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Children gifted in drawing: The incidence of precocious realism

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Abstract
Although one study has reported that 6% of children with autism spectrum disorder (ASD) have drawing talent, no study has examined the incidence of drawing talent in typical children. We asked 153 children aged 6–12 years to draw a picture of their hand. We scored the drawings for the use of detail, correct proportion, and overall contour; assessed the drawings as above average at each age based on a global assessment; and compared the drawings with those of three identified drawing prodigies. Most children were able to capture the overall contour of their hand; the ability to draw relevant details was not common until age 8; and correct proportion was not seen even in the oldest children. We identified 13% of drawings as above average for the child's age group. However, even those drawings identified as above average were significantly less realistic than the drawings of the prodigies.

Keywords
Realistic drawing, survey, qualitative

Children gifted in drawing: The incidence of precocious realism[1]

Individuals differ in their ability to draw realistically and these differences can be found in early childhood, prior to any formal instruction (Golomb, 1992; Winner, 1996).

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Children who are gifted in realistic drawing create drawings that differ in many respects from those of typical children. We refer to these children as precocious realists – prodigies in the ability to draw realistically. The incidence of precocious realism has not been established.

Studies of drawings by populations of schoolchildren have concluded that drawing talent in very young children is far rarer than talent in other domains (Goodenough, 1926; Lark-Horowitz et al., 1973). We offer three possible explanations for this finding. First, drawing ability is less valued in our culture than are abilities in other domains such as mathematics. Second, children are not routinely screened for drawing ability as they are for academic ability. Third, musical talent is more likely to be noted because children often take music lessons, but rarely take drawing lessons.

It is likely that many children who draw ahead of their age go unnoticed, and thus are unnurtured by their parents and their schools. We now have numerous reports of children who appear to be prodigies in drawing (Drake and Winner, 2011–2012; Gardner, 1989; Goldsmith, 1992; Goldsmith and Feldman, 1989; Golomb, 1992, 1995; Golomb and Hass, 1995; Winner, 1996; Winner and Martino, 1993). Early high achievement in drawing is clearly possible. Whether such achievement is as common as high achievement in other domains has not yet been determined.

Typical characteristics of precocious drawings

Children whose drawings stand out as gifted may not necessarily become artists as adults, but their drawings are at least several years in advance of those of their peers. Certain characteristics outlined below are typically shared by precocious realists.

Graphic representation, not action representation. While typical children begin to draw recognizable shapes representing objects in the world at around the age of 3 or 4 (Golomb, 1992; Kellogg, 1969; Matthews, 1984), some children produce their first representational drawings at the age of 2. Drawings by typical children are ''action representations'' (Matthews, 1984). For example, a child might draw a slash across the page and then say ''truck crashing.'' The action is in the labeling and not in the drawing itself (Figure 1). Drawings by precocious realists are ''graphic representations'': the picture represents the objects (Figure 2).

Line as contour or edge. Typical children use line to stand for ''thingness'', as in Figure 3 where the two lines stand for two apples. The precocious realist uses line to indicate contour or edge, as in Figure 4 where the line represents the rounded shape of the apple.

Differentiated shape. At a very young age, precocious realists understand how objects are structured. Figure 5 shows a drawing by a typical 3 year old of a human, known as a tadpole drawing. Figure 6 shows a drawing by a 2 year old in which all of the major body parts are differentiated.

Illusion of depth. The drawings of precocious realists capture the illusion of depth and volume. These children often invent perspective on their own, even if the perspective

Figure 1. Action representation by a 2 year old. From Matthews (1984).

they come up with is not precisely correct. Eitan, a 3-year-old child studied by Golomb (1992), represented the third dimension with parallel oblique lines (Figure 7). He could draw the shape that his brain received, rather than the shape he knew the object to be.

Incidence of drawing in individuals with Autism Spectrum Disorder

Striking realistic drawing ability has been reported in individuals with savant syndrome, those individuals with Autism Spectrum Disorder (ASD) who exhibit a disproportionate ability in one domain (Rimland and Fein, 1988; Sacks, 1995; Selfe, 1977). The drawing in Figure 8 was made by E.C., an art savant studied by Mottron and Belleville (1993). His drawings are hyper-realistic, just like the drawings by typically developing precocious realist children. Other savants who draw with extreme realism have also been reported (Pring et al., 1995). The drawings by an artistic savant named Nadia are more realistic than those of non-autistic precocious realists at the same age (Selfe, 1977).

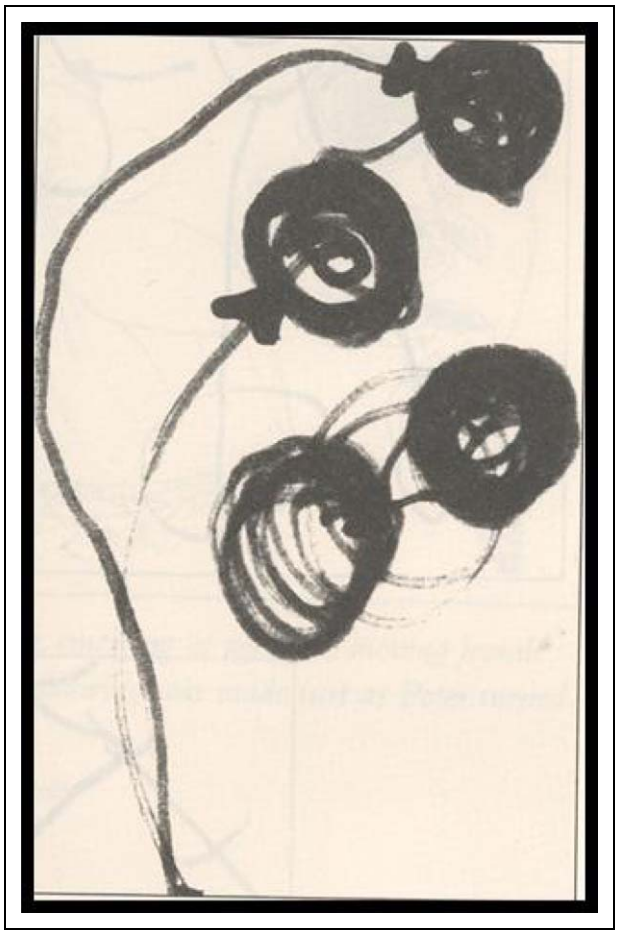

Figure 2. Balloons drawn by precocious realist, age 2. From Winner (1996).

Superior ability in drawing, even though not at the savant level, has also been reported in individuals with ASD (Vital et al., 2009). Based on a sample of over 6000 children aged 8 years, Vital et al. (2009) found that 6% of those with ASD have drawing/art talent, as reported by parents. However, no actual measures of drawing talent were given. Parents might have been over-reporting, out of a desire to view their child as talented, or under-reporting, because they do not know how to recognize artistic talent.

Current study

The goal of the current study was to investigate the incidence of precocious realism in a non-ASD population. This study was designed as a survey using a qualitative assessment. We asked children to draw a picture of their hand and scored the drawings for the use of detail, correct proportion, and overall contour. We also assessed these drawings as

Figure 3. Age-typical representation of two apples, age 2 years and 2 months. From Winner (1996).

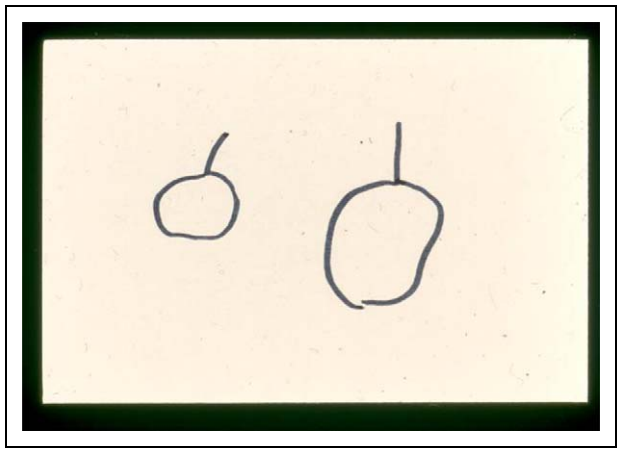

Figure 4. Two apples drawn by a precocious realist, age 2 years and 2 months. From Winner (1996).

above average at each age based on a global assessment. We compared the performance of our sample of children not selected for their drawing skill with the performance of three drawing prodigies whom we have studied.

Method

Participants

Participants were 153 children between the ages of 6 and 12 ($M = 9;4$, SD = 1;9). Participants were recruited from a children's exhibit at a local science museum; hence we used a convenience sample. All the children available at the museum in the age range of 6–12 were invited to participate, and most accepted. There were 81 girls and 73 boys.

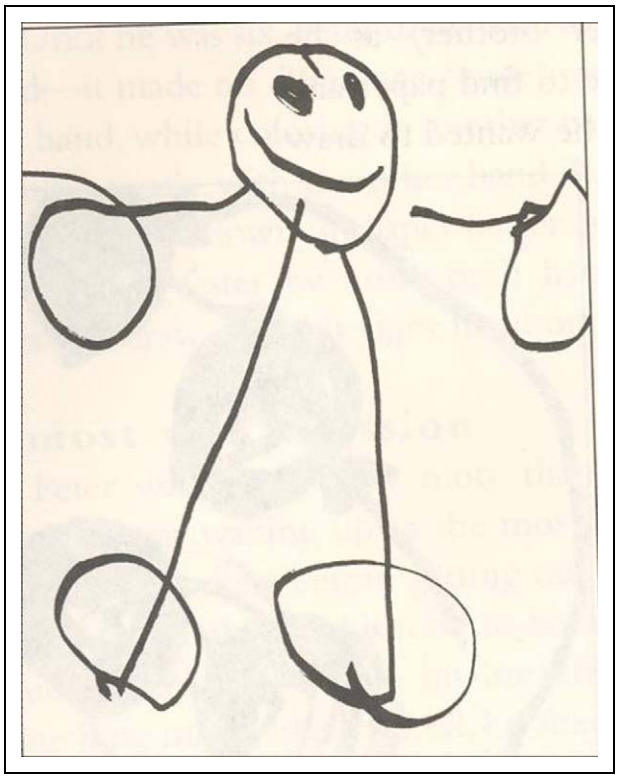

Figure 5. Tadpole human drawn by a child aged 3. From Winner (1996).

Most of the children were caucasian and middle class. No child had been diagnosed with ASD. The university Institutional Review Board approved the study. Parents provided informed consent for the study and children aged 7 years and older provided assent.

Procedure

Participants were seen individually for 5–10 minutes. The participant and the experimenter were seated next to each other at a table.

Years of art lessons

Parents were asked to indicate on a questionnaire the number of years of art lessons their child had taken in addition to the ordinary school curriculum.

Measure of drawing realism

Children were given a $9' \times 11'$ sheet of white paper and a sharpened pencil with an eraser and were asked to draw their hand. The experimenter asked each child whether he or she

Figure 6. Dancing figure drawn by Grace, a precocious realist, aged 3. From Winner (1996).

was right or left handed. Children were asked to draw their non-dominant hand. The instructions were as follows: "I want you to make a fist with your hand. I want you to draw a picture of what you see." Children were instructed to draw their fist with the palm facing up. They were asked to draw as much as they could in 3 minutes. Figure 9 is an example of the hand shape.

Drawings were independently rated by two experimenters for elements that were characteristic of artistically gifted drawings (Milbrath, 1998; Winner, 1996): detail, proportion, and contour. Detail was assessed in three ways: (1) drawing the thumb nail; (2) drawing at least one knuckle crease; and (3) drawing at least one palm crease. Children received a point for each detail element drawn successfully, with scores ranging from 0 to 3. Proportion was assessed in two ways: (1) drawing the thumb width at the same width as the fingers; and (2) if the finger nails were drawn, the palm should be drawn smaller than the fingers or if the finger nails were not drawn, the palm and fingers should be drawn in equal proportion. Children received a point for each proportion element drawn successfully, with scores ranging from 0 to 2. Contour was assessed in three ways: (1) the shape between the thumb and the wrist should be drawn with three distinct lines; (2) the shape between the wrist and little finger should be drawn as a curved line; and (3) the angle between the index finger and wrist was measured. The mean angle was 27.9° with a standard deviation of 8.46. Drawings within one half standard deviation of the

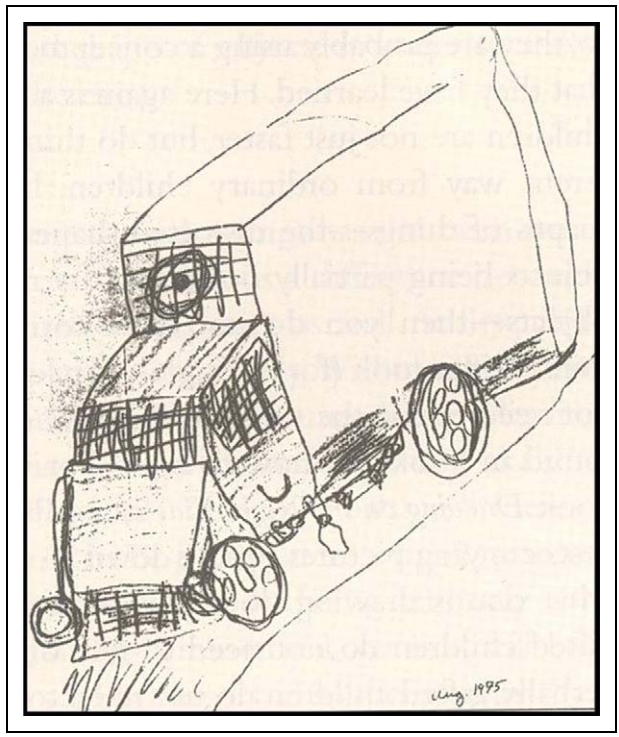

Figure 7. Truck by Eitan, age 3 years and 7 months, showing perspective.

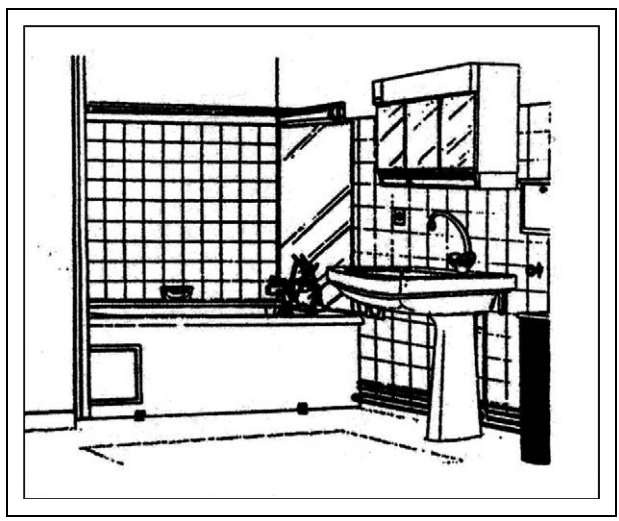

Figure 8. Drawing by savant, E.C. From Mottron and Belleville (1993).

Figure 9. Example of the hand shape.

mean received one point (23.67–32.13); drawings within one half to one standard deviation received a half point (19.44–23.67; and 32.13–36.36); and drawings above or below one standard deviation received zero points (below 19.44 or above 36.36). Children received a point for each proportion element drawn successfully, with scores ranging from 0 to 3.

For each participant, a proportion score was calculated by dividing the number of correct elements drawn by the total number of elements. Children received a score for each element as well as a total score. Participants received a continuous score ranging from 0.0 to 1.0. Inter-rater reliability was calculated at $\Phi = 0.91$. The experimenters resolved disagreements by reviewing the drawings and coming to a consensus. This scoring method has been shown to differentiate gifted from typical drawings (Drake et al., 2010) and is based on what is known about the characteristics of drawings by gifted children (Winner, 1996).

Two experimenters also carried out a global assessment of the drawings. For each age group, the experimenters examined all the drawings and identified those drawings that were above average for the age group. These drawings were identified as gifted. Inter-rater reliability was calculated at $\kappa = 0.94$.

Results

Table 1 presents the means and standard deviations for years of art lessons and the drawing scores by age. Children had an average of 0.5 years of art lessons outside of the

Table 1. Means and standard deviation for years of art lessons and drawing score by age.

Age (years)	*n*	Art lessons mean (SD)	Drawing score mean (SD)
6	16	0.31 (0.87)	0.20 (0.19)
7	16	0.56 (1.50)	0.23 (0.20)
8	36	0.28 (0.78)	0.26 (0.20)
9	25	0.20 (0.58)	0.29 (0.20)
10	22	0.68 (1.52)	0.38 (0.22)
11	26	0.46 (1.21)	0.40 (0.26)
12	12	1.75 (2.83)	0.55 (0.25)

Table 2. Regression coefficients for total, detail, proportion, and contour scores.

	Total drawing score	Detail	Proportion	Contour
Age	0.401**	0.318**	0.248*	0.316**
Gender	–0.115	–0.061	–0.086	–0.123
R^2	0.165*	0.101**	0.065*	0.107**

*$p < 0.01$; **$p < 0.001$.

ordinary school curriculum. Because 81% of the sample had less than 1 year of formal art lessons, that measure was not included in subsequent analyses.

Predictors of drawing realism

To determine whether age predicted level of drawing realism, a series of regressions were performed (Table 2). First, age and gender were regressed onto total drawing score. Age ($\beta = 0.401$, $p < 0.001$) but not gender ($p = 0.126$) was related to total drawing score.

We next assessed whether age and gender predicted detail, proportion, and contour. Age ($\beta = 0.318$, $p < 0.001$) but not gender ($p = 0.435$) was related to detail score. Age ($\beta = 0.248$, $p = 0.002$) but not gender ($p = 0.281$) was related to proportion score. Age ($\beta = 0.316$, $p < 0.001$) but not gender ($p = 0.114$) was related to contour score.

Emergence of drawing realism

We next investigated at what age these elements – detail, proportion, and contour – emerge. Figure 10 shows the number of details, proportion, and contour elements drawn successfully by age. For detail and contour, children could have earned scores ranging from 0 to 3; for proportion children could have earned scores ranging from 0 to 2.

It was not until participants were 8 years of age that they incorporated one detail into their drawing. The emergence of two or more details was not seen in our sample of children aged 6–12. On average, children aged 6–12 did not draw even one proportion element successfully. However, there was a dramatic shift from age 9–10, with scores almost doubling. At ages 10–12, children had made striking gains in their ability to draw

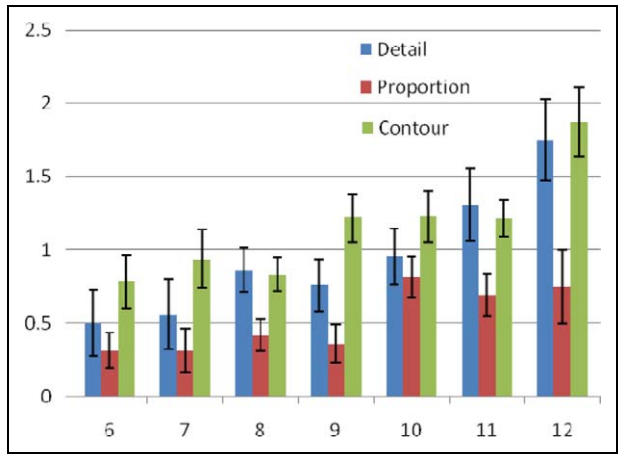

Figure 10. Mean detail, proportion, and contour score by age.

correct proportions. Children between the ages of 6 and 7 were able to draw almost one correct shape in their drawing. This ability remained stable until the age of 12. At 12 years of age, children were able to draw at least two correct shapes in their drawings.

The incidence of drawing realism

Our global assessment of drawings at each age that stood out as advanced in realism yielded 20 children (13%) identified as "gifted." This group consisted of one 6 year old; three 7 year olds; two 8 year olds; two 9 year olds; four 10 year olds; six 11 year olds; and two 12 year olds.

Comparison of typical children and precocious realists

We compared the drawings of the 6, 9, and 12 year olds in our sample (typical and those we identified as gifted) with three children, aged 6, 9, and 12, whom we had previously identified as extreme precocious realists. We used a significance test for the contrast in proportions, calculating a standard z-score (Rosenthal and Rosnow, 1985), using the formula $\sum(P\lambda)$/square root$[\sum(S^2{}_p\lambda^2)]$. A significance level was then determined using the z-scores table for a one-tailed test.

Figure 11 shows the drawings of three 6 year olds: a typical child (left), a child we identified as gifted (middle), and a precocious realists (right). The drawing of the precocious realist received a score of 0.75 while the drawing of the typical child received a score of 0.25. The precocious realist performed significantly better on the task than other 6 year olds (0.75 vs. 0.20; $z = 2.6$; $p < 0.001$).

Figure 12 shows the drawings of three 9 year olds: a typical child (left), a child we identified as gifted (middle), and a precocious realists (right). The drawing of the precocious realist received a score of 1.0 while the drawing of the typical child received a

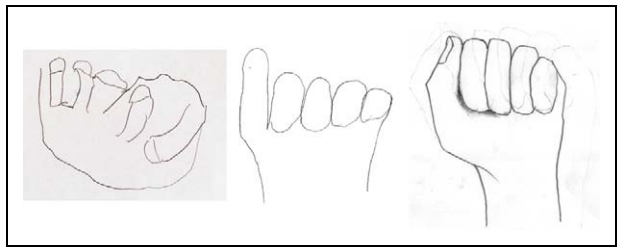

Figure 11. Drawings of three 6 year olds: typical child (left), child identified as gifted (middle), and precocious realist (right).

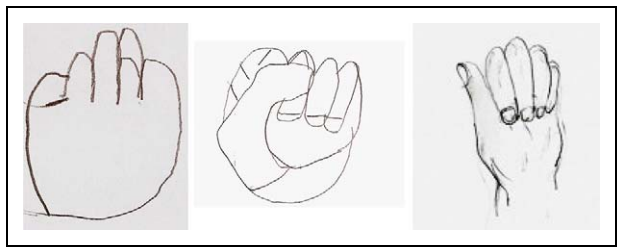

Figure 12. Drawings of three 9 year olds: typical child (left), child identified as gifted (middle), and precocious realist (right).

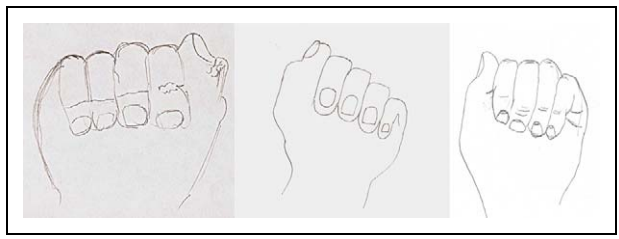

Figure 13. Drawings of three 12 year olds: typical child (left), child identified as gifted (middle), and precocious realist (right).

score of 0.25. The precocious realist performed significantly better on the task than other 9 year olds (1.0 vs. 0.29; $z = 4.3$; $p < 0.001$).

Figure 13 shows the drawings of three 12 year olds: a typical child (left), a child we identified as gifted (middle), and an autistic precocious realists (right). The drawing of the precocious realist received a score of 1.0 while the drawing of the typical child received a score of 0.50. The precocious realist performed significantly better on the task than other 12 year olds (1.0 vs. 0.55; $z = 2.6$; $p < 0.001$).

Discussion

The goal of the current study was to investigate the incidence of precocious realism in a large sample of typical children. We defined precocious realism as the ability to create

real-life representations that are different from those of typical children. We asked children to draw a picture of their hand and scored the drawings for the use of detail, correct proportion, and overall contour.

Not surprisingly, we found that age was associated with children's use of detail, correct proportion, and overall contour. As children age they may be more attuned to noticing details and the correct proportion of objects. Also, age seems to be related to the ability to differentiate shape and draw the correct contour of an object.

The ability to capture detail, proportion, and contour did not emerge as one skill. The children in this study first acquired the ability to draw the overall shape or contour of the hand. Detail emerged by the age of 8. But even the 12 year olds were unable to accurately depict the correct proportion of the hand.

The main aim of our study was to assess the incidence of precocious realism in a non-ASD population. Through our global assessment of the children's drawings, we identified 13% that were above average for their age. This figure is much higher than reported by Vital et al. (2009), who found that 6% of those with ASD (out of a sample of over 6000 8 year olds) have drawing/artistic talent. This discrepancy may be because our assessment was based on scoring the drawings whereas the Vital et al. number was based on parent report. Parents may not know what average drawings look like at different ages, and thus may not realize that their child has an advanced ability to draw.

Although we found that about 13% of the sample was above average in drawing ability for their age, we judged no child in our sample to be a drawing prodigy. Our comparison of the typical drawings with those of three child drawing prodigies revealed striking differences. The child drawing prodigies were able to capture detail and draw correct proportion and overall contour even at the age of 6. Their drawings were not labored over and were done with ease.

Our findings demonstrate that approximately one in eight children between the ages of 6 and 12 draw at an above-average level for their age. However, there are limitations. This may be an overestimation of the incidence of drawing realism. Children in our study were recruited from a local children's museum. It is possible that parents who bring their children to museums place a strong emphasis on the arts. Thus, these children may be more exposed to art museums and art lessons. However, over 80% of our sample had less than 1 year of formal art lessons.

A comparison of our results with those of Vital et al. (2009) leads to the conclusion that the incidence of drawing giftedness is higher in a typical than an autistic population. Future research should investigate these relative incidences more clearly by directly comparing drawings of autistic and non-autistic population. What does remain clear is that child drawing prodigies are rare. We are now systematically examining the visual and spatial strengths of drawing prodigies to determine the perceptual abilities that underlie drawing talent.

Summary

In our study, most children were able to capture the overall contour of their hand; the ability to draw relevant details was not common until age 8 years; and correct proportion was not seen even in the oldest children. We identified 13% of drawings as above

average for the child's age group. However, even those identified as above average were significantly less realistic than the drawings of the prodigies.

Note

1. Precocious realism is the ability to create life-like representations that are different from those drawings of typical children.

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References

Drake JE and Winner E (2011–2012). Superior visual analysis and imagery in an Autistic child with drawing talent. *Imagination, Cognition & Personality* 31: 9–29.

Drake JE, Redash A, Coleman K, Haimson J and Winner E (2010) 'Autistic' local processing bias also found in children gifted in realistic drawing. *Journal of Autism and Developmental Disorders* 40: 762–773.

Gardner H (1989) *To Open Minds*. New York: Basic Books.

Goldsmith L (1992) Stylistic development of a Chinese painting prodigy. *Creativity Research Journal* 5: 281–293.

Goldsmith L and Feldman D (1989) Wang Yarn: Gifts well given. In: Ho WC (ed.) *Wang Yani: The Brush of Innocence*. New York: Hudson Hills, pp. 51–65.

Golomb C (1992) *The Child's Creation of a Pictorial World*. Berkeley, CA: University of California Press.

Golomb C (1995) Eitan: The artistic development of a child prodigy. In: Golomb C (ed.) *The Development of Gifted Child Artists: Selected Case Studies*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 171–196.

Golomb C and Hass M (1995) Varda: The development of a young artist. In: Golomb C (ed.) *The Development of Gifted Child Artists: Selected Case Studies*. Hillsdale, NJ: Lawrence Erlbaum Associates, pp. 71–100.

Goodenough FL (1926) *Measurement of Intelligence by Drawings*. New York: Harcourt, Brace, & World.

Kellogg R (1969) *Analyzing Children's Art*. Palo Alto: National Press Books.

Lark-Horowitz B, Lewis H and Luca M (1973) *Understanding Children's Art for Better Teaching*. 2nd ed. Columbus, OH: Merrill.

Matthews J (1984) Children drawing: Are young children really scribbling? *Early Child Development and Care* 18: 1–39.

Milbrath C (1998) *Patterns of artistic development*. New York: Cambridge University Press.

Mottron L and Belleville S (1993) A study of perceptual analysis in a high-level autistic subject with exceptional graphic abilities. *Brain and Cognition* 23: 279–309.

Pring L, Hermelin B and Heavey L (1995) Savants, segments, art and autism. *Journal of Child of Child Psychology and Psychiatry* 36: 1065–1076.

Rimland B and Fein D (1988) Special talents of autistic savants. In: Obler L and Fein D (eds.) *The Exceptional Brain: Neuropsychology of Talent and Superior Abilities*. New York: Guilford Press, pp. 341–363.

Rosenthal R and Rosnow RL (1985) *Contrast Analysis: Focused Comparison in the Analysis of Variance*. Cambridge: Cambridge University Press.

Sacks O (1995) *An Anthropologist on Mars: Seven Paradoxical Tales*. New York: Knopf.

Selfe L (1977) *Nadia: A Case of Extraordinary Drawing Ability in an Autistic Child*. New York: Academic Press.

Vital PM, Ronald A, Wallace GL and Happé FGE (2009) Relationship between special abilities and autistic-like traits in a large population-based sample of 8-year-olds. *Journal of Child Psychology and Psychiatry* 50: 1093–1101.

Winner E (1996) *Gifted Children: Myths and Realities*. New York: Basic Books.

Winner E and Martino G (1993) Giftedness in the visual arts and music. In: Heller K, Monks F and Passow AH (eds.) *International Handbook of Research and Development of Giftedness and Talent*. New York: Pergamon, pp. 253–281.

Author biographies

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