

## Comparative Analysis of Cognitive Characteristics of Young Adolescents with Artistic and Intellectual Giftedness

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The work is aimed at identifying specific manifestations of creativity and basic cognitive characteristics in young adolescents with artistic and intellectual giftedness. The relevance of the study is due to lack of study of the issue of cognitive manifestations of different types of giftedness in early adolescence, in which the issue of specialization of education is often resolved. The study involved 54 intellectually gifted adolescents (M = 11.4 years old) and 32 artistically gifted peers (M = 11.2 years old). The study used the following methods: a computerized battery of test tasks for studying basic cognitive characteristics (“number sense”, visual working memory and information processing speed), "Raven's Progressive Matrixes", “Verbally-figural creativity test”, drawing tests of Urban and "Horizon Line". The results confirm the hypothesis about the specificity of creativity in younger adolescents with different types of giftedness (intellectual and artistic). Intellectually gifted younger adolescents show higher rates of divergent verbal creativity compared to their artistically gifted peers; and artistically gifted younger adolescents surpass their intellectually gifted peers in terms of picturesque (figurative) creativity and are distinguished by their high-quality originality, revealing a high emotional expressiveness and creative approach to the implementation of the plan. No statistically significant intergroup differences in the basic indicators of cognitive development and general intelligence were found, although artistically gifted adolescents better than their intellectually gifted peers compare asymmetrically expressed amounts (“number sense”), but they are inferior in terms of information processing speed.

**Keywords:** cognitive characteristics, intellectual giftedness, creativity, young adolescents, artistic giftedness

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## Introduction

The question about cognitive characteristics and early predictors of different types of giftedness is still actual for specialists in psychology, education, and medicine. Intellect and the intellectual giftedness have been studied since F.Galton, A.Binet, W.Stern. And although different interpretations of the concept of giftedness still coexist, modern researchers from different countries agree in understanding giftedness as a systemic, developing quality of the psyche, which makes it possible for a person to achieve higher, outstanding results in one or several types of activity compared to other people [1; 15]. With regard to childhood, depending on the type of activity in which the child shows high motivation and success in its implementation and development, different types of giftedness are also distinguished: intellectual, artistic, musical, etc. Latest research pays attention to the study of the basic cognitive characteristics related to the intellectual activity success such as number sense, working memory, information processing speed [3; 8; 9; 11; 12; 13; 14; 27]. Nevertheless, the topic about the origin of the artistic giftedness is studied significantly less. But as the research shows, giftedness and success in the visual art field is related to the general intellect [2; 10; 26]. Teachers of art also admit that such intellectual components as the spatial thinking and information processing speed help to achieve success in the profession. Revealing the potential of artistic giftedness in children and adolescents is perhaps a more difficult task than detecting signs of giftedness, because artistic giftedness implies the presence not only of cognitive prerequisites and pronounced intrinsic motivation, but also of such features as an aesthetic attitude to the world, the author's position and artistic imagination [6]. These characteristics cannot be measured using the “objective” tests but can be evaluated only by visual art experts. Thus, to identify these characteristics, the proprietary methodology shall be used, e.g. “The horizon line” by Melik-Pashaev [6]. The study of creativity and creative skills when identifying the artistic giftedness potential is one more challenge due to different definitions of the term creativity that are applied in creativity identification conceptions – divergent thinking [22; 23], the ability to create something new [19], the ability to think out of the box [21]. Taking into account different aspects of creativity, the methodologies are not always reliable [1]. Moreover, high scores for creativity tests do not always mean a high creative potential. The final score can be influenced by motivation, usage of the alternative ways when searching for the right answer, the desire to give the original answer that can be described by the low self-esteem, etc. [1; 20; 24]. All mentioned above dictates the clear need for applying complex evaluation of the creativity taking into consideration not only cognitive but also motivational and personal aspects. Moreover, since the creativity can be expressed differently in different areas [19], the attention shall be paid to the verbal, visually-figural, musical creativity, etc. A number of studies have found the peculiarities in the manifestation

of different types of creativity depending on the individual and age development. Thus, it is found that the verbal divergent creativity is increasing while the non-verbal one is decreasing during adolescence period (10 – 14 years old) [16]. The predominance of the verbal creativity is found in the intellectually gifted junior school children in comparison with their peers who study in the traditional education environment [17]. It was also found out that the visually-figural creativity prevailed in the artistically gifted children of 7-8 years old while the verbal creativity – in their intellectually gifted peers [25]. Nevertheless, there is a lack of the research related to the creativity manifestation of the children with different types of giftedness. Especially important is the identification of the specific characteristics of the cognitive development and creativity development of the young adolescents with the artistic giftedness. This importance is related to the significance of the young adolescence period in terms of identification of different types of giftedness and determination of the most effective directions of its development. During this age period a lot of children and their parents decide on the major (school) – mathematical or humanitarian for further education. The enrolment into specialized schools and classes often starts at the young teenage period. Moscow Central Art School at the Russian Academy of Arts enrolls students from 10 years old for government-subsidized full-time education, the Children Art School named after I.E.Repin – from 11 years old, Moscow State Watercolour Specialized School named after S.Andriyaki – from 11 till 13 years old. This age border is not a coincidence as the esthetic perception of the world typical for children of 6-7 years old is changing with the time: its emotionality and figurativeness is decreasing, the interest to the appearance of the object is being lost [4; 5; 6]. The lack of attention to the development of the children creativity even in the junior school age at school education will have a negative impact on the emotional and figural development typical for small children. Children as well as young adolescents have more opportunities to develop in many fields, especially in the art field [24]. If their potential is overlooked, it can be lost due to the end of the most sensitive and productive period for its development [15; 18; 20; 24]. That is why a special attention shall be drawn to the identification of the gifted children and teenagers. With reference to all mentioned above, the goal of our study was to identify the specific manifestations of the creativity and basic cognitive characteristics of young adolescents with the artistic and intellectual giftedness. As the basic cognitive characteristics, we worked with such as the number sense, working memory and information processing speed that play their importance in the processes of perception and thinking, learning and development. We hypothesised that in the young adolescence period the peculiarities in manifestation of the verbal and visually-figural creativity as well as the basic characteristics of the cognitive development related to the type of giftedness (intellectual and artistic) can be found. To check this hypothesis, the following research problem was formulated: to provide a comparative analysis of the creativity (verbal and visually-figural) and basic cognitive characteristics of young adolescents with the artistic and intellectual giftedness.

### **Participants**

A sample of the study consisted of 54 intellectually gifted young adolescents ( $M = 11,4$  years, 21 boys and 33 girls) and 32 artistically gifted young adolescents ( $M = 11,2$  years, 3 boys and 29 girls). The group of the intellectually gifted children consisted of the children from at school and who performed high in the at the Raven's Progressive Matrices test (upper quartile, test score  $\geq 47$ ). The group of artistically gifted adolescents included students of Moscow Art School, who were admitted there by competitive selection using a comprehensive exam, in which experts select the most talented students in the field of fine arts. The majority of women in the group of artistically gifted adolescence manifests the modern gender situation relation in the institutions with artistic majors. To study the basic cognitive characteristics, the computer set of test tasks adapted in the laboratory of the developmental psychogenetic of the Psychological Institute of the Russian Academy of Education and supervised by T.N. Tikhomirova was applied [10; 11, 25]. The set consists of four tasks: "Number line", "Number sense", "Reaction time", "Sequences". With the help of the first two computer tests, individual differences in the number sense can be identified («Number line» test – accuracy to determine the number on the number line without any indexes, "Number sense" test – comparison of the non-symbolically expressed quantities without calculating). In the case of "Number line" test, the average deviation of the position of the number on the line marked by the test subject is recorded from its actual position, in this regard, the higher the value of this indicator, the worse the test result. In "Number sense" test the computer program registers the quantity of the right comparisons, and the higher the final score is the higher the level of the number sense the subject performs. "Reaction time" test helps to estimate the information processing speed. The final score – the average time index to the right answers. "Sequences" test studies the visual working memory. The subject is requested to repeat the sequence of the cubes (from 4 to 9 pieces) by pushing the correct cubes with the help of the computer mouse. The index under the interest in this test – the quantity of correctly repeated sequences. The intellect level of the adolescence with different types of giftedness was estimated with the help of Raven's Progressive Matrices Test (parts A – E, 5 series, each consists of 12 tasks) that is considered as one of the most famous and up to date methods of general intellect study. The test was presented in a blank form and was performed individually and at intervals of several days with a computerized batter. To study the divergent creativity in the verbal and visually-figural aspect, we used "Verbal and Figural Creativity" test (VFCT) by N.B. Shumakova [16; 25]. When executing the verbal sub-test, the subject is requested to write as many assumptions of the given stimulus material as possible. Within the figural sub-test, the subject used the same stimulus material to create different pictures and name them. The subject receives 5 blanks with 6 stimulus objects on each of them. VFCT methodology has two parallel forms: A and B. In the present study only B form was used. The research was arranged in groups of 5 to 12 children. With the help of VFCT it is possible to register all major characteristics of creativity for each sub-test used in the worldwide practice (fluency, flexibility, originality, elaboration).

In addition to the study of the divergent creativity, TCT-DP Urban drawing test was [28; 29]. In contrast to VFCT, TCT-DP Urban test helps to study the synthetic ability, gives the score of general creativity and ability to think "out of the box". The test sample is a piece of paper that has

six unfinished objects on it not related to each other. The subject is requested to finalize the picture in the free format using only an ordinary graphite pencil. The total score of the following fourteen categories allows to estimate the level of general creativity from very low to very high: continuation, completion, new elements, connections made with lines, connections made that contribute to a theme, boundary-breaking being fragment-dependent, boundary-breaking being fragment-independent, perspective, humor or affectivity/emotionality/expressive power of the drawing, unconventionality, speed. The combination of these two tests of creativity provides an opportunity to get a more holistic overview of this parameter.

To identify the potential of the artistic giftedness, “The horizon line” methodology by A.A. Melik-Pashaev was used [4]. Within this methodology the subject receives a blank piece of paper crossed with a slight line. The expert instructs that the given line is a horizon. The subject is requested to colour the paper. In addition, the subject is instructed to draw anything in case he wants to do that. The evaluation of the picture is provided by several experts who range the pictures based on the level of the emotional expression of the picture: from low to high.

The results were analysed with the help of SPSS V.26, (comparison of the averages using t-criterion and Mann Whitney U-criterion).

### Research results

Table 1 represents the average indexes of the general intellect and cognitive characteristics in groups of the artistically and intellectually gifted young adolescents. The comparison analysis of the average characteristics of the cognitive development with the help of Mann Whitney U-criterion did found no statistically significant intergroup differences in none of the index including general intellect. Nevertheless, a number of differences can be mentioned on the tendency level. Thus, the artistically gifted young adolescents better than their intellectually gifted peers can compare non-symbolic expressions of the quantity (“number sense”) but concede in the information processing speed (“reaction time”). It is possible that the identified tendencies can be explained by the area of the young adolescents’ giftedness manifestation, e.g. the strong ability to compare the non-symbolically expressed quantities that the artistically gifted young adolescents have, is related to the principles of their perception. Nevertheless, to prove this hypothesis, it is necessary to arrange additional research and increase the number of subjects.

Table 1

#### Average values of the cognitive indexes and general intellect in different groups (1-intellectually gifted young adolescents, 2-artistically gifted young adolescents)

Characteristic	M (SD)		p
	Group 1	Group 2	

«Number line»	43,33 (16,04)	42,17 (14,66)	0,915
«Number sense»	105,31 (12,66)	109,21 (9,34)	0,214
«Sequence»	5,43 (1,91)	4,93 (91,72)	0,258
«Reaction time»	0,83 (0,19)	0,8716 (0,13)	0,076 t
Non-verbal intellect	49,89 (2,59)	48,73 (3,88)	0,656

Note. *M* – average value, *SD* – standard deviation; *t* – differences on the tendency level,  $p < 0,1$ .

Table 2 represents the average values of creativity indexes identified with the help of different methodologies as well as the evaluation of the potential of the artistic giftedness received with the help of the drawing methodology “Horizontal line” in the different groups of the gifted young adolescents. The comparison analysis of the average values described with Mann Whitney U-criterium for independent samples provide to find out the statistically significant intergroup differences of all indexes of the verbal creativity, drawing elaboration and artistic potential.

Table 2

**Creativity and artistic potential indexes in the groups of young adolescents (1 – intellectually gifted and 2 – artistically gifted)**

Characteristics	M (SD)		p
	Group 1	Group 2	
Verbal creativity (general characteristic)	114,54 (48,37)	70,90 (49,21)	0,000**
Fluency	23,05 (12,11)	14,90 (10,36)	0,003*
Flexibility	13,21 (4,930)	8,68 (4,33)	0,000**
Originality	40,87 (25,53)	22,87 (20,00)	0,002*
Verbal elaboration	38,46 (21,22)	25,19 (25,95)	0,001**
Non-verbal creativity (general characteristic)	100,61 (47,04)	123,13 (49,71)	0,060
Fluency	18,89 (8,68)	20,43 (9,18)	0,519

Flexibility	11,82 (4,49)	11,40 (3,80)	0,921
Originality	42,00 (30,45)	42,27 (23,68)	0,648
Drawing elaboration	27,89 (20,45)	49,03 (17,08)	0,000**
General creativity (by Urban)	25,34 (9,49)	27,19 (11,11)	0,458
Artistical potential (HL)	1,80 (0,73)	2,40 (0,88)	0,003*

Note. *M* – average value, *SD* – standard deviation; \* – statistically significant differences,  $p < 0,05$ ; \*\* – statistically significant differences,  $p \leq 0,01$ .

Intellectually gifted young adolescents represented statistically higher indexes of the verbal creativity in comparison to their artistically gifted peers. The intellectually gifted young adolescents could easily provide various and original ideas, tended to explain, develop and detalize their ideas. The artistically gifted young adolescents expressed more modest when expressing verbal ideas, tended to provide short responds. The examples of the assumptions provided by the young adolescents in different groups are represented in table 3. The received results correspond to the results of another study that investigated intellectually and artistically gifted junior school children [25]. In the age of 7-8 years old the statistically significant advantage on the indexes of the verbal creativity and originality was observed in the group of intellectually gifted young adolescents. Thus, indirect comparison of the received results in different age groups helps us to assume that the peculiarities of creativity manifestation in both intellectual and artistic giftedness is increasing (expressed more) as the child's grows older. This assumption is proved by the analysis of the drawing creativity indexes in both groups.

Table 3

**The examples of the assumptions of the young adolescents with intellectual and artistic giftedness of VFCT methodology verbal sub-test**

	Intellectually gifted young adolescents	Artistically gifted young adolescents
Examples of assumptions	“A human skeleton, specifically the ribs”	“A skeleton”
	“If turn, this looks like a river between two banks”	“A river”
	“This looks like an accessory our teacher wears”	“The teacher's accessory”

	“A wormy, rotten, dull, terrible, dead apple”	“An apple”
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Among the indexes of the non-verbal creativity the statistically significant differences were found only in “figural elaboration”. The young adolescents with the artistic giftedness had higher index than their intellectually gifted peers. Figures 1-4 demonstrate the examples of the figural elaboration sub-test of the young adolescents with the artistic giftedness (fig. 1 and fig. 3) and intellectual giftedness (fig. 4 and fig. 6) that reflect not only more detailed elaboration of the drawings of the artistically gifted young adolescents but also much stronger expressed creative approach when performing the task and implementing the ideas.



Fig. 1 “Landscape of the mountains, lawn, sheep a river”



Fig. 2. “Customer desk at the airport”



Fig. 3. “Landscape of the mountains, lawn, sheep a river”



Fig. 4. “A walk in a forest”

Thus, the qualitative differences in manifestation of the figural creativity between the groups of the intellectually gifted and artistically gifted young adolescents demonstrate the significant qualitative differences on the indexes of the drawing elaboration and general visually figural creativity (on the tendency level) within in VFCT methodology.

As given in table 2, the statistically significant differences between the groups on the general creativity received with the help of Urban test (“TCT-DP”) were not found. Nevertheless, the qualitative analysis of the drawings using the separate categories that are specified by the test author, clearly demonstrates the differences in manifestation of the figural creativity among the intellectually gifted group of young adolescents and their artistically gifted peers. The artistically gifted young peers more often break the boundaries that is a clear indication of the ability to think out of the box based on the methodology (fig. 5 and fig. 6). Moreover, the artistically gifted young adolescents more often use the abstraction, create the drawing with the common theme, title the drawing (fig. 5). The latter is not necessary according to the test instructions.



Fig.5. «An artist on the main street»

Fig.6. (No name)

To compare, below we provided the examples of the drawings performed by the young adolescents with intellectual giftedness (fig. 7 and fig. 8). They tend to use simple usage of the given objects, ignore connecting them, breaking the boundaries, or creating a common theme. The comparison of the drawings of the young adolescents with intellectual and artistic giftedness demonstrates the differences in the aesthetic perception of the world.

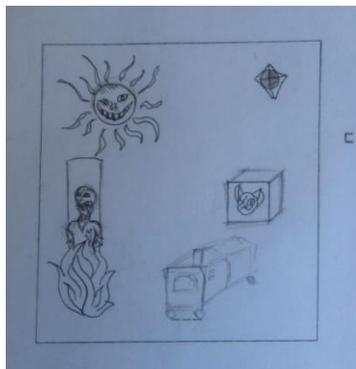


Fig. 7. (No name)

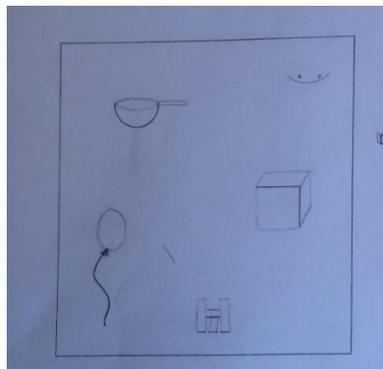


Fig. 8. (No name)

Thus, the artistically gifted young adolescents have the qualitative peculiarity in the visually-figural creativity that can be observed in the qualitative as well as quantitative results of both methodologies related to different aspects of creativity – divergent (VFCT) and synthetic ability (Urban).

As it was expected, the qualitative differences between the groups of intellectually and artistically gifted young adolescents were found in the figural methodology “The horizon line” by A.A. Melik-Pashaev. The qualitative differences were also statistically significant in terms of the expressed artistic potential ( $p \leq 0,003$ ). The artistically gifted young adolescents demonstrate higher indexes than their intellectually gifted peers. The qualitative analysis of the drawings provided by the artistically gifted young adolescents demonstrate stronger emotional expressiveness. These results correspond to the information that the artistically gifted young adolescents, especially who study in professional institutions, have more abilities to the aesthetic perception of the world [6]. Interestingly, the same results were observed in the artistically gifted children of 7-8 years old [25]. Analyzing the drawings of the artistically gifted young adolescents, we can make a note about the high aesthetic sensitivity and the ability to the aesthetic perception of the world that is appeared when performing the drawing within the creativity methodologies.

Thus, we can come to an opinion that the results received with the help of the methodologies related to the identification of different aspects of creativity, prove the hypothesis regarding the specifics of creativity manifestation of young adolescents with different types of creativity (intellectual and artistic).

## Conclusion

The results of the present empirical study show the specificity of creativity manifestation of the young adolescents with different types of giftedness – intellectual and artistic. At the same time,

the question about the peculiarities of the development of the basic cognitive characteristics of the young adolescents remains open and needs to be investigated in future.

1. It is found that the intellectually gifted young adolescents demonstrate higher divergent creativity in the verbal sphere while the artistically gifted young adolescents – in the visually-figural one.
2. Intellectually gifted young adolescents demonstrate statistically significant higher indexes of the verbal creativity in comparison with their artistically gifted peers and tend to easily provide various and original assumptions, explain and elaborate them (difference in indexes of the verbal fluency, flexibility, originality and elaboration are significant  $p \leq 0,01$ ).
3. The artistically gifted young adolescents exceeds their intellectually gifted peers in the indexes of the figural elaboration (different are significant,  $p \leq 0,001$ ) and total score of the divergent figural creativity (on the tendency level,  $p \leq 0,06$ ) and differ in the qualitative peculiarities in the manifestation of the visually-figural creativity. The drawings of the artistically gifted young adolescents are characterised not only by detailed elaboration, original perception of the world and integrity but also by a clear emotional expressiveness. The qualitative specificity is found in both quantitative and qualitative analysis of the results in two methodologies related to the identification of different aspects of creativity – divergent (VFCT) and synthetic ability (Urban).
4. It is found that the basic indexes of the cognitive development including the general intellect do not demonstrate statistically significant intergroup differences in young adolescents with intellectual and artistic giftedness. The differences in the indexes of the information processing speed and “number sense” are found only on the tendency level. The artistically gifted young adolescents better compare the non-symbolically expressed quantities (“number sense”) than their intellectually gifted peers but concede in the information processing speed (“reaction time”). It is possible that the found tendencies related to the area of giftedness manifestation but to prove this hypothesis, it is necessary to arrange additional studies and increase the number of subjects.

It is necessary to note the limitations of the study, related to its cross-sectional nature and sample size. The techniques were performed by the subjects on different days for one to two months without control of the mood and well-being of the subjects on the days of the techniques. The question of the developmental features of basic cognitive characteristics in younger adolescents with different types of giftedness needs further study. In the future, it is important to supplement their study with data from a longitudinal study with an expansion of the sample of gifted adolescents.

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