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## **Autistic Spectrum Disorders and Creativity: Comparative Study of the Art Works**

Original scientific article

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### **ABSTRACT**

The purpose of this paper is to outline the findings of a pilot study, which compares drawings of typically developed preschool children and children with autistic spectrum disorders in the same age. In the study the Goodenough-Harris Drawing Test (GHDT) (1926; 1963) was used. In this study, the auto-portraits of children from two groups were analyzed concerning such categories as line, size, colour, details. For this the statistical analysis of variance was used. The results of the study show that there are no statistically significant differences in the drawings of studied groups according to the categories line, size, colour, details.

**Key words:** drawings, creativity, TD children, ASD children, auto-portrait

## **Motnje avtističnega spektra: Primerjalna študija o likovnih delih**

Izvirni znanstveni članek

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### **POVZETEK**

Namen prispevka je orisati rezultate pilotske raziskave, v kateri smo primerjali risbe običajno razvitih predšolskih otrok in otrok z motnjami avtističnega spektra iste starosti. V raziskavi smo uporabili Goodenough-Harrisovega testa risanja (GHDT) (1926, 1963). Analizirali smo avtoportrete otrok iz obeh skupin z vidika kategorij, kot so črta, velikost, barva in detajli. Za ugotavljanje razlik med skupinama smo uporabili statistično analizo variance. Rezultati kažejo, da v risbah proučevanih skupin z vidika uporabljenih črt, velikosti, barv in detajlov ni statistično pomembnih razlik.

**Ključne besede:** risbe, ustvarjalnost, normalno razviti otroci, otroci z motnjami avtističnega spektra, avtoportret

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## Introduction

“Asperger’s syndrome provides a plus – it makes people more creative” (Fitzgerald 2003, 43). This quotation from Michael Fitzgerald, as well as reflections about results of observation and analysis conducted on seven years old autistic boy from the polish kindergarten have brought the idea of a comparative study of the art works of healthy children (TD) and children with autistic spectrum disorders (ASD). The study is still in progress, therefore in the present article only the results of the pilot study will be discussed. A further aim of this article is to invite teachers and psychologists, working in kindergartens, to participate in this research and to send similar paintings of both TD and ASD children.

### *Autism spectrum disorder*

Autism spectrum disorder (ASD) is used as a descriptive umbrella term which includes five different diagnostic categories, such as: Autistic Disorder, Asperger’s Disorder, Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS), Rett’s Disorder, Childhood Disintegrative Disorder. ASD is a “spectrum disorder” and it means that although these categories have some similarities in areas of impairment, each category have unique characteristics and diagnostic criteria, so that each person with ASD is affected in a different way. That is why symptoms can occur in any combination and can range from very mild to quite severe. For example, the cognitive abilities of children with an ASD range from above average intelligence to severe intellectual disability. In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) the important changes in diagnosis of autism spectrum disorder were made. Now diagnosis represents a new, more accurate, as well as medically and scientifically correct way of diagnosing individuals with autism-related disorders (DSM-5 Autism Spectrum Disorder Fact Sheet) (see Figure 1):

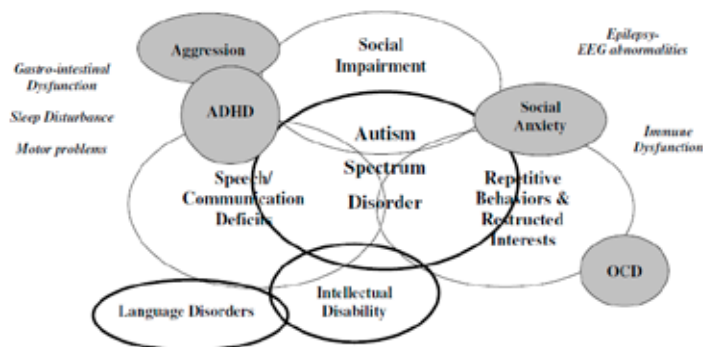


Figure 1. DSM-V: Conceptual Framework of ASD (cf: Kaufmann 2014)

Nowadays the etiology of ASD is described as brain abnormalities, immunologic vulnerability factors, and genetics. Among the ASD predominating factors modern imaging technology has allowed to find out a variety of abnormalities including

unusual serotonin levels within several brain structures of individuals with ASD (Kaufmann 2014; Belmonte et al. 2004; Schultz and Klin 2002), as well as environmental factors such as for example birth trauma, food allergies or imbalance of digestion hormones (Newschaffer 2006).

### *Creativity*

Creativity is described according to APA as “the ability to produce or develop original work, theories, techniques, or thoughts. A creative individual typically displays originality, imagination, and expressiveness” (VandenBos 2006, 242). This definition is very general and gives no links in connection with interpretation and understanding of paintings of children. More fruitful definition is given in Britannica Concise Encyclopedia, where creativity is defined as “the ability to make or otherwise bring into existence something new, whether a new solution to a problem, a new method or device, or a new artistic object or form” (Kerr 2014). Also Franken (1993) can be linked, who defines creativity as “the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others” (Franken 1993, 396).

The term creativity is generally understood as useful novelty and it has a long history in psychology, focusing on individual differences in personality, cognitive abilities, and problem-solving styles (Heerwagen 2014). Psychologists describe creativity mostly as a mental process. But Csikszentmihalyi (1999) mentions also that creativity is as much a cultural and social as it is a psychological event. Therefore it is entirely possible to say that, what is named creativity is not the product of single individuals, but rather of social systems and social environment making judgments about individual's product(s). This environment has two salient aspects: a cultural, or symbolic, aspect which Csikszentmihalyi has called the domain; and a social aspect called the field. Thus creativity is a process that can be observed only at the intersection where individuals, domains, and fields interact. This is shown in the following figure, which is overtaken from Csikszentmihalyi (1999).

That creativity can occur, a set of rules and practices must be transmitted from the domain to the individual. Furthermore the individual has to produce a novel variation in the content of the domain. And finally the variation must be selected by the field for inclusion in the domain. Indeed, creativity occurs when a person makes a change in a domain, a change that will be transmitted through time. Some individuals are more likely to make such changes, either because of personal qualities or because they have the good fortune to be well positioned with respect to the domain. With other words: they have better access to it, or their social circumstances allow them free time to experiment.

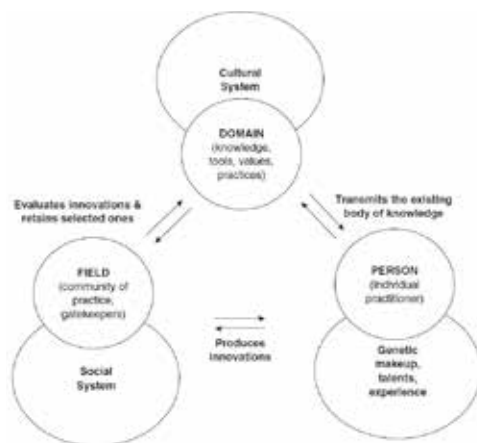


Figure 2. A systems model of creativity (Csikszentmihalyi 1999, 323)

### *Auto portrait drawings*

It is possible to transfer some keywords from the aforementioned definitions to the situation of the present research: for the children with ASD the most challenging are the terms “new artistic object”, “tendency to generate or recognize ideas” and that “creative product (appears) through the interaction of the domain, field, and person”.

In a number of psychological studies the importance of children’s free drawing was emphasized (Allen 2009; DeLoache 2004; Cox 1992; Freeman 1980; Gardner 1980). Some of the researches also showed the similarities and differences in the drawings of TD and handicapped children, as well as pointed out that children’s drawings could give an access to understanding of personality traits and psychological disorders of children (Smith 2014; Allen 2009; Low et al. 2009; Lee and Hobson 2006; Leevers and Harris 1998, Charman and Baron-Cohen 1993). Lee and Hobson (2006) compared the auto portrait drawings made by autistic children (aged 8 to 15) and by non-autistic children with learning disabilities. The authors came to the conclusion that autistic children’s sense of individual kinds and characters of people, at last their self-concepts, are less infused with personal qualities, than those of people without autism. An interesting study was made by Allen (2009), who studied the interpretation and understanding of the drawings of others by children with ASD. She came to the conclusion that describing the pictures children with ASD did not necessarily link a picture drawn by another person to its real world reference, but analyzed the pictures based upon the appearance. TD children, however, linked the picture to one of the objects. Recent studies of drawing skills of children with ASD, conducted by Low, Goddard and Melser (2009) showed that drawings of children with ASD displayed deficits in imaginative content and a piecemeal pictorial style. This research could confirm earlier results of the study of Leevers and Harris (1998), who found out that children with ASD

differ from the peers in imagination expressed in drawings and have difficulties in drawing of “impossible” figures (e.g. two headed man).

Recently Fleury (2011) studied the specific nature of graphomotorics of preschool children. In her research ASD children and TD children took part, who were asked to draw circles with the help of a computerized tablet and pen, which recorded spatio-temporal data. The research results showed no differences in statistical persistence, at the same time there were observed differences in timing of discontinuous circle drawing and in kinetic process variable such as grip and axial forces.

At last, a tendency to focus on details at the expense of configural information, ‘weak coherence’, has been proposed as a typical cognitive style in autism. Booth, Charlton, Hughes and Happé (2003) tested whether weak coherence might be the result of executive dysfunction, by testing clinical groups known to show deficits on tests of executive control. The comparison included boys with autism spectrum disorders (ASD) and boys, (IQ) matched with age- and intelligence quotient, with attention-deficit/hyperactivity disorder (ADHD), and typically developing (TD) boys. The drawing task required planning for the inclusion of a new element. A weak coherence was measured through analysis of drawing style. In line with the predictions was, however, that the ASD group was more detail-focused in their drawings than either ADHD or TD boys. Moreover poor planning did not predict detail-focus. These findings indicated that weak coherence may indeed be a cognitive style specific to autism and unrelated to cognitive deficits in frontal functions.

Jolley, O’Kelly, Barlow and Jarrold (2013) studied the idea that the autistic impairments in emotional and social competence, imagination and generating ideas predict qualitative differences in expressive drawings by children with autism. They showed happy and sad drawings to the participants with non-savant autism and compared with those drawn by three control groups matched on either degree of learning difficulty (MLD), mental age (MA) or chronological age (CA). Surprisingly and contrary to their predictions, the drawings from the autistic group were rated similar to those of the MA and MLD groups. Analysis of the people and social content of the drawings revealed that although children with autism did not draw fewer people, but they did draw more immature forms than mental age controls. Furthermore they found out that there was tentative evidence that fewer social scenes were produced by the autism sample.

Martin (2008) collected and reviewed data in his research to look at how people with ASD approach the drawing task and represent faces in particular during doing of the Portrait Drawing Assessment. In this case participants with ASD were rated as more engaged and conversational during the art therapy assessment than their neurotypical counterparts, contradicting widespread characterization of people with ASD as asocial. Portrait drawing was found to be successful as a structured, concrete means for engaging in relationships and holds potential as a therapeutic task for developing face processing and face recognition skills.

At last Pring, Ryder, Crane and Hermelin (2012) studied in their research nine talented art students, nine non-artistically talented individuals with ASD, and nine individuals with mild/moderate learning difficulties (MLD). The results showed that responses of the art students were more creative (as assessed on measures of fluency, originality, elaboration and flexibility) than the other groups on a drawing task. Although the savants did produce more elaborative responses than the ASD and MLD groups, no differences were observed on the other indices of creativity.

With above mentioned scientific research background the research started with the aim to have a more systematic view on the paintings of auto portraits of ASD and TD children.

## Method

*The research questions are:*

How creative are preschool children with autistic spectrum disorders in comparison with typically developed children while drawing auto portrait?

What are the differences between the auto portrait drawings of children with autistic spectrum disorders in comparison with typically developed children in such drawing's categories as line, size, colour and details?

*Instruments*

In the study the Goodenough-Harris Drawing Test (GHDT) (Goodenough 1926; Harris 1963) was used in the version Auto Portrait. However, in analyzing and evaluating it the Harris scoring system was not followed, but, according to the aim to look at creativity qualities, a new evaluating scale was developed, which could give answer to the research questions. The drawings were evaluated according the categories given in table 1:

*Table 1: Comparison categories*

<b>categories</b> <b>points</b>	<b>Line</b>	<b>Size</b>	<b>Colours</b>	<b>Details</b>
<b>0</b>	not clear not confident	small, less ½ of the page	one colour	no any
<b>1</b>	not clear confident	medium ½ of the page	2≤ colours	2≤ unclear
<b>2</b>	clear not confident	medium, good for the size of the page	2≤ colours coloured parts	2≤ clear
<b>3</b>	clear confident	big, for the whole page size	full coloured picture	4≤ clear, Coloured

The statistical analysis was done in STATISTICA 6.0. with use of the Analysis of variance.

*Sample*

The study was conducted in 2013 in the Integrated kindergarten nr. 8 in Słupsk, Poland, where children with special needs are mixed with typically developing

children. In the research 18 from 4 to 7 years old children took part. There were two study groups. The first group consisted of 9 children (8 boys, 1 girl; mean age:  $6,0 \pm 1,2$ ; non-verbal IQ =  $68,8 \pm 9,1$ ) with ASD such as autism (7), Asperger syndrome (1), childhood disintegrative disorder (1). The second group 9 typically developing children (5 boys, 4 girls; mean age:  $5,9 \pm 1,4$ ; non-verbal IQ =  $77,2 \pm 3,3$ ), who were randomly taken for the comparison of drawing abilities from the bigger group of healthy children on the basis of the age similarity. All paintings were done in the period of March-April 2013.

### Results

In the present sample at the stage of the pilot study no statistically significant differences could be found in the drawings of ASD and TD children according to the categories line, size, colour, details. The differences are presented in the table 2 and on the subsequent figure 3.

Table 2: Analysis of Variance,  $p < 0,05$ .

	SS – Effect	df - Effect	MS - Effect	SS - Error	df – Error	MS - Error	F	P
Age	0,05	1	0,05	27,06	16	1,69	0,03	0,87
Line	0,50	1	0,50	21,11	16	1,32	0,38	0,55
Size	0,05	1	0,05	14,44	16	0,90	0,06	0,81
Colours	0,00	1	0,00	20,00	16	1,25	0,00	1,00
Details	1,39	1	1,39	14,22	16	0,89	1,56	0,23

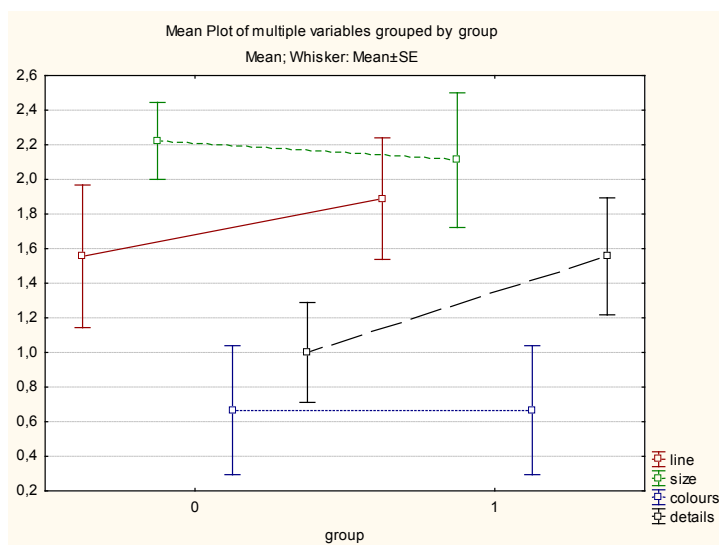


Figure 3. Comparison of the drawings in the categories line, size, colour, details in the group of children with ASD (group 0) and their healthy age-matched TD (group 1).

(Legend: highest graph: size; second: line; third: details; lowest: colours)

By analyzing and interpreting figure 3 it is possible to see the following tendencies, which should be the subject of further deeper analyses:

- It can be supposed that children in both groups are not different in the category of colour and usually use two and more colours to draw a picture of man/ auto portrait;
- It can be supposed that TD children will draw as many details on the picture of man/auto portrait, as children with ASD;
- It can be supposed that drawing lines of children with ASD and TD children would vary similarly from unclear and not confident to clear and confident drawing lines;
- It can be supposed that in both groups the size of the drawings will be between medium, and big and the individual difference in this category will be wide in both groups.
- It also can be supposed that there are no significant differences in the creativity and drawing abilities of children with ASD and their TD peers and the individual difference in the drawings quality will be wide in the both groups.

## Discussion

Literature analysis showed that ASD and creativity, on the one hand, do not typically go hand-in-hand (Low et al. 2009; Leevers and Harris 1998), but, on the other hand, their correlation is a topic that attracts more and more researchers (Pring et al. 2012; Fitzgerald 2011; 2003; Lee and Hobson 2006).

As a general assumption it is to meet the usual approach that autistic children do not have well developed creativity and imagination production. At the same time a number of researches on creativity in autism show, that creativity and imagination are present in autistic children, but often not usually displayed and therefore need special support and encouragement (Schwarz 2004; Belmonte et al. 2004). For example, art-therapy, robot interaction, sand play, as well as, everyday support proved to be an effective way in having autistic children display their creative and imaginative ideas (Smith 2014). According to Allen (2009) children with ASD showed naive realism when reasoning about other people's artwork, but when they create drawings, they more easily relate the drawing to an external object and are more likely to focus on the symbol-referent relation. Savants display creativity, even beyond that of a non-autistic individual, while high-functioning autistic children showed little or no creativity in studies and experiments (Smith 2014).

In the present research no statistically significant differences were found in the drawings of ASD and TD children according to the categories line, size, colour, details. It can be described in the frames of the idea that ASD children have a wide range of individual differences in creativity development as well as TD children: from highly developed creativity to a very low level. These results correspond to the findings of Chaman & Baron-Cohen (1993) and Eames & Cox (1994) concerning



drawing abilities of children with ASD. Their drawing skills are relatively similar to the drawing skills of TD age-matched peers. As well as in the study of Lee & Hobson (2006) who found out that the autistic children's drawings of people are just as detailed as drawings of healthy children, but they lack variation. In the theories of creativity it is also possible to find some elements to fit the concept of creativity in autistic children (Kaufman and Beghetto 2009; Sternberg 2006; Csikszentmihalyi 1999).

The results of this pilot study give some more information for the improvement of creativity among ASD children. In the studied sample children from both groups used two and more colours to draw a picture, they mostly had drawn medium or big picture of man/auto portrait and had a tendency to draw a lot of details on the picture. The category line in the pictures of ASD and TD children varies similarly from unclear and not confident to clear and confident drawing lines. At all events these results are worth to research furthermore and considerably deeper.

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## **Motnje avtističnega spektra: Primerjalna študija o likovnih delih**

V pilotski študiji smo pokazali rezultate raziskave, ki se je osredotočala na otroke z motnjo avtističnega spektra. Raziskovalna vprašanja so bila: kako ustvarjalni so med risanjem avtoportreta predšolski otroci z motnjami avtističnega spektra v primerjavi z zdravimi otroki? Kakšne so razlike med avtoportreti otrok z motnjami avtističnega spektra v primerjavi z običajno razvitimi otroki v kategorijah, kot so črta, velikost, barva in detajli? V raziskavi je bilo udeleženih 18 otrok, starih od 4 do 7 let (9 otrok z motnjo avtističnega spektra: 8 dečkov in 1 deklica, povprečne starosti  $6,0 \pm 1,2$ , neverbalni IQ =  $68,8 \pm 9,1$ , ter 9 zdravih otrok: 5 dečkov in 4 deklice, povprečne starosti  $5,9 \pm 1,4$ , neverbalni IQ =  $77,2 \pm 3,3$ ). Ustvarjalnost risarskih spretnosti je bila izmerjena s pomočjo Goodenough-Harrisovega testa risanja (GHDT). Ta test je bil prvotno pripravljen za neverbalno ocenjevanje ravni intelektualne zrelosti majhnih otrok; osredotoča se na detajle in koncepte, vključene v risbe človeške figure. Prvotni Goodenough Draw-a-Man Test (GDAMT) iz leta 1926 je leta 1963 dopolnil Harris.

V literaturi obstaja veliko študij, ki analizirajo risbe zdravih in invalidnih otrok, z različnimi nameni, kot so ugotavljanje samopodobe, osebne lastnosti (npr. Allen 2009; Lee in Hobson 2006; Leavers in Harris 1998), grafomotorične sposobnosti (npr. Fleury 2011) ali oblikovne informacije (npr. Booth et al. 2003). Pring et al. (2012) so se dotaknili raziskav glede izražanja ustvarjalnosti pri nadarjenih študentih umetnosti, posameznikih z motnjo avtističnega spektra in posameznikih

z blagimi ali zmernimi učnimi težavami. Bistvenih razlik glede ustvarjalnosti med skupinami niso zaznali.

V predstavljeni študiji so bili analizirani avtoportreti otrok iz navedenih dveh skupin (zdravi otroci in otroci z motnjo avtističnega spektra) glede osnovnih kategorij, kot so črta, velikost, barva, detajli. Razvita je bila tudi ocenjevalna točkovna lestvica. Statistična analiza je bila izvedena v statističnem programu STATISTICA 6.0 z uporabo analize variance.

Rezultati študije kažejo, da ni statistično pomembnih razlik v risbah proučevanih skupin otrok glede na kategorije črta, velikost, barva in detajli, čeprav obstajajo v obeh skupinah velike individualne razlike v kakovosti risbe. Otroci v obeh skupinah so uporabili dve ali več barv; njihove risbe so bile srednje velike ali velike risbe ljudi (avtoportreti). Pri obojih se kaže tendenca na risbi narisati veliko detajlov. Risanje črt se v obeh skupinah spreminja od nejasnih in neprepričljivih do jasnih in samozavestnih. Rezultati so potrdili druge raziskave o ustvarjalnosti otrok z avtizmom (npr. Kaufman in Beghetto 2009; Schwarz 2004; Belmonte et al. 2004), ki so dokazovale, da sta ustvarjalnost in domišljija pri avtističnih otrocih navzoči, toda pogosto se ne pokažeta in zato takšni otroci potrebujejo posebno pomoč in spodbudo.

## BIBLIOGRAPHY

Allen, Melissa.L. 2009. Brief Report: Decoding Representations: How Children with Autism Understand Drawings. *Journal of Autism and Developmental Disorders*, 39, 539-543.

Belmonte, M K., Cook, E H, Anderson, G M, Rubenstein, J L R, Greenough, W T, Beckel-Mitchner, A. 2004. Autism as a Disorder of Neural Information Processing: Directions for Research and Targets for Therapy. *Molecular Psychiatry*, 9, (7), 646-663.

Booth, Rhonda; Charlton, Rebecca; Hughes, Claire; Happé, Francesca. 2003. Disentangling Weak Coherence and Executive Dysfunction: Planning Drawing in Autism and Attention-deficit/hyperactivity Disorder. *Philosophical Transactions of Royal Society B*, 358, 387-392.

Charman, Tony; Baron-Cohen, Simon. 1993. Drawing Development in Autism: The Intellectual to Visual Realism Shift. *The British Journal of Developmental Psychology*, 11, 171-185.

Cox, Michael. 1992. *Children's Drawings*. London: Penguin.

Csikszentmihalyi, Mihaly. 1999. A Systems Perspective on Creativity. In *Handbook of Creativity*, (ed.) R. Sternberg, 313-335. Cambridge: Cambridge University Press.

DeLoache, Judy, S. 2004. Becoming Symbol-minded. *Trends in Cognitive Sciences*, 8, 66-70.

Eames, Kate; Cox, Maureen, V. 1994. Visual Realism in The Drawings of Autism, Down's Syndrome, and Normal Children. *The British Journal of Developmental Psychology*, 12, 235-239.

Kerr, Albert, B. 2014. *Encyclopedia Britannica*. Electronic edition. Assessed October 10, 2014. <http://www.britannica.com/EBchecked/topic/142249/creativity>

Fitzgerald, Michael. 2003. *Autism and Creativity: Is There a Link between Autism in Men and Exceptional Ability?* New York: Taylor & Francis.

Fitzgerald, Michael. 2011. *Creativity Psychosis Autism and the Social Brain, a Comprehensive Book on Autism Spectrum Disorders*, Electronic edition. Assessed October 10, 2014. <http://www.intechopen.com/books/a-comprehensive-book-on-autism-spectrum-disorders/creativitypsychosis-autism-and-the-social-brain>.

Fleury, Amanda. 2011. *Fractal Dynamics of Circle Drawing in Children with ASD*. A thesis submitted in conformity with the requirements for the degree of Master of Applied Science Graduate Department of Biomaterials & Biomedical Engineering University of Toronto. Electronic edition. Assessed October 10, 2014. [https://tspace.library.utoronto.ca/bitstream/1807/30599/1/Fleury\\_Amanda\\_N\\_201111\\_MASc\\_thesis.pdf](https://tspace.library.utoronto.ca/bitstream/1807/30599/1/Fleury_Amanda_N_201111_MASc_thesis.pdf)

Franken, Robert. E. 1993. *Human Motivation*. Wadsworth: Brooks/Cole.

Freeman, Natalie. 1980. *Strategies of Representation in Young Children: Analysis of Spatial Skills and Drawing Processes*. Waltham, Mass.: Academic Press.

Gardner, Howard. 1980. *Artful Scribbles: The Significance of Children's Drawings*. New York: Basic Books.

Goodenough, Florence. 1926. *Measurement of Intelligence by Drawings*. New York, US: World Book Co.

Harris, Dale, B. 1963. *Children's Drawings as Measures of Intellectual Maturity*. New York: Harcourt, Brace & World, Inc.

Heerwagen, Judith, H. 2014. *Creativity*. Electronic edition. Assessed October 10, 2014. [http://us.docsity.com/en-docs/Management\\_Benchmark\\_Study-Book\\_Summary\\_Chapter\\_15-Literature-Elizabeth\\_L\\_Malone](http://us.docsity.com/en-docs/Management_Benchmark_Study-Book_Summary_Chapter_15-Literature-Elizabeth_L_Malone).

Jolley, Rihard, P.; O'Kelly Rachael; Barlow Claire; Jarrold, Christopher, 2013. Expressive Drawing Ability in Children with Autism. *British Journal of Developmental Psychology*, 31, (1), 143-149.

Kaufmann, Walter, E. 2014. *DSM-5: The New Diagnostic Criteria For Autism Spectrum Disorders*. Electronic edition. Assessed October 10, 2014. <http://www.autismconsortium.org/symposium-files/WalterKaufmannAC2012Symposium.pdf>

Kaufman, James, C., Beghetto, Ronald, A. 2009. Beyond Big and Little: The Four C Model of Creativity. *Review of General Psychology*, 13, 1-12.

Lee, Anthony, Hobson, Peter, R. 2006. Drawing Self and Others: How do Children with Autism Differ From Those with Learning Difficulties? *British Journal of Developmental Psychology*, 24, (3), 547-565.

Leevers, Hilary, J.; Harris, Paul, L. 1998. Drawing Impossible Entities: A Measure of The Imagination in Children with Autism, Children with Learning Disabilities, and Normal 4-year Olds. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 39, 399-410.

Low, Goddard, Melser, Joseph; 2009. Generativity and Imagination in Autism Spectrum Disorder: Evidence From Individual Differences In Children's Impossible Entity Drawings. *British Journal of Developmental Psychology*, 27, (2), 425-44.

Martin, Nicole. 2008. Assessing Portrait Drawings Created by Children and Adolescents With Autism Spectrum Disorder. *Art Therapy: Journal of the American Art Therapy Association*, 25, (1), 15-23.

Newschaffer, C. 2006. Epidemiologic Approaches to Autism and the Environment. Electronic edition. Assessed October 10, 2014. [http://www.autism\\_society.org/site/DocServer/EH\\_epidemiologic\\_approaches.pdf?docID=4751](http://www.autism_society.org/site/DocServer/EH_epidemiologic_approaches.pdf?docID=4751)

Pring, Linda; Ryder, Nuala; Crane, Laura; Hermelin, Beate, 2012. Creativity in Savant Artists with Autism. *Autism*, 16, 1, 45-57. Electronic edition. Assessed October 10, 2014. <http://research.gold.ac.uk/6667/>

Schultz, Robert, T; Klin, Ami. 2002. Genetics of Childhood Disorders: XLIII. ASD, part 2: Neural foundations. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, (10), 1259-1262.

Schwartz, James. 2004. *Special Training May Help People with Autism Recognize faces, UW Study Shows*. Electronic edition. Assessed October 10, 2014. <http://www.washington.edu/newsroom/news/2004archive/02-04archive/k021204>.

Smith, Ashley, 2014. *Creativity in autism*. Electronic edition. Assessed October 10, 2014. [http://dialogues.rutgers.edu/all-journals/doc\\_download/166-creativity-in-autism&prev=search](http://dialogues.rutgers.edu/all-journals/doc_download/166-creativity-in-autism&prev=search)

Sternberg, Robert. J. 2006. Creativity is a habit. *Education Week*, 25, (24), 47-64.

VandenBos, Gary (Ed.) 2006. *APA. Dictionary of Psychology*. Washington DC: APA

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