

Creativity, intellectual abilities and response styles: Implications for academic performance in the secondary school

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Abstract: The aim of this paper is to study the creative competence of a specific sample of secondary pupils in a multicultural and multilingual school context, taking into consideration their intellectual abilities, response style and academic performance in the different subject areas of the secondary education. The sample consists of 75 pupils at the European School of Alicante— a European Commission funded school— in their 5th year of the secondary school. The average age is 15 years old with a range between 14 and 17 years old. 56% are male pupils; 44% female pupils. For the evaluation of their creativity, the CREA test (Corbalán, Martínez, Donolo, Alonso, Tejerina y Limiñana, 2003) has been used. This test aims at measuring creative intelligence through an indicator of generation of questions. For the evaluation of the intellectual abilities, the EFAI test (*Evaluación Factorial de las Aptitudes Intelectuales*; Santamaría, Arribas, Pereña & Seisdedos, 2005) has been used. This test contains different sets of questions referred to the 5 basic abilities (Spatial, Numerical, Reasoning, Verbal and Memory). It also offers measurements related to General Intelligence (Ig) and assesses the response style (Speed, Efficiency) and contains the subtest of Verbal Fluency of the PMA (*Primary Mental Abilities*; TEA, 2002; Thurstone & Thurstone, 1989). The academic performance was measured through the marks in core subjects and through the average mark for the 1st semester. The results indicate that there are significant relationships among some intellectual abilities, the academic performance and the creativity, which moreover seem to be modulated by the gender variable. The analysis of the variables according to the creative performance of this sample has allowed us to identify the most significant intellectual abilities related to the creative performance and to consider its implications for academic performance in general.

Key words: Creativity; intelligence; intellectual abilities; academic performance

Título: Creatividad, aptitudes intelectuales y estilos de respuesta: implicaciones para el rendimiento académico en secundaria.

Resumen: El objetivo de este trabajo es estudiar la competencia creativa en una muestra específica de estudiantes de secundaria, en un contexto escolar multicultural y plurilingüe, valorando su relación con las aptitudes intelectuales, el estilo de respuesta y el rendimiento académico en las distintas áreas de conocimiento de la educación secundaria obligatoria. La muestra está formada por 75 alumnos de 5^º de Educación Secundaria de la Escuela Europea de Alicante —una escuela que pertenece al sistemas de las Escuelas Europeas auspiciado por la Comisión Europea—. La media de edad de los alumnos es de 15 años, con un rango de 14 a 17 años. El 56% son varones y el 44% son mujeres. Para la evaluación de la creatividad se ha utilizado el Test CREA (Corbalán, Martínez, Donolo, Alonso, Tejerina y Limiñana, 2003), que tiene como finalidad la apreciación de la inteligencia creativa a través de un indicador de generación de cuestiones. Para la evaluación de las aptitudes intelectuales se ha utilizado el EFAI (*Evaluación Factorial de las Aptitudes Intelectuales*; Santamaría, Arribas, Pereña y Seisdedos, 2005), una batería para la evaluación factorial de las cinco aptitudes básicas (Espacial, Numérica, Razonamiento, Verbal y Memoria), que ofrece también una medida de la Inteligencia general (Ig) y una valoración del estilo de respuesta (Rapidez y Eficacia); y la subprueba de Fluidez Verbal del PMA (*Aptitudes Mentales Primarias*; TEA, 2002; Thurstone & Thurstone, 1989). El rendimiento académico fue medido a través de las calificaciones en las asignaturas más representativas, y las notas promedio del semestre. Los resultados indican que existen relaciones significativas entre algunas aptitudes intelectuales, el rendimiento académico y la creatividad, que parecen estar moduladas por la variable género. El análisis de las variables, según el rendimiento creativo en esta muestra, nos ha permitido identificar las aptitudes más significativas relacionadas con el alto rendimiento creativo, y discutir sus relaciones con el rendimiento académico.

Palabras claves: Creatividad; inteligencia; aptitudes intelectuales; rendimiento académico.

Introduction

The concept of creativity, like the concept of intelligence, has been becoming more and more precise and complex with the years. Both are indispensable resources for the human being and therefore one of the main objectives to develop in our societies. In this sense, one of the main referents in the study of creativity was Guilford (1950) who saw it as a variety of stable intellectual abilities and defined the creative person as that who gathered a series of characteristic traits such as intervention, elaboration, organisation, composition, planning, etc. With his studies as a basis, the investigation in creativity has been directed to identify personal abilities or attitudes and internal or external factors facilitating the creative activity. Creativity or creative thought

are conceived, in this way, as a capacity that can be developed or exercised if we pay attention to those abilities, attitudes or related factors.

There is a great conceptual difference in current theories of creativity. From different paradigms and methods many compatible and integrative proposals are raised. They evidence that creativity must be considered as a multifaceted construct, which represents the interaction or confluence among multiple dimensions (Corbalán, 2008; Sternberg, 2005; Taylor, 1975). For Feldman (1999), the dimensions concerned in creativity would be basically the cognitive and socio-emotional processes, current and developmental familiar aspects, education and training, the characteristics of the domain (theoretical content) and the field (social group), aspects of the socio-cultural context, and the historical influences (trends and events). Guilford (1950, 1959) identifies the divergent thought as the key for the creative activity, together with other intellectual abilities such as flexibility, originality and fluency. Amabile (1983) proposed a model of creativity formed by three components: the relevant skills

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and knowledge in a certain area, the relevant skills for creativity and the intrinsic motivation. Other authors consider that creativity is centred in the personality or in the values system of an individual (Maslow, 1959; Rogers, 1978) Csikszentmihalyi (1988, 1996) proposes a model of systems which includes the interaction of the individual, the domain and the field. Sternberg and Lubart (1991), from a more integrative perspective, claim that creativity is centred in the combination of personality traits and intellectual capacity and he refers to the confluence of six interrelated resources: intellectual abilities, knowledge, cognitive styles, motivation and environment.

Research on cognitive abilities in relation with creativity started with the works of Guilford (1950, 1959, 1970), who offers a view of divergent thought as an independent and individual entity associated to creativity, as opposed to convergent thought that had traditionally occupied most of the research on human intelligence. Convergent thought normally implies a correct solution to each problem, in a way that all the information must be arranged correctly so that the solution can be reached. This is the type of thought that is mostly exercised and assessed in academic contexts. Divergent thought, however, perceives multiple and different options, since the problems are approached from different angles, which may lead to a certain variety of discovery paths and multiple solutions.

Although the implication of intelligence in creativity is evident, both capacities seem to imply different cognitive abilities (Getzels & Csikszentmihalyi, 1976; Guilford, 1950) Creativity has been defined as the process to generate something new and useful at the same time; intelligence, as the voluntary ability to adapt by selecting or reshaping a certain environment (Sternberg 1985) Intelligence appears to be a necessary component for the acquisition of knowledge and skills but it is not sufficient to guarantee creative results (Amabile, 1983; Barron & Harrington, 1981; Sternberg, 1990). In general, all research suggests that creativity seems to imply synthetic, analytic and practical aspects of intelligence; the synthetic aspects are necessary to find ideas, the analytical aspects to assess the quality of those ideas, and the practical aspects to formulate the appropriate way to communicate them and convince others of their value (Sternberg & O'Hara, 1999)

In this sense, and having in mind that creativity is nowadays one of the challenges of the educational systems, this paper aims at showing how the inclusion of creativity in the school curriculum, can be developed into an essential part of the evaluation and the career advice activities rather than being limited to concrete teaching or methodological proposals. The evaluation of creativity in a school context allows us to improve the individual profile of pupils, providing an estimation of the divergent cognitive abilities; to identify the convergent cognitive abilities related or contained in creativity; and to study the contribution of creativity to the academic performance of pupils. Also, creativity would explain relevant key factors contributing to excellence in cer-

tain performances (Bermejo, Hernández, Ferrando, Soto, Sáinz & Prieto, 2010; Corbalán, 2008) Therefore, creativity would furnish information regarding the possibilities and problems generated around highly gifted performances. As Sternberg and Lubart (1993) point out, an important challenge for the educator would be to identify the creative pupil and to help him develop his academic potential. But that would mean to consider not only the marks in evaluation reports of very good pupils, or the results of aptitude or intelligence tests, but also to look into other sort of abilities related with the construction of knowledge rather than its reproduction.

Therefore, our objective is to study creative competence in school contexts, putting it in relation with intellectual abilities, response style and academic performance in the different areas of the compulsory secondary education.

Through the evaluation of abilities, we want to assess the current capacity to solve rapidly convergent problems of different nature, to maintain an adequate intellectual flexibility and to carry out deductive and inductive logical processes; also we want to check the response style (speed and efficiency), which will in great part determine the pupil's aptitude level and academic performance. Respectively, the evaluation of creative competence aims at determining the capacity of using information and knowledge in a new way, and finding divergent solutions to problems.

Method

Participants

The sample consists of 75 pupils of secondary education of the European School of Alicante. The European schools (*Schola Europaea*) are public intergovernmental institutions, whose aim is to provide the children of the officials of the European Union institutions a comprehensive schooling from 3 years old until 18 in three cycles: nursery, primary and secondary in their mother tongue or dominant language. In the European schools the core subjects can be taught in all the official languages of the 27 member states depending on the language sections that each school hosts, and in any case the mother tongue, or dominant language of the pupil (LI) is always assured. Except for the LI syllabi, the rest of the subjects share harmonised syllabi for all subject regardless of the language in which they are taught. All pupils must choose a second language or working language (LII) This is always either English, French or German. The subjects in the area of humanities (Human sciences, History, Geography) are taught through L2 from the third year of the secondary school on (equivalent to the 2 ESO in the Spanish system). In these lessons, pupils from the different sections are mixed. This mix of pupils can also happen in other subjects like Art, Music, Physical Education or ICT. These subjects can also be taught through a working language or through the language of the host country. All pupils need to choose for a first foreign language (LIII) from the ones that

each school offers. This is compulsory from the second year of the secondary school (equivalent to 1 ESO in the Spanish system). until the 5th year of the secondary school (4 ESO) A second foreign language (LIV) is also optional from the fourth year of the secondary school (3 ESO). In this sense, the education that the European Schools provide is multilingual and multicultural: many different languages are learnt and used as vehicular languages for the instruction of other subjects in the curriculum, and pupils from different nationalities and cultures come together in the different subjects of the school curriculum, and of course in the school.

The 75 pupils referred to in this study are in the 5th year of the secondary school (equivalent to 4th year ESO in the Spanish system) and they are enrolled in the four languages sections of the European School of Alicante: 23 are in the English section, 27 in the Spanish section, 14 in the French section and 11 in the German section. The average age is 15 years old (D.T.=54), with a range between 14 and 17 years old. 56% are male pupils; 44% female pupils.

Given the diversity of options, we have considered as a core indicator of academic performance the results in the subjects taught through the pupils' LI, mother tongue or dominant language. For the overall performance of pupils, we have taken in consideration the average mark of the 1st semester.

Instruments

1. CREA: *Creative Intelligence. A cognitive creativity measure* (Corbalán, Martínez Alonso, Donolo, Tejerina & Limiñana, 2003). This test aims at assessing creative intelligence through a cognitive evaluation of individual creativity considering the indicator of question generation in the theoretical framework of problem assessment and problem solving. The test consists of three illustrated pages (two of them are specific for adults) from which the subject has to generate all kind of questions that the drawings contained suggest to him. The CREA Test complies with reliability and validity basic standards (reliability estimated for the A and B forms is .87). For this sample, two pages have been used: CREA A and B, for adults.
2. EFAI, *Factory Evaluation of the Intellectual Abilities* (Santamaría, Arribas, Pereña & Seisdedos, 2005). The EFAI is a battery of tests for the factorial evaluation of the five basic abilities: Spatial, Numerical, Reasoning, Verbal and Memory. It has four levels (from EFAI-1 to EFAI-4) with an increasing complexity so that it allows evaluation of subjects of different ages (from 8 years old up to adults) and with different levels of education. In this survey, the level 3 has been used (EFAI-3) matching the age and school year the pupils are enrolled.

This test takes as first order factors: Spatial ability(E), considering it as the capacity and agility to imagine movements and object transformations in space; Numerical ability(N), as the capacity for reasoning with numbers and dealing with them in a methodical, agile and appropriate

way; Reasoning (R), described as the capacity and current agility of the subject to establish links among various elements and to discover the existing relations within abstract and complex sets; Verbal Ability(V), as the faculty to understand language subtleties and to manipulate verbal data correctly; and Memory, described as the capacity to retain and to consolidate new information in the medium-term memory and to recall it afterwards in a fluent way. As second order factors, The EFAI test also offers a General Intelligence (Ig) measurement, described as the current capacity of the subject to solve rapidly problems of different sorts which may imply verbal aspects, numerical aspects, or abstract and symbolic concepts. From the implementation of the five abilities of the EFAI, we can also obtain a measure of the speed and effectiveness in the answer style. From the application of the five abilities of the EFAI, we can also measure the speed and the efficiency in the response style. The speed (RAP) is assessed with the number of elements that the subject tries to solve and it is related to the speed with which the subject processes the different problems. The efficiency (EFI) is the percentage of correct elements attempted by the subject that are actually correctly solved. The studies of reliability done with the EFAI test indicate that, in general, the accuracy in respect to the intelligence factor is excellent (around .90) and for the subtests are satisfactory (between .70 and .90). For further information on the psychometric characteristics of the EFAI, see Santamaría et al. (2005).

3. PMA, *Primary Mental Abilities* (TEA 2002; Thurstone & Thurstone, 1989). This test allows an evaluation of what Thurstone (1939) referred to as primary mental abilities. The PMA consists of five tests that assess five factors isolately (Verbal, Spatial, Reasoning, Numerical calculation and Verbal Fluency). In this study, we have only used the test that evaluates the F factor, Verbal Fluency, which allows us to measure the ability to speak and write fluently. The reliability index for this test has been .07 (Secadas, 1958)

Data analysis

Data were analyzed using the statistical software package SPSS (v.17.0) for Windows. Significant linear relationships using Pearson's correlation coefficient were analysed. For the comparison of means, the Student t-test and the analysis of variance (ANOVA) have been used. Before running the ANOVA, normality and homogeneity of variance (Levene's test) were verified. The indexes for the effect size were also calculated using Cohen's *d* (1977, 1088).

Results

Significant relations between the creative performance and age have not been found. The descriptors and mean comparison, both for the whole group and by genders, is shown in Table 1. As it can be observed, the total group averages

are significantly above the standard values in the CREA Test in the B form; this recurs for male pupils, but in female pupils the values are statistically significant in both forms, with

effect size from moderate to high, placing them above the CREA standard values for the Spanish population.

Table 1: CREATIVITY: Means, standard deviations, Student t and Cohen's d.

	TOTAL (N=75)			Male (n=42)			Female (n=33)		
	Mean/ SD	t (75)	d	Mean/ SD	t (42)	d	Mean/ SD	t (33)	d
CREA A	17.83 (6.28)	1.25		16.55 (6.16)	-.39		19.13 (6.13)	2.37*	.47
CREA B	16.32 (4.58)	5.65***	.71	15.45 (4.34)	3.17**	.52	17.42 (4.70)	5.00***	.91

Nota: * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$

Differences between men and women have only been found in Verbal Fluency ($t(73)=-3.20$, $p=.002$, $d=-.74$), with higher values in female pupils. In academic performance there are differences in favour of female pupils, that have higher marks in: Language I ($t(73)=-2.37$, $p=.021$, $d=-.55$), History ($t(73)=-2.23$, $p=.029$, $d=-.52$), Biology ($t(73)=-2.05$, $p=.044$, $d=-.48$), Chemistry ($t(73)=-2.25$, $p=.028$, $d=-.52$) and in the average marks of the 1st semester ($t(73)=-2.04$, $p=.045$, $d=-.47$).

In Table 2, correlations among Creativity, Intellectual Abilities and Response Style are shown. There are significant correlations with Verbal Ability, Verbal Fluency and Speed; the higher punctuations in creativity (pages A, B and average for both), the higher results in the Verbal and Fluency Ability tests, and the higher speed in the execution of tasks. The results obtained when the sample is divided using gender criteria are different and more significant (See Table 3 below). In the group of male pupils, there are significant correlations between the creative performance and the Rea-

soning Abilities and Verbal Abilities on page B, and the average for both, and with Speed on page A. In the female group the results show correlations statistically significant with Verbal Ability and Verbal Fluency on both page A and average.

Table 2: Correlations: Intellectual Abilities and Creativity (N=75).

Abilities EFAI/PMA	CREA A	CREA B	CREA Mean
1. Spatial	.137	.049	.106
2. Numerical	-.047	-.054	-.053
3. Reasoning	.058	.071	.067
4. Verbal	.345**	.307**	.349**
5. Memory	.086	-.025	.042
6. Verbal Fluency	.339**	.254*	.321*
7. General Intelligence	.167	.127	.159
8. Speed	.242*	.249*	.255*
9. Efficiency	-.028	-.056	-.042

** Correlation is significant at $p < .01$ level (bilateral).

* Correlation is significant at $p < .05$ level (bilateral).

Table 3: Correlations: Intellectual Abilities and Creativity for Males and Females (N=75).

Abilities EFAI/PMA	Male (n=42)			Female (n=33)		
	CREA A	CREA B	CREA Mean	CREA A	CREA B	CREA Mean
1. Spatial	.278	.234	.275	.067	-.092	-.002
2. Numerical	-.008	.090	.034	.007	-.133	-.057
3. Reasoning	.274	.309*	.305*	-.252	-.244	-.265
4. Verbal	.302	.322*	.328*	.448**	.324	.421*
5. Memory	-.050	-.155	-.099	.231	.096	.184
6. Verbal Fluency	.071	.147	.108	.499**	.239	.412*
7. General Intelligence	.231	.274	.263	.085	-.059	.024
8. Speed	.219	.311*	.272	.339	.247	.319
9. Efficiency	.065	.072	.072	-.153	-.209	-.189

** Correlation is significant at $p < .01$ level (bilateral).

* Correlation is significant at $p < .05$ level (bilateral).

The relationship between Creativity and Academic Performance in the core subjects of the different areas of knowledge are also low (Table 4) There are only significant results for the subjects Language I and Chemistry. In the same way as with the Intellectual Abilities, when analyzing

the relationship between creativity and academic performance in males and females separately (Table 5), we obtain higher correlations and with a greater number of subjects in the male group. However, there is not a significant correlation in the female group.

Table 4: Correlations: Academic Achievement and Creativity (N=75).

Academic Achievement	CREA A	CREA B	CREA Mean
1. Language I	.270*	.247*	.275*
2. History	.167	.147	.168
3. Geography	.028	-.027	.005
4. Mathematics	.146	.162	.162
5. Biology	.213	.202	.221
6. Chemistry	.276*	.241*	.276*
7. Physics	.159	.069	.128
8. Average Marks	.196	.189	.204

** Correlation is significant at $p < .01$ level (bilateral).

* Correlation is significant at $p < .05$ level (bilateral).

Note: Language I (Mother tongue or dominant language)

Table 5: Academic Achievement for Males and Females (N=75).

Academic Achievement	Male (n=42)			Female (n=33)		
	CREA A	CREA B	CREA Mean	CREA A	CREA B	CREA Mean
1. Language I	.374*	.474**	.439**	.034	-.109	-.030
2. History	.296	.331*	.338*	-.169	-.239	-.213
3. Geography	.149	.136	.152	-.175	-.260	-.226
4. Mathematics	.219	.311*	.272	-.024	-.068	-.046
5. Biology	.366*	.439**	.419**	-.133	-.229	-.186
6. Chemistry	.317*	.305*	.330*	.079	.025	.059
7. Physics	.206	.186	.209	-.012	-.195	-.097
8. Average Marks	.348*	.415**	.398**	-.119	-.190	-.160

** Correlation is significant at $p < .01$ level (bilateral).

* Correlation is significant at $p < .05$ level (bilateral).

Table 6: CREA groups: Means, standard deviations.

	CREA 1 (n=10)		CREA 2 (n=51)		CREA 3 (n=14)	
	M	SD	M	SD	M	SD
CREA A	9.70	2.00	17.02	3.40	26.57	6.43
CREA B	9.80	2.35	15.67	2.50	23.36	1.98
CREA Mean	9.75	1.53	16.34	2.44	24.96	3.81

Note: * $p \leq .05$. ** $p \leq .01$. *** $p \leq .001$

Table 7: Anovas Intellectual Abilities Groups CREA Test.

Abilities	CREA 1 (n=10)		CREA 2 (n=51)		CREA 3 (n=14)		ANOVA (N=75)	
	M	SD	M	SD	M	SD	F(72)	p
1. Spatial	8.50	2.37	9.02	2.73	8.71	2.64	.18	.822
2. Numerical	12.50	3.75	12.49	4.26	11.71	4.23	.20	.823
3. Reasoning	10.50	3.57	12.24	4.00	10.64	3.52	1.50	.231
4. Verbal	7.50	3.24	9.88	3.33	11.50	3.67	4.08*	.021
5. Memory	14.40	1.35	13.31	2.36	13.86	1.88	1.20	.307
6. Verbal Fluency	32.20	9.37	36.37	9.75	43.36	11.81	3.99*	.023
7. General Intelligence	19.50	7.18	22.55	6.68	22.29	6.80	.86	.429
8. Speed	55.00	10.26	64.06	13.98	69.07	13.73	3.19*	.047
9. Efficiency	70.80	13.70	68.20	15.02	63.36	18.13	.78	.463

Note: * $p < .05$. ** $p < .01$. *** $p = .001$

The comparison of averages in academic performance (Table 8) has given statistically significant results among groups in Language I, History, Biology and Chemistry, and for the average marks in all subjects. The significant differ-

In order to identify the intellectual abilities and the academic performance in relation to the creative performance of these pupils, we analyse these variables according to the three levels of creativity (low, medium and high) offered by the authors of the CREA Test (Corbalán *et al.*, 2003). The average values of the results in the A and B pages (M=17.07, D.T.=5.12) are used to that purpose. According to the CREA Test standars, each group average is approximately in percentiles 20, 60-65 and 90, for the low, medium and high creativity group respectively. In table 6 the descriptive statistics for each group in the A, B pages and averages are shown.

The Anova results of Intellectual Abilities, indicate statistically significant differences in the tests of Verbal Ability and Verbal Fluency, and in the variable Speed (Table 7). In both tests, Verbal Ability and Verbal Fluency and Speed, there are significant differences between group 1 and group 3 (Post-hoc Bonferroni tests); students from group 3 obtain results significantly higher than group 1 ($p \leq .05$).

ences are, as for the intellectual abilities, between group 1 and group 3 ($p \leq .01$ for Chemistry and $p \leq .05$ for the rest of subjects and the average marks), obtaining the latter the highest scores in the four subjects and in the average marks.

Table 8: Anovas Academic Achievement Groups CREA.

Academic Achievement	CREA 1 (n= 10)		CREA 2 (n=51)		CREA 3 (n =14)		ANOVA (N=75)	
	M	SD	M	SD	M	SD	F(72)	p
1. Language I	6.35	.94	7.22	1.12	7.68	1.15	4.31*	.017
2. History	6.23	1.45	7.46	1.25	7.32	1.38	3.78*	.028
3. Geography	6.63	.71	7.09	1.38	6.77	1.68	.65	.525
4. Mathematics	7.08	1.33	7.58	1.150	7.91	1.22	1.45	.242
5. Biology	5.70	1.83	7.03	1.52	7.16	1.46	3.35*	.041
6. Chemistry	5.03	1.63	6.82	1.63	7.20	1.44	6.31**	.003
7. Physics	5.98	.92	6.75	1.41	6.95	1.21	1.77	.178
8. Average Marks	6.68	.66	7.53	.81	7.55	.93	4.81*	.011

Note: * $p < .05$. ** $p < .01$. *** $p = .001$

Discussion and conclusions

This study has explored the creative performance in a specific sample of secondary school pupils in a multicultural and multilingual context. The relationships between the creative performance of these pupils and their intellectual abilities and academic performance have been analyzed. Considering creativity as a capacity (Corbalán et al., 2003), the results reveal that in addition to a highly creative performance in the analyzed sample, there are significant differences in their creativity performance between male and female pupils. These results contradict the findings in this field, which generally show a lack of difference between men and women in terms of creativity (Baer, 1999, 2005; Mac-coby & Jacklin, 1974; Matud, Rodríguez & Grande, 2007). Given the specific academic context where this study has taken place, the results must be taken with caution, bearing in mind the relationships with the curricular variables analyzed, and considering that creativity implies very specific and diverse intellectual abilities (Stenberg & O'Hara, 1999; Mumford, Hunter, Eubanks, Bedell & Murphy, 2007; Kaufman & Beghetto, 2009) in which men and women have indeed shown significant differences (Feingold, 1996; Halpern, 1992; Springer & Deutsch, 2001).

The results reveal that there are significant relationships among some intellectual abilities, academic achievement and creativity; but these relationships, as it has been confirmed in previous research (Haddon, 1968; Karimi, 2000; Krause, 1972, 1977; McCabe, 1991) are not high. The intellectual abilities that correlate with creativity can be found in the linguistic domain: verbal ability and verbal fluency. These results would confirm previous research (Urban, 1972; Moreno, 1992; Garaigordobil & Torres, 1997). The subjects in which we find correlations between between academic and creative performance are two: Language I and Biology. The two of them belong to very different areas of knowledge. This could be explained in both cases by the nature of the curricular contents and by the cognitive process involved, rather than being the teaching methodology a crucial factor since the final marks come from a wide range of assessment techniques and formats (regular progress tests, cumulative exams, project work, oral interrogations and participation in class.) which are common to all subjects.

When we take the parameter gender into account, the findings obtained show more significant relationships, although different, for male and female pupils. In the case of female pupils in comparison with male pupils, creativity is more significantly linked to Verbal Aptitude, Verbal Fluency and Speed in their response style. However, no relationship with academic performance, which could be related to the higher academic achievement in the case of the female pupils in this sample, has been found. In male pupils, creativity is related to Reasoning, an ability extensively linked to creativity (Cattell, 1971; Sternberg, Kaufman & Grigorenko, 2008; Urban, 1990, 1995;), and also to Verbal Ability and Speed, although in a lesser degree than in the female sample. In the male sample, creativity also correlates with academic achievement in most of the subjects: Language 1, History, Mathematics, Biology, Chemistry, and with the average marks of the 1st semester. It could be assumed that the contribution of creative capacity to academic achievement is more evident in male students than in female students.

These results would also confirm recent research about the modulation role of gender in the relationship between creativity and intellectual performance (Ai, 1999; Naderi, Abdullah, Aizan, Sharir & Kumar, 2010). Together with the differential results obtained in intellectual abilities, they would empirically support the hypothesis on differences in creative performance with gender as a basis.

The analysis of intellectual abilities and academic performance according to the creative performance of these pupils, has allowed us to identify the most significant abilities related to highly creative performance and their relationships with academic achievement. The identified abilities confirm the presence of higher linguistic capacities (Verbal Ability and Verbal Fluency) and a response style characterised by the high speed of information processing in the group with a highly creative performance.

The academic performance in this group has also been higher in the subjects of Language I, History, Biology and Chemistry. The group with the highest achievements also shows the highest overall average marks, thus a high academic performance, which supports previous research about the relationship between creativity and high levels of achievement in academic performance (Ai, 1999; Bentley, 1966; Shin & Jacobs, 1973; Smith, 1971) and confirms, what

Getzels and Jackson (1962) had already stated: creativity is as important as intelligence for academic performance.

The relationships found between a fast response style and creative performance can be highly revealing of processes linked to the creative performance which go beyond verbal fluency and fluency of ideas, traditionally associated to creativity. The measurements used in this test to analyse speed and response style gives information about the speed in processing different tasks (Santamaría et al., 2005). In the assessment of intellectual abilities, speed plays an essential role in the building up of associations. However, according to Eysenck (1995), in the area of creativity, the cognitive key would be part of the rank of associations. In any case, according to Alonso and Corbalán (1999), the fact of having a higher speed in the building up of associations would mean learning faster thus facilitating the arrangement of a greater number of elements, despite the possibility that the quality of processing could decrease. This would also justify that efficiency not only does not correlate with creative performance but it even becomes lower in the most creative individuals, as in this case.

The results, both in relation to the intellectual abilities and the academic performance, reveal too a relationship between creative capacity and linguistic aptitude. These relationships are still more significant if we take into consideration that we refer to a multilingual context, where the students use at least three different languages. The linguistic intelligence, according to Chomsky (1968, 1977), involves complex acquisition processes that seem to differ from the processes involved in the convergent intellectual abilities. This is obvious when we compare how easy it is for a child to produce language at ages where the ability to solve problems is still being developed. At those ages, the synthetic and phonological processes are essential for the acquisition of

the language and they operate with scarce environmental support (Gadner, 1983). Following Chomsky and the defenders of the generative grammar, language seems to behave as a relatively independent intelligence. Will be these synthetic processes maybe the ones that creativity and linguistic intelligence share? Can these synthetic processes be the ones that besides contributing to understanding the nature of the creative process also explain the differences between men and women in a linguistically advanced sample? These are, however, questions that go beyond the scope of this study, but indeed open new challenges and ways to continue the research about the contribution of these and other variables to the understanding of the creative phenomenon and its contribution to the development of the capacities of individuals.

Finally, this study presents some limitations due to the limited size of the sample, which was insufficient to measure the mediation effect of gender in relation to the level of creative performance, as the differences found between male and female pupils suggested. Likewise, in the differential creative performance in both forms of CREA (Pages A & B) and in its different contributions to the academic performance in men and woman, the existence of other variables related to the different contents in the pages that could be analyzed in subsequent studies. Future research may allow us to present more arguments to answer the hypothesis that these results have triggered and to address the aforementioned limitations.

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References

- Ai, X. (1999). Creativity and Academic Achievement: An Investigation of Gender Differences. *Creativity Research Journal*, 12(4), 329-337.
- Alonso Monreal, C. & Corbalán Berná, F. J. (1999). La visión de Hans J. Eysenck sobre la creatividad. En A. Andrés Pueyo & R. Colom Marañón (Eds.), *Hans Jürgen Eysenck (1916-1997) Psicólogo científico* (pp. 215-238). Madrid: Biblioteca Nueva.
- Amabile, T.M. (1983). *The social psychology of creativity*. New York: Springer-Verlag.
- Baer, J. (1999). Gender differences. En M. A. Runco & S. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 753-758). San Diego: Academic Press.
- Baer, J. (2005). *Gender and creativity*. Paper presented at the Annual Meeting of the American Psychological Association, Washington, DC (August).
- Barron, R. & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual Review of Psychology*, 32, 439-476.
- Bentley, J. C. (1966). Creativity and academic achievement. *Journal of Educational Research*, 59, 269-272.
- Bermejo, R., Hernández, D., Ferrando, M., Soto, G., Sáinz, M. & Prieto, M. D. (2010). Creatividad, inteligencia sintética y alta habilidad. *Revista Electrónica Interuniversitaria de Formación del Profesorado*, 13 (1), 97-109. Enlace web: <http://www.aufop.com>. Consultada en fecha: 03-05-2010.
- Cattell, R. B. (1971). *Abilities: Their structure, growth and action*. Boston: Houghton Mifflin.
- Chomsky, N. (1977). *El lenguaje y el entendimiento* [Language and Mind, 1968]. Barcelona: Seix-Barral.
- Corbalán, F. J. (2008). ¿De qué se habla cuando hablamos de creatividad?. *Cuadernos. Revista de la Facultad de Humanidades y Ciencias Sociales UNJU* (Argentina), 35, 11-21.
- Corbalán, F. J., Martínez, F., Alonso, C., Donolo, D., Tejerina, M., Limiñana, R. M. (2003). *CREA. Inteligencia creativa. Una medida cognitiva de la creatividad*. Madrid: TEA ediciones.
- Csikszentmihalyi, M. (1988). The flow experience and its significance for human psychology. En M. Csikszentmihalyi (Ed.), *Optimal experience: psychological studies of flow in consciousness* (pp. 15-35). Cambridge, UK: Cambridge University Press.
- Csikszentmihalyi, M. (1996). *Creativity: Flow and the Psychology of Discovery and Invention*. New York: Harper Perennial.
- Eysenck, H. J. (1995). *Genius. The natural history of creativity*. Cambridge: University Press.
- Feingold, A. (1996). Cognitive gender differences: Where are they, and why are they there?. *Learning and Individual Differences*, 8(1), 25-32.
- Feldman, D. H. (1999). The Development of Creativity. En R.J. Sternberg (Eds.), *Handbook of Creativity* (pp. 169-187). Cambridge: Cambridge University Press.

- Garaigordobil, M. & Torres, E. (1997). Evaluación de la creatividad en sus correlatos con inteligencia y rendimiento académico. *Revista de Psicología Universitat Tarraconenses*, XV(1), 87-98
- Gardner, H. (1983). *Frames of Mind: The theory of Multiple intelligences*. New York: Basic Books.
- Getzels, J. W. & Csikszentmihalyi, M. (1972). The creative artist as an explorer. En J. MeVicker Hunt (Ed.), *Human intelligence* (pp. 182-192). New Brunswick, N.J.: Transaction Books.
- Getzels, J. W. J., & Jackson P. W. (1962). *Creativity and intelligence*. New York: Wiley.
- Guilford, J. P. (1970). Creativity: Retrospect and prospect. *Journal of Creative Behavior*, 4, 149-168.
- Guilford, J. P. (1950). Creativity. *American Psychologist*, 14, 469-479.
- Guilford, J.P. (1959). *Traits of creativity*. En H.H. Anderson (Ed.), *Creativity and Its cultivation* (pp.142 – 161). New York: Harper and Row.
- Haddon, F. A., & Lytton, H. (1968). Teaching approach and the development of divergent thinking abilities in primary schools. *British Journal of Educational Psychology*, 38, 171-180.
- Halpern, D. F. (1992). *Sex differences in cognitive abilities* (2nd ed.). London: Lawrence Erlbaum Associates.
- Karimi, A. (2000). *The relationship between anxiety, creativity, gender, academic achievement and social prestige among secondary school*. Shiraz: University of Shiraz.
- Kaufman, J. C. & Beghetto, R. A. (2009). Beyond big and little: The Four C Model of Creativity. *Review of General Psychology*, 13, 1-12.
- Krause, R. (1972). *Kreativität* [Creativity]. Munich: Goldmann.
- Krause, R. (1977). *Produktives Denken bei Kindern* [Productive thinking with children]. Weinheim, Germany: Beltz.
- Maccoby, E. E., & Jacklin, C. N. (1974). *The Psychology of Sex Differences*. Stanford: Stanford University Press.
- Maslow, A. (1959). Creativity in self actualizing people. En H. Anderson (Ed.), *Creativity and its cultivation*. New York: Harper & Row.
- Matud, P., Rodríguez, C. & Grande, J. (2007). Gender differences in creative thinking. *Personality and Individual Differences*, 43, 1137-1147
- McCabe, M. P. (1991). Influence of Creativity and Intelligence on academic performance. *Journal of Creative Behavior*, 25(2), 116-122.
- Moreno, J. A. (1992). La capacidad creadora y los aprendizajes escolares. Estudio de los factores constitutivos de la Creatividad. *Revista de Psicología de la Educación*, 3(9), 15-26.
- Mumford, M. D., Hunter, S. T., Eubanks, D. L., Bedell, K. E. & Murphy, S. T. (2007). The Future of Leadership Development. *Human Resource Management Review*, 17 (4), 402-417
- Naderi, H., Abdullah, R., Aizan, H. T., Sharir, J. & Kumar, V. (2010). Relationship between creativity and academic achievement: A study of gender differences. *Journal of American Science*, 6(1), 181-190
- Rogers, C. (1978). Hacia una teoría de la creatividad. En Th. Roberts (Ed.), *Cuatro psicologías aplicadas a la educación*. Madrid: Narcea.
- Santamaría, P., Arribas, D., Pereña, J. & Seisdedos, N. (2005). *EFAI, Evaluación Factorial de las Aptitudes Intelectuales*. Madrid: Departamento I+D TEA Ediciones.
- Secadas, F. (1958). Reajuste de valoraciones del P.M.A. *Revista de Psicología General y Aplicada*, 45, 129-131
- Shin, S. H., & Jacobs, S. S. (1973). An analysis of the interrelationships among intelligence and multilevels of creativity and achievement. *Paper presented at the Proceedings of the 81st Annual Convention*. American Psychological Association, USA, 81, 629-630.
- Smith, I. L. (1971). I.Q., creativity and achievement: Interaction and threshold. *Multivariate Behavioral Research*, 6, 51-62.
- Springer, S. P. & Deutsch, G. (2001). *Cerebro izquierdo. Cerebro derecho*. Barcelona: Ariel Neurociencia.
- Sternberg, R. J. & O'Hara, L. (1999). Creativity and intelligence. En Robert J. Sternberg (Ed.), *Handbook of Creativity*. N. York: Cambridge University Press
- Sternberg, R. J. (1985). *Beyond IQ: A triarchic theory of human intelligence*. Cambridge: Cambridge University Press.
- Sternberg, R. J. (1990). Thinking styles: keys to understanding student performance. *Phi Delta Kappan*, 71 (5), 366-371.
- Sternberg, R. J. (2005). Creativity or creativities?. *International Journal of Human-Computer Studies*, 63 (4-5), 370-382.
- Sternberg, R. J., & Lubart, T. I. (1991). An investment theory of creativity and its development. *Human Development*, 34(1), 1-32.
- Sternberg, R. J., Kaufman, J. C., Grigorenko, E. L. (2008). *Applied Intelligence*. New York, US: Cambridge University Press.
- Sternberg, R.J., y Lubart, T.I. (1993). Investing in creativity. *Psychological Inquiry*, 4(3), 229-232.
- Taylor, I. A. (1975). A retrospective view of creative investigation. En I.A. Taylor and J.W. Getzels (Eds.), *Perspectives in creativity*. Chicago: Aldine.
- Thurstone, L. & Thurstone, T. G. (1989, 2002). *Aptitudes Mentales Primarias*. Madrid: TEA.
- Thurstone, L. L. (1939). *Primary mental abilities*. Chicago: University of Chicago Press.
- Urban, K. K. (1990). Recent Trends in Creativity Research and Theory in Western Europe. *European Journal for High Ability*, 1, 99-113.
- Urban, K. K. (1995). Different Models in Describing, Exploring, Explaining and Nurturing. Creativity in Society. *European Journal for High Ability*, 6, 143-159.

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