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RELATIONSHIP BETWEEN CREATIVITY, INTELLIGENCE AND ACADEMIC ACHIEVEMENT AMONGST PRIMARY EDUCATION STUDENTS

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Abstract: *The research purpose is to examine the relationships between creativity, intelligence and academic performance among children in primary education and if the relationships differ between males and females. Participants (N = 40, male = 18, female = 22) were students of second cycle in primary school, asessed using creativity and intelligence tests. Results indicate a significant relationship between intelligence and creativity, as well as between creativity and academic achievement. The creative attitude positively associated with the performance of the divergent thinking test. No significant gender differences were obtained on creativity as well as on the relationships creativity-academic achievement and intelligence-academic achievement, but this results should be interpreted with caution because the small number of participants can reduce research power.*

Key words: *creativity, convergent thinking, divergent thinking, intelligence, academic achievement.*

1. Introduction

Although research on the relationship between intelligence, creativity and academic performance are quite numerous in the literature, very few of them investigate students of school age, when creativity plays a key role, and correlations between divergent thinking and other individual variables must be treated with the utmost importance.

Creativity will always be a topical issue because it is a basic tool for the advancement of any society or community, so any development area should consider it.

As shown by numerous authors, creativity has always been associated to intelligence. Although studies show that the two constructs are distinct and they are not mutually exclusive, in school the focus is often on equipping intellectual ability, considered one of the most effective predictors of school performance, and creativity is neglected or promoted only in a declarative way. Unfortunately, sometimes divergent thinking and

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creative attitude can be even a disadvantage in traditional schools because substandard rigid evaluation rewards only convergent thinking skills.

Creativity allows people to make the most of their life experiences and their resources. It increases self-confidence, produces ideas, new concepts and opportunities for innovation (Olatoye, Akitunde, & Ogunsanya, 2010).

According to Akinboye (as cited in Olatoye et al., 2010, p. 135), "without creativity, a person is not able to access the fullness of information and resources available but is locked up in old habits, structures, patterns, concepts and perceptions". Creativity is the result of interaction between intellectual work, knowledge, motivation, cognitive styles, personality and environment. Therefore, it should be a central element of any educational system. Most often, however, education does not include or encourage creative thinking or attitude, does not reward them in any way, which leads to suppression of these skills. Children can come into the world with a genetic predisposition or tendency to be creative, but then comes the role of parents and teachers, which should encourage and develop these attitudes and innated traits.

Dingledine (as cited in Olatoye et al., 2010) argues that family support, effectiveness of teaching materials and social pressures are among the factors shaping the development of creativity. Given these data, it is clear that teaching, school evaluation and social environment should not impose barriers, but support creative children, from the youngest ages, so they become confident, flexible, original adults and are able to innovate and adapt to continuous changes in all facets of society.

1.1. Creativity and Intelligence

The connection between the two constructs was always regarded with interest, but despite that the issue has been investigated for decades, authors have not yet reached an agreement on how they relate to each other. Kaufman & Plucker (2011) consider that, in general, research and developed theories on the relationship between intelligence and creativity contradict each other. Thus, Threshold Theory, one of the hypotheses most often proposed, suggests that intelligence is necessary but not sufficient condition for creativity (Jauk, Benedek, Dunst, & Neuber, 2013; Runco, & Albert, 1986).

Sternberg and O'Hara (as cited in Kaufman & Plucker, 2011) argue that the relationship between creativity and intelligence influences both children's lives and that of adults. However, psychologists and teachers focus on intelligence issues, neglecting creativity and interaction between the two.

One of the most popular research conducted in order to identify differences between highly creative individuals and those with high IQ is that of Getzels and Jackson (as cited in Starko, 2005). The authors concluded that creativity can lead to school success without having high intelligence, but also that some of the students' creative features may be associated with difficulties in traditional schools. Creative students are not preferred by teachers because they cannot adapt routine activities and overregulation, interrupt the teacher, often ask questions that require deviation from strict lesson's plan established before (Kaufman & Plucker, 2011; Gowan, Khatena & Torrance, as cited in Kaufman &

Sternberg, 2010). Sight (as cited in Kaufman & Sternberg, 2010) studied attitudes towards creative children using Ideal Child List proposed by Torrance and discovered that parents do not react favourably to personality traits associated with creativity.

1.2. Creativity and Academic Achievement

There are relatively few studies investigating the relationship between creativity and academic performance, these having largely conflicting results. Getzels is the first who identified, in 1962, the role of creativity in educational achievement, and the investigation had a significant impact on education. Aim of the study was to identify differences between groups of students with high score on intelligence tests and groups who obtained high scores on creativity tests (Naderi, Abdullah, Aizan, Kumar, Sharir, 2010). In 1998, Jensen (as cited in Candrasekaran, 2013) showed that the academic performance of high-school students are strongly correlated (between .50 and .70) with scores of creativity tests. The connection between the two constructs has been also demonstrated by recent research, such as those of Wang, 2011; Pishghadam et al. (as cited in Kaboodi & Jiar, 2012) or Aness, Anwar, Khizar, Muhammad, & Naseer, (2012).

Some studies (Cicirelli 1965; Hirsh & Peterson, 2008, as cited in Naderi et al., 2009) even suggested that creativity tests could be predictors of academic performance.

On the other hand, in 1965 Edwards made a research whose results showed that academic performance is not related with creativity. Similar results were obtained later by authors like Behrooz (1997) or Clouds (2002, as cited in Naderi et al., 2010). Other authors identified a low correlation between creativity and school performance, located around .25.

There are authors who suggest that the relationship between creativity and academic performance is largely associated with a component of mental dynamics. In other studies there was considerable debate on the causal priority in the relationship between creativity and academic performance. While some researchers see creativity and school performance as identical constructs, others believe that the relationship between the two is mutual (Candrasekaran, 2013).

Also results reported negative correlations between academic performance and creativity, for example, in the study by Tsai (2013). These findings suggest that intelligence and creativity are different constructs, or negative associated to one another.

Researchers are far from being reached a consensus acceptable for the interdependence between creativity and academic achievement, suggesting that this issue is complex and dependent on culture or society investigated.

1.3. Intelligence and Academic Achievement

The relationship between intelligence and school performance has been, especially in recent years, a significant problem for researchers.

In general, research indicates a strong correlation between general cognitive abilities and academic performance, between .50 and .75 (Rohde & Thompson as cited in Naderi et al., 2010). However, some authors (e.g.. Watkins, Lei & Few as cited in Naderi et al.,

2010) believes that between intelligence and performance there is a exclusive causality, while others believe that the two constructs are identical. Another perspective of the researchers is the mutual relationship between intelligence and school performance.

In 2006, Allik, Laidra, & Pullmann performed a study investigating predictors of academic performance (including intelligence), for a wide range of ages, from primary to secondary school. The results obtained indicate a moderate correlation of .50 between intelligence and academic performance (average value accepted by most authors), IQ proved to be the best predictor of academic achievement for all stages of age. Previous studies (Aluja-Fabregat & Blanch; Lounsbury, Sundstrom, Loveland, & Gibson; Rindermann & Neubauer, as cited in Allik et al., 2006) also showed that intelligence is more closely linked to academic performance than any personality trait.

The relationship between intelligence and academic performance tends to decrease with age and is higher in primary and in lower secondary school, as shown by Jensen (as cited in Allik et al., 2006).

2. Objectives

The goal of this study was to identify correlations between intelligence, creativity and academic performance of primary school children and the role that creativity and intelligence play in achieving higher academic results. Given the goals, the research questions were as follows:

1. What is the relationship between creativity and intelligence?
2. What is the relationship between intelligence and academic performance?
3. What is the relationship between different aspects of creativity and academic achievement?

We also wanted to know if there are gender differences regarding creativity and correlations between intelligence and academic achievement, as between creativity and academic achievement. At the same time, we want to know if there are correlations between self-reported creative attitude and divergent thinking ability. The hypothesis in line with the threshold theory (Runco, & Albert, 1986) assumed that there is a moderate correlation between intelligence, academic achievement and creativity. Also it was expected that girls will have higher results in academic tests while intelligence and creativity will not differ between genders.

3. Material and Methods

3.1. Sample

We investigated a sample of 40 typical students in primary school, aged between 10 and 12 years. Of the subjects, 22 were girls and 18 boys. The sample was constituted by the voluntary participation of students from two classes IV, coming from Gymnasium School no. 14, Braşov.

3.2. Measures

3.2.1. Creative Attitude Survey (CAS) designed for children by Schaefer and Bridges (1970) is a multidimensional self-report instrument designed to assess predisposition for creativity addressed to children aged between 9 and 11 years. It measures imagination, interest in art and writing, desire and attraction of new abstract and magical ideas.

Creative Attitude Survey includes 30 items based on data from the literature on attitudes, beliefs and values of highly creative people. It covers seven dimensions of creative work: confidence in their own ideas, theoretical and aesthetic orientation, appreciation of fantasy, openness to impulse expression, and desire for novelty.

3.2.2. Two samples of creativity tests (one verbal and one figurative) adapted by Roco (2001), from Wallach-Kogan Creativity Test - WKCT (1965): alternative uses and figure interpretation (meaning pattern). WKCT battery samples are scored according to fluency/fluidity (number of ideas), flexibility (different category) and originality (metaphorical, unique, unusual answers).

Sample of alternative uses requires generating as many novels uses possible for a number of everyday objects specified (8 in this case), such as a chair or a newspaper. It has been calculated the score for each item of the sample (according to the three criteria), then the total score obtained for each sample scoring criteria.

The sample of figurative pattern interpretation requires generating a number of possible meanings for eight abstract figures. Responses were evaluated in terms of fluency (total responses) originality (number of unique responses) and flexibility (number of classes of response). It has been calculated the score for each item of the sample (according to the three criteria), then the total score.

3.2.3. Four tasks of Generating alternatives, adapted from De Bono (2003). Generating alternatives is one of the techniques E. de Bono proposes to stimulate lateral thinking, in the book of the same name. For the sample of generating alternatives we choose four tasks, three geometric and one non-geometric (combining elements). Geometric tasks referring to the description of figures (outlines of houses, two straight lines at right angles and circles joined by a line) in four different ways, and the non-geometric involves combining objects presented so as to obtain three different models (description of a 1 litre bottle of water containing half a litre of milk).

We set one share alternative for each of the four tasks (4 responses for the first three and 3 for the last) to facilitate scoring. The responses were scored according to the flow and the originality.

3.2.4. For measuring intelligence, we used *Bonnardel 53 test*, which consisted in sixty items requiring to understand the logic of a figural series and to continue it, by selecting the correct figure. The test is highly saturated in *g* factor and is considered “culture free”.

3.2.5. Academic performance was measured by collecting the mean results after the first semester of the school year ended for four subjects: Mathematics, Romanian, Geography

and History. The students' grades where transform as follows: **I** = 4, **S** = 6, **B** = 8, **FB** = 10.

The general academic performance resulted from the mean of the four disciplines.

3.2. Procedures

Two classes of students were tested, using paper and pencil versions, in two sessions: first the questionnaire on creative attitude was filled in, followed by divergent thinking tests (with a twenty minutes time limit). In the second session, alternative generation tasks (with a ten minutes time limit) and intelligence test were completed.

4. Results

Regarding the relationship between creativity and intelligence, Pearson's correlation coefficient obtained is reduced, but statistically significant: r = .34 and p = .02. These values suggest that children with an IQ medium high (raw scores in the test B53 between 12 and 32 points) get higher performance to divergent thinking samples compared with students who have intellectual capacities fall below the limit (scores lower 11 points).

If we refer to the correlation coefficients obtained between general intelligence and the three types of creative skills, we obtained a positive and statistically significant association between cognitive abilities and verbal creativity: r = .46; p < .05 (see table 1). In literature, verbal fluency is one of the most consistent cognitive ability associated with creativity.

Correlation between creativity results and general intelligence Table 1

		Figural creativity	**Verbal creativity**	**Alternative generation**	**Creativity total score**
B53 General intelligence	r	.10	.46**	.11	.34*
	p	.50	.01	.47	.02
	N	40	40	40	40

For the relationship between intelligence and academic achievement we obtained a significant positive association between the intellectual abilities and general school performance: r = .54 and p < 0.01.

Regarding to the association between creativity and academic achievement, results show that the two constructs are significantly associated (r= .42, p = .006). Creative students can get high school results, which somewhat contradicts the idea that intelligence is the single most important predictor of academic performance. Divergent thinking is significantly correlated with academic performance in Romanian language (r = .41, p = .01). For other disciplines, the correlations are low, but statistically significant (Mathematics: r = .36 and p = .02; History: r = .34 and p = .02; Geography: r = .33 and p = .03), which underlines applicability of creativity in various areas and possibility of inclusion in all school areas (see table 2).

Association between creativity and school performance (N = 40) Table 2

		Romanian language school results	**Mathematics school results**	**History school results**	**Geography school results**	**Academic performance**
Figural creativity	r	.17	.09	.06	.13	.13
	p	.27	.57	.70	.39	.39
Verbal creativity	r	.51**	.50**	.50**	.43**	.56***
	p	.001	.001	.001	.005	.001
Alternative generation	r	.15	.12	.08	.09	.13
	p	.34	.43	.58	.54	.40
Creativity total score	r	.41**	.36*	.34*	.33*	.42**
	p	.01	.02	.02	.03	.006

T-test for independent samples showed no statistically significant differences between girls and boys for any of the subtypes of creativity, although some authors consider that girls score higher than boys at divergent thinking tests. It seems that there are some minor differences between girls and boys on the combination of intellectual abilities and school performance. While in the case of boys, correlation between the general intelligence and academic achievement is one of the average ($r = .57$, $p < .05$) for girls the association is stronger ($r = .60$, $p < .05$). Therefore, it is possible that girls' grades depend heavily on general intelligence while for boys, other factors may be responsible.

Regarding the relationship between creative attitude and creativity, Pearson correlation coefficient indicates a strong and statistically significant association: $r = .55$, $p < .01$. This result is consistent with the literature that stresses that in addition to skills, highly creative people possess a number of specific attitudes (such as openness to experience, trust in his own ideas, fantasy appreciation).

4. Discussion

The result obtained for association between intelligence and creativity is consistent with a number of theories (Kaufman, & Plucker, 2011; Kaufman, & Sternberg, 2010). First, the three layers theory (Carroll, 1993) argues that divergent thinking is a subcomponent of intelligence as part of long-term storage and updating two of the ten factors of intelligence extended. Another theory which considers the creativity part of intelligence is the successful intelligence theory, with three subsections: componential, experiential and contextual. Gardner's theory of multiple intelligences includes creativity through the eight intelligences types.

Similarly, the threshold theory argues that although it is not sufficient for the manifestation of creativity, intelligence is a necessary condition of its existence. So, medium-high intelligence can be considered as one of the predictors of creativity in primary school. According to a classification made by Wallach and Kogan (as cited in López-Martínez & Navarro-Lozano, 2010) individuals with mid-upper intellect and high creativity

are people who have control over their lives and manifest freedom both in childhood and in adulthood.

The significant correlation between intelligence and academic achievement suggests that intelligence is a necessary condition to obtain superior results because traditional schools emphasis on student's convergent thinking skills and the evaluation is based on their results in tasks that require reproduction of knowledge, thinking practical, or problem solving after specific algorithms. The result is consistent with many previous studies that identified strong correlations between general intellectual abilities and academic performance. In the view of the authors, between intelligence and performance are an exclusive causal relationship or the two constructs are identical. But, for the research sample the strong correlation may be due to the low age of the students because association between intelligence and academic performance tend to decrease in later school years. For these reasons, students with an average intellectual capacity, but with a great creative potential can be considered inferior compared to those highly intelligent but less creative, which adapt perfectly to styles of teaching and learning promoted in most schools and have exemplary academic results.

Lack of gender differences in the sample of this research may be due to demographics and socio-cultural characteristics in tested subjects. Also, at this age they have not made so many gender stereotypes as adults do, so creative capabilities of students are not influenced by such beliefs. On the other hand, it is possible that gender differences in terms of creativity is declining due to changes in modern society.

Some authors argue that the lack of consensus on the correlation between creativity and academic performance is precisely that research did not take into account gender differences; conflicting results could be explained by different gender roles assigned to men and women (Azimmudin, & Chandra, 2013). In our case, there are no significant gender differences regarding the association between creativity and school performance. However, it seems that the performance of girls in Romanian language are related more to creativity than boys' performance. This result it could be consistent with previous research showing that for women fluency associated with superior performance is more significant than for men.

An interesting direction to be explored in the future studies is to investigate teachers, students and parents′ beliefs on the contribution of intelligence and creativity for academic performance and how these beliefs modify the association among the variables. More participants should be considered and individual testing as opposed to collective one (as the one used for the present research) is also recommended.

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