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EARLY PREDICTORS OF CREATIVE WRITING AT AGE 9

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Abstract

The present study investigated the extent to which creative expressiveness in writing at age 9 could be predicted by early human figure drawing ability and general cognitive ability, measured at age 4. Participants (N=277) were members of the Twins Early Development Study, for whom measures of human figure drawing and general cognitive ability were available at age 4 and a measure of creative writing was available at age 9. Creativity was measured with the Consensual Assessment Technique, which is a commonly used technique to estimate creativity of a product. Each story, based on three pictures shown to children, was coded on 10 dimensions by five independent judges. Creative Expressiveness score was created as a composite measure of dimensions that correlated highly with creativity dimension. Human figure drawing ability, measured by The Draw-A-Child test at 4, was found to be a weak but significant predictor of Creative Expressiveness at age 9 (r =.17). General cognitive ability at 4 did not predict Creative Expressiveness in writing at 9. It is concluded that examining individual differences in human figure drawing ability may provide a promising direction for exploring the early antecedents of creativity throughout childhood.

Keywords: Creativity, Writing, Drawing, Children.

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1. Introduction

Across cultures, creativity is considered essential for stimulating advances in the sciences, technology, arts, education and society as a whole (Runco, 2014). Empirical research on creativity is rapidly growing employing clinical, cognitive, developmental, educational, differential, organisational and other psychological paradigms (Chamorro-Premuzic, 2011). Research has shown that creative ideation is associated with mental health and well-being (Forgeard & Elstein, 2014), academic performance (Gajda, Karwowski, & Beghetto, 2017; Toivainen, Malanchini, Oliver & Kovas, 2017), and organisational innovation (Amabile, 1988; George, 2007). Creativity has been found to facilitate children's problem-solving skills, adjustment to unfamiliar situations, coping ability and emotional understanding (Carson, Bittner, Cameron, Brown & Meyer, 1994; Runco, 2001). These positive associations reinforce the suggestion that creativity in children should be highly encouraged (Bruner, 1962). However, enhancement of creativity depends on our understanding the nature of creativity during early childhood and its links with traits involved in creative behaviour across the lifespan.

Creativity has been defined as a multidimensional construct that arises through a system of interacting components that operate at both the level of the individual and the socio-cultural environment (Hennessey & Amabile, 2010). Individual differences in creativity are often assessed based on the production of a creative product, which is required to be both novel and useful for the individual and/or large socio-cultural group (Barron, 1955; Hennessy & Amabile, 2010). The development of creativity, from early childhood onwards, is viewed as a continuous process which becomes increasingly elaborate and complex over time (e.g. Keegan, 1996; Russ, 1996; Vygotsky, 1967). As such, individual characteristics associated with creativity in adults may be similar to those that predict creativity throughout childhood (Russ, 1996). Cognitive processes that have been identified as especially important for the development of creativity include divergent thinking, cognitive flexibility, receptivity to problems, associative abilities, analogical reasoning and breadth of general knowledge (e.g. Barron, & Harrington, 1981; Getzels & Csikszentmihalyi, 1976; Guilford, 1968; Russ, 1996, 2004; Runco, 2004; Sternberg, 1988).

Many measures of creativity have been proposed. For children's writing, the Consensual Assessment Technique (CAT) has been applied (Baer, Kaufman, & Gentile, 2004; Hennessey & Amabile, 1988; Toivainen et al., 2017). A recent pilot study assessed creativity in children's written stories on 10 dimensions using the CAT (Toivainen et al., 2017). An exploratory factor analysis on the 10 dimensions, revealed two independent factors, based on high factor loadings, which were labelled as Creative Expressiveness and Logic. Creative Expressiveness had high loadings from seven dimensions, namely Creativity, Imagination, Novelty, Liking, Detail, Emotion and Vocabulary. Straightforwardness, Logic and Grammar loaded highly onto the second factor, Logic. The dimensions loading onto Creative Expressiveness appear representative of the multifaceted nature of creativity. Previous studies have reported associations between creativity and similarly defined factors (e.g. Barron, 1955; Hennessey & Amabile, 1988; Mumford, 2003; Toivainen et al., 2017).

In very young children, creativity can emerge through drawing (Wright, 2010). Drawing is an imaginative act that enables children to explore and communicate their thoughts and perceptions of the surrounding environment through the use of visual representations (Brooks, 2009; Ring, 2001; Vygotsky,

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1978). Through drawing, children develop essential skills related to creative ideation, such as the use of fantasy, symbol systems, conceptual associative processes, transformation abilities, spatial visualisation, problem-solving skills and perspective-taking (Brooks, 2009; Thompson, 1995; Wright, 2010). The dualistic nature of drawing requires children to think symbolically and flexibly in order for them to recognise that a drawing refers to both a thing in itself and its existing referent (Malchiodi, 1998). By the age of four, children begin to develop these cognitive skills, enabling them to transform their schematic representations of objects or thoughts into drawings (Jolley, 2008).

Early research of young children's human figure drawing primarily viewed individual differences in this ability as an index of cognitive maturity (Goodenough, 1926; Piaget & Inhelder, 1956). Validated measures of human figure drawing ability, such as the Goodenough-Harris Draw-a-Man Test (Harris, 1963) and the Draw-a-Child test (McCarthy, 1972), focus on whether the essential body parts of a human figure are present in the child's drawings. Recent studies have found modest associations between figure drawing ability and general intelligence at the same age (e.g. Arden, Trzaskowski, Garfield, & Plomin, 2014; Malanchini et al., 2016). Furthermore, these longitudinal studies reported that human figure drawing ability measured at age 4 predicted general intelligence at ages 12 and 14 (Arden et al., 2014) and mathematical ability at age 14 (Malanchini et al., 2016), with modest to moderate associations ($r = .18 - .33$). One possible explanation for the weaker associations is that the young children's ability to draw a human figure depends on a wider range of skills than just verbal and nonverbal abilities assessed by standard measures of general intelligence. For example, visually representing the human figure through drawing requires a child to appropriately assimilate their mental representations of the symbolic elements that constitute their understanding of the human figure (Piaget & Inhelder, 1956). It is possible that this act may tap into distinct cognitive processes that are associated with creative ideation.

Several drawing tasks, assessing divergent thinking skills, have been developed to specifically measure and predict creativity in childhood (e.g. Clark, 1989; Torrance, 1974). For example, the figural component of the Torrance Tests of Creative Thinking (TTCT) is commonly used to predict creativity in children. It consists of three timed tasks that involve constructing pictures based on a given stimulus, incomplete figures, and lines or circles. The drawings are then scored on fluency, elaboration, originality, abstractness of titles and resistance to premature closure (Ball & Torrance, 1984). However, the TTCT has recently been criticised for poor construct validity due to the narrow range of creativity dimensions assessed (Zeng, Proctor, & Salvendy, 2011). It has been argued that divergent thinking tests are unlikely to represent the multifaceted nature of the development of creativity (Baer, 2012; Said-Metwaly, den Noorgate, & Kyndt, 2017). A further limitation of the TTCT is that young children may find it difficult to comprehend or conceptualise the task requirements because of their limited representational and language skills (Jolley, 2008; Klepsch & Logie, 2013; Welsh, 1975). This could both constrain and demotivate them from engaging in the drawing task, which may obscure their true creative potential.

Another drawing task - the Draw-A-Child Test (DACT; McCarthy, 1972)–could be useful for predicting creative behaviour during childhood. In contrast to the material used in the TTCT, the human figure is more familiar to young children. This makes it easier for them to recall and represent the features that they would like to convey in their drawings (Cox, 1997; Goodenough, 1926). Goodenough (1926) claimed that because the human figure is equally familiar to all children it makes it the ideal subject for

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systematically comparing children's drawings. The projective uses for young children's human figure drawings as measures of personality, self-perception, attitudes and group values have also been suggested (Klepsch & Logie, 2013). It has been proposed that the task allows for greater expression of children's perspectives, motivations and attitudes that may otherwise be limited using other techniques. Although the DACT has primarily been used as an index of cognitive development, the process of drawing a human figure may also require children to engage in imaginative and representational thought necessary for creative ideation (Klepsch & Logie, 2013; Wright, 2010). It is plausible that young children's differences in the ability to access, combine and transform their mental representations of the human figure into drawings may tap into similar latent processes that are more directly observed by other creativity measures.

2. Problem Statement

Previous research has found associations between early human figure drawing and later cognitive ability and achievement (Arden et al., 2014; Malanchini et al., 2016). However, the cognitive processes underlying these associations remain poorly understood. Better understanding may be achieved by examining whether early human drawing is linked to later creative expression, beyond general cognitive ability**.**

3. Research Questions

Does human figure drawing ability at age 4 predict creativity in children's written stories at age 9, beyond variance that may be accounted for by general cognitive ability?

4. Purpose of the Study

The present study will explore whether early human figure drawing ability (at age 4), assessed by the DACT (McCarthy, 1972), predicts creative expressiveness in written stories over five years later. This research will extend the application of tests of human figure drawing ability to assessing creativity beyond general intelligence. Additionally, it is hypothesised that the present study will replicate previous findings presenting a 2-factor structure among the 10 dimensions used in the assessment of creativity in children's writing (n=59; Toivainen et al., 2017).

5. Research Methods

5.1. Sample

The present investigation includes a selected subsample of children from the Twins Early Development Study (TEDS; Haworth, Davis, & Plomin, 2013). TEDS is a large-scale, longitudinal twin study, following the same sample from infancy through to young adulthood. Initial recruitment occurred between 1994 and 1996 during which all families with twin births in England and Wales were contacted by The Office for National Statistics on behalf of TEDS. To date, over 13,000 twin pairs representative of the general population of England and Wales remain involved (Haworth et al. 2013). The present investigation was based on data from 277 participants (172 females), whose creative data were collected at age 9 and were coded specifically for the current analyses. Data on drawing at age 4 and general

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cognitive ability at age 4 were also available from the same participants. In order to account for non-independence of observation, analyses were conducted using a randomly selected twin from each pair. Informed consent was obtained from the children's parents/guardians at each point of assessment. The present study received ethical approval from Goldsmiths, University of London's Ethics Committee.

5.2.Measures

The measures for human figure drawing and general cognitive ability were collected at two different assessment waves at ages 4 and 9. In the present study, the raw mean for human figure drawing was slightly higher (*M* = 7.27, *SD* = 2.42) in comparison with the means obtained from the larger sample (N = 14,580, *M* = 6.81, *SD* = 2.88; Malanchini et al., 2016). Also, the standardised mean for general cognitive ability was slightly higher (*M* = .10, *SD* = .92) than the average intelligence found for the entire TEDS sample, which more closely resembles that of the general population and shows a standard deviation of 3.5.

5.2.1. Human Figure Drawing Ability at Age 4

The Draw-A-Child test (DACT; McCarthy, 1972) was administered separately to each twin by their guardians when they were four years old. Each drawing was completed in the questionnaire booklets provided to the family. The drawings were scored according to McCarthy's (1972) standardised method which allocates one point for the presence and correct depiction of each of the following body parts: head, eyes, nose, mouth, ears, hair, body, arms, legs, hands, feet, and clothes. If the feature is absent, a score of 0 is awarded. As such, each child's drawing received a score between 0-12. Previous literature reports high inter-rater reliability (.93) and internal consistency (.79) for this test (Arden et al., 2014; Naglieri & Maxwell, 1981).

5.2.2. General Cognitive Ability at Age 4

General cognitive ability was assessed at the age of 4 using parent-administered measures of verbal and nonverbal ability (Oliver & Plomin, 2007). These measures were included in the questionnaire booklets provided to the families. For verbal ability, vocabulary and grammar were assessed using the short form version of the MacArthur Communicative Development Inventory (Fenson, Pethick, & Cox, 1994). Nonverbal ability was assessed using an age-appropriate version of the Parent Report of Children's Abilities (PARCA) originally developed for TEDS (Oliver et al., 2002; Saudino et al., 1998). The PARCA includes items modified from existing standardised tests, as well as novel items designed specifically for the PARCA. The total PARCA score is derived from two components: a composite score of three parent-administered nonverbal cognitive tasks and a total score from a parent-report questionnaire assessing conceptual knowledge. A correlation of .70 between total scores derived from the parent-administered PARCA and standardised nonverbal cognitive measures administered by TEDS staff in the homes of a select subsample of twins from TEDS demonstrates the good validity of the PARCA (Price, 2002). The PARCA also shows good internal consistency (α = .74; Saudino et al., 1998).

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5.2.3. Creative Expressiveness in Written Stories at Age 9

Data collected at the age of 9 included a measure of written stories. The task prompted the children to write an imaginative story based on three images depicting scenarios on a farm (see Toivainen et al. in this issue for illustration). The stories were written at home in the questionnaire booklets provided to the family. There was no time limit for the task. The stories were transcribed without any corrections to spelling or grammar prior to coding in order to reduce the influence of handwriting.

Creative expressiveness in the written stories was evaluated using the Consensual Assessment Technique (CAT; Amabile, 1982). The CAT is a validated and reliable measure of creativity that is based on the consensus of observers' subjective judgments (Amabile, 1982). The CAT relies on the assumption that there is a common understanding of what constitutes as a creative performance or artefact. The CAT has been applied to assess creativity in children's poems, oral and written stories, drawings, and collages (Baer, Kaufman, & Gentile, 2004; Hennessey & Amabile, 1988 Toivainen et al. 2017; Lubart, Pacteau, Jacquet, & Caroff, 2010). These studies have reported high inter-rater reliabilities among independent judges, with alpha coefficients typically ranging from .70-to-.95 (e.g. Baer et al., 2004; Hennessey & Amabile, 1988; Toivainen et al. 2017).

Five independent judges rated each of the stories on 10 different dimensions using a 7-point Likert-scale. The dimensions were defined as follows: Creativity, Imagination, Novelty, Liking, Detail, Emotion, Vocabulary, Straightforwardness, Logic, and Grammar (Hennessey & Amabile, 1988). The coding procedure was a direct extension from the previously reported pilot study (Toivainen et al., 2017). The judges were first asked to familiarise themselves with the stories before going through them to assess each one on the different dimensions. The stories and coding dimensions were presented to each judge in a random order to minimise potential order effects. The judges were instructed to evaluate the stories in relation to all other stories and to use their own subjective interpretation of creativity. Hence, no specific criteria for judging creativity was given.

6. Findings

The inter-rater reliabilities between the five judges for all 10 dimensions on which the stories were rated were moderate-to-high (α = .67 - .88; see Table 01). To investigate the structure of this measure, a Principle Component Analysis (PCA) with varimax (orthogonal) rotation was performed on the 10 dimensions. The Kaiser-Meyer-Olkin test of sampling adequacy was high (KMO = .92) and Bartlett's test of sphericity was significant (χ^2 (45) = 4253.08, p< .001), indicating that the correlations between the dimensions are sufficiently large for PCA and that the data are well-suited for structure detection. Analysis of the initial eigenvalues and scree plot revealed two independent components explaining 88.4% of the total variance. The rotated factor loadings (see Table 02) replicated the structure previously reported in a pilot study (Toivainen et al., 2017), with the first component representing Creative Expressiveness and the second component representing Logic. Internal consistencies were high for both Creative Expressiveness (α = .98) and Logic (α = .89). In line with Toivainen et al. (2017), composite variables were created for each of the two components, based on the sum of scores, from all five judges, on the dimensions that had factor loadings greater than 0.7 (see Table 2). Creative Expressiveness was formed by the following dimensions: Creativity, Imagination, Novelty, Liking, Detail, Emotion and

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Vocabulary. Logic had high loadings from Straightforwardness, Logic and Grammar. Both Creative Expressiveness and Logic composite scores showed near normal distributions.

Table 01. Inter-Rater Reliabilities for the 10 Story Coding Dimensions.

Dimension	Reliability
Creativity	.88
Imagination	.86
Novelty	.85
Liking	.84
Detail	.86
Emotion	.86
Vocabulary	.85
Straightforwardness	.67
Logic	.73
Grammar	.77

Note. α = Cronbach's alpha. Number of judges = 5.

Table 02. Rotated Factor Loadings for Principle Components Analysis (Varimax Rotation) of the 10 Story Coding Dimensions.

Dimension	Creative Expressiveness	Logic
Creativity	**.95**	.24
Imagination	**.96**	.21
Novelty	**.94**	.17
Liking	**.91**	.35
Detail	**.86**	.34
Emotion	**.89**	.31
Vocabulary	**.75**	.56
Straightforwardness	.19	**.91**
Logic	.30	**.86**
Grammar	.25	**.84**

Note. Factor loadings > .70 are in boldface. N = 277.

Table 03 presents the descriptive statistics and bivariate correlations between measures of general cognitive ability age 4, figure drawing ability age 4, Creative Expressiveness at age 9, and Logic at age 9. Creative Expressiveness and Logic were moderately correlated (r = .56, p < .001). Creative expressiveness correlated significantly with human figure drawing ability at age 4 (r = .17, p = .003), but not with general cognitive ability at age 4 (r = .05, p = .394). Logic correlated significantly with human figure drawing ability (r = .21, p < .001) and with general cognitive ability (r = .15, p < .01). Figure drawing ability and general cognitive ability showed a moderate correlation (r = .32, p < .001).

Table 03. Descriptive Statistics and Correlations for All Variables

Variable	M	SD	Min, Max	1	2	3
1. General cognitive ability at 4	0.09	0.94	-2.4, 1.98	1		
2. Human figure drawing score at 4	7.27	2.42	0, 12	.32**	1	

3. Creative Expressiveness factor score at 9	105.50	34.48	33, 195	.06	.17*	1
4. Logic factor score at age 9	65.70	12.19	24, 93	.15*	.21*	.56**

Note. General cognitive ability was standardised on the whole sample. *N* = 277; * *p*< .05, ** *p*<.01 (two tailed)

Next, 2 hierarchical regressions were run to investigate the extent to which human figure drawing ability at age 4 would predict Creative Expressiveness and Logic at age 9. In both analyses, general cognitive ability was entered into the regression model first, followed by human figure drawing ability at step 2. Although general cognitive ability did not correlate significantly with Creative Expressiveness, it was included in the regression model based on a priori considerations of the relationship between these two constructs.

The results for Creative Expressiveness are presented in Table 04. At step 1, general cognitive ability did not significantly explain variation in Creative Expressiveness, $R^2 = .04$, $F(1, 275) = 1.09$, $p >$ .05. Including figure drawing ability to the regression model explained an additional 2.4% of the variance in Creative Expressiveness, F_{inc} (1, 275) = 6.67, $p = .01$. The overall model, including both predictors was significant $F(2, 274) = 3.89$, $p = .02$ and accounted for 2.8% of the variance in Creative Expressiveness.

Table 04. Summary of Hierarchical Regression Analysis for Variables Predicting Creative Expressiveness at age 9.

Variable	β	*t*	sr²	R	R²	ΔR²
Step 1				.63	.00	.00
g at 4	2.4	1.1	.00			
Step 2				.17	.03	.024
g at 4	.38	.16	.00			
HFD at 4	2.3	2.6*	.02			

Note. g = general cognitive ability; HFD = human figure drawing score. N = 277;* *p* < .05, ** *p* < .01

The results for Logic are presented in Table 05. At step 1, general cognitive ability contributed significantly to the regression model, $F(1, 275) = 6.68$, $p = .01$, and accounted for 2.4% of the variance in Logic. Introducing figure drawing ability to the regression model explained an additional 2.9% of the variance in Logic, F_{inc} (1, 275) = 8.4, $p = .004$. The overall model including both predictors was significant $F(2, 274) = 7.61$, $p = .\ 001$ and accounted for 2.3% of the variance in Logic.

Table 05. Summary of Hierarchical Regression Analysis for Variables Predicting Logic at age 9.

Variable	β	*t*	sr²	R	R²	ΔR²
Step 1				.15	.02	.02
g at 4	2.0	2.6	.02			
Step 2				.23	.05	.029
g at 4	1.26	1.5	.00			
HFD at 4	.91	2.90*	.03			

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7. Conclusion

The present study replicated the two-factor structure reported in the pilot study using a larger sample (Toivainen et al., 2017). The first component represents Creative Expressiveness, formed by the following dimensions: Creativity, Imagination, Novelty, Liking, Detail, Emotion and Vocabulary. The second component represents Logic, which has high loadings from Straightforwardness, Logic and Grammar.

Focusing on these two dimensions, the present study investigated the role of early human figure drawing ability at age 4 in predicting Creative Expressiveness and Logic in written stories at age 9. We predicted that human drawing would be related to the Creative Expressiveness rather than Logic, because the act of drawing taps into abilities that have been associated with creative performance in previous literature (e.g. Barron, 1955; Hennessey & Amabile, 1988; Mumford, 2003; Toivainen et al., 2017).

The results showed that human figure drawing ability at age 4 explained an additional 2.8% of the variance in Creative Expressiveness at age 9. In contrast, there was no evidence for a relationship between general intelligence at age 4 and Creative Expressiveness at age 9. For Logic, both general cognitive ability and human figure drawing explained significant variance (2.9%). This suggests that children's human figure drawings may be a useful measure for both creativity in children's written stories, and as a cognitive ability measure. Although the variance explained is small, these findings suggest that individual differences in early human figure drawing ability to some extent reflect cognitive processes that are relatively specific to Creative Expressiveness five years later. A plausible explanation for this association is that when drawing, children apply imaginative, representational, symbolic, associative and flexible cognitive processes that are central to the development of creative ideation and behaviour (e.g. Brooks, 2009; Malchiodi, 1998; Wright, 2010). These results cast a new light on the use of human figure drawing ability tests that extends beyond their traditional use as an index for cognitive development (Arden et al., 2014; Goodenough, 1926; Harris, 1963; Malanchini et al., 2016; McCarthy, 1972). Applying the CAT procedure to young children's human figure drawings may also capture a wider range of relevant processes that are associated with creativity throughout childhood.

Further research is needed to validate the conclusions that can be drawn from this study. For example, future studies should aim to investigate the association between general cognitive ability, human figure drawing ability and creativity (measured by the CAT) with latent variable analyses. This would control for measurement error. Recent studies on creativity have provided evidence that applying the latent variable approach often produces stronger relationships between latent constructs, in contrast to analyses of observed variables that do not consider measurement error and are thus liable to biased results (Silvia, 2008; Silvia & Beaty, 2012; Stefanski, 2002).

In conclusion, the present study suggests that through drawing, children apply and develop a number of cognitive skills that are associated with observable manifestations of creativity and general cognitive ability. Assessing individual differences in human figure drawing ability provides a promising direction for exploring the early antecedents of creativity throughout childhood. However, potentially different ways of assessing the young children's drawings are needed to capture more of the relevant processes.

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