

**Research Question 4: Are there differences in the rate and sequence of development among sub-groups of children with varying levels of visual function?**

***Statistical Methods***

In addition to the analyses on visual function conducted in previous research questions, the Battelle and Vineland scores were used to analyze development among sub-groups of children with varying levels of visual function.

***Presentation of Results***

**Table 72. One-Way Analysis of Variance for Vineland and Batelle Total Scores by Visual Functioning for Age Groups**

Instrument	Age group	Within df	F	p
Battelle	0-5	20	0.56	0.6489
Vineland	0-5	20	3.57	0.0324*
Battelle	6-11	124	5.37	0.0018*
Vineland	6-11	124	4.01	0.0093*
Battelle	12-17	8	1.77	0.2201
Vineland	12-17	8	0.58	0.4676
Battelle	18-23	83	5.42	0.0020*
Vineland	18-23	85	3.28	0.0245*
Battelle	24-35	94	4.00	0.0100*
Vineland	24-35	86	2.39	0.0729
Battelle	36-47	52	2.43	0.0757
Vineland	36-47	45	1.24	0.3063
Battelle	48-59	23	6.15	0.0032*
Vineland	48-59	19	3.34	0.0412*

\* Significant at .05 level.

***Table 73. Descriptive Statistics for Battelle and Vineland by Age Group and Visual Functioning.***

Age Group	Visual Functioning	Battelle			Vineland		
		Mean	N	s.d.	Mean	N	s.d.
0-5 mos	No light perception	44.33	6	17.91	21.33	6	7.20
	Light perception	39.00	4	15.43	17.50	4	8.96
	Severe low vision	45.00	4	9.49	18.67	3	3.79
	Moderate low	50.60	10	16.74	28.73	11	7.11
6-11 mos	No light perception	57.86	42	29.52	31.95	43	14.38
	Light perception	79.08	12	20.74	46.90	10	12.64
	Severe low vision	75.91	32	37.27	38.16	32	18.99
	Moderate low	86.36	42	36.02	43.33	43	19.12
12-17 mos	No light perception	121.67	6	10.76	69.50	6	7.06
	Light perception	140.25	4	32.49	75.50	4	17.69
18-23 mos.	No light perception	107.82	28	56.11	60.39	31	30.39
	Light perception	158.71	7	55.19	77.67	6	34.19
	Severe low vision	145.43	21	68.43	66.91	21	33.85
	Moderate low	170.29	31	59.76	85.87	31	35.36
24-35 mos.	No light perception	135.42	33	69.08	78.43	30	43.84
	Light perception	178.20	10	76.08	90.90	10	39.00
	Severe low vision	158.33	21	90.00	78.05	19	46.35
	Moderate low	200.12	34	78.84	105.71	31	45.99
36-47 mos.	No light perception	161.94	18	97.55	90.00	13	59.08
	Light perception	230.60	5	119.33	126.60	5	70.96
	Severe low vision	180.13	15	118.37	101.13	15	26.98
	Moderate low	250.17	18	99.82	131.63	16	61.80
48-59 mos.	No light perception	165.22	9	89.05	86.88	8	51.97
	Light perception	161.50	2	149.20	81.50	2	78.49
	Severe low vision	183.17	6	153.48	81.20	5	80.20
	Moderate low	381.30	10	126.86	187.25	8	88.11

***Table 74. Scheffe Pairwise Comparisons at .05 Level of Significance for Vineland and Battelle with Significant p in ANOVAs by Visual Functioning.***

Age Group	Assessment	Visual Functioning (with Mean)	Homogenous Groups
0-5 mos	Vineland	Moderate low vision (28.73)	
		No light perception (21.33)	
		Severe low vision (18.67)	
		Light perception (17.50)	
6-11 mos	Battelle	Moderate low vision	
		Light perception	
		Severe low vision	
		No light perception	..
	Vineland	Light perception (46.90)	There is a significant difference between "no light perception" and "moderate low vision."
		Moderate low vision (43.33)	
		Severe low vision (38.16)	
		No light perception (31.95)	
18-23 mos	Battelle	Moderate low vision (170.29)	
		Light perception (158.71)	
		Severe low vision (145.43)	
		No light perception (107.82)	..
	Vineland	Moderate low vision (85.87)	
		Light perception (77.67)	
		Severe low vision (66.91)	
		No light perception (60.387)	..
24-35 mos	Battelle	Moderate low vision (200.12)	
		Light perception (178.20)	
		Severe low vision (158.33)	
		No light perception (135.42)	..
48-59 mos	Battelle	Moderate low vision (381.30)	There are significant differences between (1) "moderate low" and "severe low" and (2) "no light perception."
		Severe low vision (183.17)	
		No light perception (165.22)	
		Light perception (161.50)	
	Vineland	"moderate low" and "no light perception" (86.88)	
		Moderate low vision (187.25)	
		No light perception (86.88)	
		Light perception (81.50)	
		Severe low vision (81.20)	

## ***Discussion of Visual Functioning Results***

The most frequent difference in Battelle and Vineland total scores for the four visual functioning groups was between those with moderate vision and those with no light perception. The moderate vision group scored significantly higher than the group of participants with no light perception.

**Research Question 5: Are there differences in the rate and sequence of development between groups of children who are visually handicapped only and those who have one or more additional impairments?**

## ***Statistical Methods***

In addition to the analyses conducted previously using milestones, the Battelle scores were used to analyze development as it pertains to the children with one or more additional impairments and children with no additional impairments. Included in the analysis conducted were tests (Kruskal-Wallis) of milestone attainment as it pertains to risk which was a classification according to length of hospital stay after birth. The RISK variable ranged from 1 to 3 (lowest to highest risk).

The Vineland and Battelle assessment instruments were used to measure rate of development. Scores for these two instruments were compared over age groups for the three levels of additional impairment (0 = none, 1 = mild, and 2 = severe). One way ANOVA was used in all analyses. Results are presented for the milestones for which there were statistically significant differences.

## ***Presentation of Results for Milestones***

***Table 75. Kruskal-Wallis One-way Nonparametric Analysis of Variance and Parametric Analysis of Variance Applied to Ranks of Milestone Attainment by Risk Level***

Milestone	K-W Statistic	Chi <sup>2</sup> Approximated p	Source	Df	F	p
7	11.92	0.0076	Within	90	4.41	0.0062
8	12.42	0.0061	Within	122	4.49	0.0052
11	9.60	0.0223	Within	63	3.57	0.0187
15	12.68	0.0054	Within	34	5.91	0.0023

***Table 76. Pairwise Comparisons of Mean Ranks of Milestones Risk Level.***

Milestone	Risk Level	Mean Rank	Homogenous Groups	Sample Size	Comments Regarding Homogenous Groups
7	3	73.58		6	There is a significant difference in milestone attainment between two groups: the group with highest risk and the group with lowest risk.
	2	65.25		10	
	1	45.84		22	
	0	42.19	..	56	
8	3	89.00		7	There is a significant difference between the mean attainment of the milestone for those with risk = 0 and those with risk = 2.
	2	88.50		12	
	1	66.57		30	
	0	56.09		77	
11	2	56.20		5	There is a significant difference between the mean of milestone attainment for those with risk = 0 and those with risk = 2.
	1	39.42		13	
	3	38.00		2	
	0	29.97	..	47	
15	3	35.00		2	There is a significant difference between the mean of milestone attainment for those with risk = 0 and those with risk = 2.
	2	32.88		4	
	1	20.56		8	
	0	15.63		24	

***Discussion of Milestone Results***

There were differences in milestone attainment as tested by Kruskal-Wallis for RISK levels for Milestones 7 (feeds self), 8 (c/v sounds), 11 (walks 10 ft.), and 15 (2-word utterances). Those at risk level = 2 attained milestones later than those with risk level = 0. Sizes of the group with risk level = 3 were quite small, which may have impacted comparisons involving participants with risk level = 3.

***Presentation of Results for Rate of Development as Measured by the Battelle and Vineland***

**Table 77. One-Way Analysis of Variance for Vineland and Battelle Total Scores by Degree of Additional Impairment.**

Instrument	Age Group	Within df	F	<i>p</i>
Vineland	6-11	148	35.14	0.0000
Battelle	6-11	149	38.33	0.0000
Vineland	12-17	87	29.86	0.0000
Battelle	12-17	95	38.04	0.0000
Vineland	18-23	94	27.94	0.0000
Battelle	18-23	95	29.56	0.0000
Vineland	24-35	89	36.42	0.0000
Battelle	24-35	98	33.69	0.0000
Vineland	36-47	48	11.39	0.0001
Battelle	36-47	55	13.62	0.0000
Vineland	48-59	21	13.28	0.0002
Battelle	48-59	25	15.25	0.0000

**Table 78. Descriptive Statistics for Battelle and Vineland by Age Group and Degree of Additional Impairment.**

Age Group	Degree of Additional Impairment	Battelle			Vineland		
		Mean	N	s.d.	Mean	N	s.d.
6-11	0	97.82	56	26.50	49.74	57	17.0
	1	75.74	39	30.53	39.77	39	14.53
	2	50.84	57	29.06	26.07	55	12.83
12-17	0	138.09	35	34.84	74.74	31	20.42
	1	111.18	22	30.91	58.86	22	17.99
	2	72.90	41	31.74	39.03	37	18.52
18-23	0	192.91	35	37.55	98.55	33	21.93
	1	144.58	19	49.76	68.40	20	27.89
	2	103.36	44	60.76	51.23	44	30.92
24-35	0	238.06	32	59.64	130.93	28	29.35
	1	165.67	18	71.43	99.21	14	40.57
	2	119.92	51	63.59	62.82	50	34.74
36-47	0	299.80	15	82.91	167.55	11	47.08
	1	212.91	11	83.32	135.90	10	58.15
	2	151.81	32	96.63	81.97	30	55.04
48-59	0	401.50	6	139.53	198.50	4	94.78
	1	346.33	6	97.97	186.50	6	59.23
	2	152.19	16	96.11	67.29	14	45.35

**Table 79. Scheffe Pairwise Comparisons at .05 Level of Significance for Vineland and Battelle with Significant p in ANOVAs by Degree of Additional Impairment.**

Age Group	Assessment	Degree of Additional Impairment	Homogeneous Groups
6-11, 12-17 and 24-35 mos.	Vineland	0	
		1	..
		2	...
6-11, 12-17, 18-23, and 24-35 mos.	Battelle	0	
		1	..
		2	...
18-23, 36-47, and 48-59	Vineland	0	
		1	
		2	..
36-47	Battelle	0	
		1	
		2	..
48-59	Battelle	0	
		1	
		2	..

## ***Discussion of Results***

There was a significant difference in rate of development as measured by the Vineland and Battelle for all age groups except 0-5 months over the dimension of additional impairment. Vineland and Battelle scores were higher for the group with no additional impairment than the group with severe additional impairment for all age groups. In the oldest age group (48-59 months) those with mild additional impairment were more like those with no additional impairment in rate of development than those with severe additional impairment. Since there was also some cross-over of groups in the immediately previous group (36-47 months), it is possible that what is happening is that the effects of mild impairment on development begin to disappear over time but the effects of severe impairment on development do not.

In age groups 6-11 months and 12-17 months there was a significant difference in Vineland and Battelle scores for the three groups with lower scores associated with additional impairment. In age group 18-23 months, all three groups scored significantly different on the Battelle but on the Vineland, the group consisting of mild and severe disability scored significantly different than the group with no additional impairment. In age group 24-35 months, all three groups scored significantly different on both assessments. In age group 36-47 months, those with no additional and mild additional impairment scored significantly higher than those with severe additional impairment on the Vineland while on the Battelle, one can conclude that those with no additional impairment scored higher than those with severe additional impairment. In age group 48-59 months, those with no additional and mild additional impairment formed one group and scored higher on both the Vineland and the Battelle than the group with severe additional impairment.

**Research Question 6: Are there differences in the rate and sequence of development among children who differ along various social cultural, or other familiar variables?**

***Statistical Methods***

Analyses of the milestones was conducted using procedures used previously in this study. Battelle scores were also analyzed.

***Discussion of Results***

No differences in rate and sequence of milestone attainment as measured in this study were evident. Likewise, these variables did not result in statistically significant differences in rate and sequence as measured by the Battelle.

**Research Question 7: What differences in rate and sequence of development are associated with infant temperament styles?**

***Statistical Methods***

The Parenting Stress Index was used to study differences in rate of development. Since infant temperament scores vary from age group to age group as measured by the Infant Temperament Scale, the Child Subscale, Parent Subscale, and Total score on the Parenting Stress Index were used to assess the differences in rate of development, but not sequence. A method for stabilizing temperament measure across time would be needed to determine milestone sequence acquisition.

The Parenting Stress Index is a screening assessment with three categories for the total score: high score, low score, and normal score. A high score is one in the 90th percentile of the norming population and a low score is in the 5th percentile. Child and parent subscale scores are either high or normal and high is in the 90th percentile of the norming population. High parent and child subscale scores indicate families under the highest stress. Low scores can mean there are no problems within the family or a low score can be an indication of problems within the family unit. High child subscale scores are associated with children who display qualities which make it difficult for parents to fulfill their parenting roles. The child characteristics comprising the child

domain including (1) child adaptability/plasticity, (2) acceptability of child to parent, (3) child demandingness, (4) child mood, (5) child distractibility/hyperactivity, and (6) child reinforcement of parent which (except for #2) are all associated directly or indirectly with child temperament.

The frequency distribution of total and subscale scores was compiled (Table 80). Correlations between scores over age groups were computed beginning with the 12-17 month age group (sample sizes were too small to compare for earlier age groups). Developmental rate was analyzed using the Vineland total score and the Battelle total score. The two-sample t-test was used to analyze the Vineland and Battelle for the child and parent subscales: 1 = normal score and 2 = high score. One way analysis of variance was used to analyze both tests for the total score which was at three levels: 0 = low score; 1 = normal score, and 2 = high score.

**Presentation of Results**

**Table 80: Frequency Distribution of Parenting Stress Index Scores (Total Score, Child Subscale, and Parent Subscale)**

Age Group	Total Scores			Child Subscale		Parent Subscale		Both
	High	Normal	Low	High	Normal	High	Normal	High <sup>2</sup>
0-5	5 (18.5%)	22 (81.5%)	0 (0.0%)	2 (10.7%)	25 (89.3%)	3 (10.7%)	25 (89.3%)	1 (3.7%)
6-11	23 (24.7%)	69 (74.2%)	1 (1.1%)	17 (18.3%)	76 (81.7%)	12 (12.9%)	81 (87.1%)	1 (1.1%)
12-17	17 (21.0%)	57 (70.4%)	7 (8.6%)	16 (19.8%)	65 (80.2%)	10 (12.3%)	71 (87.7%)	6 (7.4%)
18-23	12 (24.0%)	35 (70.0%)	3 (6.0%)	13 (25.0%)	39 (75.0%)	8 (16.0%)	42 (84.0%)	6 (12.0%)
24-35	20 (28.6%)	44 (62.9%)	6 (8.6%)	21 (30.0%)	49 (70.0%)	9 (12.9%)	61 (87.1%)	7 (10.0%)
36-47	5 (13.9%)	28 (77.8%)	3 (8.3%)	6 (16.7%)	30 (83.3%)	4 (11.1%)	32 (88.9%)	2 (5.5%)
48-59	4 (23.5%)	12 (70.6%)	1 (5.9%)	6 (35.3%)	11 (64.7%)	2 (11.8%)	15 (88.2%)	1 (5.9%)

Table 80 NOTE. <sup>2</sup> Both Parent subscale and Child subscale high. Percent is percent of total assessed in age group.

**Correlations**

Correlations between Parenting Stress Index total scores, parent subscale, and child subscale for given age groups with given sample sizes are indicated in Table 81..

***Table 81. Parenting Stress Index Correlations***

Age Groups	Subscale	Correlation	N
12-17 mos and 18-23 mos	Parent	.22	21
	Child	.73	22
	Total:	.66	21
18-23 mos and 24-35 mos	Parent	.62	32
	Child	.67	33
	Total	.71	32
24-35 mos and 36-47 mos	Parent	.57	28
	Child	.77	28
	Total	.64	28
36-47 mos and 48-59 mos	Parent	.76	10
	Child	.65	10
	Total	.76	10

***Table 82. Two-Sample T Tests for Vineland Total Score by Parent Stress Subscale Scores at 0-5 Months***

Parent Stress Subscale	Mean	Sample Size	s.d.	S.E.
1	22.211	19	6.321	1.4501
2	38.000	2	11.314	8.0000

Null Hypothesis: Difference = 0.000

Alternative Hypothesis: Difference <> 0.000

Assumption	T	DF	$p$
Equal variances	-3.18	19	0.0049
Unequal variances	-1.94	1.1	0.2905

	F	NUM DF	DEN DF	$p$
Tests for Equality of Variances	3.20	1	18	0.0903

Cases included = 21 Missing cases = 181

***Table 83. Two-Sample T Tests for Vineland Total Score by Child Stress Subscale Score at 6-11 Months***

Child Stress Subscale	Mean	Sample Size	s.d.	S.E.
1	41.188	69	17.735	2.1351
2	27.333	15	17.216	4.4451

Null Hypothesis: Difference = 0.000

Alternative Hypothesis: Difference <> 0.000

Assumption	T	DF	<i>p</i>
Equal variances	2.76	82	0.0072
Unequal variances	2.81	21.0	0.0105

	F	NUM DF	DEN DF	<i>p</i>
Tests for Equality of Variances	1.06	68	14	0.4799

Cases included = 84 Missing cases = 118

***Table 84. Two-Sample T Tests for Battelle Total Score by Child Stress Subscale at 6-11 Months***

Child Stress Subscale	Mean	Sample Size	s.d.	S.E.
1	80.100	70	33.184	3.9663
2	45.250	16	32.310	8.0775

Null Hypothesis: Difference = 0.000

Alternative Hypothesis: Difference <> 0.000

Assumption	T	DF	<i>p</i>
Equal variances	3.81	84	0.0003
Unequal variances	3.87	22.8	0.0008

	F	NUM DF	DEN DF	<i>p</i>
Tests for Equality of Variances	1.05	69	15	0.4822

Cases included = 86 Missing cases = 116

## ***Discussion of Results***

Parenting Stress Index total scores indicate a higher percentage of high scores than in the norming population (13.9% to 28.6% over all age groups). There is a larger percentage of higher child subscale scores than in the normed population except in age group 0-5 (10.7%). The percentage of high child subscale scores for the remaining age groups varies from 16.7% to 35.3%. Although there is a higher percentage of high parent subscale scores, the percentages are not very much higher (10.7% to 16.0%). The high total scores are primarily due to the child subscale.

In the 0-5 month age group, there was a significant difference in the Vineland total scores for those with high parent stress subscale scores compared to those with normal parent stress subscale scores. The mean Vineland total score was higher for the normal group compared to the high-stress group which implies that the rate of development is different in the two groups. There were only 3 families with high parenting scores with Battelle scores so meaningful analysis comparable to that which was done with the Vineland was not possible for this age group. One of the two families in the high stress group had both high parent and high child scores. There was no significant difference in developmental rates (Battelle and Vineland total scores) for the total parenting stress index score or for the child subscale score.

In the 6-11 month age group, there was a significant difference in both the Battelle and Vineland total scores for the child subscale of the Parenting Stress Index. Both the Battelle and Vineland scores were higher for the normal stress group than for the high stress group. There was a difference in rate of development as measured by the Battelle and Vineland as measured by the child subscale.

There were no significant differences in Battelle and Vineland scores for the remaining five age groups categorized according to total score, parent subscale score, and child subscale score on the Parenting Stress Index.