefficients of Step 1 of Model 4

Step 1 of model 4 coincides with model 1 (Effect of the Hollingshead Four Factor Index of Social Status on grade repetition), so table 5 can be found in the previous description of model 1 to observe the regression coefficients. It shows that the regression coefficients obtain significance taking the Hollingshead Index as a predictor (p=0.039). The probability of not repeating increases by 0.01 (Estimate= 0.0127; SE=0.00615; OddsRatio=1.01) for each point in the Hollingshead Index.

Regression Coefficients of Step 2 of Model 4

The regression coefficients of step 2 are shown in table 12.

Table 12
Regression Coefficients of Step 2 in Model 4

Predictor	Estimate	SE	Z	p	Odds ratio
Intercept	0.4526	0.39301	1.15	0.249	1.57
Hollingshead	0.0102	0.00629	1.62	0.105	1.01
WISC_IV	0.0612	0.03117	1.96	0.050	1.06

Note. Recoded "Repeater_recod = 0" vs. "Repeater_recod = 1"

When the WISC IV Information Subtest is added as a predictor, the Hollingshead Index is no longer significant (p= 0.105), and the significance of the WISC Information Subtest is maintained (p=0.050). As shown in the previous models, both variables influence the probability of repeating a grade. On this occasion, the value 1 corresponds to not repeating and the value 0 to repeating (it is recoded), therefore, there is a greater probability of not repeating according to estimate. For each point on the WISC IV Information Subtest (odds ratio) there is 0.06% more probability of not repeating than of repeating.

Another element to take into account is that there is a certain correlation between the predictors, which means that including them in the model slightly modifies their significance, because

there is a certain correlation between the two variables, as were shown in table 3 (Spearman's rho= 0.246, p=<.001).

Regression Coefficients of Step 3 of Model 4

Table 13 shows the regression coefficients for step 3 of model 4. By including the effect of ethnic origin, the Hollingshead Index is again significant, and the WISC IV Information Subtest is no longer significant.

Table 13
Regression Coefficients of Step 3 in Model 4

Predictor	Estimate	SE	Z	p	Odds ratio
Intercept	0.52344	0.39964	1.310	0.190	1.688
Hollingshead	0.01296	0.00660	1.965	0.049	1.013
WISC_IV	0.05478	0.03126	1.752	0.080	1.056
Holllingshead ✻ Origin:					
HOLLINGSHEAD ✻ (Arabic – Spanish)	-0.00612	0.02062	-0.297	0.767	0.994
I_HOLLINGSHEAD ✻ (Latin – Spanish)	-0.01622	0.00775	-2.093	0.036	0.984
I_HOLLINGSHEAD ✻ (Eastern Europe – Spanish)	-0.01050	0.01114	-0.943	0.346	0.990
HOLLINGSHEAD ✻ (Others – Spanish)	0.02111	0.03397	0.622	0.534	1.021

Note. Recoded "Repeater_recod = 0" vs. "Repeater_recod = 1"

In Table 13, the Hollingshead Index Estimate includes only the reference group, in this case the students of Spanish ethnic origin. These students improve their chances of passing by approximately 0.013 for each point increase in their index result.

The only significant difference when comparing this result with the results of other ethnic groups occurs with the Latin American ethnic group (p= 0.036). The Estimate of the reference group and the Latin American group should be added: 0.01296+(-0.01622)=0.00326. In this case, a logit very close to 0 is obtained.

This indicates that the improvement in the Hollingshead Index has no effect on the probability of passing in this group. In the rest of the groups there are no significant differential effects.

Since it has been indicated that step 3 (including the origin) does not represent a significant improvement in explanation, as can be seen in table 11, Field (2013) recommends considering the simplest step (step 2, Hollingshead and WISC), referring to the *principle of parsimony*.

Discussion and Conclusions

This paper examines the determinants or predictors of grade repetition during the Compulsory Secondary Education stage (ESO). The first hypothesis assumed that socioeconomic variables, represented by the Hollingshead Index significantly predict the probability of not repeating a grade. The results support this hypothesis, although explaining a small part of the variance (R2=0.01). A lower Hollingshead Index represents a higher probability of repeating, a result consistent with the findings of White (1982), Herrnstein and Murray (1994), Cordero et al. (2014), Von Stumm (2017), López-Rupérez et al. (2021) and Salza (2022). However, other lines of research focus on the role of educational institutions and alert us to practices that, taking this socio-economic disadvantage as a justification, worsen the situation for students from disadvantaged backgrounds.

The results of this study underscore the influence of students' socioeconomic status on their chances of promotion or repetition. This finding is not novel, as it builds on a substantial body of literature. However, the need to scrutinize the educational responses provided by schools and whether they contribute to overcoming challenges or, conversely, exacerbate these disparities remains paramount (Flecha & Soler, 2013; Valls & Kyriakides, 2013). The predictive capacity of the study explains only 1% of the variance, cautioning against overemphasizing the socioeconomic index as an insurmountable determinant of educational outcomes.

The second hypothesis proposed that individual cognitive variables could significantly predict the likelihood of avoiding grade repetition. These cognitive variables are represented by a test that assesses Primary Mental Aptitudes (PMA), by a test of general intelligence, the RAVEN Progressive Matrices Test, and a test of crystallized intelligence, the Wechsler Intelligence Test Information Subtest for Children-IV (WISC-IV). This hypothesis was partially supported. While the PMA and RAVEN tests did not yield significant results as predictors ($p>0.05$), the Information Subtest of the WISC-IV emerged as a significant predictor of grade repetition ($p<0.05$). Consequently, the WISC-IV Information Subtest was the sole cognitive variable included in a subsequent model examining the combined influence of crystallized intelligence and socioeconomic status.

The data revealed a group of students for whom general intelligence, as measured by the PMA and RAVEN, did not significantly predict the likelihood of not repeating a grade. Instead, significant results were observed for the variable related to crystallized intelligence, defined as the ability to acquire, store, and retrieve information, a critical skill in the school environment.

As mentioned in the introduction, crystallized intelligence encompasses the richness, breadth, and depth of knowledge acquired (Cattell, 1963). Therefore, the context and educational environment in which a child develops play a crucial role in nurturing this type of intelligence. In light of these findings, it is evident that socioeconomic factors influence grade repetition, but they should not be perceived as insurmountable determinants of academic

success. These results underscore the need for educational policies that foster the development of crystallized intelligence, particularly in the context of instrumental learning, from an early age.

Carabaña (2015) highlights that literacy level is the strongest predictor of grade promotion or repetition among fourth-grade students. Since literacy is the main gateway to knowledge acquisition in formal education, it is coherent to think that low proficiency in this skill makes it difficult for students to access information and develop higher order thinking skills. Ramírez-Benítez et al. (2016) and Choi et al. (2018) also draw the attention of schools to the need to detect literacy difficulties as early as possible and to develop concrete actions to overcome them.

The data indicate that students who have not adequately developed instrumental learning skills are more likely to repeat grades. This finding aligns with the research of Ayala-Valenzuela and Messing-Grube (2013), who associate university students' challenges in solving exam tasks with difficulties in accurately comprehending verbs frequently used in written assessments.

The third hypothesis analyzes whether socio-economic variables mediated by ethnical origin, as well as an individual cognitive variable, linked to crystallized intelligence, jointly influence the probability of grade repetition.

By combining the effects of socio-economic variables and the WISC-IV Information Subtest, a significant model ($p=0.05$) emerges. This combined model exhibits a better fit to the data, explaining approximately 2% of the variance, surpassing the 1% explained by the previous model that considered the Hollingshead Index as the sole predictor. Notably, crystallized intelligence exerts a stronger influence on promotion probability compared to the socio-economic index, which loses significance upon introducing this cognitive variable.

The finding that the WISC-IV Information Subtest explains approximately the same percentage of variance as the combined model offers a glimmer of hope. While modifying students' environments may be challenging, crystallized intelligence can be enhanced through appropriate stimuli (Alloway & Alloway, 2009).

Flecha and Soler (2013) emphasize the pivotal role of schools in breaking the cycle of inequality experienced by disadvantaged students in Europe. To this end, they present successful educational actions identified in schools across Europe.

Valls and Kyriakides (2013) stress the importance of aligning academic standards with inclusive practices, seeking ways to improve educational approaches that prevent students from falling behind. They advocate for classroom arrangements that foster active participation, learning opportunities, and high expectations, utilizing quality materials and activities that guide students towards instrumental learning and higher-order thinking skills. Their study examines the impact of diverse classroom arrangements on students' learning experiences, demonstrating that more inclusive forms benefit not only those facing difficulties but also high-achieving students.

Another aspect addressed in the third hypothesis is the differential effect of the socio-economic variable, Hollingshead Index, on students of different backgrounds. This interaction fails to produce significant differences between the Spanish origin group and the other groups

(Arab, Eastern European, and Other), suggesting a rejection of the relationship between origin and grade repetition.

The data indicate that ethnic origin does not determine promotion chances. As socioeconomic conditions improve, promotion prospects also increase, regardless of the three aforementioned ethnic origins. This effect, accounting for approximately 1% of the variance, again challenges prevailing myths in schools. Perhaps the focus should not be on who is part of the class-group, but on enhancing their living conditions.

The Latin American origin group stands out as the only group exhibiting significantly different results compared to the Spanish origin group. For them, an improvement in the Hollingshead Index does not translate into a higher probability of promotion. A potential explanation lies in Conchas (2001) study highlighting the interplay between educational structures and cultures. Additionally, Navarro et al. (2014) caution against teachers' assumptions regarding Spanish-speaking students' linguistic proficiency in Catalonia. They argue that teachers may underestimate the linguistic difficulties faced by these students and consequently provide less linguistic support. It is crucial to acknowledge the distinction between conversational language acquired early on and the more formal academic language, as proposed by Cummins (2002). Without this consideration, teachers may misinterpret a student's linguistic proficiency based on observed interactions (verbal exchanges with strong contextual cues and non-linguistic cues) while overlooking their potential struggles with formal language acquisition (Navarro et al., 2014, p. 377).

In relation to the limitations of the study, it should be noted that the predictor variables could be more specific. Therefore, future lines of research could address the prediction of grade repetition by considering factors such as irregular class attendance, lack of motivation, a deficit in study skills and/or strategies, a deficit in social skills and/or behavioral problems or difficulties in educational support at home.

The findings of this study underscore the pivotal role of crystallized intelligence in influencing the likelihood of grade repetition, surpassing the influence of socioeconomic background. This highlights the significant impact of educational interventions focused on enhancing crystallized intelligence, particularly in the context of instrumental learning.

The results challenge the prevailing notion that socioeconomic factors solely determine academic success. Instead, they emphasize the importance of educational environments that prioritize the development of crystallized intelligence, fostering literacy skills and inclusive classroom practices that cater to the diverse needs of learners.

The findings call for a paradigm shift in addressing grade repetition, moving away from solely focusing on socio-economic factors and adopting a more holistic approach that embraces the crucial role of crystallized intelligence. Educational institutions have a pivotal responsibility to implement strategies that nurture crystallized intelligence from an early age.

Schools should prioritize instrumental learning, a foundation for academic success, and integrate it into inclusive programs that detect and address learning difficulties early on. Literacy development should be at the forefront, equipping students with the essential skills for accessing, storing, and retrieving information.

Educational practices should be tailored to enhance students' crystallized intelligence, emphasizing high expectations, quality resources, and engaging activities that foster active participation and learning. By focusing on crystallized intelligence, schools can effectively

address grade repetition and its detrimental consequences, including increased risk of school failure.

Further research is warranted to delve into the intricate interplay between educational practices, student background, and crystallized intelligence. This in-depth understanding will enable the development of evidence-based strategies that effectively combat grade repetition and promote equitable educational outcomes for all students.

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