

Supplemental Table S1. Participant characteristics for the retained/analyzed versus non-retained samples.

	Retained (analyzed) Sample (<i>n</i> = 147)	Non-Retained Sample (<i>n</i> = 38)	<i>p</i> -value
High-Risk, <i>n</i> (%)	89 (60.5%)	25 (65.8%)	0.55
Male Sex, <i>n</i> (%)	90 (61.2%)	20 (52.6%)	0.34
Race^a, <i>n</i> (%)			0.58
White	96 (65.6%)	18 (64.3%)	
Non-White	42 (30.4%)	10 (35.7%)	
Hispanic Ethnicity^b, <i>n</i> (%)	28 (19.7%)	10 (31.3%)	0.15
Income^c, <i>n</i> (%)			0.04
Under \$50k	12 (9.2%)	10 (32.3%)	
\$50k-\$80k	24 (18.5%)	4 (12.9%)	
\$80k-\$100k	17 (13.1%)	5 (16.1%)	
\$100k-\$125k	18 (13.9%)	3 (9.7%)	
\$125k-\$150k	20 (15.4%)	1 (3.2%)	
\$150k or higher	39 (30.0%)	8 (25.8%)	
Maternal Education^d, <i>n</i> (%)			0.55
Less than College	46 (31.9%)	3 (21.4%)	
College or Higher	98 (66.7%)	11 (28.9%)	
Gestational Age (weeks), mean (SD)	39.1 (1.6)	38.9 (1.5)	0.49

Note. SD = Standard Deviation. Due to rounding, percentages may not sum to 100. Group differences were assessed using χ^2 tests for all categorical variables except income (for which Cochran-Mantel-Haenszel test for ordinal data was used) and Wilcoxon two-sample nonparametric tests for gestational age.

Missing for: ^a9 participants in retained/analyzed group, 10 in non-retained group; ^b5 participants in retained/analyzed group, 6 in non-retained group; ^c17 participants in retained/analyzed group, 7 in non-retained group; ^d3 participants in retained/analyzed group, 24 in non-retained group.

Supplemental Table S2. Demographic information by age among those with and without object exploration data at each visit.

	Visit age											
	9 months		12 months		15 months		18 months		24 months		36 months	
	Non-	Missing	Non-	Missing	Non-	Missing	Non-	Missing	Non-	Missing	Non-	Missing
	Missing (n=127)	(n=20)	Missing (n=120)	(n=27)	Missing (n=120)	(n=27)	Missing (n=106)	(n=41)	Missing (n=71)	(n=76)	Missing (n=110)	(n=37)
High-Risk, n (%)	77 (60.6%)	12 (60.0%)	74 (61.7%)	15 (55.6%)	72 (60.0%)	17 (63.0%)	67 (63.2%)	22 (53.7%)	40 (56.3%)	49 (64.5%)	66 (66.0%)	23 (62.2%)
Male Sex, n (%)	78 (61.4%)	12 (60.0%)	75 (62.5%)	15 (55.6%)	74 (61.7%)	16 (59.3%)	67 (63.2%)	23 (56.1%)	42 (59.2%)	48 (63.2%)	65 (59.1%)	25 (67.6%)
Race^a, n (%)												
White	83 (86.5%)	13 (31.0%)	78 (68.4%)	18 (75.0%)	80 (71.4%)	16 (61.5%)	73 (73.7%)	23 (59.0%)	45 (67.2%)	51 (71.8%)	72 (69.2%)	24 (70.6%)
Non- White	37 (88.1%)	5 (11.9%)	36 (31.6%)	6 (25.0%)	32 (28.6%)	10 (38.5%)	26 (26.3%)	16 (41.0%)	22 (32.8%)	20 (28.2%)	32 (30.8%)	10 (29.4%)
Hispanic Ethnicity^b, n (%)	24 (18.9%)	4 (20.0%)	23 (19.8%)	5 (19.2%)	26 (22.4%)	2 (7.7%)	22 (21.2%)	6 (15.8%)	13 (18.8%)	15 (20.6%)	19 (17.8%)	9 (25.7%)
Income^c, n (%)												
Under \$50k	8 (7.2%)	4 (21.1%)	10 (9.4%)	2 (8.3%)	11 (10.6%)	1 (3.9%)	9 (9.3%)	3 (9.1%)	5 (7.7%)	7 (10.8%)	7 (7.2%)	5 (15.2%)
\$50k-\$80k	19 (17.1%)	5 (26.3%)	18 (17.0%)	6 (25.0%)	22 (21.2%)	2 (7.7%)	19 (19.6%)	5 (15.2%)	15 (23.1%)	9 (13.9%)	18 (18.6%)	6 (18.2%)

\$80k-\$100k	16	1	15	2	13	4	16	1	10	7	12	5
	(14.4%)	(5.3%)	(14.2%)	(8.3%)	(12.5%)	(15.4%)	(16.5%)	(3.0%)	(15.4%)	(10.8%)	(12.4%)	(15.2%)
\$100-\$125k	17	1	15	3	12	6	14	4	6	12	13	5
	(15.3%)	(5.3%)	(14.2%)	(12.5%)	(11.5%)	(23.1%)	(14.4%)	(12.1%)	(9.2%)	(18.5%)	(13.4%)	(15.2%)
\$125-\$150k	19	1	14	6	14	6	14	6	11	9	16	4
	(17.1%)	(5.3%)	(13.2%)	(25.0%)	(13.5%)	(23.1%)	(14.3%)	(18.2%)	(16.9%)	(13.9%)	(16.5%)	(12.1%)
\$150k+	32	7	32	5	32	7	25	14	18	21	31	8
	(28.8%)	(36.8%)	(32.1%)	(20.8%)	(30.8%)	(26.9%)	(25.8%)	(42.4%)	(27.7%)	(32.3%)	(32.0%)	(24.2%)
Maternal education^d, n (%)												
< College	39	7	79	19	41	5	35	11	26	20	33	13
	(84.8%)	(15.2%)	(67.5%)	(70.4%)	(35.0%)	(18.5%)	(33.0%)	(29.0%)	(37.1%)	(27.0%)	(30.3%)	(37.1%)
≥ College	85	13	38	8	76	22	71	27	44	54	76	22
	(86.7%)	(13.3%)	(32.5%)	(29.6%)	(65.0%)	(81.5%)	(67.0%)	(71.1%)	(62.9%)	(73.0%)	(69.7%)	(63.9%)
Gestational age	39.1	39.2	39.1	38.9	39.1	39.2	39.0	39.2	39.4*	38.8*	39.1	39.0
(weeks), mean (SD)	(1.7%)	(1.1)	(1.5)	(2.2)	(1.7)	(1.3)	(1.7)	(1.5)	(1.3)	(1.8)	(1.6)	(1.7)
36-month Outcome, n (%)												
ASD	16	1	14	3	15	2	12	5	9	8	16	1
	(12.6%)	(5.9%)	(82.4%)	(17.6%)	(88.2%)	(11.8%)	(70.6%)	(29.4%)	(52.9%)	(47.1%)	(94.1%)	(5.9%)
High-Risk Non-ASD	61	11	60	12	57	15	55	17	31	41	50	22
	(48.0%)	(55.0%)	(83.3%)	(16.7%)	(79.2%)	(20.8%)	(76.4%)	(23.6%)	(43.1%)	(56.9%)	(69.4%)	(30.6%)
Low-Risk Non-ASD	50	8	46	12	48	10	39	19	31	27	44	14
	(86.2%)	(13.8%)	(79.3%)	(20.7%)	(82.8%)	(17.2%)	(67.2%)	(33%)	(53.4%)	(46.6%)	(75.9%)	(24.1%)

Note. ASD = Autism Spectrum Disorder; SD = Standard Deviation. Due to rounding, percentages may not sum to 100. Group differences in were assessed using χ^2 tests for all categorical variables except income (for which Cochran-Mantel-Haenszel test for ordinal data was used) and Wilcoxon two-sample nonparametric tests for continuous variables.

* $p < .05$. All other p -values were > 0.08 .

Missing for: ^a7 participants in Non-Missing group and 2 in Missing group at 9 months, 6 participants in Non-Missing group and 3 in Missing group at 12 months, 8 participants in Non-Missing group and 1 in Missing group at 15 months, 7 participants in Non-Missing group and 2 in Missing group at 18 months, 4 participants in Non-Missing group and 5 in Missing group at 24 months, 6 participants in Non-Missing group and 3 in Missing group at 36 months; ^b5 participants in Non-Missing group at 9 months, 4 participants in Non-Missing group and 1 in Missing group at 12 months, 4 participants in Non-Missing group and 1 in Missing group at 15 months, 2 participants in Non-Missing group and 3 in Missing group at 18 months, 2 participants in Non-Missing group and 3 in Missing group at 24 months, 3 participants in Non-Missing group and 2 in Missing group at 36 months; ^c16 participants in Non-Missing group and 1 in Missing group at 9 months, 14 participants in Non-Missing group and 3 in Missing group at 12 months, 16 participants in Non-Missing group and 1 in Missing group at 15 months, 9 participants in Non-Missing group and 8 in Missing group at 18 months, 6 in Non-Missing group and 11 in Missing group at 24 months, 13 participants in Non-Missing group and 4 in Missing group at 36 months; and ^d3 participants in Non-Missing group at 9 months, 3 participants in Non-Missing group at 12 months, 3 participants in Non-Missing group at 15 months, 3 participants in Missing group at 18 months, 1 participants in Non-Missing group and 2 in Missing group at 24 months, 1 participant in Non-Missing group and 2 in Missing group at 36 months.

Supplemental Table S3. Reasons for missingness at each age for the ASD ($n = 17$), High-Risk Non-ASD ($n = 72$), and Low-Risk Non-ASD ($n = 58$) participants.

Outcome group	Total missing (n)	Missed visit	Incomplete/invalid administration	Task refusal	Task excluded from battery	Video recording problems/missing video	Could not be coded
9 months							
ASD	1	0	0	0	0	1	0
High-Risk Non-ASD	11	4	1	4	0	2	0
Low-Risk Non-ASD	8	2	0	4	0	2	0
12 months							
ASD	3	0	0	3	0	0	0
High-Risk Non-ASD	12	2	0	5	0	3	2
Low-Risk Non-ASD	12	4	0	5	0	3	0
15 months							
ASD	2	1	1	0	0	0	0
High-Risk Non-ASD	15	8	2	4	0	1	0
Low-Risk Non-ASD	10	2	1	2	0	3	2
18 months							
ASD	5	0	1	3	0	0	1
High-Risk Non-ASD	17	4	2	9	0	1	1
Low-Risk Non-ASD	19	2	1	15	0	1	0
24 months							
ASD	8	0	0	3	5	0	0
High-Risk Non-ASD	41	5	0	9	26	1	0
Low-Risk Non-ASD	27	2	1	12	12	0	0
36 months							
ASD	1	0	1	0	0	0	0
High-Risk Non-ASD	22	0	3	10	1	2	6
Low-Risk Non-ASD	14	0	0	10	1	0	3

Note. ASD = Autism Spectrum Disorder

Supplemental Table S4. Age in months at each visit by outcome group.

Visit	ASD		High-Risk Non-ASD		Low-Risk Non-ASD		<i>p</i>
	Mean	Range	Mean	Range	Mean	Range	
	(SD)		(SD)		(SD)		
9 months	9.2 (0.2)	8.9–9.7	9.2 (0.3)	8.7–10.2	9.1 (0.2)	8.6–9.7	0.07
12 months	12.1 (0.3)	11.5–12.5	12.2 (0.3)	11.5–12.9	12.2 (0.2)	11.5–12.6	0.33
15 months	15.0 (0.2)	14.6–15.5	15.1 (0.3)	14.5–15.8	15.2 (0.3)	14.5–15.7	0.09
18 months	18.2 (0.3)	17.9–19.1	18.1 (0.3)	17.6–18.7	18.1 (0.3)	17.7–18.7	0.56
24 months	24.4 (0.4)	23.7–24.8	24.2 (0.4)	23.3–25.3	24.1 (0.4)	23.3–24.9	0.14
36 months	36.5 (0.9)	34.0–38.3	36.3 (0.6)	35.0–37.6	36.6 (1.0)	34.8–40.9	0.16

Note. ASD = Autism Spectrum Disorder; SD = Standard Deviation. Overall group differences in continuous age at visit were assessed using one-way analysis of variance.

Supplemental Table S5. Estimated group means and 95% confidence intervals for unusual visual inspection, rotate, and spin at each visit age.

	ASD (<i>n</i> = 17)	High-Risk Non-ASD (<i>n</i> = 72)	Low-Risk Non-ASD (<i>n</i> = 58)
	Estimated Mean (95% CI)	Estimated Mean (95% CI)	Estimated Mean (95% CI)
Unusual visual inspection			
9 months	0.48 (0.26 – 0.86) ^a	0.22 (0.14 – 0.34) ^b	0.19 (0.11 – 0.33) ^b
12 months	0.50 (0.33 – 0.77) ^a	0.17 (0.12 – 0.25) ^b	0.13 (0.09 – 0.20) ^b
15 months	0.52 (0.35 – 0.78) ^a	0.14 (0.10 – 0.20) ^b	0.10 (0.06 – 0.15) ^b
18 months	0.53 (0.34 – 0.84) ^a	0.12 (0.08 – 0.18) ^b	0.07 (0.04 – 0.12) ^b
24 months	0.53 (0.31 – 0.92) ^a	0.09 (0.05 – 0.14) ^b	0.05 (0.03 – 0.10) ^b
36 months	0.43 (0.21 – 0.87) ^a	0.06 (0.02 – 0.16) ^b	0.07 (0.03 – 0.15) ^b
Rotate			
9 months	0.45 (0.22 – 0.90)	0.42 (0.30 – 0.59)	0.49 (0.37 – 0.65)
12 months	0.49 (0.30 – 0.80)	0.40 (0.31 – 0.50)	0.38 (0.31 – 0.46)
15 months	0.51 (0.33 – 0.79) ^a	0.37 (0.30 – 0.46) ^{a,b}	0.31 (0.25 – 0.38) ^b
18 months	0.51 (0.32 – 0.82) ^a	0.34 (0.26 – 0.43) ^{a,b}	0.26 (0.20 – 0.34) ^b
24 months	0.46 (0.25 – 0.82) ^a	0.26 (0.19 – 0.36) ^{a,b}	0.21 (0.15 – 0.30) ^b
36 months	0.23 (0.11 – 0.45)	0.13 (0.07 – 0.23)	0.24 (0.14 – 0.39)
Spin			
9 months	0.05 (0.01 – 0.24) ^a	0.29 (0.17 – 0.51) ^b	0.36 (0.19 – 0.69) ^b
12 months	0.38 (0.18 – 0.79)	0.63 (0.45 – 0.88)	0.52 (0.33 – 0.83)
15 months	1.20 (0.64 – 2.23)	0.80 (0.53 – 1.20)	0.66 (0.41 – 1.05)
18 months	1.99 (1.10 – 3.60) ^a	0.70 (0.44 – 1.12) ^b	0.75 (0.46 – 1.22) ^b

24 months	1.57 (0.54 – 4.59) ^a	0.34 (0.15 – 0.74) ^b	0.81 (0.44 – 1.47)
36 months	0.74 (0.20 – 2.77)	1.03 (0.57 – 1.87)	1.12 (0.67 – 1.87)

Note. ASD, autism spectrum disorder, CI = confidence interval.

^{a,b,c}Different subscripts indicate significant differences ($p < 0.05$) between groups.

From mixed-effects negative binomial regression models with fixed effects for outcome group (ASD, High-Risk Non-ASD, Low-Risk Non-ASD); linear, quadratic, and cubic (for spin) age (in years, centered at 9 months); and interactions between age effects terms and group and random effects for child-specific intercept and linear slope. Log transformed task duration (in minutes) was used as an offset in the model. The estimates and confidence intervals are rescaled to the original scale.

Supplemental Table S6. Sensitivity and specificity for presence of unusual visual inspection at each age without imputation (using complete case data).

Age	ASD		All Non-ASD		Low-Risk Non-ASD		ASD vs. All Non-ASD		ASD vs. Low-Risk Non-ASD	
	True	False	False	True	False	True	Sensitivity	Specificity	Sensitivity	Specificity
	Positive	Negative	Positive	Negative	Positive	Negative	(95% CI)	(95% CI)	(95% CI)	(95% CI)
9 mos	10	6	41	70	16	34	62.5 (35.4-84.8)	63.1 (53.4-72.0)	62.5 (35.4-84.8)	68.0 (53.3-80.5)
12 mos	9	5	38	68	14	32	64.3 (35.1-87.2)	64.2 (54.3-73.2)	64.3 (35.1-87.2)	69.6 (54.3-82.3)
15 mos	11	4	30	75	12	36	73.3 (44.9-92.2)	71.4 (61.8-79.8)	73.3 (44.9-92.2)	75.0 (60.4-86.4)
18 mos	8	4	20	74	8	31	66.7 (34.9-90.1)	78.7 (69.1-86.5)	66.7 (34.9-90.1)	79.5 (63.5-90.7)
24 mos	6	3	11	51	7	24	66.7 (29.9-92.5)	82.3 (70.5-90.8)	66.7 (29.9-92.5)	77.4 (58.9-90.4)
36 mos	11	5	17	77	10	34	68.8 (41.3-89.0)	81.9 (72.6-89.1)	68.8 (41.3-89.0)	77.3 (62.2-88.5)

Note. ASD, autism spectrum disorder; CI, confidence interval. Non-ASD = High-Risk Non-ASD and Low-Risk Non-ASD. Two separate analyses were conducted for each visit, one comparing the ASD vs. combined Non-ASD groups (i.e., Low-Risk and High-Risk Non-ASD) and one comparing the ASD vs. Low-Risk Non-ASD groups. Sensitivity is the percentage of those diagnosed at 36 months who engaged in any unusual visual inspection at the specified visit, calculated as $\text{True Positives} / (\text{True Positives} + \text{False Negatives}) \times 100$. Specificity is the percentage of those without a diagnosis at 36 months who did not engage in unusual visual inspection at the specified visit, calculated as $\text{True Negatives} / (\text{True Negatives} + \text{False Positives}) \times 100$.