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TALENT AND CREATIVITY IN PRESCHOOL AGE CHILDREN: A PILOT STUDY

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Abstract

The paper deals with an analysis of the relationship between overall giftedness and two types of creativity (figural and verbal) in preschool age children. The objective was to describe and analyze the relationship between the two types of creativity and the relationship between each type and the overall amount of talent as well as to design a predictive model with the overall amount of talent as the dependent variable. The overall amount of talent was measured on the Characteristics of Giftedness Scale, verbal creativity through storytelling, and figural creativity with the Test for Creative Thinking – Drawing Production. The data was obtained on a sample of 32 preschool aged children obtained through convenience sampling. The results suggest a (significant) moderate correlation between the two types of creativity and a not significant weak correlation between creativity and giftedness (verbal creativity r = 0.361 and figural creativity r = 0.222). Of the component characteristics, giftedness was most closely correlated with a child's inclination to assign pictures of unknown animal names not typical for humans and the inclination to conceive of a drawing as a single thematic whole (completing unfinished figures). These elements also had the greatest weight in the presented predictive model. A byproduct of the study is the finding that overall giftedness at preschool age is weakly correlated with the education of the father (r = 0.248) and even more so that of the mother (r = 0.363). The study discusses its own limitations and suggests opportunities for further research.

Keywords

Giftedness, behavioral scale, figural creativity, verbal creativity, preschool age

Introduction

Interest in identifying gifted children so that they can be provided with care suited to their academic and social needs has been growing immensely in recent years (Demetrikulos & Pecore, 2015; Limont, Dreszer-Drogoróba, Bedyńska, Śliwińska, & Jastrzębska, 2014; McCormick & Plucker, 2013). Many studies have offered strong arguments in favor of initiatives focused on identifying gifted children and subsequently providing them with accelerated education, or even segregated education and special support. For instance, Reid (2014, p. 106) used outcomes of experimental education for children with general intellectual abilities to provide evidence that segregated education of exceptionally gifted children can be "highly effective and successful" in terms of both academic and psychosocial development. In addition, Miraca Gross (especially Gross, 2006) and many other authors (e.g., Silvermann, 2013) have described negative consequences from gifted children staying in common classes appropriate to their biological age, with the children evidencing such phenomena as social isolation, social alienation, and self-alienation in common peer-group classes. In a conventional classroom and without special support, gifted children face internal conflicts in having to cope with a "forced choice between their intellectual needs and their desire for acceptance by less-advanced classmates" (Jung, McCormick, & Gross, 2012, p. 15). Considering these facts, identifying gifted children at preschool age seems meaningful, desirable, and useful as it may provide the basis for timely decisions concerning early school attendance, accelerated education (skipping a grade), segregated education, and early initiation of other methods and forms of education corresponding with gifted children's special psychological and educational needs.

Giftedness is generally associated with performance. Age-based theories of giftedness at an early age refer to performance potential (the potential to perform quantitatively or qualitatively better than peers) and at later ages to performance (Sternberg, & Davidson, 2005, pp. 438–40). Many authors (e.g., Gross, 2004) evoke the model from Gegné, which strictly distinguishes between giftedness as "superior ability" and talent as "superior performance." A gifted preschool child can therefore be understood in this sense as a child with the potential to exhibit the same performance as their peers at earlier age, with more ease, or at a qualitatively higher level (Havigerová, 2015). A gifted child is defined in the same sense by Pfeifer (2015, p. 7) as a child who "demonstrates a greater likelihood, when compared to other students of the same age, experience and opportunity, to achieve extraordinary accomplishments in one or more culturally valued domains."

The present research focused on intellectually gifted children, i.e. children predisposed to achieving extraordinary performance in tasks and situations

for which the same skills are required as for IQ test items or for which IQ is a crucial prerequisite. The fundamental concept of intelligence as well as tests measuring intelligence in children and adolescents were originally developed and are currently administered in connection with school success (see the Binet–Simon test, the Stern test). In this context, general intellectual giftedness in the form of an IQ score or its equivalent may also be understood as a predictor of school success. Eysenck (2014, p. 12) stated that "intelligence test scores typically correlate approximately with school or college performance. This is usually highly significant statistically, and indicates a reasonably strong relationship between the two measures." Gardner (2013, p. 39) noted that "IQ tests predict school performance with considerable accuracy, but they are only an indifferent predictor of performance in a profession after formal schooling." Identifying generally intellectually gifted children amounts to identifying children with the potential to achieve superior school performance (provided the children live in conditions supporting the development of this potential, see, e.g., strength-based interventions according to Proyer, Gander, & Tandler, 2016).

Theoreticians dealing with giftedness approach a potential correlation between intellect and creativity in varying ways. For instance, Prenckel, Holling and Wiese (2006), who tested intelligence and creativity in 1,328 adolescents, confirmed a close correlation between creativity and intelligence across IQ bands. For a number of years, the starting point used by experts to study giftedness in this context had been threshold theory, which "predicts that IQ and creativity are related up to an IQ of approximately 120" (Kim & Pierce, 2013, p. 154). However, findings from recent studies (e.g., Rajamanickam, 2005) as well as experience show that exceptional performance in terms of creativity can be achieved also by individuals with IQ scores lower than the threshold for exceptional giftedness (IQ $\geq$ 120 according to threshold theory, IQ $\geq$ 130 according to such authors as Pfeiffer, 2008), namely individuals with IQ in the average band (120 > IQ $\geq$ 100) if their creativity is highly developed. Jauk, Benedek, Dunst, and Neubauer (2013) explored the IQ threshold above which IQ and creativity are the most strongly correlated. Applying segmented regression to data from 297 participants, they found that the threshold shifted depending on task complexity: the threshold for a quantitative measure of creative potential (ideational fluency) was an IQ of 85, that for a simple qualitative measure (two original ideas) was an IQ of 100, and that for a more demanding criterion (more original ideas) was an IQ of 120. The bivariate correlation coefficients in that study were $r = 0.38$ for respondents with IQ < 100 and $r = 0.14$ for respondents with IQ > 100. Threshold theory thus acquired a new meaning. Pritzer (1999) noted that co-occurrence of below average intelligence and above average creativity is unlikely at best, if not impossible. Given this,

intelligence (giftedness) and creativity should be moderately correlated. The present study puts this assumption to the test by innovatively asking this research question about preschool aged children (while threshold theory is usually researched in respondents of school age and older).

Like intelligence and giftedness, creativity is a construct which has been defined in many different ways. According to Pritzer (1999, p. 19), the most frequent definition of creativity describes it as "the production of something new or rare that has value in the world." The reference to social value restricts creativity to a very limited range of phenomena, which suggests a reformulation of the definition, in line with Monet and Rogaten (2016), who wrote that "creativity is a property of a finished idea or product," or with Průcha, Walterová, and Mareš (2003), who viewed creativity as an ability to find new solutions that are not only correct but also new, unusual, original, and unexpected. For the purposes of educational psychology research and research on childhood creativity, it may be more appropriate to define creativity as "a complex of psychological characteristics that are needed to achieve effective novelty in all areas" (Pritzer, 1999, p. 631). Such a definition shifts attention from the outcome of the creative process to its creator. The present study takes as its starting point a definition formulated by Urban, Jellen, and Kováč (2003), specifying creativity as:

> The ability to create a new, unusual and surprising product as a solution to an insightfully perceived or given problem; done on the basis of insightful perception of the broadest context of input and other sought information; using analysis and flexible processing focused on resolving, using unusual associations, using restructuring or combination of given information with data from personal experience and imagination; by synthesizing, structuring, and composing these data, elements, and structure to elaborate a new solution, expressed as a product, or in a product in any form, that is ultimately understood as meaningful through its communication by others. (p. 8)

Creativity is thus a specific ability developed through experience, reflected in specific characteristics of an individual's verbal, figural, and other products.

Research in creativity leads to the conclusion that there is not one single general creativity, but it is useful to distinguish different types of creativity. Recent research has pointed to creativity's domain specificity (e.g., Baer, 2010; Baer, 2015) or content specificity (e.g., Hu, Jia, Plucker, & Shan, 2016; Tyagi, 2016). An exploratory study by Rački (2015) examined creative behavior in children aged 8–15 and concluded that it is useful to distinguish three types of creative behavior: everyday creativity (including writing and storytelling), artistic creativity (including drawing), and scientific creativity. That study found that approximately 20% of children were gifted with only

one creativity type, 5.6% were gifted with two types of creativity, and 5.5% were gifted in all three areas of creativity, i.e. distinguishing the various types of creativity increases the proportion of children who can be viewed as gifted with creativity approximately fourfold. Research aiming at formulating a model (SEM analysis) usually concludes that creativity is a multidimensional phenomenon (Plucker, 1999; Kim, 2010). Our study focuses on two types of creativity—figural and verbal—and explores them not in the usual subjects of school-aged and older children but in preschool-aged children. These two types of creativity tend to be moderately or somewhat strongly correlated. For instance, Edl, Bendek, Papousek, Weiss & Fink (2016), who explored correlations between types of creativity and cognitive control ability in adult respondents, found a correlation between verbal and figural originality of $r = 0.25$. We expected preschool children's performance in verbal and figural creativity in our research to be also moderately correlated.

As noted above, intelligence and generalized creativity have been repeatedly shown to strongly correlate. Studies distinguishing among different types of creativity have found moderate correlations. Probably the most cited finding is that by Torrance (1967, as cited in, e.g., Batey & Furnham, 2006) of a correlation between IQ and verbal creativity of $r = 0.21$ but one between IQ and figural creativity of $r = 0.06$. According to Batey and Furnham, a series of follow-up studies found moderate to strong correlations between the two forms under examination with the correlation usually below $r = 0.30$. Yong (1994) determined a moderate correlation between verbal creativity and giftedness in schoolchildren ($r = 0.32$) and a weaker correlation between figural creativity and giftedness ($r = 0.16$). Kitano and Kirby (1986) established a correlation between intelligence and verbal creativity of $r = 0.21$, while De Cassia Nakano, Wechsler, Campos, and Milian (2015) established a correlation between intelligence and figural creativity in the range of $r = 0.139–0.276$. De Cassia Nakano et al. (2016) found a correlation between academic giftedness and figural creativity in adolescents of $r = 0.22$. Given that, other than a few exceptions, most studies have found stronger correlations between intelligence/giftedness and verbal creativity, we expected verbal creativity to be more strongly correlated with intelligence/giftedness in our study of preschool children.

The sine qua non for providing adequate care for gifted and exceptionally gifted children is early identification. Gifted and exceptionally gifted children have been identified from 18 months of age on (Kauffman, Hallahan, and Cullen, 2011); systematic identification of intellectually gifted children has been proven to work well at preschool age. In the Czech Republic, there are several initiatives focused on identifying intellectually gifted children of preschool age (e.g., Faculty of Education, Charles University, Hříbková, 1993 and 2010; Společnost pro talent a nadání [Society for Talent and

Giftedness], Vondráková, 2016; Center for Gifted Children Development, Portešová, 2016; Children's Mensa, Mazal, 2016). The identification and screening of such children in the Czech Republic is based on different authorities and methods as well as foreign methods localized into Czech (for an overview see Jabůrek, 2014). In the Hradec Králové Region, gifted preschool children are identified using the Characteristics of Giftedness Scale (Silverman, 1993), localized for the Czech environment, which has proven to be a reliable indicator of intellectual giftedness (correlation with IQ $r = 0.557$) and a good tool for screening gifted and exceptionally gifted children (Havigerová, 2015). Creativity level can also be regarded as an important indicator for spotting gifted and exceptionally gifted children. Our previous research (e.g., Havigerová, Burešová, Smetanová, and Haviger, 2013) dealt with the correlation between intellectual giftedness and creativity in children of early preschool age. The current study lowers the age limit, dealing with the correlation in preschool aged children between the two different ways creativity is expressed (verbally and figurally) on the one side and behavioral characteristics enabling estimation of the overall level of giftedness on the other. The third part of the study endeavors to determine the degree to which individual types of creativity can contribute to predicting the overall level of giftedness (operationalized as scores on the Characteristics of Giftedness Scale for Preschool Children).

Aim of the Study

The overall objective of the study is to verify whether there is a correlation between expressions of creativity and giftedness in preschool aged children. The other objectives are: (1) to verify a correlation between the two ways creativity is expressed (verbal and figural), (2) to determine which specific elements of verbal and figural creativity are strongly correlated with overall giftedness, and (3) to determine reliable predictors of general giftedness (to develop a predictive model).

Based on the existing state of knowledge, the following hypotheses were formulated:

H1: Performance on the verbal and figural creativity tests will be weakly correlated (within $\left|0.1–0.3\right|$),

H2: Creativity (both verbal and figural) will be weakly correlated ($\left|0.1 – 0.3\right|$) with overall giftedness, and

H3: Verbal creativity will be correlated with overall giftedness more strongly than figural creativity will.

Beyond verifying these hypotheses, our objectives are exploratory.

Methods

Data acquisition instruments

To acquire the data, three tools were selected: the Characteristics of Giftedness Scale (CGS), the Test for Creative Thinking – Drawing Production (TCT-DP), and the Storytelling – Verbal Creativity Test (S-VCT).

Characteristics of Giftedness Scale

The CGS was developed in 1993 by Linda Kreger Silverman (1993), although the first version this test dates back to as early as 1973. Its author developed the scale based on 10 years of experience teaching and providing counseling for gifted people. The scale was first published in the *Association for the Gifted and Talented Newsletter* in 1978 and was subsequently modified and verified at the Gifted Development Center in Denver, Colorado. The scale contains 25 items mapping a child's behavioral characteristics so as to discern the behavior of a gifted child. The 25 descriptors employed in the scale were selected to meet the following requirements: a) applicability to a wide age range, b) generalizability for children from varying socioeconomic and ethnic environments, c) gender equality, d) easy applicability in home conditions, e) brevity and clarity of formulations even for parents, and f) replicability (Silverman, 1993).

The localized Czech scale (see Havigerová, 2015) contains the original 25 items. These were supplemented with a 26th item, although this does not affect the total score. The original items are as follows:

1. *reasons well (good thinker),*
2. *learns rapidly,*
3. *has extensive vocabulary,*
4. *has an excellent memory,*
5. *has a long attention span (if interested),*
6. *sensitive (feelings hurt easily),*
7. *shows compassion,*
8. *perfectionistic,*
9. *intense,*
10. *morally sensitive,*
11. *has strong curiosity,*
12. *perseverant in their interests,*
13. *has high degree of energy,*
14. *prefers older companions or adults,*
15. *has a wide range of interests,*
16. *has a great sense of humor,*
17. *early or avid reader (if too young to read, loves being read to),*
18. *concerned with justice, fairness,*

19. *judgment mature for age at times,*
20. *is a keen observer,*
21. *has a vivid imagination,*
22. *is highly creative,*
23. *tends to question authority,*
24. *has facility with numbers,*
25. *good at jigsaw puzzles.*

The items are assessed on a four-point assessment scale (do not agree, not sure, agree, totally agree) where from 1 to 4 points are assigned; total scores thus range within 25–100 points. The final score expresses an estimate of giftedness (the correlation between total CGS score and IQ measured using the WISC-III is $r = 0.557$, $p < 0.01$; Havigerová, 2015). For research purposes, a 26th item (*seems gifted overall*) has been added. The scale is used by adult assessors who know the child well – usually parents or teachers. In the present study, the scale was applied by the class teacher, who has been working with the children over the long term and who had also undergone training in identifying and working with gifted preschool children (an 80-hour course certified by the Ministry of Education, Sports and Youth, offered by Hradec Králové University, and led by one of the authors of this study.)

Test for Creative Thinking – Drawing Production

The TCT-DP is a screening tool developed by Urban and Lellen and adapted into Czech by Kováč (Urban, Jellen & Kováč, 2003). The localized Czech version enables identification of individuals with exceptionally high creative ability as well as individuals in whom this ability is underdeveloped. The test can be administered both individually and to groups. It targets people in the wide range of 4 to 95 years of age. Completing the test takes 15 minutes per form (form B was not used in our study). Thanks to its figural modality, the TCT-DP is a culture-fair test (Urban, Jellen, & Kováč, 2003).

The test material consists of a sheet of paper with six different figural fragments, five of which are situated within a square frame (a semi-circle, dot, right angle, wavy line, and dashed line), while the sixth (a lowercase horizontal u) is outside the square. The instructions are as follows: "You are looking at a drawing that someone started but stopped before knowing what they wanted to draw. Your task is to finish the picture as you like. There are no correct or incorrect solutions; anything you draw is correct." The respondent's task is to finish the incomplete figure as they wish. The respondent can only use a black pen (erasers, rulers, and other aids are not allowed).

The test is not a typical performance test. Urban had a broader understanding of the phenomenon of creativity and when designing the test in addition to cognitive aspects (divergent thinking, general and specific knowledge) he also focused on personality components (focus and determination, motivation, openness, and tolerance for ambiguity). These components are reflected in the test assessment: the final drawing is assessed based on 14 criteria (the total score is the sum of scores for individual criteria):

1. *Continuations* (Cn) (0–6 points);
2. *Completion* (Cm) (0–6 points): input elements finished into shapes;
3. *New elements* (Ne) (0–6 points): self-standing figures, supplementing input elements;
4. *Connections made with a line* (Cl) (0–6 points): linking two or more input elements;
5. *Connections made to produce a theme* (Cth) (0–6 points): semantic linking of elements even without graphic linking;
6. *Boundary breaking that is fragment dependent* (Bfd) (0 or 6 points): finishing the horizontal *u*;
7. *Boundary breaking that is fragment dependent* (Bfi) (0 or 6 points): new elements outside the frame;
8. *Perspective* (Pe) (0 or 6 points): effort at three-dimensional representation;
9. *Humor and affectivity* (Hu) (0–6 points);
10. *Unconventionality, a* (Uc, a)*:* manipulating the material unconventionally (0 or 3 points);
11. *Unconventionality, b* (Uc, b)*:* abstraction, fiction, symbolism (0 or 3 points);
12. *Unconventionality, c* (Uc, c): combining figures and symbols (0 or 3 points);
13. *Unconventionality, d* (Uc, d): finishing fragmented figures in an unusual manner (0 or 3 points); and
14. *Speed* (Sp): (0–6 points; this factor was not considered in our study).

The final score provides an estimate of the individual's creative ability (it does not assess quality of artistic performance). Children could score up to 66 points, as speed (criterion 14) was not considered. Criteria 10–13 were not applied in our study as most children tested did not acquire a score that could be worked with (mode 0 points). Children averse to drawing for any reason or children with psychomotor impairments could be at a disadvantage in this test. With preschool children, however, drawing is a natural way of expression in an overwhelming majority of cases; children enjoy drawing and the risk of the aforementioned bias is, in our opinion, minimal.

Storytelling – Verbal Creativity Test

This original Czech tool developed by Durmeková, Hříbková, and Rendl (2013) was designed to diagnose creativity mainly in primary school pupils; the standards cover children 5 years and older. Stimuli cards are pictures of imaginary animals the subject is to name and tell a story about. The task is repeated in the second part of the test but this time each animal on a card is pictured in a specific situation. The test has an assessment manual. The following criteria are assessed (Pa–Ph are assessed twice – once for the first story and a second time for the second story):

1. *P naming animals;*
2. *Pa including animals in story;*
3. *Pb relationships, interactions, and complexity of characters;*
4. *Pc storyline structure;*
5. *Pd unifying theme of the story;*
6. *Pe originality of story;*
7. *Pf subplots;*
8. *Pg figurative (sensory) level of story;*
9. *Ph overall dramatic nature of story;*
10. *P12a plot twists; and*
11. *P12b thematic links.*

Component scores can be either positive or negative. The preschool children we (the authors of this paper and colleagues who used the method while developing the standards) were testing were mostly unable to tell a story, only dwelling on simple descriptions and sometimes giving up on the task (after which we let them color in the animals in the picture and, if no story emerged, assigned them another task).For this reason, we decided to use a different method of assessment in this study – a sentence was defined as the unit and the numbers of sentences were quantified within the following assessment criteria:

1. *Nomen name* – giving the animal a human name (indicates low creativity),
2. *Animal name* – giving the animal the name of an existing or dinosaur species,
3. *Original name* – giving the animal an unusual and original name,
4. *Description C* – the number of sentences used to describe the c*hrupoň* or situations involving it,
5. *Description N* – the same for the *coati*,
6. *Description D* – the same for the *little dragon*,
7. *Characters* – the number of newly introduced characters,
8. *Action* – the number of sentences describing an action (what

preceded the picture, what happened next, things that were not directly in the picture),

9. *Communication* – whether there was direct speech or communication between characters (yes/no), and
10. *Link* – the number of characters (including those in the pictures) included in the story.

P1 denotes scores based on quantifying the first story, while P2 denotes scores for the second story.

Procedure

The research was conducted in cooperation with a specific preschool (which is kept anonymous) with which the authors have long cooperated – both the teachers and the children know us well. We first acquired informed consent from the parents of children attending preschool classes. The consent form included information on the parents' education. At a joint session, children were motivated by listening to a talk about fairy tales, fairy tale books, and illustrations. Individual sessions with children were held during two weeks at the turn of February to March, during which time the children told stories (S-VCT) and drew pictures (TCT-DP). The CGS was administered in January as part of a yearly screening at 24 preschools under the governance of the Hradec Králové municipality (in cooperation with Ing. Synková, Head of the Education Department). For the purposes of this study, data concerning children from the preschool which participated in the aforementioned creativity testing were extracted.

The testing included 35 children meeting the inclusion criteria: informed consent from their parents, age ≥ 5, and being present in the preschool during the testing period. Face-to-face testing involved 33 children. Convenience sampling was applied (one child did not participate in the testing due to being sick and one parent did not agree to their child being included in the research). The narrated stories were recorded and pictures scanned. Children were matched with records from the CGS database. The data was anonymized (each child was assigned an identification code) and assessed following the aforementioned criteria. The quantitative data was subjected to statistical analysis.

Results

Descriptive statistical data (means, medians, SD) were first acquired and analyzed. Grubbs' test identified one outlier (a boy with ID_017) who achieved extremely high values on the S-VCT. This respondent was excluded from further analysis and data from 32 respondents—20 boys and 12 girls—from 1,868 days (5 years and 2 months) to 2,593 days (7 years and 2 months) in age were analyzed.

Table 1 presents summary scores of verbal creativity (S-VCT total), figural creativity (TCT-DP total), and giftedness (CGS total).

Table 1
Total scores from each test: descriptive statistics (n = 32)

	Mean	Median	SD	Minimum	Maximum
S-VCT total	36.30	36	9.02	18	82
TCT-DP total	16.36	15	8.355	6	38
CGS total	51.26	49	12.318	31	73

The Kolgomorov–Smirnov test was used to check for a normal distribution (not found) and Spearman's correlation coefficient was calculated for individual items under analysis as well as total scores. Correlations among total scores revealed a strong correlation ($r = 0.484$, $p = 0.019$) between the two methods of measuring creativity while there was not a significant correlation between giftedness and creativity; giftedness was more strongly associated with overall verbal creativity ($r = 0.361$, $p = 0.099$) and less strongly with figural creativity ($r = 0.222$, $p = 0.229$).

The components of the CGS (behavioral components) were also analyzed, and Table 2 presents all significant correlations between components and the two types of creativity.

Table 2
Associations between CGS components and figural (total TCT-DP score) or verbal (total S-VCT score) creativity: Spearman's correlation (n = 32)

CGS item * figural creativity	rho	sig	CGS item * verbal creativity	rho	sig
Is active	0.379	0.032	Has a wide range of interests	0.511	0.009
Is an eager observer	0.366	0.039	Persistent when interested	0.505	0.010
Has vivid imagination	0.343	0.050	Mature opinions for the age	0.417	0.038
Is gifted overall	0.329	0.066	Is gifted overall	0.482	0.015

If the results are viewed through the prism of individual variables mapped by the verbal creativity test, however, there seems to be a correlation between overall giftedness as expressed by total CGS score and certain elements of the verbal creativity test (for details see Table 3).

Table 3
Associations between total CGS score and S-VCT criteria: Spearman's correlation (n = 32)

CGS total	rho	sig	CGS total	rho	sig
Nomen name	−0.375	0.054	Original name	0.027	0.894
P1 Description Ch	0.410*	0.034	P2 Description Ch	−0.125	0.517
P1 Description N	0.266	0.180	P2 Description N	0.188	0.328
P1 Description D	0.475*	0.012	P2 Description D	0.131	0.497
P1 Characters	0.147	0.483	P2 Characters	−0.013	0.946
P1 Action	0.376	0.053	P2 Action	0.171	0.375
P1 Communication	0.277	0.161	P2 Communication	0.180	0.341
P1 Link	0.178	0.386	P2 Link	0.190	0.322

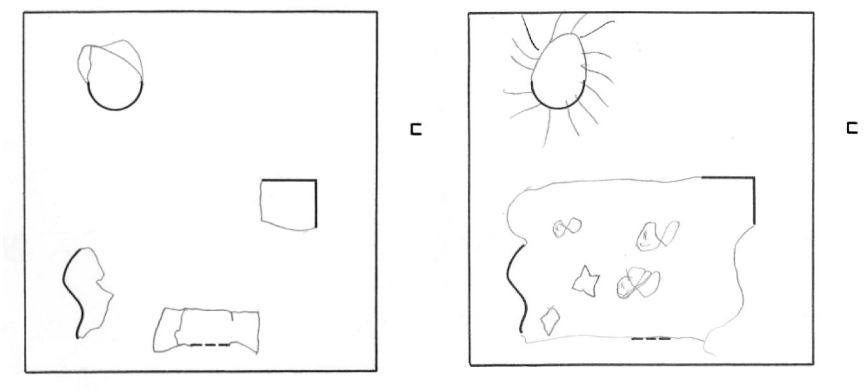
Table 3 shows that character naming and especially the first story were strongly correlated with overall giftedness while the second story was not to be related to this characteristic.

Similarly, potential correlations between individual criteria in the figural creativity test and overall giftedness were analyzed (see Table 4).

Table 4
Associations between total CGS score and TCT-DP criteria: Spearman's correlation (n=32)

CGS total	rho	sig
Continuations (Cn)	0.115	0.529
Completion (Cm)	−0.025	0.892
New elements (Ne)	0.063	0.734
Connections made with a line (Cl)	0.219	0.227
Connections made to produce a theme (Cth)	0.307	0.087
Boundary breaking that is fragment dependent (Bfi)	−0.205	0.262
Perspective (Pe)	−0.061	0.738
Humor and affectivity (Hu)	0.109	0.552

Table 4 shows that none of the criteria assessed were significantly correlated with overall giftedness (total CGS score). The component that came the closest to significance was *Connections made to produce a theme* (*Cth*), which relates to children not conceiving of a picture as a set of solitary individual elements but making an effort to link them together to form a meaningful whole. Examples of pictures which scored low and high on this criterion are shown below (left the low scoring "Some shapes"; right the high scoring "Goldfish in a bowl").



In the last step, we attempted to design a predictive model of the level of giftedness (operationalized as total CGS score). The linear model was selected automatically using best subsets regression, with the criterion for best subset set to adjusted r^2 and the confidence level to 95. The resulting linear model explained 49.4% of response variable variation.

Table 5
Predictors of CGS total score: Spearman's correlation (n = 32)

Source	Sum of squares	df	Mean square	F	t	Sig.	Importance
Intercept	2627.69	5	525.53	7.06	5.95	.000	
Age	1237.47	1	1237.47	16.63	−4.07	.000	0.49
Nomen	645.88	1	645.88	8.68	2.94	.007	0.25
Cth	330.01	1	330.01	4.43	−2.11	.045	0.13
Residual	1934.52	26	74.40				
Corrected total	4562.21	31					

It must be noted that the *age* and *nomen* variables contributed to the model negatively, i.e. the older the respondent and the more animals called by human names, the lower the predicted CGS score was. *Cth* contributed positively, i.e. the higher the score for thematic linking, the higher the predicted CGS score was. The strongest predictor in the model was age (saturating the model by 49%), followed by giving the animal an "ordinary" human name (25%), and thematic linking in finishing the unfinished shapes (13%). In other tested models, not presented here due to lack of space, parent education was also an important predictor, supported by correlation with the mother's education of $r = 0.363$ and with the father's education of $r = 0.248$.

Discussion

The objective of the study was to analyze correlations between two types of creativity (verbal and figural) and overall giftedness in preschool children. Before discussing the results, it is necessary to mention the limitations to the study. The study was, without a doubt, limited by the size of its sample. Data were acquired from 31 preschool children. Another limitation is the sampling method – convenience sampling. Yet another limitation is the scoring system for the verbal creativity assessment – the standard scoring system provided insufficient score variability, and so an original neutorized scoring system without norms was applied. Another limitation was the absence of a threshold for creative talent in both of the creativity tests used. Another potential limitation is the one-off nature of the testing: the children's performance may have been influenced by their psychosomatic condition and circumstances at the time; retesting may have yielded more reliable values for the creative performance of the children tested. Having acknowledged the aforementioned limitations, we will attempt to generalize the knowledge we acquired, put it into context, and point out potential intentions. Although the statements in the following paragraphs may appear rather clear cut, this is only to make the text readable. They should be read with the aforementioned limitations in mind – primarily the fact that the data have been drawn from a relatively small and non-representative population sample. The proposals are meant rather to stimulate discussion and further research

We will first focus on the relationship between the two types of creativity under analysis. The results suggest a correlation between performance on two radically different tests of creativity measuring two types of creativity ($r = 0.484$, $p = 0.019$); according to Dancey, and Reidy (2014), this value represents a moderate positive correlation. We expected a weak correlation. Hypothesis H1 was thus confirmed regarding the correlation's direction (the results support a positive correlation) but not its strength. Considering the small size of the sample, the results may have been affected by the occurrence of the outlier, i.e. a first- or second-order error. The results might also potentially suggest that the correlation between different types of creativity is stronger at an earlier age while the domain-specific nature of creativity becomes more prominent with age and experience.

The findings also suggest that relationships may exist between overall giftedness and verbal creativity ($r = 0.361$) and overall giftedness and figural creativity ($r = 0.222$). Hypotheses H2 and H3 can be regarded as supported by the data (although these correlations are not significant, we regard them as evidential, see, e.g., Soukup, P., 2016; Utts & Heckard, 2011, p. 126). This conclusion is in accordance with the existing state of knowledge – a number of studies that found correlations between giftedness/intelligence and creativity were cited in the introduction.

Some authors assume a certain level of intelligence to be a sine qua non for the development of creativity (threshold theory). The correlations measured in our sample of preschool children roughly coincide with those reported by other authors. The present findings suggest a correlation between overall giftedness and figural creativity ($r = 0.222$, moderate correlation) and a stronger correlation between overall giftedness and verbal creativity ($r = 0.361$, strong correlation). Although these correlations are not significant ($p > 0.05$), they can be regarded as evidential, in light of such facts as that the level of significance depends on sample size (Bates, Zhang, Dufek, & Chen, 1996) and this sample consisted of 32 respondents, a size requiring very strong correlations to find significance.

A more detailed analysis of the correlations between overall giftedness and individual components of figural creativity revealed that *Connections made to produce a theme* (*Cth*) came the closest to significance. A positive score on this criterion reflects the fact that the child did not conceive of the picture as merely a set of individual solitary elements but attempted to provide them with coherence and connect them into a meaningful whole. That this criterion would have a correlation with giftedness makes sense. Overall giftedness, as studied in our research, significantly correlates with intelligence and intelligence may be generally viewed as the ability to identify relationships (e.g., in 1920 Thorndike distinguished three types of intelligence depending on the type of relationship involved: specific intelligence was defined as the ability to understand relationships between objects and manipulate them, abstract intelligence as the ability to understand symbols and manipulate them, and social intelligence as the ability to understand relationships between people and influence them effectively). Current theories of intelligence divide this construct into components, including selective intelligence, which consists of linking acquired information in a manner that results in an integrated meaningful whole (Blatný et al., 2010, p. 83). This component of intelligence seems to correspond to *Cth* in the test of figural creativity. The analogous item in the test of verbal creativity would be *Pb*, but this criterion could not be used due to the very low sophistication of the stories collected from the children in the age group under examination.

A more detailed analysis of the correlations between overall giftedness and individual elements of verbal creativity showed that a sufficiently reliable correlation with overall giftedness was found for the number of sentences a child generated upon being exposed to the animals for the first time. Suitable data for estimating the overall level of giftedness came from the child's ability to place the animals into some kind of action. A quickly analyzed indicator of a child's ability was his or her naming of the animals – using ordinary human names was a sign of a low level of giftedness, while any other reference (animal-like or entirely original) was a sign of a higher level of

giftedness. These features of the narrated story seem to indicate the child's ability to find the heart of the problem and a suitable solution. The child was told to come up with a new name for a new, previously unknown animal – a common name used for humans is thus a solution which in its essence does not complete the assignment. An ability to generate a name/reference for an animal beyond the child's common everyday experience may thus be related to procedural components of intelligence (according to Sternberg, quoted in Blatný, 2010), which involve the ability to code input information, compare various aspects of a problem, and determine the correct answer.

The results of our study further show that the first story told (telling stories upon encountering three new characters without any other instructions) is of key importance. Creating a story set within a specific environment (the springboard for the second story) proved relatively independent and, considering the very limited number of propositions, unsuitable for further analysis. For preschool children, creating a story generally proved to be a task that requires intense mental activity and that children at this age fail (without assistance, no child tested created a story in the true sense of the word; only a few children created one with some help). This may appear to be a surprising finding, considering that narrative thinking (the ability to perceive narration as a sequence of causally arranged events) develops as soon as a child's first year of life and that two-year-old children may be verbally adept enough to narrate a plot themselves (Trávníček, 2007). Although we are aware we used a scoring system very different from the one developed by the verbal creativity test's creators, our experience recommends the test for detecting exceptionally gifted children. This same experience, however, shows it is not suited for mass screening of preschool children.

The third part of the analysis focused on designing a predictive model with overall giftedness as the dependent variable. Although the results cannot be generalized (see the aforementioned study limitations), the model presented suggests that *respondent's age* and *nomen* (giving the unknown animal character a human name) contributed to the model negatively, i.e. the older the respondent and the more animals the child gave human names, the lower the predicted CGS score was. This result seems meaningful, logical, and expected. In particular, the relevance of the number of animal characters given human names seems meaningful. It is worth remembering that human names are part of our cultural symbols, i.e. not natural characteristics of things/phenomena but representations (e.g., Nakonečný, 1997, p. 118). Assigning an animal character a human name is thus likely rooted in the not-so-relevant association that humans also have names and in selecting this kind of a name the child is likely to be using memory rather than creative thinking. In contrast, giving an animal character the name of an animal species (animal name) or a freshly invented original name requires an

awareness of certain features of the animal in the drawing and is driven by an idea or even a creative process in the child's mind, not just a reliance on memory. Given that the categories *nomen*, *animal*, and *original name* are mutually exclusive, the more human (non-creative) names the child used, the fewer creative ones (animal or original names) were employed.

The predictive force of age seems less obvious. Interpreting its presence in the model might require knowledge of developmental psychology and social cognition. Developmental speed at preschool age is rather dramatic (perceptual speed and accuracy develop very quickly, as do such aspects as performance on motor tasks, memory capacity, number speed, and the difficulty of tasks the child can handle; differences are apparent over months, cf. Langmeier & Krejčířová, 1998). If teachers observe identical behavior (such as richness of vocabulary) in two children of different ages (the children in the sample were aged 5.0–6.92 years), they might associate this with the younger child being more gifted (see the contrast effect, order effect, etc.; e.g., Biemer, Groves, & Lyberg, 2011).

Last but not least, let us note that more complex models indicate that intelligence itself is insufficient to predict creativity, especially in people with above average intellectual potential. In intellectually gifted people, personality is a stronger predictor of creativity. Studies, usually conducted on adolescents (e.g., Bateya, Chamorro-Premuzic, & Furnham, 2009), agree on a strong correlation between creativity and extroversion (extroversion is a very strong predictor of creativity in intellectually gifted individuals) and a strong negative correlation with agreeableness (i.e., low agreeableness scores are a good predictor of creativity). In adolescence, when relationships with peers are one of the highest priorities in terms of natural needs, gifted individuals are often at a risk of social exclusion, which can make them conceal their original thinking and creative potential (see, e.g., Machů, 2013, Machů, & Červinková, 2014).

Conclusion

This study focused on a pilot analysis of correlation in preschool children between overall giftedness and two types of creativity. The findings revealed that at preschool age overall figural and verbal creativity seem to be very strongly correlated. The test of figural creativity is easier for preschool children to complete because drawing is an activity characteristic of this age, as such children are generally unburdened with criticism or self-criticism. The administration of the verbal creativity test is more dependent on the relationship between the test administrator and the child and children feel that the task is more difficult (we believe that the fact that children are only

rarely given such tasks was an additional influence). Sensitive indicators of children's overall giftedness included their abilities to connect individual elements into a whole (to complete unfinished shapes in the figural test and give their picture a name so as to indicate it is regarded as a meaningful whole) and surpass the boundaries of everyday reality (give unknown animals names not common for humans in the test of verbal creativity). Administering to preschool children the behavioral CGS together with creativity tests has the potential to contribute to improving screening for exceptionally gifted children as early as in preschool, identifying their special needs, and ensuring adequate measures during pre-elementary and elementary education.

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