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Creativity and Decision Making in Giftedness

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Abstract: Creativity is the ability to re-experience mental representations and is the basis of intuitive thinking when constructing images prior to the elaboration of an action plan. Creativity is thought to be related to orbitofrontal functions that govern decision making, such as inhibitory control, risk–benefit evaluation and acceptance of limits and rules, given that these processes prepare one against possible scenarios. Objective: In this study, the relationship between creativity and decision making is investigated to understand the needs of gifted students. Method: A cross-sectional descriptive study was carried out with gifted students (IQ mean = 133) aged 8–10 years old (n = 25). Instruments: Creative Imagination Test (PIC) and subtests of the Neuropsychological Battery of Executive Functions and Frontal Lobes (BANFE-2) were employed. Analysis: A Spearman correlation analysis was conducted between the normalized BANFE-2 scores and the percentiles of PIC. Results: Moderate correlations were found between creative/narrative flexibility and decision making/risk percentage ($r = 0.432$, $p \leq 0.05$) and decision making/response-effectiveness ($r = 0.426$, $p \leq 0.05$), as well as between graphic creativity/shadow and color with decision making/response-effectiveness ($r = 0.452$, $p \leq 0.05$) and inhibition ($r = 0.673$, $p \leq 0.01$); moderate negative correlations were found between inhibition and graphic creativity/title ($r = -0.570$, $p \leq 0.05$) and general graphic creativity ($r = -0.489$, $p \leq 0.05$). Conclusions: Creativity in students with intellectual giftedness is favored by a relationship with orbitofrontal functions. Analysis of risk situations and effective decision making increase narrative creation and diminished inhibition allows for greater creative graphic production.

Keywords: creativity; inhibition; decision making; giftedness; limits–rules; students

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1. Introduction

Creativity is the ability to re-experience mental representations and is the basis of intuitive thinking when constructing images prior to creating and executing an action plan [1].

For creativity to manifest, it is necessary to analyze and interpret the available information on a given topic [2] and feel the need to increase one's knowledge (that is, be curious), starting with the interpretation of the stimuli received from the environment and a personal motivation to transform problems into results [3].

Creativity includes originality in solving problems, breaking rules when necessary and meeting the expectations of the situation [4]. Given all these statements, creativity should be conceptualized as a process that involves a variety of steps to generate novel and contextually appropriate ideas [5,6], and in this way, it can be conceived as the result of applying basic cognitive processes to existing knowledge structures [7].

Starting with genetics, it has been shown that there is genetic influence on intelligence and that this influence extends to creative scientific achievements [8,9]. This suggests that creative work can be achieved through a variety of cognitive processes and through different cognitive strategies, which pose different demands on information processing depending on the domains of expression. Cognitive abilities, personality, interests and the probability of participating, enjoying and excelling in certain activities or domains are affected by both genetic composition and life experiences [8].

Cognitive flexibility and persistence lead to creative achievements as they allow for free and fluid associative thinking between semantic concepts, enabling systematic, effortful and deep explorations of an issue [8].

Therefore, creativity is the result of a dynamic interaction between various brain regions, networks and systems. The patterns of brain activity seen during creative problem solving depend largely on the problem-solving strategies used [10] and in turn on the objective of the task. For instance, the lateral prefrontal cortex exerts top-down control on intended behavior, and the medial prefrontal cortex is activated to organize brain systems into automated processes [8].

Creative performance can be associated with both increased and decreased activity in the dorsolateral prefrontal cortex and other working memory regions, depending on the prerequisites of the task [10].

It is known that the inferior prefrontal cortex, related to memory retrieval, executive processes and focused attention, plays a predominant role in divergent reasoning [10,11]. Divergent reasoning is as a central component of creative capacity, being understood as the production of original ideas to solve problems [12] and implying fluidity of thought, ideas, flexibility and elaboration or complexity [13].

Some studies have already found that damage to the ventromedial areas of the frontal lobe is associated with a low reactivity of the central nervous system [14].

The integration of different cognitive components associated with the prefrontal cortex through the activation of synaptic networks that connect prefrontal areas with cortical and subcortical areas in order to process complex information gives rise to the decision-making process. Decision making consists of appropriately selecting response alternatives to complete a task or action plan or for problem resolution; it requires evaluating, initiating, supervising, monitoring and controlling the established plan [15].

Controlling the plan to be executed implies pre-considering and prioritizing actions to carry out what is important. Inhibitory control is the ability to suppress inappropriate responses and allow other responses that could resolve a situation to continue [16,17].

Inhibitory control has been associated with the orbitofrontal cortex, as this region modulates anticipatory stimulation and immediate rewards [15] and is aided by alpha brain wave activity [18].

In decision making, the acceptance of limits and rules helps guide the generation of a variety of possibilities of how to direct intentional behavior [19]. In this way, decision making is closely related to the ability to measure risk in a situation. Risk probability analysis is one of the variables evaluated in decision-making studies, as it is related to the anticipation of behavior [15]. Risk–benefit analysis depends on the initial activation of the ventromedial prefrontal cortex and involves the decision-making process mentioned above to select the best option without variance that will attain the result with the greatest benefits [20,21].

Inhibitory control, risk–benefit analysis and acceptance of limits and rules represent the basic components of the decision-making process since they prepare one for all possible scenarios [15,22].

In the context of students who are intellectually gifted, creativity is an essential characteristic that helps resolve difficulties when preparing projects [23]. Despite extensive research on the cognitive components of creativity, further research on this topic is needed in the context of intelligence, as Stenberg et al. [24] discuss.

Creativity is thought to be related to some orbitofrontal functions that govern decision making [15,22]. Inhibitory control is associated with the activity of the orbitofrontal cortex, which modulates anticipated stimuli and immediate rewards [15], supported by alpha brain wave activity [18].

Creativity has been described as a characteristic of gifted students, and some studies define creativity as divergent thinking [25] that allows ideas and processes to be related creatively in order to find alternatives to solving a problem. Therefore, a question arises about the relationship between creativity and decision making in gifted students, which could help us to better understand the needs of students with intellectual giftedness.

This study takes Gagné's Differentiated Model of Giftedness and Talent and Mexican regulations for identification [26,27] as the bases for identifying giftedness in students, in which the conceptualization of this term is proposed as the possession and use of untrained and spontaneously expressed natural abilities (called aptitudes or gifts) in at least one skill domain to a degree that places the child or adult at least in the top 15% of their age peers.

The aim of this research is to analyze the relationship between creativity and decision making in students with intellectual giftedness.

2. Materials and Methods

2.1. Design and Participants

An ex post facto prospective cross-sectional descriptive study was carried out to analyze the relationship between creativity and decision making in students with intellectual giftedness.

Twenty-five students (eight girls, seventeen boys) with intellectual giftedness (mean IQ = 133) aged between 8 and 10 years old participated in this study. They were students of basic education between grades two and six.

The selection of participants was carried out based on convenience criteria. All participants were students of the CEPAC Educational Center for High Capacity, located in the city of Guadalajara, Jalisco, Mexico, which is a public school of basic-level educational specialty and innovation that provides educational care to children identified with intellectual giftedness. To be accepted into this school, students must apply in the annual public announcement and meet specific criteria, including residence in Jalisco, being a regular student, having a score of 130 points in the giftedness diagnosis and completing each of the selection stages. The selection stages include cognitive, socio-affective, behavioral and academic evaluations [26].

The intellectual characteristics of participants are described in Table 1. An analysis of the descriptive data was carried out, and the following intelligence variables were found (Table 1): general intelligence quotient of 133; intelligence indexes showed higher scores in verbal comprehension (ICV = 134) and perceptual reasoning (IRP = 131); and lower processing speed scores (IVP = 116).

Table 1. Descriptive statistics of intelligence.

Intelligence Index [1]	Mean	Standard Deviation
General intelligence	133.88	7.628
Verbal comprehension	134.56	10.989
Perceptual reasoning	131.44	10.778
Working memory	118.00	10.062
Processing speed	116.00	13.973

[1] This table shows intelligence indexes of participants from Wechsler Children's Intelligence Scale, WISC-IV [28].

2.2. Instruments

Intelligence was assessed using the Wechsler Intelligence Scale for Children—4th edition in Spanish (WISC-IV) [28]. To evaluate creativity and decision making, we used the following instruments: the Creative Imagination Test (PIC) [1] and Neuropsychological Battery of Executive Functions and Frontal Lobes (BANFE-2) subtests [22].

The Creative Imagination Test (PIC) [1] was created based on the classic studies of Guillford and Torrance. This test takes a factorial approach to measuring creativity, with specific scores in fluency, flexibility, originality, elaboration, shadow and color, title and special details and general scores in graphic creativity, narrative creativity and general creativity.

The Neuropsychological Battery of Executive Functions and Frontal Lobes [3] (BANFE-2) can be applied to people between 6 and 80 years old. It has 14 subtests of different executive functions. The following subtests were used to estimate orbitofrontal functioning in this study: Mazes (subtest 3) to assess the acceptance of rules and limits in a visuospatial–visuospatial task; Card Classification (subtest 6), involving the counting of the number of maintenance errors for inhibition; Stroop A (subtest 8), which assesses inhibition of an automatic response and selects a response based on arbitrary criteria; Gambling Card Game (subtest 10) to evaluate the ability to detect and avoid risky selections and to detect and maintain beneficial selections; Stroop B (subtest 15) for inhibition, which is the second part of Stroop A. This battery of tests has high validity and reliability for the evaluation of cognitive processes that depend on the prefrontal cortex (Table 2).

Table 2. BANFE-2 subscales and subfunctions.

Subscale	Normal Score	Subfunction	Abbreviation [1]
Mazes	Cross walls	Acceptance of limits and rules	TD-ACE-LR
Gambling cards	Risk–benefit percentage	Risk–benefit analysis percentage	TD-RA-P
	Gambling cards effectiveness	Risk–benefit analysis effectiveness in gambling cards	TD-RA-H
Stroop A	Stroop A mistake	Inhibition of Stroop A mistakes	TD-INH-STA-M
	Stroop A time	Inhibition of Stroop A time	TD-INH-STA-T
	Stroop A effectiveness	Inhibition of Stroop A effectiveness	TD-INH-STA-H
Stroop B	Stroop B mistake	Inhibition of Stroop B mistakes	TD-INH-STB-M
	Stroop B time	Inhibition of Stroop B time	TD-INH-STB-T
	Stroop B effectiveness	Inhibition of Stroop B effectiveness	TD-INH-STB-H
Classification cards	Maintenance errors	Inhibition of maintenance errors in classification cards task	TD-INH-ME

[1] This table shows abbreviations to be used in the following tables for a better understanding of each BANFE-2 [22] subscale and subfunction.

2.3. Procedure

The WISC-IV scale [28] was administered to individual students in a classroom setting without distractions. Prior informed consent was given by the parents in the access stage to the High Abilities Educational Center. The application sessions had a maximum duration of 50 min.

The administration of the PIC [1] test was carried out collectively in a group in a classroom during the access stage to the High Abilities Educational Center.

The BANFE-2 [22] subscales were administered during the school year in a classroom without distractions. The application sessions had a maximum duration of 90 min, with a 5 min rest between tests, depending on the child's condition.

This project addressed the ethical considerations of the regulation of the official Mexican standard called Norma Official Mexicana NOM 004-SSA3-2012 and the General Health Law on health research, in articles 13, 14, 15, 16 and 17, based on the understanding that it is not a work of experimentation or invasive medical intervention and implies minimal risk for the participants related to the application of psychological tests. In the admission process to CEPAC, informed consent letters authorized by the children's parents were obtained.

2.4. Procedure

Descriptive statistics (mean and standard deviation) were calculated for creativity scores as assessed using the PIC test [1] (fluency, flexibility, originality, elaboration, shadow and color, title, special details and general scores of graphic creativity, narrative creativity and general creativity) and decision-making variables as assessed using BANFE-2 [22] (inhibition, risk analysis and acceptance of limits and rules). A Spearman correlation analysis was performed between normalized BANFE-2 scores and PIC percentiles as a hypothesis test. The Statistical Package for Social Sciences (SPSS) v.24 was used for data analysis.

3. Results

3.1. Descriptive Analysis

Regarding creativity, the descriptive statistics are shown in Table 3. A mean percentile of general creativity of 67 was found, with higher percentiles observed in special details (79th percentile) and narrative originality (73rd percentile) and lower percentiles in preparation (47th percentile) and title (49th percentile).

Table 3. Descriptive statistics of creativity.

Creativity [1]	Mean	Standard Deviation
General creativity	67.30	26.573
Fluid (Flu)	62.52	25.886
Flexibility (Flexi)	67.61	25.729
Narrative originality (O.N.)	72.70	22.493
Graphic originality	69.48	28.163
Elaboration	47.83	29.497
Shadow and color	67.13	24.052
Title	49.09	31.284
Special details	79.00	5.901
Narrative creativity	68.13	25.446
Graphic creativity	56.83	26.834

[1] This table shows descriptive statistics of creativity scores of the PIC test [1] participants.

The decision-making evaluation yielded scores between 7 and 13 standardized points; all subscales of the neuropsychological battery obtained scores at a normal (average) level (Table 4).

Table 4. Descriptive statistics of decision-making function.

Decision-Making Measures [1]	Mean	Standard Deviation
Acceptance of limits and rules	7.96	4.937
Risk–benefit analysis percentage	10.76	3.282
Risk–benefit analysis effectiveness in gambling cards	12.08	4.071
Inhibition of Stroop A mistakes	11.65	3.856
Inhibition of Stroop A time	10.65	2.914
Inhibition of Stroop A effectiveness	11.06	2.461
Inhibition of Stroop B mistakes	12.59	3.203
Inhibition of Stroop B time	10.94	2.989
Inhibition of Stroop B effectiveness	11.88	1.654
Inhibition of maintenance mistakes in classification cards task	13.24	1.363

[1] This table shows descriptive statistics of participants' decision-making functions based on BANFE-2 [22] scores.

3.2. Correlational Analysis

3.2.1. Spearman's Correlational Analysis between Verbal Creativity and Decision-Making Function

Spearman's correlational analysis showed moderate correlations between creative/narrative flexibility and decision making/risk–benefit analysis percentage (r = 0.432, $p = 0.040$) and the effectiveness of decision-making/risk–benefit analysis in a gambling cards game (r = 0.426, $p \leq 0.043$).

On the other hand, there were not significant correlations between the verbal creativity variables (fluency, flexibility and narrative originality) and the acceptance of limits and rules, the inhibition of Stroop A mistakes, the inhibition of Stroop A time, the inhibition of Stroop A effectiveness, the inhibition of Stroop B mistakes, the inhibition of Stroop B time, the inhibition of Stroop B effectiveness or the inhibition of maintenance mistakes in the card-sorting task (Tables 5 and 6).

Table 5. Correlations between verbal creativity and decision-making function.

	TD-ACE-LR	TD-RA-P	TD-RA-H	TD-INH-STA-M [3]
Flu	0.329	0.383	0.267	−0.247
Flexi	0.212	0.432 [2]	0.426 [2]	−0.026
O.N.	0.174	0.390	0.232	−0.108

[1] $p \leq 0.001$. [2] $p \leq 0.05$. [3] Abbreviations: Flu = fluency; Flexi = narrative flexibility; O.N. = narrative originality; TD-ACE-LR = acceptance of limits and rules; TD-RA-P = risk–benefit analysis percentage; TD-RA-H = effectiveness of risk–benefit analysis in gambling cards game; TD-INH-STA-M = inhibition of Stroop A mistakes.

Table 6. Correlations between verbal creativity and decision-making function (cont.) [3].

	TD-INH-STA-T	TD-INH-STA-H	TD-INH-STB-M	TD-INH-STB-T	TD-INH-STB-H	TD-INH-ME
Flu	−0.405	−0.272	0.248	0.002	−0.249	−0.058
Flexi	−0.224	−0.157	0.275	0.058	−0.194	−0.034
O.N.	−0.227	−0.131	0.396	0.091	0.055	0.080

[1] $p \leq 0.001$. [2] $p \leq 0.05$. [3] Abbreviations: cont. = continuation; Flu = fluency; Flexi = narrative flexibility; O.N. = narrative originality; TD-INH-STA-T = inhibition of Stroop A Time; TD-INH-STA-H = inhibition of Stroop A effectiveness; TD-INH-STB-M = inhibition of Stroop B mistakes; TD-INH-STB-T = inhibition of Stroop B time; TD-INH-STB-H = inhibition of Stroop B effectiveness; TD-INH-ME = inhibition of maintenance mistakes in classification cards task.

3.2.2. Spearman's Correlational Analysis between Graphic Creativity and Decision-Making Function

In Spearman's correlational analysis between graphic creativity and decision-making functions, moderate correlations were found, specifically between graphic creativity/shadow and color and the effectiveness of the risk–benefit analysis of decision making (r = 0.452, p = 0.030); moderate negative correlations were found between graphic creativity/shadow and color and inhibition of Stroop B effectiveness (r = −0.0673, p = 0.003) and between inhibition of Stroop B effectiveness and graphic creativity/title (r = −0.570, p = 0.017). There were no significant correlations between graphic originality, elaboration and special details and any of the decision-making functions (Tables 7 and 8).

Table 7. Correlations between graphic creativity and decision-making function.

	TD-ACE-LR	TD-RA-P	TD-RA-H
O.G.	0.080	−0.263	−0.177
Elab	0.198	−0.020	0.002
SC	−0.045	−0.100	0.452 [1]
Tit	0.031	0.260	0.306
DE	0.274	0.290	−0.249

[1] $p \leq 0.05$. [2] Abbreviations: O.G. = graphic originality; Elab = elaboration; SC = shadow and color; Tit = title; DE = special details; TD-ACE-LR = acceptance of limits and rules; TD-RA-P = risk–benefit analysis percentage; TD-RA-H = risk–benefit analysis effectiveness in gambling cards game.

Table 8. Correlations between graphic creativity and decision-making function (cont.) [3].

	TD-INH-STA-M	TD-INH-STA-T	TD-INH-STA-H	TD-INH-STB-M	TD-INH-STB-T	TD-INH-STB-H	TD-INH-ME
O.G.	−0.114	−0.237	−0.031	0.110	−0.167	0.012	0.071
Elab	−0.217	−0.236	0.072	−0.205	−0.257	−0.153	−0.166
SC	−0.069	0.017	−0.229	−0.126	−0.040	−0.673 [1]	−0.088
Tit	−0.164	0.199	−0.215	0.026	−0.104	−0.570 [2]	0.090
DE	−0.086	0.074	0.161	0.273	0.331	0.353	0.113

[1] $p \leq 0.01$. [2] $p \leq 0.05$. [3] Abbreviations: O.G. = graphic originality; Elab = elaboration; SC = shadow and color; Tit = title; DE = special details; TD-INH-STA-M = inhibition of Stroop A mistakes; TD-INH-STA-T = inhibition of Stroop A time; TD-INH-STA-H = inhibition of Stroop A effectiveness; TD-INH-STB-M = inhibition of Stroop B mistakes; TD-INH-STB-T = inhibition of Stroop B time; TD-INH-STB-H = inhibition of Stroop B effectiveness; TD-INH-ME = inhibition of maintenance mistakes in classification cards task.

3.2.3. Spearman's Correlational Analysis between General Creativity and Decision-Making Function

Considering the general score, there was only a negative correlation between the general score of graphic creativity and the inhibition of Stroop B effectiveness ($r = -0.489$, $p = 0.047$). The rest of the general scores did not show significant correlations with the decision-making functions (Tables 9 and 10).

Table 9. Correlations between general scores of creativity and decision making [3].

	TD-ACE-LR	TD-RA-P	TD-RA-H
CN	0.295	0.379	0.338
CGf	−0.038	−0.007	0.147
CG	0.255	0.372	0.362
OM	0.343	0.333	0.335

[1] $p \leq 0.01$. [2] $p \leq 0.05$. [3] Abbreviations: CN = narrative creativity; CGf = graphic creativity; CG = general creativity; OM = orbitomedial functions; TD-ACE-LR = acceptance of limits and rules; TD-RA-P = risk–benefit analysis percentage; TD-RA-H = risk–benefit analysis effectiveness in gambling cards game.

Table 10. Correlations between general scores of creativity and decision making [3].

	TD-INH-STA-M	TD-INH-STA-T	TD-INH-STA-H	TD-INH-STB-M	TD-INH-STB-T	TD-INH-STB-H	TD-INH-ME
CN	−0.128	−0.317	−0.219	0.349	0.064	−0.108	−0.057
CGf	−0.231	−0.163	−0.093	0.007	−0.247	−0.489 [2]	0.033
CG	−0.146	−0.285	−0.229	0.371	0.018	−0.101	−0.007

[1] $p \leq 0.01$. [2] $p \leq 0.05$. [3] Abbreviations: CN = narrative creativity; CGf = graphic creativity; CG = general creativity; TD-INH-STA-M = inhibition of Stroop A mistakes; TD-INH-STA-T = inhibition of Stroop A time; TD-INH-STA-H = inhibition of Stroop A effectiveness; TD-INH-STB-M = inhibition of Stroop B mistakes; TD-INH-STB-T = inhibition of Stroop B time; TD-INH-STB-H = inhibition of Stroop B effectiveness; TD-INH-ME = inhibition of maintenance mistakes in classification cards tasks.

4. Discussion

The aim of this study was to analyze the relationship between creativity and decision making in gifted students.

In this study, we present results on three relationships: verbal creativity and decision-making functions, graphic creativity and decision-making functions and general creativity and decision-making functions.

Moderate correlations were found between decision-making functions and both verbal and graphic creativity. Specifically, the results show moderate correlations between creative narrative flexibility with risk–benefit analysis in decision making, between creative narrative flexibility and the effectiveness of risk–benefit analysis in decision making and between shadow and color (as a measure of graphic creativity) and the effectiveness of the risk–benefit analysis in decision making in a gambling cards game. Few studies have focused on this topic, especially not on an intellectually gifted population.

After evaluating 113 university students using the Iowa Gambling task, Harada [29] found that people with characteristic results of divergent thinking, also understood as creative thinking, tend to adopt more risky behaviors in the face of losses; he found a relationship between risk attitudes and creativity. In a subsequent study, Harada [30] tested the effects of positive mood and risk taking on creativity using a rigorous computational approach and found that risk-taking behavior in the face of losses exhibited positive effects on divergent thinking. This finding suggests that risk taking contributed to driving exploratory behavior, which in turn facilitated divergent thinking as a determinant of creativity.

This study employs the principles of the Iowa Gambling task, included in the BANFE-2 [22] battery, an instrument validated in the ages of our evaluated population, whose results reinforce the relationship between creativity and risk attitudes. This relationship is presented as the percentage that is deduced from the frequency of choosing stimuli that represent a higher score with a greater probability of loss.

On the other hand, looking at the results of the Wisconsin Card Sorting Test based on the BANFE-2 [22] sorting cards, we found normal levels for all intellectually gifted participants, that is, average levels of performance. These results differ from the results of Viana-Saenz [31] who evaluated 30 children between 9 and 11 years old with the Wisconsin Card Sorting Test, using a free BCST version that is similar to the BANFE-2 [22] sorting cards. In that study, statistical differences were found between gifted and talented children in terms of maintenance errors, which means that children with intellectual giftedness made fewer maintenance errors than talented children.

Sastré-Ribe [32] examined 41 participants who were 13 years old. This study showed differences between the cognitive profiles of talented children and children with intellectual giftedness as evaluated using the Torrance Differential Aptitude and Creative Thinking Test. In this study, intellectually gifted participants' decision-making results were similar to average levels of executive development; that is, higher scores were not found in the decision-making tests among intellectually gifted students.

Concerning graphic creativity and decision-making functions, we found a moderate negative correlation with inhibition effectiveness.

Benedek et al. [33] examined the role of cognitive inhibition and intelligence in creativity and found a positive correlation between cognitive inhibition, assessed by the random motor generation task, with creativity. In this study, it was found that the cognitive control used to inhibit irrelevant responses seems to facilitate the fluid generation of new ideas on a topic, suppressing the proactive interference of previous responses. This result is compatible with the results of the present study, which found a correlation between both variables. However, in the current study a negative correlation was found that could explain the response to the underlying process in the Stroop-type tasks. In this way, our study coincides with that carried out by Sánchez-Macias et al. [34], who found a negative correlation between creativity and verbal inhibition in their evaluation of high school students between 14 and 17 years old.

On the other hand, in this research, a correlation was found between an aspect of inhibition in the Stroop task (i.e., inhibition of effectiveness in the Stroop B BANFE-2 [22] task) and some variables of graphic creativity but not of narrative creativity. Cipolotti et al. [16] advocate for exhaustive cognitive evaluation, including executive functions, among which is decision making; they also state that fluid intelligence is part of a set of specific functions in cognitive estimation.

When considering the general scores, there was only a negative correlation between the general scores of graphic creativity and inhibition of effectiveness. Cipolotti et al. [16] evaluated 30 adult patients with frontal lesions and 60 healthy adults and reported that the Stroop test is an executive task that represents a small component of fluid intelligence. Research is still needed regarding cognitive functioning, intelligence and creativity.

Benedek et al. [35] evaluated 230 people with an average age of 23 years to examine the relative contributions of different executive functions to individual differences in fluid intelligence and creativity and to understand the structural relationship between intelligence and creativity. They found no correlation between fluid intelligence and creativity and did not find inhibition to be a predictor of fluid intelligence; however, they discovered that inhibition could predict creativity. This study is compatible with the results of the present study demonstrating the correlation between inhibition effectiveness and graphic creativity.

Some limitations of this study stem from its correlational nature, which demonstrates associations between variables without establishing causal relationships. Consequently, it is impossible to determine from this study alone which variable influences the other. Moreover, there may be additional unobserved variables (third variables) that could be intervening factors. These variables may encompass sociodemographic, socioemotional, biological and educational factors, among others.

The limitations of this study suggest future studies should be conducted with a larger sample size, a search for a biological marker (EEG, fMRI) to clarify the abovementioned processes, a case–control study and an evaluation of the adolescent population.

5. Conclusions

In conclusion, it was found that creativity in students with intellectual giftedness is favored by the relationship with orbitofrontal functions. In addition, it was found that analysis of risk situations and effective decision making increase narrative creation, whereas decreased inhibition allows creative graphic production.

Although this is an evaluation study, the results show the association between decision-making variables and creativity. This is a field that requires further research, including the adoption of other techniques such as neuroimaging. For now, our study shows that different aspects of creativity correlate with different aspects of orbitofrontal functions, including inhibitory behavior, analysis of risk situations and decision making.

It is important to make these results and associations known and to observe and try to understand, within their limitations, the creativity of children with high intellectual capacity and their behavior in school contexts. In addition, along with the accompaniment of an adult, such as the teacher, as a guide, and in an environment of respect and understanding, the need for graphic and/or narrative expression to aid in the inhibited expression of their behavior can be better understood.

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Informed Consent Statement: Broad informed consent was obtained from all the parents of the subjects involved in the study and broad letters of consent were obtained from all the participants. These included informed consent for publication.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

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