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Emergent Writing Among Young Children From Twelve to Sixty Months of Age

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The age-related development of emergent writing skills was examined in 49 studies including 1647 children 12 to 60 months of age. The extant literature was used to develop a multi-level sequence of emergent writing ranging from mark making to conventional writing which was used to code findings in the primary studies. Results showed that there were clearly discernible age-related changes in young children's development of pre-emergent and conventional writing abilities. Results also showed that there were similar age-related changes under adult prompted and unprompted conditions. Implications for practice are described.

The extent to which infants, toddlers, and preschoolers acquire prewriting and emergent writing abilities in an ordinal manner was the focus of analysis described in this research synthesis. A number of investigators and writing experts have proposed developmental sequences of emergent writing and coding systems for categorizing different types of infant, toddler, and preschooler mark making, scribbling, drawing, and letter and word writing (Akita, Padakannaya, Prathibha, Panah, & Rao, 2007; Di Leo, 1996; Lancaster, 2007; Levin & Bus, 2003; Martlew & Sorsby, 1995; Yamagata, 1997, 2007). These different frameworks were used to develop the proposed hierarchy of emergent writing shown in Table 1 and illustrated in Figure 1. The coding system was used to evaluate the extent to which there were age-related changes in young children's development of convention writing abilities.

The purposes of this research synthesis were the following: (1) to discern the ages at which young children manifest different types of emergent writing skills and (2) to evaluate whether the conditions under which children were engaged in drawing and writing were related to differences in the ages of acquisition of emergent writing. The first purpose was achieved by estimating the ages at which young children attained the 13 levels of prewriting and emergent writing shown in Table 1. The second purpose was achieved by investigating the influences of adult prompts on variations in emergent writing of young children. The research synthesis was both a replication and extension of a *CELLreview* that focused on the development of mark making and scribbling among infants and toddlers (Dunst & Gorman, 2009).

Search Strategy

Studies were located using *scribb** OR *draw** OR *print** OR *crayon** OR *pencil** OR *trace** OR *writ** OR *tracing* OR *draw** tool OR *writ** tool OR *draw* instrument* OR *writ* instrument* OR *doodle** AND *infant* OR *infancy* OR *toddler* OR *children* OR *preschool** OR *young child** as search terms. PsychInfo, ERIC, MEDLINE, and Academic Search Premiere were searched for studies. These were supplemented by Google Scholar, Scirus, Google, and Ingenta searches as well as a search of an EndNote Library maintained by our Institute. Hand searches of the reference sections of all journal articles, book chapters, books, dissertations, conference papers, and other retrieved papers were examined to locate additional studies. Studies were included if the age of acquisition of any of the 13 levels of emergent writing shown in Table 1 could be calculated or estimated for individual children or groups of children in the primary studies.

Search Results

Forty-nine studies were located that included 55 sam-

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Table 1
Description of Different Types of Mark Making, Scribbling, Drawing, and Writing

Type	Level	Description
Marks	1	Marks on a piece of paper or other writing surface
	2	Makes discernible dots
Scribbling	3	Random mark making without discernible form
	4	Random circular mark making
	5	Controlled mark making
Line Drawing	6	Controlled strokes and straight lines (vertical, horizontal, zigzag, etc.)
	7	Geometric shapes (circles, squares, ovals, etc.)
Representational Drawing	8	Draws figures of objects or people with discernible features
	9	Invented drawing
	10	Conventional drawing (pictures, faces, etc.)
Symbolic	11	Conventional symbolic letters
	12	Invented spelling
	13	Conventional name writing/ spelling

ples of children. Appendix A includes selected characteristics of the study participants. The 55 samples included 1647 children. The children's ages ranged between 8 and 66 months. The average ages of the children in the 49 studies ranged between 12 and 57 months. In the studies where investigators reported child gender, 51% were males and 49% were females. The large majority of the children were typically developing without any identified disabilities or delays. The studies were conducted in seven different countries: United States (N = 19), Great Brittain (N = 11), Israel (N = 5), Japan (N = 5), Canada (N = 2), Hong Kong (N = 2), Sweden (N = 1), Norway (N = 1), and France (N = 1). Two studies included samples of children from both Israel and the Netherlands.

Appendix B shows the emergent writing activities that were the focus of secondary investigation and the types of writing that were coded for individual children or groups of children in the studies. The emergent writing activities included unstructured/nonprompted activities where the children were provided writing instruments without any guidance or instruction, activities that included a visual template (typically a writing surface with a drawing or figure as the

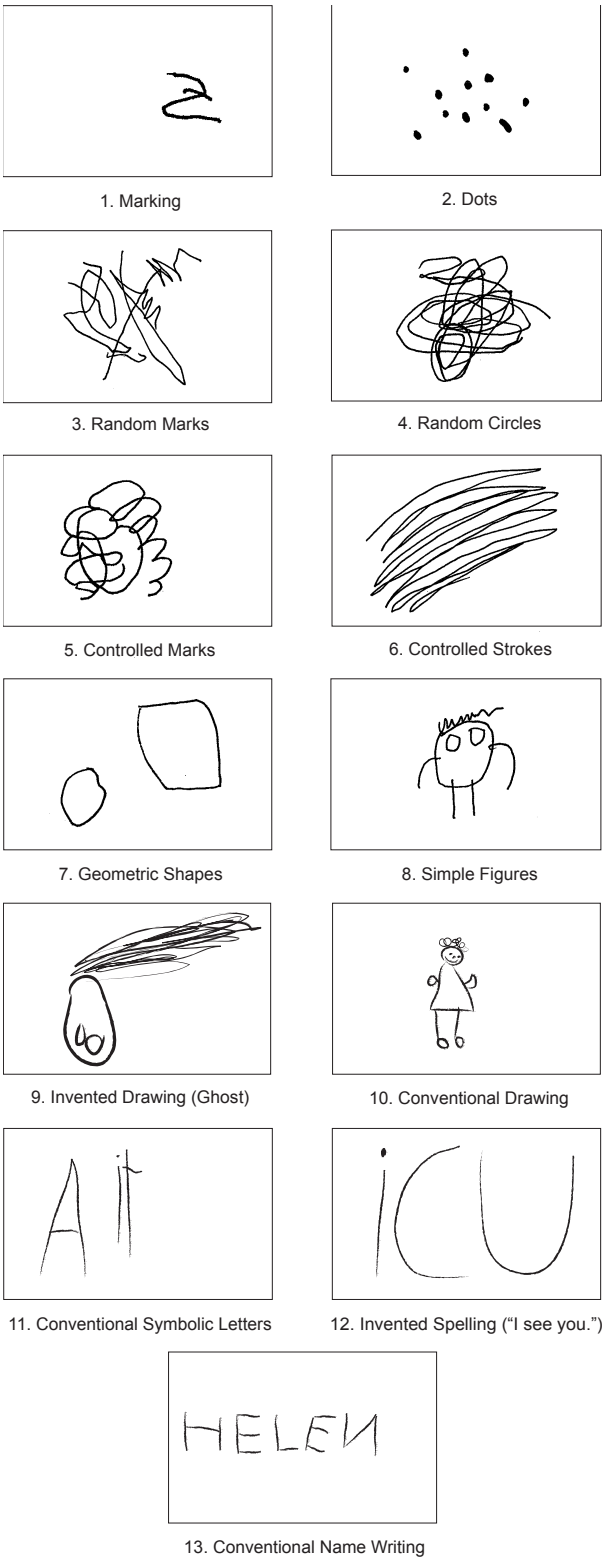

Figure 1. **Examples of emergent writing at the 13 different levels of mark making, scribbling, line drawing, figure drawing, and symbolic writing.**

background) but without any explicit adult guidance or instruction, and explicit adult prompts or instruction for the children to draw or write specific letters, words, pictures, or figures. Whether prompted versus unprompted drawing or writing was related to differences in the children's ages of acquisition of levels of writing was examined as part of the synthesis. The weighted average ages of children's acquisition of the 13 levels of emergent writing were calculated from the data shown in Appendix B to depict patterns of development of drawing and writing from 12 to 60 months of age. (Too few Level 2 *mark making* and Level 12 *invented drawing* data were available to estimate an age of acquisition and were excluded from further analysis.) The estimated ages of acquisition from studies with larger sample sizes were used to adjust the average ages for all subsequent analyses.

A Between Level of Drawing ANOVA was used to test for a between level of change in the age of acquisition of emergent and conventional writing. An *F*-test for a linear trend was used to evaluate whether there was a discernible increase in age of acquisition of children's emergent writing. Cohen's *d* effect size for the linear trend was used to estimate the size of effect for the increase in the children's age of acquisition of writing abilities.

A series of between type of intervention (adult prompted vs. non-adult prompted) comparisons of the ages of acquisition of the children's writing abilities were used to evaluate whether the two conditions were associated with differences in the estimated age scores. Cohen's *d* effect sizes for the between group differences was used to estimate the sizes of effects for comparitive conditions.

Synthesis Findings

Figure 2 shows the patterns of results for the development of the different emergent writing abilities. There is clearly a discernible pattern of increases in age of acquisition of the levels for which estimated ages could be determined from available data. The 11 Between Level of Drawing ANOVA produced a significant between level effect, $F(10, 2316) = 471.19$, $p = .0000$, and a significant linear trend (increase) in the age of acquisition from Level 1 to Level 13, $F(1, 2326) = 3860.64$, $p = .0000$. The Cohen's *d* for the linear trend was 1.81. These different sets of results indicate that emergent writing develops in a predictable manner consistent with descriptions in the published literature (Lancaster, 2007; Levin & Bus, 2003; Martlew & Sorsby, 1995; Yamagata, 1997).

A number of notable findings can be discerned from the results shown in Figure 2. First, there was, for nearly all writing levels, a progressive increase in the age of acquisition of the children's writing abilities. This indicates that children's writing emerges in a predictable sequence. Second, except for Level 1 mark making, the standard deviations for the average ages of acquisition of all other levels of drawing are much alike. This indicates that the variability in children's ages of acquisition of the different emergent writing abilities appears to be similar at most levels of writing.

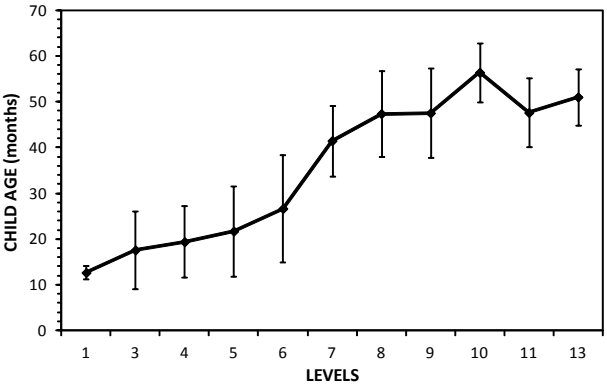

Figure 2. **Weighted average ages and standard deviations for the acquisition of different emergent writing skills.**

The reason(s) why the ages of acquisition of Level 11 *conventional symbolic letters* and Level 13 *conventional name writing/spelling* occurred earlier than that for Level 10 *conventional drawing* is not readily apparent but suggests that perhaps the order of the upper levels of emergent writing shown in Table 1 need to be modified and the levels reordered. This is partly supported by the fact that a 3 Between Level (10 vs. 11 vs. 13) ANOVA yielded a statistically significant difference in the children's age of acquisition of the three types of writing, $F(2, 210) = 24.79$, $p = .0000$. Therefore, it could be the case that *conventional drawing* is a symbolic rather than a representational drawing ability as shown in Table 1.

Table 2 shows the ages of acquisition of emergent writing under prompted and unprompted conditions and the results for the comparisons of the two types of conditions that were coded for the studies included in the synthesis. What are shown are the ages of acquisition for the particular levels for which there were sufficient data to do between conditions comparisons.

A 9 Between Level ANOVA for the unprompted, $F(8, 802) = 553.89$, $p = .0000$, and prompted, $F(8, 1438) = 182.29$, $p = .0000$, sequences both showed that there were between level differences in the children's ages of acquisition of the different types of emergent and conventional writing. There were significant linear trends (increases) in the ages of acquisition of the writing levels for both the unprompted, $F(1, 794) = 553.89$, $p = .0000$, and the prompted, $F(1, 1438) = 182.29$, $p = .0000$, sequences. The Cohen's *d* effects for the linear changes in the ages of acquisition under the two conditions were $d = 3.35$ and $d = 1.64$ respectively. Both sets of findings showed that there were similar patterns of change regardless of condition.

The between condition comparisons showed that the children acquired mark making and scribbling at earlier ages

Table 2
Average Age of Acquisition of Different Levels of Emergent Writing for Adult Prompted and Nonprompted Child Writing

	Unprompted			Prompted			Cohen's *d*
Writing Level	N	Mean	SD	N	Mean	SD	Effect Size
Random Mark Making	173	13.16	3.42	69	28.72	6.75	-2.91
Random Circular Mark Making	132	15.78	6.02	88	24.82	7.07	-1.38
Controlled Mark Making	48	16.98	2.40	91	24.22	11.40	-.88
Controlled Strokes and Lines	151	19.05	6.04	178	33.14	11.53	-1.53
Geometric Shapes	233	35.54	5.96	637	43.67	7.20	-1.23
Simple Figures	16	50.00	5.86	184	47.16	9.71	.35
Conventional Drawing	17	57.18	6.63	21	55.81	7.22	.20
Conventional Symbols/Letters	22	50.09	5.38	112	47.16	7.89	.43

under non-prompted conditions and that representational drawing and symbolic writing were acquired at somewhat earlier ages under prompted conditions. The pattern of findings suggests that adult instruction and guidance are indicated as strategies for promoting acquisition of conventional writing abilities.

Discussion

Findings showed that the development of infant, toddler, and preschooler writing skills are acquired in a highly predictable sequence and that regardless of condition, the skills emerge in very similar ways from mark making to conventional writing. The one exception was *conventional drawing* which was acquired at a later age than was *conventional letter writing* and *conventional name writing*. As was suggested earlier, this may be an indication that *conventional drawing* may be a symbolic rather than representational drawing ability.

The fact that the age of acquisition of *mark making* and *scribbling* occurred earlier under unprompted compared to prompted conditions does not necessarily mean that interventions at earlier ages are not warranted. This is the case because Dunst and Gorman (2009) found, for example, that collaborative drawing between young children and adults was associated with more child engagement in prewriting and emergent writing and more complex emergent writing behavior (see also Aram & Biron, 2004; Rowe & Neitzel, 2010; Yang & Noel, 2006). The results do indicate that formal instruction may not be needed at the infant and toddler levels of writing but are indicated for older preschoolers (see also Neumann & Neumann, 2010; Sprecher, 1999).

Implications for Practice

There are more than 12 *CELL practice guides* that include different methods and strategies for engaging infants, toddlers, and preschoolers in interest-based and highly engaging emergent writing activities (www.centerforearlyliteracylearning.org/). The practice guides include evidence-based guidelines and suggestions for promoting children's acquisition of the types of writing abilities shown in Table 1 and depicted in Figure 1. The interested reader is referred to Armington (1997), Meier (2011), Kaderavek et al. (2009), and Schickedanz (1999) for other methods and strategies for engaging young children in writing activities.

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Appendix A

Selected Characteristics of the Study Participants

Study	Number	Age (Months)		Gender		Participants	SES	Country	Program Type/ Location
		Mean	Range	Male	Female				
Adi-Japha et al. (1998) (Sample 1)	6	33	30-35	3	3	Typically developing	Not reported	Israel	Not reported
Adi-Japha et al. (1998) (Sample 2)	48 (5)[a]	31	25-36	21	27	Typically developing	Middle to high	Israel	Nursery schools
Ames (1943, 1945) (Sample 1)	123	NR	36-60	NR	NR	Average intelligence (IQ 90-110)	Not reported	United States	Child development clinic
Ames (1943, 1945) (Sample 2)	94	NR	30-60	NR	NR	Advanced/superior intelligence (IQ ≥120)	Not reported	United States	Child development clinic
Bayley (2006)	100 100 100	12 16 33	— — —	50 50 50	50 50 50	Typically developing	Low to high	United States	Not applicable
Berefelt (1987) (Sample 1)	100 (17)	18	16-20	50	50	Typically developing	Not reported	Sweden	Physician's waiting room
Berefelt (1987) (Study 2, Sample 2)	64 (6)	18	NR	34	30	Typically developing	Not reported	Sweden	Physician's waiting room
Bialystok (1995)	60 (2)	48	47-75	26	34	Typically developing	Not reported	Canada	Child care center
Bloodgood (1999)	2	44	44-45	2	0	Typically developing	Middle	United States	Half-day preschool
Braswell (2001) Braswell & Rosengren (2005)	16 16 16	18 29 43	16-20 29-33 41-44	8 7 8	8 9 8	Typically developing	Middle	United States	Home
Callaghan (1999)	16 16 (15) 16	28 39 48	25-32 35-42 45-52	5 9 8	11 7 8	Typically developing	Middle	Canada	Child care center, Psychology lab, Home
Chan et al. (2008)	1	53	—	0	1	Typically developing	Not reported	Hong Kong	Preschool
Chan & Louie (1992)	5	45	37-56	NR	NR	Typically developing	Low	Hong Kong	Nursery school
Coates (2002)	4	48	26-60	3	1	Typically developing	Not reported	Great Brittain	Nursery school
Coates & Coates (2006)	7	53	47-60	NR	NR	Typically developing	Low to middle	Great Brittain	Nursery school
Cox & Parkin (1986) (Sample 1)	42 (6)	40	24-59	21	21	Typically developing	Not reported	Great Brittain	Day nursery
Cox & Parkin (1986) (Sample 2)	6	32	31-33	4	2	Typically developing	Not reported	Great Brittain	Day nursery
Fox & Saracho (1990	5	38	36-48	2	3	Typically developing	Not reported	United States	Child care center
Frisch (2006)	2	50	42-48	1	1	Typically developing	Not reported	Norway	Preschool
Gibson & Yonas (1967)	14 (1)	28	15-38	NR	NR	Typically developing	Not reported	United States	Home
Golomb (1973)	57 (8)	53	46-59	NR	NR	Typically developing	Middle	United States	Nursery school
Gombert & Fayol (1992)	16 16	40 53	34-46 48-59	NR NR	NR NR	Typically developing	Middle	France	Nursery school
Gridley (1938)	16	48	—	11	5	Typically developing	Middle	United States	Child development center
Griffiths & Huntley (1996)	57 67 73 59	— — — —	8-12 15-16 19-20 23-24	NR NR NR NR	NR NR NR NR	Typically developing	Low to high	Great Brittain	Not applicable

Appendix A, continued.

Study	Number	Age (Months) Mean	Age (Months) Range	Gender Male	Gender Female	Participants	SES	Country	Program Type/ Location
Hardy (1981)	4 4	42 55	40-44 53-58	1 2	3 2	Typically developing	Middle	United States	Preschool, Child care center
Hildreth (1936)	3 5 6 10	38 45 51 57	37-40 42-47 48-53 54-60	1 3 1 4	2 2 5 6	Typically developing	Not reported	United States	Private school
Hresko et al. (1994)	151 (45) 173 (45)	NR NR	13-24 25-38	74 85	77 88	Typically developing Atypically developing	Low to high	United States	Not applicable
Lancaster (2007)	2	31	30-32	1	1	Typically developing	Not reported	Great Britain	Home
Levin et al. (2005) (Sample 1)	8	54	42-58	3	5	Typically developing	Low	Israel	Nursery school, Preschool
Levin et al. (2005) (Sample 2)	16 16 16 16 16 16	NR NR NR NR NR NR	28-35 36-43 44-53 28-35 36-43 44-53	8 8 8 8 8 8	8 8 8 8 8 8	Typically developing	Middle	Israel Israel Israel Netherlands Netherlands Netherlands	Play group, Nursery school or Preschool
Levin et al. (2005) (Sample 3)	32 32 32	NR NR NR	41-47 48-54 55-61	16 16 16	16 16 16	Typically developing	Middle to high	Netherlands	Play group, Nursery school, Preschool
Levin & Bus (2003) (Study 1)	16 16 16 16 16 16	NR NR NR NR NR NR	28-36 37-45 46-53 28-36 37-45 46-53	8 8 8 8 8 8	8 8 8 8 8 8	Typically developing	Middle	Israel Israel Israel Netherlands Netherlands Netherlands	Playgroup, Preschool
Levin et al. (1996)	10	NR	56-59	NR	NR	Typically developing	Middle to high	Israel	Preschool
Martens (1999)	1	40	—	0	1	Typically developing	Middle	United States	Home
Martlew & Sorsby (1995)	12 12	48 50	44-52 42-52	12 0	0 12	Typically developing	Middle	Great Britain	Nursery school
Matthews (1984)	2	26	25-28	2	0	Typically developing	Not reported	Great Britain	Not reported
Matthews & Jessel (1993)	7	35	23-47	3	4	Typically developing	Not reported	Great Britain	Public nursery
Osborne (1995)	1 1	36 48	— —	1 0	0 1	Typically developing	Not reported	United States	Preschool
Pemberton & Nelson (1987)	2	46	38-54	1	1	Typically developing	Middle	United States	Preschool
Ring (2006)	3	54	48-54	1	2	Typically developing	Low to Middle	Great Britain	Home and Classroom
Saracho (1990)	16	40	36-44	7	9	Typically developing	Not reported	United States	Head Start, Nursery school, Child care centers
Silk & Thomas (1986)	5	49	46-56	2	3	Typically developing	Not reported	Great Britain	Nursery school
Sitton & Light (1992)	24 (1) 24 (1)	NR NR	44-53 54-66	12 12	12 12	Typically developing	Middle	Israel	Nursery school
Springate (1984)	16 16	NR NR	36-45 48-57	8 8	8 8	Typically developing	Middle	United States	Child care center, Nursery program
Thomas & Tsalimi (1988)	6	45	41-48	2	4	Typically developing	NR	Great Britain	Nursery school

Appendix A, continued.

Study	Number	Age (Months)		Gender		Participants	SES	Country	Program Type/ Location
		Mean	Range	Male	Female				
Thomas & Rinehart (1990)	4	53	50-55	3	1	Typically developing	Low	United States	Head Start
Tolchinsky-Landsmann & Levin (1985)	5	53	44-56	3	2	Typically developing	Middle	Israel	Nursery school
Tolchinsky-Landsmann & Levin (1987)	2	54	49-59	2	0	Typically developing	Middle	Israel	Nursery school
Villaume & Wilson (1989)	11	48	36-60	6	5	Typically developing	Not reported	United States	Child care center
Yaden & Tardibuono (2004)	13	48	NR	6	7	Typically developing	Low	United States	Preschool classroom
Yamagata (1991)	17 (2)	NR	12-24	9	6	Typically developing	Not reported	Japan	Not reported
Yamagata (1997)	2	13	12-13	1	1	Typically developing	Middle	Japan	Home
Yamagata (2001)	16 (4) 23 (3) 27 (2)	20 27 33	18-23 24-29 30-35	10 12 11	6 11 16	Typically developing	Middle	Japan	Child care center
Yamagata (2007)	9 15 14 14 14	22 27 32 38 43	NR NR NR NR NR	5 11 8 6 7	4 4 6 8 7	Typically developing	Middle	Japan	Child care center
Yamagata & Shimizu (1997)	14 (2)	18	NR	4	10	Typically developing	Not reported	Japan	Not reported

[a] Number of children included in the analysis.

Appendix B

Levels and Age of Acquisition of the Different Types of Writing/Drawing

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Adi-Japha et al. (1998) (Sample 1)	Children drew what they wanted	6	Random circular mark making	4	33[c]
Adi-Japha et al. (1998) (Sample 2)	Children drew what they wanted	1	Random circular mark making	4	28
		1	Random circular mark making	4	32
		1	Controlled strokes and lines	6	33
		1	Random mark making	3	34
		1	Geometric shapes	7	35
Ames (1943, 1945) (Sample 1)	Children drew a picture of a man	20	Geometric shapes	7[b]	36[c]
		38	Geometric shapes	7[b]	48[c]
		15	Geometric shapes	7[b]	54[c]
		50	Draws simple figures	8[b]	60[c]
Ames (1943, 1945) (Sample 2)	Typical examples of children's drawing of a picture of a man	5	Controlled strokes and lines	6	30[c]
		20	Geometric shapes	7	36[c]
		18	Draws simple figures	8	42[c]
		24	Geometric shapes	7	48[c]
		15	Draws simple figures	8	54[c]
		12	Conventional drawing	10	60[c]
	Children drew accessories on the complete-a-man picture	5	Random circular mark making	4	30[c]
		20	Geometric shapes	7	36[c]
		18	Geometric shapes	7	42[c]
		12	Conventional drawing	10	60[c]
	Children drew with symmetry on the complete-a-man picture	1	Geometric shapes	7	48
		1	Conventional drawing	10	48
		1	Draws simple figures	8	60
Bayley (2006)	Children drew what they wanted	100	Random mark making	3	11
		100	Random circular mark making	4	13
	Children drew structured pictures	100	Controlled strokes and lines	6	17
		100	Geometric shapes	7	33
Berefelt (1987) (Study 1)	Children drew what they wanted on paper with a circle in the middle	5	Random mark making	3	18
		8	Controlled marks	5	18
		3	Controlled strokes and lines	6	18
		1	Geometric shapes	7	18
Berefelt (1987) (Study 2, Sample 2)	Children drew what they wanted	4	Random mark making	3	18
		2	Controlled strokes and lines	6	18
Bialystok (1995)	Children wrote something	1	Controlled strokes and lines	6	51
		1	Conventional symbols/letters	11	54
Bloodgood (1999) (Child A)	Child drew a picture and wrote about it	1	Draws simple figures	8	44
		1	Conventional name writing/spelling	13	49
		1	Conventional drawing	10	56
Bloodgood (1999) (Child B)	Child drew a picture and wrote about it	1	Draws simple figures	8	45
		1	Draws simple figures	8	47
		1	Conventional name writing/spelling	13	59
Braswell (2001) Braswell & Rosengren (2005)	Children drew unstructured and structured pictures with their mother	16	Controlled stokes and lines	6[b]	18[c]
		16	Geometric shapes	7[b]	29[c]
		16	Geometric shapes	7[b]	43[c]
Callaghan (1999) (Study 1) (Free drawing)	Children drew a picture of anything they liked	16	Geometric shapes	7	28[c]
		15	Geometric shapes	7	39[c]
		16	Geometric shapes	7	48[c]

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Chan et al. (2008)	Child drew and wrote many times	1	Conventional symbols/letters	11	53
		1	Invented spelling	12	55
		1	Conventional name writing/spelling	13	57
		1	Conventional name writing/spelling	13	60
Chan & Louie (1992)	Child drew a picture	1	Geometric shapes	7	38
	Child drew a picture and wrote name	1	Conventional symbols/letters	11	49
	Children wrote their name	1	Controlled mark making	5	37
		1	Conventional symbols/letters	11	44
		1	Conventional symbols/letters	11	56
Coates (2002)	Children drew during a free choice activity	1	Controlled strokes and lines	6	26
		1	Conventional symbols/letters	11	40
		1	Invented drawing	9	54
		1	Draws simple figures	8	58
		1	Conventional symbols/letters	11	60
Coates & Coates (2006)	Children drew what they chose	1	Invented drawing	9	47
		1	Draws simple figures	8	51
		1	Invented drawing	9	52
		1	Conventional symbols/letters	11	53
		1	Conventional symbols/letters	11	55
		1	Conventional name writing/spelling	13	56
		1	Conventional drawing	10	60
Cox & Parkin (1986) (Study 1, Task 1)	Children drew a picture of a person	6	Draws simple figures	8	37[c]
Cox & Parkin (1986) (Study 2)	Children drew a picture of a person	1	Controlled strokes and lines	6	31
		1	Controlled strokes and lines	6	32
		1	Random mark making	3	33
		2	Random circular mark making	4	33
		1	Draws simple figures	8	33
		4	Controlled strokes and lines	6	34
		1	Geometric shapes	7	34
		1	Random circular mark making	4	35
		1	Controlled strokes and lines	6	35
		3	Draws simple figures	8	35
		2	Controlled mark making	5	36
		2	Geometric shapes	7	36
		2	Draws simple figures	8	36
		2	Controlled mark making	5	37
		1	Geometric shapes	7	37
		3	Draws simple figures	8	37
		1	Controlled mark making	5	38
		1	Geometric shapes	7	38
		1	Draws simple figures	8	38
		1	Controlled mark making	5	39
		1	Controlled strokes and lines	6	39
		1	Geometric shapes	7	39
		1	Draws simple figures	8	39
		1	Random circular mark making	4	40
		2	Geometric shapes	7	40
		3	Draws simple figures	8	40
		2	Geometric shapes	7	41
		1	Draws simple figures	8	41
		2	Draws simple figures	8	42
		3	Draws simple figures	8	43
		1	Conventional drawing	10	43
		1	Geometric shapes	7	44
		2	Draws simple figures	8	44
		1	Conventional drawing	10	44
		2	Draws simple figures	8	45

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Fox & Saracho (1990)	Children wrote four nouns	1	Controlled strokes and lines	6	36
		1	Draws simple figures	8	36
		1	Geometric shapes	7	36
		1	Conventional symbols/letters	11	36
		1	Conventional symbols/letters	11	48
Frisch (2006)	Children drew pictures of themselves	1	Conventional drawing	10	42
		1	Conventional drawing	10	48
Gibson & Yonas (1967)	Child drew what she wanted	1	Random mark making	3	16
Golomb (1973)	Children drew a picture of a person	1	Random mark making	3	42
		1	Geometric shapes	7	43
		1	Conventional drawing	10	44
		1	Geometric shapes	7	45
		1	Conventional drawing	10	46
		1	Draws simple figures	8	47
		1	Draws simple figures	8	54
		1	Draws simple figures	8	60
Gombert & Fayol (1992)	Children wrote words, sentences, their name, and drew pictures	1	Random circular mark making	4	36
		1	Controlled strokes and lines	6	36
		1	Controlled strokes and lines	6	39
		2	Controlled mark making	5	40
		1	Geometric shapes	7	40
		1	Draws simple figures	8	41
		1	Geometric shapes	7	42
		1	Controlled strokes and lines	6	43
		1	Geometric shapes	7	43
		1	Geometric shapes	7	44
		1	Controlled mark making	5	46
		1	Draws simple figures	8	48
		1	Controlled mark making	5	49
		1	Geometric shapes	7	51
		1	Geometric shapes	7	52
		1	Geometric shapes	7	55
		1	Geometric shapes	7	57
Gridley (1938)	Children drew a man on day 1	1	Controlled strokes and lines	6	48
		12	Geometric shapes	7	48
		2	Draws simple figures	8	48
		1	Geometric shapes	7	49
		1	Draws simple figures	8	49
	Children drew a man on day 2	1	Random circular mark making	4	48
		1	Controlled strokes and lines	6	48
		8	Geometric shapes	7	48
		1	Geometric shapes	7	49
	Children copied a picture of a man	1	Draws simple figures	8	48
	Children drew a man from dictated body parts	3	Controlled stokes and lines	6	48
		6	Geometric shapes	7	48
		1	Geometric shapes	7	49
	Children drew a man with a little head and big long legs	2	Controlled stokes and lines	6	48
		2	Draws simple figures	8	48
		1	Geometric shapes	7	49

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Griffiths & Huntley (1996)	Children drew what they wanted	3	Marks	1	8
		5	Marks	1	10
		32	Marks	1	12
		17	Marks	1	12
		5	Random mark making	3	14
		19	Random mark making	3	14
		37	Random mark making	3	16
		35	Controlled mark making	5	16
		15	Random circular mark making	4	18
		13	Controlled strokes and lines	6	18
	Children drew structured pictures	2	Controlled mark making	5	18
		6	Random mark making	3	20
		33	Random circular mark making	4	20
		5	Random circular mark making	4	20
		20	Random circular mark making	4	22
		5	Controlled mark making	5	22
		19	Controlled mark making	5	22
		3	Controlled strokes and lines	6	24
		2	Controlled strokes and lines	6	24
Hardy (1981) (Pretests)	Children wrote their name	1	Geometric shapes	7	40
		1	Conventional symbols/letters	11	44
	Children wrote their age	1	Controlled mark making	5	53
	Children wrote numerals	1	Controlled strokes and lines	6	40
		1	Controlled strokes and lines	6	43
	Children wrote letters	1	Controlled strokes and lines	6	42
		1	Controlled strokes and lines	6	43
	Children wrote words	1	Controlled strokes and lines	6	44
		1	Controlled strokes and lines	6	53
Hardy (1981) (2nd Observation session)	Children wrote whatever they wanted	1	Invented drawing	9	42
		1	Controlled strokes and lines	6	45
		1	Conventional name writing/spelling	13	46
		1	Invented drawing	9	55
		1	Conventional name writing/spelling	13	58
Hildreth (1936)	Children wrote their name	1	Random mark making	3	37
		1	Controlled strokes and lines	6	38
		1	Random circular mark making	4	40
		1	Controlled mark making	5	42
		1	Controlled strokes and lines	6	43
		2	Controlled mark making	5	46
		1	Controlled strokes and lines	6	47
		1	Controlled mark making	5	48
		1	Controlled strokes and lines	6	51
		1	Controlled strokes and lines	6	52
		2	Conventional symbols/letters	11	52
		1	Controlled mark making	5	53
		1	Controlled strokes and line	6	54
		1	Conventional symbols/letters	11	54
		1	Conventional symbols/letters	11	55
		2	Conventional symbols/letters	11	57
		3	Conventional symbols/letters	11	59
		2	Conventional name writing/spelling	13	60

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Hresko et al. (1994)	Children drew what they wanted	45	Marks	1	14
	Children drew structured pictures	45	Controlled mark making	5	17
		45	Controlled strokes and lines	6	18
		45	Geometric shapes	7	38
Lancaster (2007)	Children drew a picture	1	Controlled strokes and lines	6	30
		1	Geometric shapes	7	32
Levin et al. (2005) (Sample 2)	Children wrote their name	32	Controlled strokes and lines	6[b]	32[c]
		32	Geometric shapes	7[b]	40[c]
		32	Geometric shapes	7[b]	49[c]
	Children wrote dictated words	32	Geometric shapes	7[b]	32[c]
		32	Geometric shapes	7[b]	40[c]
		32	Geometric shapes	7[b]	49[c]
Levin et al. (2005) (Sample 3)	Children wrote their name	32	Geometric shapes	7[b]	44[c]
		32	Conventional symbols/letters	11[b]	51[c]
		32	Invented spelling	12[b]	58[c]
	Children wrote dictated words	32	Geometric shapes	7[b]	44[c]
		32	Geometric shapes	7[b]	51[c]
		32	Geometric shapes	7[b]	58[c]
Levin et al. (2005) (Sample 1 & 3)	Children wrote words	1	Controlled strokes and lines	6	42
		1	Conventional drawing	10	54
		1	Conventional symbols/letters	11	54
		1	Controlled strokes and lines	6	56
		1	Conventional symbols/letters	11	56
		1	Controlled strokes and lines	6	57
		1	Conventional symbols/letters	11	57
		1	Controlled mark making	5	58
	Children wrote their name	1	Geometric shapes	7	42
		1	Conventional symbols/letters	11	54
		1	Conventional name writing/spelling	13	54
		2	Conventional name writing/spelling	13	56
		2	Conventional symbols/letters	11	57
		1	Conventional name writing/spelling	13	58
Levin & Bus (2003)	Children wrote dictated words	1	Controlled strokes and lines	6	37
		1	Controlled mark making	5	38
		1	Controlled strokes and lines	6	38
		1	Geometric shapes	7	38
		2	Controlled strokes and lines	6	39
		1	Geometric shapes	7	40
		2	Controlled strokes and lines	6	41
		1	Geometric shapes	7	41
		2	Controlled strokes and lines	6	43
		1	Geometric shapes	7	44
		2	Conventional symbols/letters	11	44
		1	Controlled strokes and lines	6	46
		1	Controlled strokes and lines	6	47
		1	Conventional name writing/spelling	13	50
		1	Geometric shapes	7	51
		1	Conventional symbols/letters	11	51
		1	Conventional symbols/letters	11	52
		1	Conventional symbols/letters	11	53
		1	Invented spelling	12	53
		1	Conventional name writing/spelling	13	53

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Levin & Bus (2003)	Children drew a picture of father	1	Controlled strokes and lines	6	28
		1	Random circular mark making	4	29
		1	Geometric shapes	7	30
		1	Geometric shapes	7	35
		1	Draws simple figures	8	42
		1	Draws simple figures	8	44
		1	Draws simple figures	8	47
		1	Draws simple figures	8	50
		1	Draws simple figures	8	51
		1	Draws simple figures	8	53
	Children wrote 9 stimuli words	16 (Israeli)	Geometric shapes	7[b]	32[c]
		16 (Dutch)	Geometric shapes	7[b]	32[c]
		16 (Israeli)	Geometric shapes	7[b]	41[c]
		16 (Dutch)	Geometric shapes	7[b]	41[c]
		16 (Israeli)	Geometric shapes	7[b]	50[c]
		16 (Dutch)	Geometric shapes	7[b]	50[c]
Levin et al. (1996) (Study 1 & 2)	Children wrote words	1	Controlled strokes and lines	6	56
		2	Conventional symbols/letters	11	56
		1	Geometric shapes	7	57
		1	Conventional symbols/letters	11	57
		2	Geometric shapes	7	58
		3	Controlled strokes and lines	6	59
	Child drew	1	Controlled mark making	5	56
Martens (1999)	Child drew pictures and "wrote"	1	Controlled strokes and lines	6	40
		1	Conventional symbols/letters	11	42
		1	Invented spelling	12	53
		1	Conventional name writing/spelling	13	57
		1	Invented spelling	12	59
		1	Invented spelling	12	60
Martlew & Sorsby (1995)	Children wrote or drew something to help them remember different items	1	Draws simple figures	8	42
		2	Controlled strokes and lines	6	44
		1	Conventional symbols/letters	11	44
		1	Draws simple figures	8	45
		1	Conventional symbols/letters	11	47
		2	Draws simple figures	8	48
		3	Conventional symbols/letters	11	48
		1	Draws simple figures	8	49
		1	Conventional symbols/letters	11	49
		4	Conventional symbols/letters	11	50
		1	Draws simple figures	8	51
		1	Conventional symbols/letters	11	51
		3	Draws simple figures	8	52
		2	Conventional symbols/letters	11	52
Matthews (1984)	Child drew and painted	1	Controlled strokes and lines	6	25
		1	Random circular mark making	4	26
		1	Random circular mark making	4	29
		1	Geometric shapes	7	30
		1	Random circular mark making	4	32
		1	Controlled strokes and lines	6	34
		1	Geometric shapes	7	36
		1	Controlled strokes and lines	6	37
		1	Invented drawing	9	38
		1	Invented drawing	9	39
		1	Conventional drawing	10	54

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Matthews & Jessel (1993)	Children drew what they wanted	1	Controlled strokes and lines	6	22
		1	Geometric shapes	7	24
		1	Geometric shapes	7	38
		1	Controlled strokes and lines	6	42
		1	Geometric shapes	7	42
		1	Invented drawing	9	47
Osborne (1995)	Child 1 wrote/drew	1	Random mark making	3	36[c]
	Child 1 wrote/drew	1	Geometric shapes	7	43[c]
	Child 2 wrote/drew	1	Geometric shapes	7	48[c]
	Child 2 wrote/drew	1	Conventional symbols/letters	11	52[c]
Pemberton & Nelson (1987)	Child drew a person	1	Draws simple figures	8	38
		1	Geometric shapes	7	54
Ring (2006)	Children drew pictures	1	Controlled strokes and lines	6	48
		1	Invented drawing	9	54
		1	Conventional symbols/letters	11	60
	Child wrote letters	1	Conventional symbols/letters	11	48
Saracho (1990)	Children wrote their name	1	Controlled strokes and lines	6	36
		1	Random marks	3	37
		3	Controlled strokes and lines	6	37
		1	Random circular mark making	4	38
		1	Controlled strokes and lines	6	38
		1	Controlled strokes and lines	6	39
		2	Controlled strokes and lines	6	41
		1	Geometric shapes	7	41
		1	Controlled strokes and lines	6	42
		2	Conventional symbols/letters	11	42
		2	Conventional symbols/letters	11	43
		1	Conventional symbols/letters	11	44
Silk & Thomas (1986)	Children drew pictures of a man and a dog	1	Geometric shapes	7	44
		1	Draws simple figures	8	46
		1	Conventional drawing	10	49
		1	Geometric shapes	7	50
		1	Conventional drawing	10	56
Sitton & Light (1992)	Children drew pictures of people	1	Draws simple figures	8	48[c]
		1	Conventional drawing	10	60[c]
Springate (1984)	Children wrote their name	8	Draws simple figures	8	36[c]
		5	Conventional symbols/letters	11	36[c]
		2	Conventional name writing/spelling	13	36[c]
		3	Conventional symbols/letters	11	48[c]
		11	Conventional name writing/spelling	13	48[c]
Thomas & Tsalimi (1988) (Study 1)	Children drew a picture of a man	1	Draws simple figures	8	41
		1	Draws simple figures	8	44
		1	Draws simple figures	8	47
		1	Draws simple figures	8	48
	Children added a head to the body of a man	1	Draws simple figures	8	44
		1	Draws simple figures	8	45
Thomas & Rinehart (1990)	Children drew pictures and wrote name, words	1	Geometric shapes	7	50
		1	Conventional name writing/spelling	13	52
		1	Conventional name writing/spelling	13	54
		1	Draws simple figures	8	55

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Tolchinsky-Landsmann & Levin (1985)	Children wrote words and their name	1	Geometric shapes	7	44
		1	Conventional symbols/letters	11	53
		1	Conventional symbols/letters	11	54
		1	Controlled strokes and lines	6	56
		1	Conventional name writing/spelling	13	56
Tolchinsky-Landsmann & Levin (1987)	Children wrote words and sentences	1	Controlled strokes and lines	6	49
		1	Conventional symbols/letters	11	59
Villaume & Wilson (1989) (Task 1-Name writing)	Children wrote their name	1	Random circular mark making	4	36
		1	Controlled strokes and lines	6	37
		1	Conventional symbols/letters	11	41
		1	Geometric shapes	7	45
		1	Conventional symbols/letters	11	46
		1	Controlled strokes and lines	6	50
		1	Controlled strokes and lines	6	51
		1	Conventional symbols/letters	11	54
		1	Conventional name writing/spelling	13	54
		1	Conventional name writing/spelling	13	57
		1	Conventional symbols/letters	11	60
Yaden & Tardibuono (2004)	Children wrote words or their name	3	Controlled strokes and lines	6	48[c]
		1	Draws simple figures	8	48[c]
		3	Conventional symbols/letters	11	48[c]
		6	Conventional name writing/spelling	13	48[c]
Yamagata (1991)	Children drew in book with picture stimuli	1	Marks	1	12[c]
		1	Controlled stokes and lines	6	24[c]
Yamagata (1997)	Children drew what they wanted	2	Mark	1	13
		1	Controlled strokes and lines	6	17
		1	Controlled strokes and lines	6	22
Yamagata (2001)	Children colored in or added to pictures of a face, car or animal	1	Controlled mark making	5	18
		2	Controlled mark making	5	21
		1	Controlled mark making	5	22
		1	Geometric shapes	7	27
		1	Geometric shapes	7	28
		1	Controlled mark making	5	29
		1	Controlled strokes and lines	6	31
		1	Geometric shapes	7	34
Yamagata (2007)	Children drew pictures	3	Random mark making	3	22[c]
		2	Random circular mark making	4	22[c]
		5	Random mark making	3	27[c]
		5	Random circular mark making	4	27[c]
		4	Geometric shapes	7	27[c]
		1	Draws simple figures	8	27[c]
		1	Random mark making	3	32[c]
		2	Random circular mark making	4	32[c]
		3	Geometric shapes	7	32[c]
		8	Draws simple figures	8	32[c]
		1	Random circular mark making	4	38[c]
		1	Geometric shapes	7	38[c]
		12	Draws simple figures	8	38[c]
		14	Draws simple figures	8	43[c]

Appendix B, continued.

Study	Activity	Number of Children	Type of Writing	Level[a]	Age (Months)
Yamagata (2007)	Children wrote numbers	5	Random mark making	3	22[c]
		11	Random mark making	3	27[c]
		2	Random circular mark making	4	27[c]
		1	Geometric shapes	7	27[c]
		1	Conventional symbols/letters	11	27[c]
		6	Random mark making	3	32[c]
		2	Controlled strokes and lines	6	32[c]
		3	Geometric shapes	7	32[c]
		3	Conventional symbols/letters	11	32[c]
		3	Random mark making	3	38[c]
		3	Random circular mark making	4	38[c]
		3	Geometric shapes	7	38[c]
		5	Conventional symbols/letters	11	38[c]
		1	Random mark making	3	43[c]
		1	Controlled strokes and lines	6	43[c]
		4	Geometric shapes	7	43[c]
		8	Conventional symbols/letters	11	43[c]
	Children wrote their name (letters)	5	Random mark making	3	22[c]
		9	Random mark making	3	27[c]
		2	Random circular mark making	4	27[c]
		3	Controlled strokes and lines	6	27[c]
		1	Conventional symbols/letters	11	27[c]
		4	Random mark making	3	32[c]
		1	Random circular mark making	4	32[c]
		6	Controlled strokes and lines	6	32[c]
		3	Conventional symbols/letters	11	32[c]
		3	Random mark making	3	38[c]
		1	Random circular mark making	4	38[c]
		6	Controlled strokes and lines	6	38[c]
		4	Conventional symbols/letters	11	38[c]
		3	Random mark making	3	43[c]
		1	Random circular mark making	4	43[c]
		6	Controlled strokes and lines	6	43[c]
		1	Geometric shapes	7	43[c]
		2	Conventional symbols/letters	11	43[c]
		1	Conventional name writing/spelling	13	43[c]
Yamagata & Shimizu (1997)	Children drew on an outline of a face	1	Random circular mark making	4	18
		1	Geometric shapes	7	18

[a] See Table 1for the descriptions of the writing levels.
[b] Mean writing level.
[c] Estimated age.