The Role of Gender in the Development of Divergent Thinking in Early Childhood

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Abstract

Previous research offers little insight into gender differences in the development of divergent thinking (DT) in early childhood. The present longitudinal study addressed this subject. Participants, aged 3.92 to 5.00 years at the start of the study, were tested at two measurements, six months apart. They completed the figural version of the Torrance Test of Creative Thinking as well as the Alternative Uses test, measuring figural DT and verbal DT, respectively. Figural DT was scored on fluency, originality, and elaboration, while verbal DT was scored on fluency and originality. Results show that girls scored significantly higher on figural elaboration than boys at the first measurement, while there were no gender differences for the other variables, or at the second measurement. Furthermore, there was an improvement over time for scores of figural fluency, figural elaboration, verbal fluency, and verbal originality. There were no significant gender differences in the way in which DT developed over time. The present study is a starting point for further research in this area and it offers guidelines for supporting children in their development of divergent thinking.

Keywords: divergent thinking, gender, development, early childhood, longitudinal.

The Role of Gender in the Development of Divergent Thinking in Early Childhood

Creativity–"the application of knowledge and skills in new ways to achieve a valued goal" (Seltzer & Bentley, 1999, p. 10)–is a complex feature and insight into creativity is essential to the understanding of human development (Kerr & Gagliardi, 2003). Nowadays, society places more emphasis on creativity than ever before (Zeng, Proctor, & Salvendy, 2011). It has been acknowledged that creativity is an important catalyst for social transformation and economic growth (Shneiderman, Fischer, Czerwinski, Myers, & Resnick, 2005) and that without it, there would be no potential for continuous innovation of products and services (Howard, Culley, & Dekoninck, 2008). Even though creativity has been extensively researched over the last decades, several questions and controversies remain (Zeng et al., 2011), including uncertainties about the role of gender (e.g., Baer and Kaufman, 2008).

Recent research often used *divergent thinking* (DT) tests as a means of measuring creativity (Zeng et al., 2011). Divergent thinking is a central cognitive ability within the area of creativity (Charles & Runco, 2001), which has been defined as "the ability to generate numerous and diverse ideas to open-ended questions" (Kuhn & Holling, 2009a, p. 116). Although DT is not synonymous with creativity, DT tests predict creative achievement significantly better than intelligence tests do (Kim, 2008) and DT tests are considered reliable and valid (e.g., Barron & Harrington, 1981). DT has generally been scored on *fluency* (number of relevant ideas), *originality* (number of infrequent ideas), and *elaboration* (number of details) (e.g., Palmiero, Di Giacomo, & Passafiume, 2014). A second categorization is that of *figural* and *verbal* DT, referring to the capability of coming up with new ideas through drawing or language, respectively (e.g., Torrance, 1966).

Existing Knowledge of the Development of Divergent Thinking

Several previous studies have found that DT develops in a non-linear manner in childhood. A widely known feature of DT development is the *fourth-grade slump*, where DT shows an early peak, followed by a slump in fourth grade, after which an increase is once again observed (Torrance, 1968). This trajectory has been found in the United States (e.g., Torrance, 1968), India (Raina, 1980), and Egypt (Sayed & Mohammed, 2013). In contrast, Charles and Runco (2001) did not find the fourth-grade slump in their U.S.-based study using a verbal DT test–they even found that fluency scores were higher for fourth graders than they were in third and fifth grade. Gralewski, Lebuda, Gajda, Jankowska, and Wiśniewska (2016) further confirmed the non-linear nature of development of creative ability. In their extensive

cross-sectional study (N = 4898, aged 4 to 21, M = 12.43, SD = 4.41) measuring figural DT they found three trajectories: development with a stagnation at age 15 and a minor decline between ages 16 and 18-19; a rise from the age of 15 with a decline between ages 16 and 18-19, followed by a rise; and a trajectory of consistent growth of creative ability with age, which continues until early adulthood. Kleibeuker, De Dreu and Crone (2013) compared participants (N = 98) in the age groups 12-13 years, 15-16 years, 18-19 years and 25-30 years. This study showed that the oldest age group performed better on the originality measure for verbal DT, while no age differences were found for fluency. Finally, Kuhn and Holling (2009b) researched participants aged 12 to 16 and found that older students scored higher on both verbal and figural DT.

While previous research has been inconclusive regarding DT development throughout the entire childhood period, there is a general consensus that DT increases in early childhood (e.g., Gralewski et al., 2016; Krampen, 2012; Torrance, 1968). The earliest slump in DT development was identified between the ages of 3 and 6 (Daugherty, 1993), yet generally the first possible slump is said to occur at ages 6-7, when children begin (formal) primary school (Krampen, 2012; Smith & Carlsson, 1983; Urban, 1991). Three reasons for this slump at the start of formal education have been hypothesized. Firstly, a cognitive reason might be a shift from egocentric thinking to sociocentric thinking (Piaget, 1950). This could make children more susceptible to authority and more likely to follow rules (Runco & Charles, 1997), which may limit creative expression (Gralewski et al., 2016). Secondly, a social reason might be taking on the role of student and school discipline (Cropley, 2001; Gardner, 1982; Runco & Charles, 1997; Smith & Carlsson, 1990), since at this age, children are being taught to submit to rules and convergent thinking is stimulated (Krampen, 2012). Finally, a biological reason for this slump might be the development of the dorsolateral prefrontal cortex (Diamond, 2002). This area of the brain develops rapidly between the ages of 5 and 7, while the inhibitor of control is still underdeveloped (Diamond, 2002). This may lead to a tendency to recall known solutions rather than new ideas (Benedek, 2013).

In summary, a slump in DT at the start of formal education has been found (e.g., Krampen, 2012; Smith & Carlsson, 1983; Urban, 1991) and this might be explained by cognitive, social, and biological changes associated with this transition. Still, a great number of researchers agree upon trajectories that display consistent growth in early childhood, at least up until fourth grade (e.g., Charles & Runco, 2001; Gralewski et al., 2016; Torrance, 1968).

Existing Knowledge of Gender Differences in Divergent Thinking

In addition to the development of DT, the relationship between DT and gender has been investigated. Findings are highly inconsistent. Several studies found no gender differences in DT (e.g., Donnell, 2005; Lee, 2002; Reese, Lee, Cohen, & Puckett, 2001; Runco & Okuda, 1988; Sousa Filho & Alencar, 2003). On the other hand, some studies found DT scores in favor of males (e.g., Ruth & Birren, 1985) and many studies found higher scores for female participants (e.g., Bharadwaj, 1985; Dudek, Strobel, and Runco, 1993; Kim & Michael, 1995; Kuhn and Holling, 2009a, 2009b).

Gender differences in subtypes of DT are generally in favor of girls. This is the case for figural fluency (Bharadwaj, 1985; Kim & Michael, 1995; Kuhn & Holling, 2009b) and verbal fluency (Bharadwaj, 1985; Kim and Michael (1995). Similarly, scores were found to be higher for girls on figural DT (Kuhn and Holling, 2009b) as well as verbal DT (Dudek et al., 1993; Kuhn and Holling, 2009b). However, the nature of the subtest may influence these findings: Ruth and Birren (1985) found higher scores for males on DT subtests that were technical in nature. Finally, Dudek and colleagues (1993) found no gender differences in figural DT. Based on a large comparative study, Bear and Kaufman (2008) conclude that even though findings are largely inconsistent, the greater number of studies in favor of girls suggests that females score higher on creativity tests than males. In summary, no clear conclusions are yet to be drawn, but we can tentatively assume higher levels of DT for girls for both verbal and figural DT.

The Present Study: Are there Gender Differences in the Development of Divergent Thinking?

Previous research offers insufficient insight into the role of gender in the development of DT. Studies that have looked into DT and gender were predominantly cross-sectional in nature (e.g., Kuhn & Holling 2009a; Kuhn & Holling 2009b; Reese et al., 2001; Runco & Okuda, 1988), thus failing to provide insight into gender differences in DT development. Furthermore, previous research on gender and DT has mainly focused on older children and adults (e.g., Kuhn & Holling, 2009b; Dudek et al. 1993), overlooking early childhood. Supporting DT development effectively is crucial–after all, creativity plays an important role in society (e.g., Howard et al., 2008; Shneiderman et al., 2005; Zeng et al., 2011). This is particularly important in early childhood: The prefrontal cortex, which is related to divergent thinking (e.g., Fink et al., 2009), matures considerably at this age (Tsujimoto, 2008). Furthermore, previous research has found that DT can improve through training (e.g., Cliatt, Shaw, & Sherwood, 1980; Scott, Leritz, & Mumford, 2004; Zahra, Yusooff, & Hasim, 2013),

emphasizing the important role of education in the development of DT. Gaining a better understanding of DT development in early childhood can help to support this process in this dynamic life phase.

In light of this gap in research, the aim of the present study is to gain more insight into the role of gender in the development of DT. Hence, the central research question is: Are there gender differences in the development of divergent thinking? Sub-questions are:

1. Are there gender differences in fluency, originality, and elaboration of figural DT?
2. Are there gender differences in fluency and originality of verbal DT?
3. Are there gender differences in the development of fluency, originality, and elaboration of figural DT?
4. Are there gender differences in the development of fluency and originality of verbal DT?

An increase in DT scores over time is expected. Additionally, girls are expected to score higher than boys on all elements of DT. As for the main question–how gender relates to the development of DT–previous research provides insufficient information to form a strong hypothesis. The present study will be explorative in researching this question.

Method

Participants

This study builds upon an ongoing longitudinal study on DT, from which the first two measurements were used. The researchers of the ongoing study sent out letters to 10 to 15 primary schools in the Netherlands, introducing their project. Four of them chose to participate in the study and informed parental consent was obtained through these schools. This resulted in a sample of 107 participants (58 girls), aged 3.92 years to 5.00 years at the first measurement (M = 4.41, SD = 0.27). In line with the longitudinal design of the bigger study the present data are a part of, 51 randomly selected children (27 girls) participated in the second measurement.

Measures

Torrance Test of Creative Thinking-Figural. In this test (TTCT; Torrance, 1966), participants were presented with incomplete figures. They were asked to make them into something new by adding their own drawing and to give them a title. The TTCT consists of three parts with different incomplete figures, each taking around ten minutes to complete. Drawings of this test were scored on the elements of fluency, originality, and elaboration as instructed in the scoring manual (Torrance, 2008). The scores for each section of the test were added per element so that three total scores were formed: figural fluency, figural originality,

and figural elaboration. The TTCT has been found to feature adequate reliability and validity (Treffinger, 1985; Cooper, 1991). It features high interrater consistency (Chase, 1985) and satisfactory test-retest consistency (Kim, 2008; Treffinger, 1985).

Alternative Uses. In this test (AU; Guilford, 1967), children came up with multiple uses for everyday objects. First, the researcher explained the aim of the test. This was clarified with the help of an example object: The researcher explained various (uncommon) uses of a newspaper that they brought, as well as the thinking process that helped them come up with these uses. The child was given a chance to come up with more ideas. During the rest of the test, the child was presented with six pictures of everyday objects, in a random order. In this study, two sets of six pictures were used. The set at the first measurement consisted of a washcloth, a brick, a broom, a basket, a fishing net, and a spoon. The set at the second measurement consisted of a toothbrush, a shovel, an umbrella, a tire, a food container, and a pencil. The child was encouraged to verbally express new ideas on what one could do with these objects. For each of the objects' uses, points were awarded for fluency and originality. These were added to form two variables: verbal fluency and verbal originality. The AU test is a standard test for measuring divergent thinking (Dippo & Kudrowitz, 2013) and it features a satisfactory degree of interrater reliability (Gilhooly, Fioratou, Anthony, & Wynn, 2007).

Design and Procedure

The participants completed the TTCT and AU tests mostly on separate testing days and at least with a break between the two, when testing on the same day. The tests were completed individually, under the supervision of a researcher, in a quiet room. Furthermore, the tests were recorded on video and the AU tests were transcribed, based on the recordings. The TTCT generally takes 30 to 50 minutes to complete and the AU takes around 20 to 30 minutes, both depending on the children's response speed. Both tests were carried out at two measurement waves, roughly six months apart.

Results

Of the 107 participants (58 girls) who took part in the first measurement, 51 randomly selected children (27 girls) participated in the second measurement. There were some unexpected missing data: Nine children did not complete all tests due to lack of understanding of the instructions and shyness. These nine cases were excluded from the analyses so that analyses were performed for a sample of 98 children (54 girls). The first measurement included data for all of these children. For the second measurement, data of 47 children (25 girls) were included. There were some outliers, as assessed by inspection of a boxplot.

However, these seemed to represent genuinely unusual values rather than data entry or measurement errors, so they were kept as a part of the data for the analysis.

Preliminary Analyses

Descriptive analyses showed that the mean age of the participants at the first measurement was 4.43 years (*SD* = 0.28, *N* = 98) and at the second measurement, the mean age was 4.85 years (*SD* = 0.28, *N* = 47). The mean DT scores and standard deviations for both measurements are displayed in Table 1.

Table 1

Mean Scores and Standard Deviations for the DT Outcome Variables.

	Girls		Boys		Total	
	M	*SD*	*M*	*SD*	*M*	*SD*
	First Measurement (*N* = 98, 54 girls)					
FF	11.61	6.05	9.89	5.75	10.84	5.95
FO	8.69	5.58	9.09	5.97	8.87	5.73
FE	11.94	10.70	7.34	9.15	9.88	10.25
VF	16.94	7.21	15.95	8.29	16.50	7.69
VO	8.31	6.81	6.80	6.88	7.63	6.85
	Second Measurement (*N* = 47, 25 girls)					
FF	14.40	5.08	14.36	3.67	14.38	4.43
FO	8.96	5.06	10.23	4.02	9.55	4.60
FE	17.88	14.58	12.27	10.48	15.26	13.00
VF	21.80	7.15	18.27	6.34	20.15	6.94
VO	16.16	11.83	11.50	7.96	13.98	10.37

Note. FF = figural fluency, FO = figural originality, FE = figural elaboration, VF = verbal fluency, VO = verbal originality.

Table 2 shows the correlations among the DT outcome variables. This analysis indicates that the variables are mostly significantly interrelated within the variable groups of figural DT and verbal DT, as well as across the measurements within these groups. On the other hand, correlations between figural and verbal variables mostly fail to reach significance. Subsequently, a principal components analysis was conducted for the first measurement–since this measurement has more participants than the second. This test proved that the DT

variables can be captured in two factors, as shown in Table 3, which explain 83,5% of variance. This confirms previous theory (e.g., Torrance, 1966): Figural DT and verbal DT are to be recognized as two distinct constructs.

Table 2

Correlations Among DT Variables.

	FF_1	FF_2	FO_1	FO_2	FE_1	FE_2	VF_1	VF_2	VO_1	VO_2
FF_1	-									
FF_2	.557**	-								
FO_1	.880**	.496**	-							
FO_2	.366*	.589**	.380**	-						
FE_1	.687**	.486**	.601**	.144	-					
FE_2	.437**	.537**	.391**	.316*	.601**	-				
VF_1	.122	.098	.083	.046	.048	.218	-			
VF_2	.336*	.041	.236	.011	.237	.254	.322*	-		
VO_1	.095	.136	.055	.069	.063	.363*	.721**	.376**	-	
VO_2	.309*	.022	.249	-.014	.243	.176	.291*	.837**	.375**	-

Note. $N = 98$ for the first measurement, $N = 47$ for the second measurement. FF = figural fluency, FO = figural originality, FE = figural elaboration, VF = verbal fluency, VO = verbal originality. $_1$ = first measurement, $_2$ = second measurement. *$p < 0.05$, ** $p < 0.01$.

Table 3

Factor Loadings for Exploratory Factor Analysis with Varimax Rotation of DT Variables in the First Measurement.

	Factor 1: Figural DT	Factor 2: Verbal DT
Figural fluency	**.950**	.077
Figural originality	**.922**	.034
Figural elaboration	**.833**	.016
Verbal fluency	.033	**.927**
Verbal originality	.052	**.926**

Note. $N = 98$. Factor loadings > .40 are in boldface (as suggested by Stevens, 2002).

Gender Differences in Divergent Thinking

In order to look at differences for gender (independent variable) on DT scores (dependent variables) of both measurements, MANOVAs were conducted. For significant

results, further analysis was performed using ANOVA. Shapiro-Wilk tests showed that MANOVA's assumption of multivariate normality was violated for several variables. Since transforming the data into squared values did not solve this problem and ANOVA-based tests are quite robust to deviations from normality (Games & Lucas, 1966; Glass, Peckham, & Sanders, 1972), the initial (unsquared) data were used for the analyses in this study.

Question 1: Are there gender differences in fluency, originality, and elaboration of figural DT? With regard to figural DT, a significant gender difference was found for DT scores at the first measurement, $F(3, 94) = 6.287$, $p = .001$, Wilks' $\Lambda = .833$, partial $\eta^2 = .167$. Further inspection with ANOVAs showed an effect of gender on figural elaboration, $F(1, 96) = 5.099$, $p = .026$, partial $\eta^2 = .050$, whereby girls ($M = 11.94$, $SD = 10.70$) scored significantly higher on figural elaboration at the first measurement than boys ($M = 7.34$, $SD = 9.15$), see Figure 1. There were no significant gender differences in figural fluency, $F(1, 96) = 2.057$, $p = .155$, partial $\eta^2 = .021$, or figural originality, $F(1, 96) = .120$, $p = .729$, partial $\eta^2 = .001$. For figural DT at the second measurement, the MANOVA showed no significant gender differences, $F(3, 43) = 1.673$, $p = .224$, Wilks' $\Lambda = .904$, partial $\eta^2 = .096$.

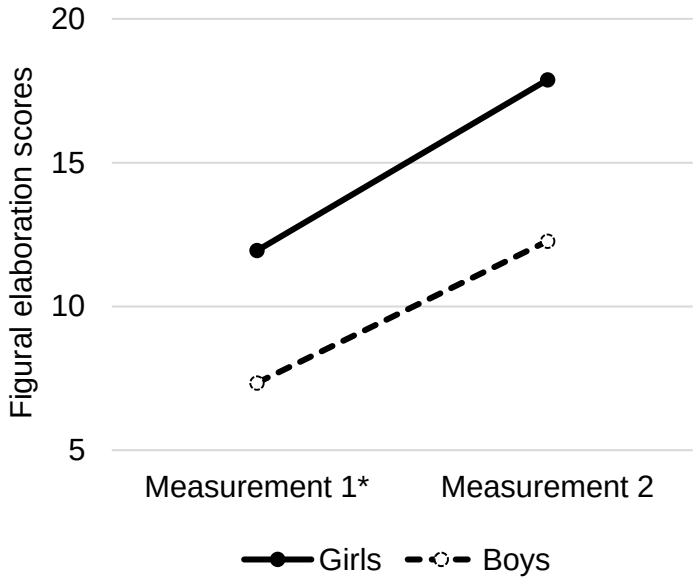

Figure 1. Figural elaboration and gender for both measurements. $N = 98$ for the first measurement, $N = 47$ for the second measurement. $^*p < .05$ for gender differences.

Question 2: Are there gender differences in fluency and originality of verbal DT? For verbal DT, girls scored slightly higher than boys on both variables at both measurements, see Table 1. Nevertheless, there were no significant gender differences in verbal DT, neither

for the first measurement, $F(2, 95) = .616$, $p = .542$, Wilks' $\Lambda = .987$, partial $\eta^2 = .013$, nor for the second measurement, $F(2, 44) = 1.559$, $p = .222$, Wilks' $\Lambda = .934$, partial $\eta^2 = .066$.

Gender Differences in the Development of Divergent Thinking

In order to look at differences for gender (between-subject variable) and the effect of time (within-subject variable) on DT scores (dependent variables), two repeated measures MANOVAs were conducted, for figural and verbal DT. Significant results were further analyzed using ANOVA. The interaction of the gender and time variables allowed for investigating the role of gender in the development of DT.

Question 3: Are there gender differences in the development of fluency, originality, and elaboration of figural DT? First of all, the repeated measures MANOVA showed a significant main effect of time on figural DT variables, $F(3, 43) = 10.516$, $p < .001$, Wilks' $\Lambda = .577$, partial $\eta^2 = .423$. Further analysis with ANOVA showed a significant effect of time on figural fluency, $F(1, 45) = 13.034$, $p = .001$, partial $\eta^2 = .225$, as well as on figural elaboration, $F(1, 45) = 6.436$, $p = .015$, partial $\eta^2 = .125$. It failed to show a significant main effect of time on figural originality, $F(1, 45) = 0.085$, $p = .772$, partial $\eta^2 = .002$. These results represent an increase of DT scores over time for both figural fluency and figural elaboration, whereas figural originality remains unchanged. Figure 2 displays estimated marginal means for figural originality. Next, the repeated measures MANOVA revealed a significant main effect of gender on figural DT, $F(3, 43) = 3.498$, $p = .023$, Wilks' $\Lambda = .804$, partial $\eta^2 = .196$. Further analysis with ANOVA showed a significant effect of gender on figural elaboration, $F(1, 45) = 5.086$, $p = .029$, partial $\eta^2 = .102$, but not on figural fluency, $F(1, 46) = 0.344$, $p = .560$, partial $\eta^2 = .008$, or on figural originality, $F(1, 45) = 0.441$, $p = .441$, partial $\eta^2 = .010$. The gender difference in figural elaboration indicates higher scores for girls on this variable, as displayed in Table 1.

There was no significant interaction effect of gender and time on figural DT scores, $F(3, 43) = 0.420$, $p = .740$, Wilks' $\Lambda = .972$, partial $\eta^2 = .028$. In other words: There were no gender differences in the development of figural DT.

Question 4: Are there gender differences in the development of fluency and originality of verbal DT? For this last research question, the repeated measures MANOVA showed a main effect of time on verbal DT scores, $F(2, 44) = 10.554$, $p < .001$, Wilks' $\Lambda = .676$, partial $\eta^2 = .324$. Further analysis with ANOVA showed a main effect of time on both verbal fluency, $F(1, 45) = 9.002$, $p = .004$, partial $\eta^2 = .167$, and verbal originality, $F(1, 45) = 21.575$, $p < .001$, partial $\eta^2 = .324$. There was no main effect of gender on verbal DT, $F(2, 44) = 1.468$, $p = .241$, partial $\eta^2 = .063$.

Again, there was no significant interaction effect of gender and time on verbal DT scores, $F(2, 44) = .329$, $p = .722$, Wilks' $\Lambda = .985$, partial $\eta^2 = .015$. Thus, as with figural DT, there were no gender differences in the development of verbal DT.

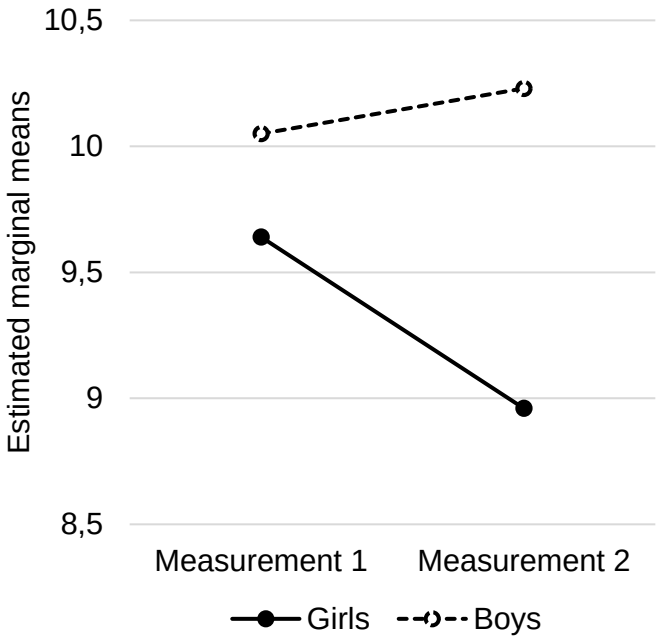

Figure 2. Estimated marginal means of figural originality, interaction of time and gender. *N* = 98 for the first measurement, *N* = 47 for the second measurement

Discussion

The present study aimed to add to the existing knowledge of gender differences in the development of DT in early childhood. Expanding this knowledge will enhance our understanding of the way in which DT develops, which can eventually improve the way in which we support children in their development.

The present study shows gender differences in figural elaboration at the first measurement–higher scores for girls–and no significant differences in the other variables, although many scores were slightly in favor of girls. This does not fully match the present hypothesis, but it is in line with the existing uncertainty about gender differences in DT–with more studies pointing towards girls scoring higher (e.g., Baer & Kaufman, 2008), while many studies found no gender differences (e.g., Donnell, 2005; Sousa Filho & Alencar, 2003). Previous research on drawing in childhood has found that girls tend to draw more details and decoration (Boyatzis & Albertini, 2000). This might explain why figural elaboration is the one variable on which girls score higher in this young age group. When looking at the trajectory of figural elaboration, see Figure 1, the gender pattern seems similar for both measurements.

Gender differences at the first measurement were significant. The second measurement showed the same trend, but results were not significant. Further research needs to investigate gender differences in figural elaboration more thoroughly, with a larger sample.

Next, the results suggest an overall increase of DT scores (except figural originality) between the two measurements. This is in line with the hypothesis and the majority of the literature (e.g., Gralewski et al., 2016; Krampen, 2012; Torrance, 1968). It shows us that young children display a trajectory of improving DT skills. The finding that figural originality remained unchanged is in line with the notion that entering formal schooling may lead to children wanting to provide precise and appropriate answers, which hinders the development of originality (Charles & Runco, 2001; Kim, 2011).

Furthermore, the results of the present study do not show gender differences in the development of DT. This relationship has not been studied before, to the author's knowledge, and this finding may provide important new insights into the development of DT. It may very well represent a genuine pattern where boys' and girls' development of DT proceeds in a similar way. This might be a consequence of relatively little gender distinction in early education compared to later education, as has been found in science education, for example (Logan & Skamp, 2008). It has been hypothesized that strong gender roles may inhibit creativity (Cropley, 2001) and relative gender equality at this age may explain why DT develops similarly across genders. Still, results such as displayed in Figure 2 deserve some attention. Even though there was no significant gender difference in the development of figural originality, the estimated marginal means graph seems to suggest different trajectories: Girls' scores decrease, while boys' scores increase. It must be left to further research to determine whether this trend holds for a larger sample size.

This leads us to a limitation of the present study: The sample was quite small, especially at the second measurement. Cohen (1992) suggests a sample size of at least 52 for an ANOVA with two groups, $\alpha = .05$, and medium effect size, in order to reach a strong enough statistical power. This number is slightly higher than the 47 participants in the second measurement. The modest sample size could have caused statistical tests to overlook effects that would become apparent at a larger sample size, especially for the tests that compared the first and second measurement. A second limitation is the limited number of two measurements. Children develop very rapidly in the first five years of their lives (Phillips & Shonkoff, 2000; Tsujimoto, 2008). Therefore, having only two measurements might cause small differences over time to remain unnoticed. Luckily, the longitudinal study that the present study is a part of will have access to data of more measurements soon. With more

participants and more measurements, DT variables and their relationships with gender and time will be studied more rigorously.

Moreover, the present study has important strengths: the longitudinal design, the young age group, and the array of DT variables that were investigated. It offers new insights into the role of gender in DT development, for both verbal and figural DT. These qualities make the study a unique contribution to this area of research. Furthermore, the present study offers insights that can help to shape DT education in early childhood. Firstly, the finding that DT improves over time calls for increasing levels of DT education with age. Secondly, DT variables were mostly similar in both genders, as was the development of DT. This tells us that boys and girls can be treated in the same way when it comes to DT education.

Finally, the insights of the present study, although provisional, pave the way for further research in this area. DT and gender in early childhood should be investigated with more participants and with more measurement waves in order to enhance the present knowledge. Then, we need to investigate how we can effectively support the development of DT in childhood education. In this way, we can prepare children to become active members of our creative society.

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