

Research & Curriculum Development for Early Childhood Education

The PediNaturalSM Predictor of Standardized Test Scores:

An 8-Year Longitudinal Assessment Study

Preschool-3 Thru 5th Grade

Research by: Dr. Terica Lynn Swangin, ND

Abstract

The purpose of this study was to examine the feasibility of using kindergarten performance to predict future standardized testing results and verify that preschool (formal or informal) played an active role in kindergarten achievement. The kindergarten final cumulative classroom grades and the 5th grade *TerraNova* CTBS national standardized test scores from eighty-eight (n=88) 5th grade students (50 females, 38 males, and 16 minorities) were analyzed to determine if there was a significant change in skill level (based on the PediNaturalSM Skill Assessment Scale) between kindergarten performance and the 5th grade *TerraNova*. This study found that an average of 56% of the children researched who scored within a particular skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova*; also, an average of 31% who scored within a particular skill level in the kindergarten decreased skill levels on the 5th grade *TerraNova*. Additionally, 59% of those who received some form of preschool education (formal or informal) scored higher in kindergarten than those that did not. However, on average, the minority students scored lower than non-minority students regardless of preschool education exposure.

Introduction

The State of New Jersey Abbott mandate and the federal No Child Left Behind Act (NCLB) focus on closing the educational gap between disadvantaged and advantaged students using early childhood assessment and standardized test scores to measure accountability and academic achievement. In light of this, community-based preschool providers are being called upon to deliver a high quality preschool education. The preschool / kindergarten years are essential to life long learning; in fact, according to Glenn Doman (2005), by the age of six (traditionally the end of the kindergarten), the brain reaches full neurological maturity. The PediNaturalSM Predictor of Standardized Test Scores: An 8-Year Longitudinal Assessment (Preschool-3 Thru 5th Grade) Study verifies that a preschool education (formal or informal) builds the foundation for kindergarten achievement and shows that kindergarten performance has a direct correlation with standardized testing.

Method

Research Design: PediNaturalSM used a quantitative historical-comparative design to answer the research question: “Can kindergarten performance be used as a valid predictor of future standardized testing results?” The approach consisted of establishing two separate trends: 1. whether kindergarten performance mirrored future standardized testing results and 2. whether preschool plays an active role in kindergarten performance. PediNaturalSM separated the sample population into two classifications: those who had a

preschool education (formal or informal) and those who had none. It used the kindergarten final cumulative classroom grades and the 5th grade *TerraNova* CTBS (Form A) national test scores as its dependent measure.

For uniformity, all results were converted into grade point average (GPA) scores based on a 4.0 scale and the findings were categorized according to the PediNaturalSM Skill Assessment Scale. PediNaturalSM documented the performance of the students from each class in both stages of their academic career (kindergarten GPA and 5th grade *TerraNova* GPA) and then analyzed the results to determine the magnitude of preschool influence and the feasibility of using kindergarten grades as a prediction model. All statistical assumptions were verified.

Participants: Eighty-eight (n = 88) 5th grade students (50 females, 38 males, and 16 minorities) were chosen based on the availability of their complete school records dating back to kindergarten. Additionally, 65 students attended a formal preschool throughout 6 New Jersey counties, 3 other U.S. states, and 3 different countries; 15 students received various forms of preschool homeschooling; and 8 received no form of preschool education. PediNaturalSM believes that this sample population represents all U.S. students because the data was compiled from a multicultural and economically diverse suburban elementary school, housed in a large New Jersey public school district.

Instruments: The following three measures were used:

1. *The TerraNova CTBS Test* is a 1996 norm-referenced, standardized assessment designed to measure the achievement of the basic skill subjects (Reading/Language Arts, Mathematics, Science, Social Studies, Word Analysis, Vocabulary, Language Mechanics Mathematics Computation, and Spelling) most common to curricula throughout the United States.
2. The final cumulative classroom grades for kindergarten.
3. *PediNaturalSM Skill Assessment Scale* is arranged to categorize skill levels based on a 4.0 scale calculation.
 - a. Mastery 3.5 – 4.0
 - b. Above Average 3.0 – 3.4
 - c. Average 2.0 – 2.9
 - d. Below Average 1.0 – 1.9
 - e. Limited 0.0 – 0.9

Results

Part A

When the kindergarten scores were matched with the 5th grade *TerraNova* standardized test scores the results were as follows:

1. 62% of the students who scored within the Mastery skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova* test.

2. 50% of the students who scored within the Above-Average skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova* test.
3. 46% of the students who scored within the Average skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova* test.
4. 32% of the students who scored within the Below Average skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova* test. Fifty-two percent {52%} dropped to the Limited skill level.
5. 90% of the students who scored within the Limited skill level in the kindergarten scored within that same skill level on the 5th grade *TerraNova* test.

The majority of the students who scored within one of the skill level categories in the kindergarten remained in that same category on the 5th grade *TerraNova* standardized test (with the exception of the Below Average scores, where the majority dropped to the Limited skill category). The students who did not remain in the same skill level either increased 1 to 2 skill levels or decreased 1 to 2 skill levels [Ref. Table 1]. No one increased or decreased 3 or more levels.

Using a 95% confidence level, a two-tailed 2-sample paired t-test that assumed equal variances was used to analyze this dataset [Ref. Appendix 1]. When viewing a histogram of the paired differences, no evidence was found to contradict the normality assumption.

Part B

Of the students (80 of 88) who attended preschool (formal or informal), 26% (21 students) performed at Mastery/Above-Average skill levels and 74% (59 students) performed below Mastery/Above-Average skill levels in the kindergarten [Ref. Chart 1]. On the 5th grade *TerraNova* test, 33% (26 students) performed at Mastery/Above-Average skill levels and 67% (54 students) performed below Mastery/Above-Average levels [Ref. Chart 2].

Of the students (8 of 88) who received no form of pre-school (formal or informal), 0% (0 students) performed at Mastery/Above-Average skill levels and 100 % (8 students) performed below Mastery/Above-Average skill levels in the kindergarten [Ref. Chart 1]. On the 5th grade *TerraNova* test, 0% (0 students) performed at Mastery/Above-Average skill levels and 100% (8 students) performed below Mastery/Above-Average levels [Ref. Chart 2].

Using a 95% confidence level, a one-sided 2-sample t-test that assumed equal variances was used to analyze this dataset [Ref. Appendix 2]. Using a histogram, no evidence was found to contradict the normality assumption. The two classifications: those who had a preschool education (formal or informal) and those who had none presumed the following:

1. All classification values are independent of the kindergarten GPA scores.

2. All formal preschools provided some form of quality education before kindergarten.
3. Some form of quality education before kindergarten can also be given at home (via. homeschool, home based preschools, home based daycares, etc.)

Part C

Of the minority students (12 of 16) who attended preschool (formal or informal), 8 % (1 student) performed at Mastery/Above-Average skill levels and 92% (11 students) performed below Mastery/Above-Average skill levels in the kindergarten [Ref. Chart 3]. On the 5th grade *TerraNova* test, 17% (2 students) performed at Mastery/Above-Average levels and 83% (10 students) performed below Mastery/Above-Average levels [Ref. Chart 4].

Of the minority students (4 of 16) who received no form of preschool (formal or informal), 0% (0 students) performed at Mastery/Above-Average skill levels and 100% (4 students) performed below Mastery/Above-Average skill levels in the kindergarten [Ref. Chart 3]. On the 5th grade *TerraNova* test, 0% (0 students) performed at Mastery/Above-Average skill levels and 100% (4 students) performed below Mastery/Above-Average levels [Ref. Chart 4].

The kindergarten GPA scores and the 5th grade *TerraNova* test GPA scores of the minority students were compared with those of the non-minority students. Using a 95% confidence level, a one-sided 2-sample t-test that assumed equal variances was used to

analyze this dataset [Ref. Appendix 3]. Based on a histogram, the normality assumption was verified.

Implications

First, the results of the two-tailed 2-sample paired t-test indicate that there is no evidence to support a change in GPA scores between kindergarten and the 5th grade *TerraNova*. This was further seen when a regression model was calculated. Using a regression model, PediNaturalSM has the capability to predict 5th grade standardized test GPA scores based on kindergarten GPA scores. The prediction can be estimated for groups of students at a specific kindergarten GPA score, by using a confidence interval.

Second, based on a 2-sample t-test, this study supports evidence that children who had some type of quality preschool education (formal or informal) prior to entering kindergarten performed better (higher kindergarten GPA scores) than those children that received no preschool education before kindergarten. Therefore, a preschool education (formal or informal) does play an active role in kindergarten achievement.

Third, the results from a 2-sample t-test reveal evidence that the minority students averaged lower (kindergarten and 5th grade *TerraNova*) GPA scores than the non-minority students.

Based on the total observations and statistical analysis of this study, PediNaturalSM asserts with 95% confidence that kindergarten performance could be used as a valid predictor of future standardized testing results.

Closing Remarks

“The world has regarded brain growth and development as if it were predetermined and unalterable. Instead, brain growth and development is a dynamic and ever-changing process...that can be stopped...slowed...(or) speeded (up)” (Doman, 2005, p. 200). Adhering to Abbott and NCLB standards, the PediNaturalSM Assessment and Community Learning Center can be a resource in standardizing a high quality, balanced curriculum among community-based preschools, childcare centers, and home school providers. The opportunity to study under a high quality, balanced curriculum will allow the whole child to master the established milestones that are imperative to solid learning foundations. This center can be used as a model of best practice for early childhood learning in urban communities where high levels of poverty often hinder educational excellence. Its researched-based techniques can be the key to closing the educational gap for society’s underserved student population.

References

Abbott v. Burke V, 153 N.J. 480, 710 A.2d 450 (1998).

Abbott v. Burke VI, 163 N.J. 95, 748 A.2d 82 (2000).

Abbott v. Burke VIII, 170 N.J. 537, 790 A.2d 842 (2002).

CTB/McGraw-Hill. (1996). TerraNova CTBS (Form A). Monterey, CA:

CTB/McGraw-Hill.

Doman, G. (2005). What to do about your brain-injured child. Square One

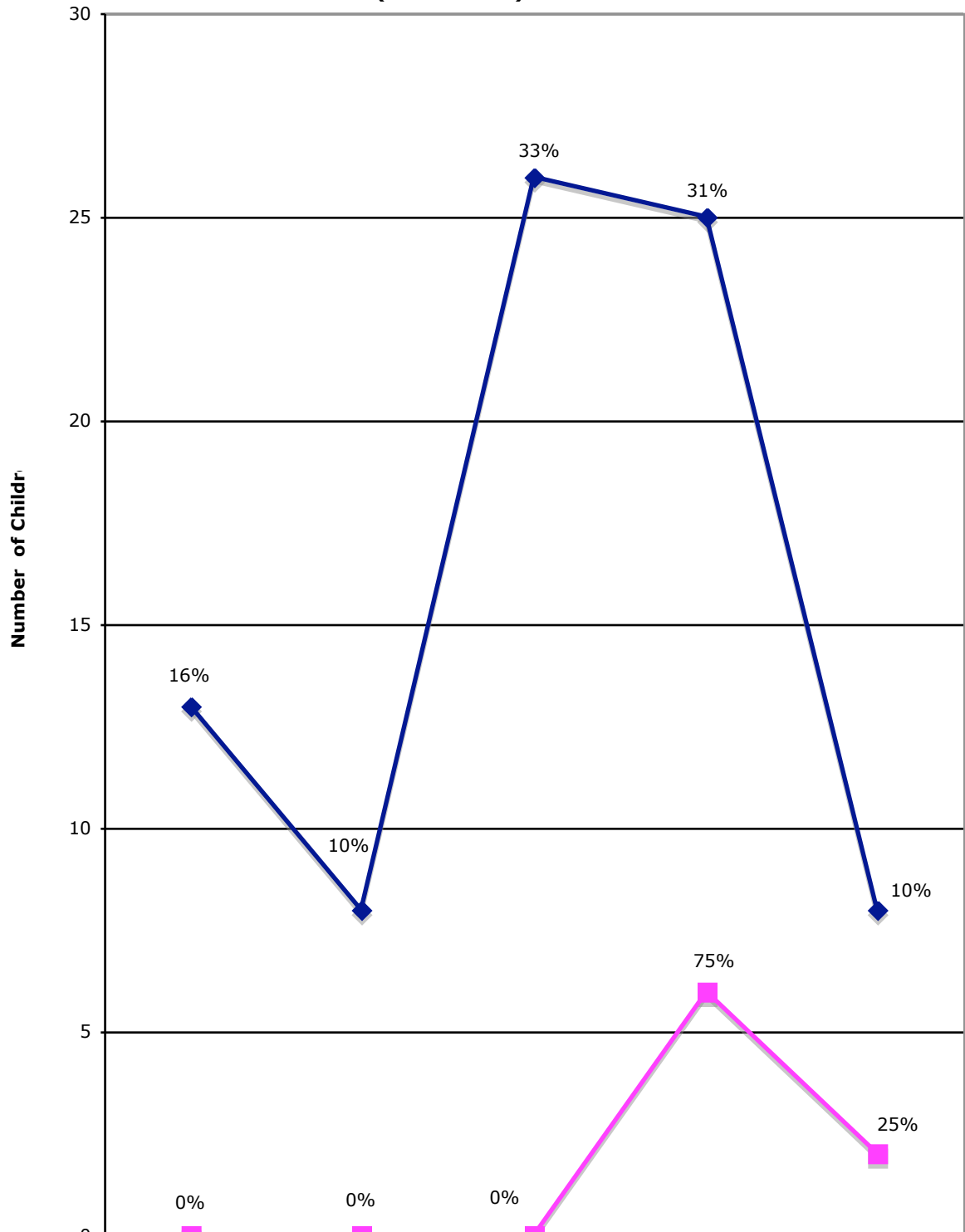
Publishers, Garden City Park, NY. P. 116, 133-137, 200

U.S. Department of Education. (2002). No child left behind act of 2001 (Pub. L. 107-

110). Washington, DC: U.S. Government Printing Office.

**The PediNaturalSM Predictor of Standardized Test Scores:
An 8-Year Longitudinal Assessment Study
Preschool-3 Thru 5th Grade
Years (1997 - 2004)**

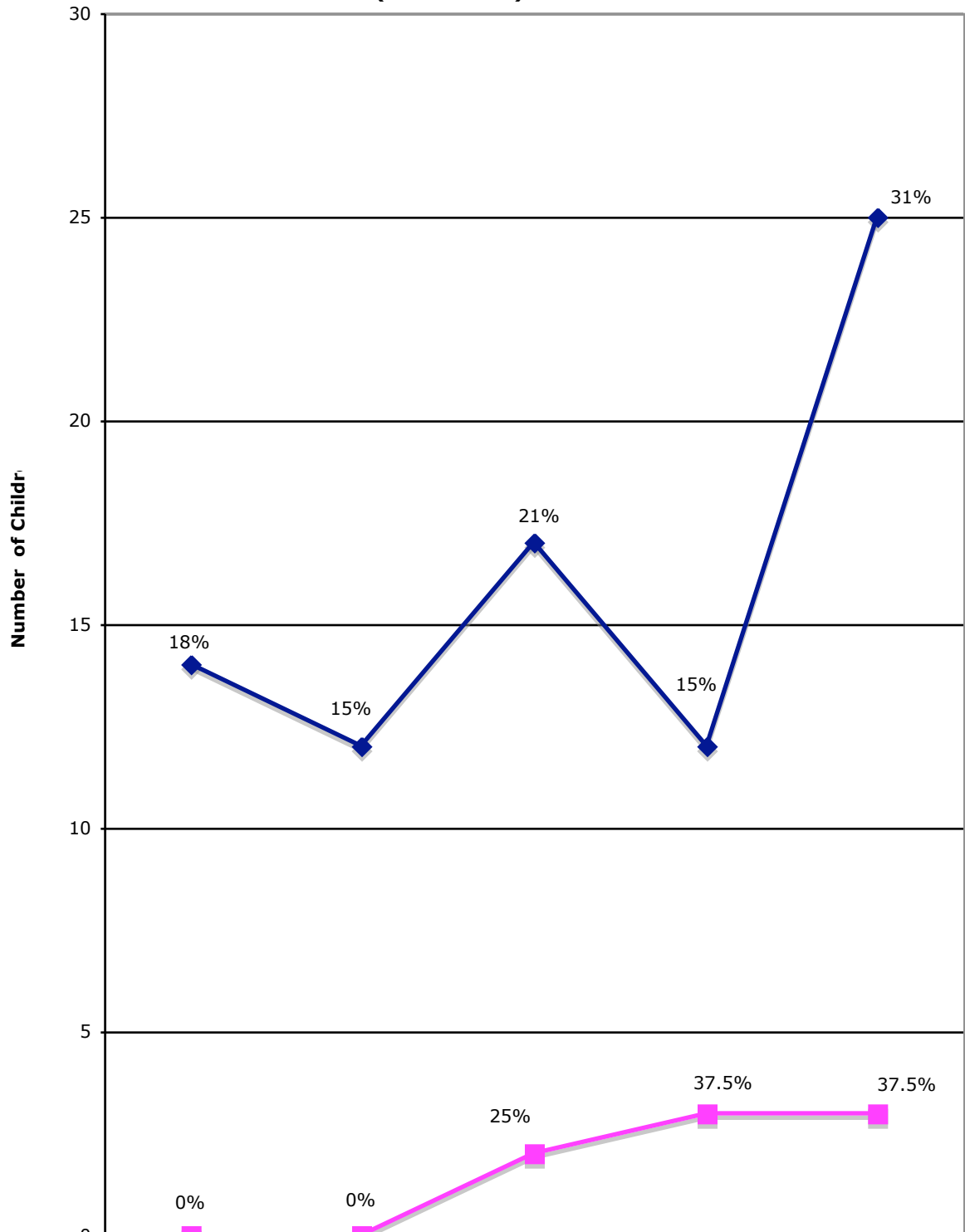
**Preschool Link to Kindergarten Assessment
Sample Population
(88 Children)**



◆ Preschool (80)	13	8	26	25	8
■ No Preschool (8)	0	0	0	6	2

**The PediNaturalSM Predictor of Standardized Test Scores:
An 8-Year Longitudinal Assessment Study
Preschool-3 Thru 5th Grade
Years (1997 - 2004)**

**Preschool Link to Fifth Grade TerraNova Assessment
Sample Population
(88 Children)**

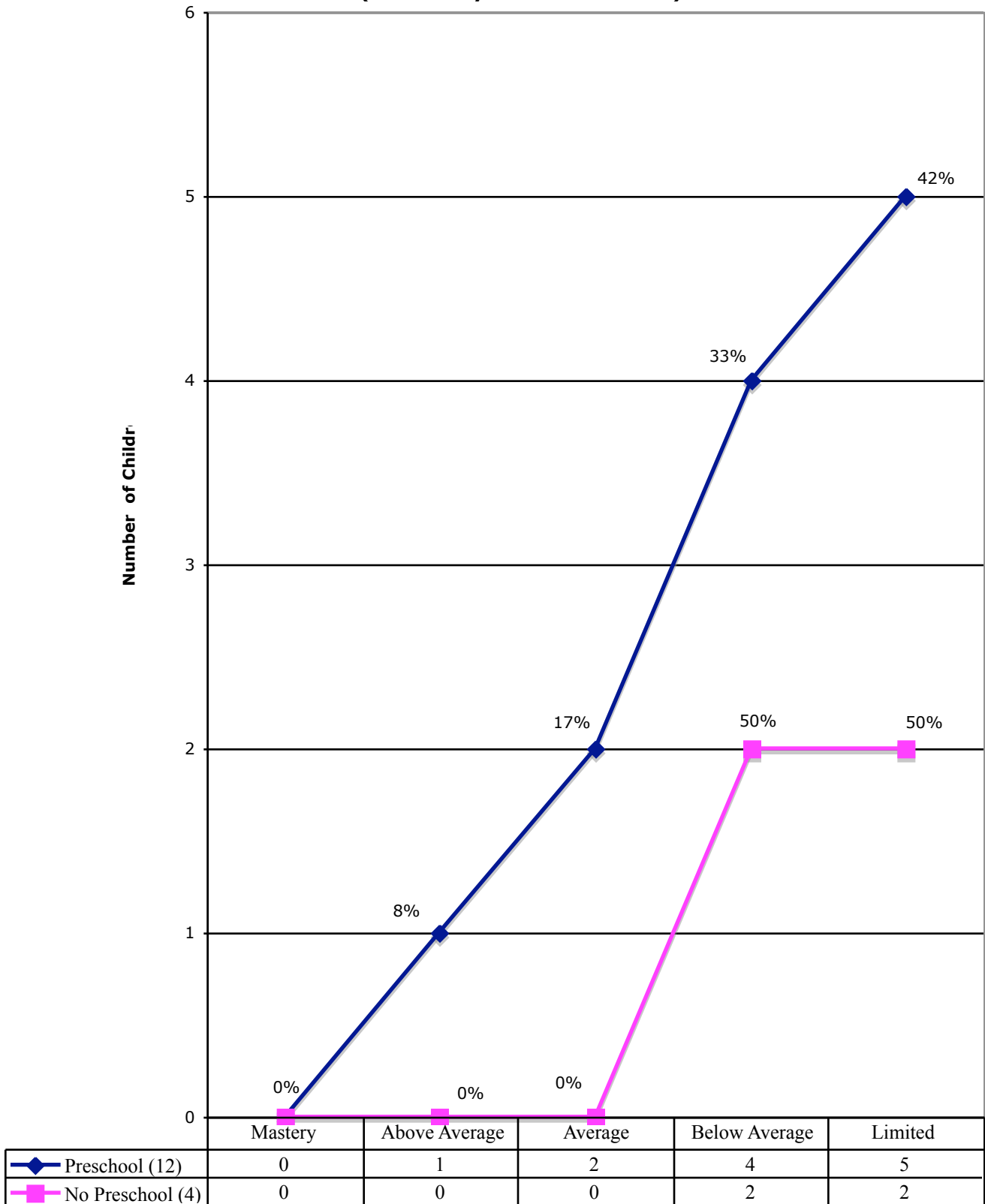


◆ Preschool (80)	14	12	17	12	25
■ No Preschool (8)	0	0	2	3	3

Skill Level:

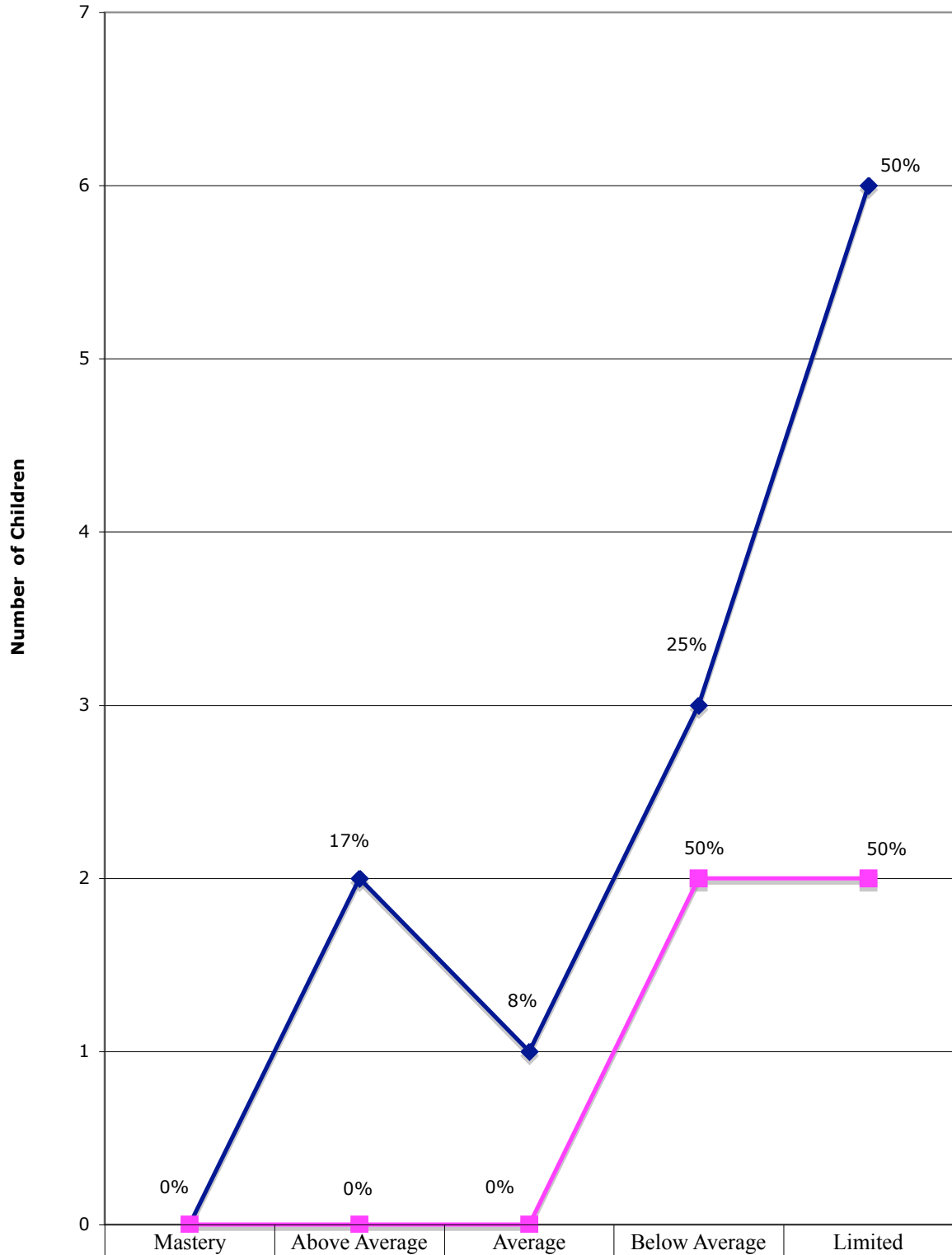
**The PediNaturalSM Predictor of Standardized Test Scores:
An 8-Year Longitudinal Assessment Study
Preschool-3 Thru 5th Grade
Years (1997 - 2004)**

**Preschool Link to Kindergarten Assessment
Sample Population
(16 Minority out of 88 Children)**



**The PediNaturalSM Predictor of Standardized Test Scores:
An 8-Year Longitudinal Assessment Study
Preschool-3 Thru 5th Grade
Years (1997 - 2004)**

**Preschool Link to Fifth Grade TerraNova Assessment
Sample Population
(16 Minority out of 88 Children)**



◆ Preschool (12)	0	2	1	3	6
■ No Preschool (4)	0	0	0	2	2

Skill Levels

The PediNaturalSM Predictor of Standardized Test Scores:
 An 8-Year Longitudinal Assessment Study
 Preschool-3 Thru 5th Grade
 Years (1997 - 2004)

A Comparison of Skill Levels Between
 Kindergarten Performance and the 5th Grade TerraNova Test

Kindergarten Mastery Level (13 students)	5th Grade TerraNova Scores	Percent of Results
Mastery	8	62%
Above Average	4	30%
Average	1	8%
Below Average	0	0%
Limited	0	0%
Kindergarten Above Average Level (8 students)	5th Grade TerraNova Scores	Percent of Results
Mastery	1	13%
Above Average	4	50%
Average	2	25%
Below Average	1	13%
Limited	0	0%
Kindergarten Average Level (26 students)	5th Grade TerraNova Scores	Percent of Results
Mastery	5	19%
Above Average	2	8%
Average	12	46%
Below Average	4	15%
Limited	3	12%
Kindergarten Below Average Level (31 students)	5th Grade TerraNova Scores	Percent of Results
Mastery	0	0%
Above Average	2	6%
Average	3	10%
Below Average	10	32%
Limited	16	52%
Kindergarten Limited Level (10 students)	5th Grade TerraNova Scores	Percent of Results
Mastery	0	0%
Above Average	0	0%
Average	1	10%
Below Average	0	0%
Limited	9	90%

Appendix 1

Paired T-Test and CI: K GPA, 5th TerraNova GPA

Paired T for K GPA - 5th TerraNova GPA

	N	Mean	StDev	SE Mean
K GPA	88	1.96591	1.10588	0.11789
5th TerraNova GPA	88	1.85909	1.38520	0.14766
Difference	88	0.106818	0.870829	0.092831

95% CI for mean difference: (-0.077693, 0.291329)

T-Test of mean difference = 0 (vs not = 0): T-Value = 1.15 P-Value = 0.253

Appendix 2

Two-Sample T-Test and CI: K GPA, Quality Before K Yes/No

Two-sample T for K GPA

Quality

Before

K

Yes/No	N	Mean	StDev	SE Mean
N	8	1.000	0.535	0.19
Y	80	2.06	1.10	0.12

Difference = mu (N) - mu (Y)

Estimate for difference: -1.06250

95% upper bound for difference: -0.40369

T-Test of difference = 0 (vs <): T-Value = -2.68 P-Value = 0.004 DF = 86

Both use Pooled StDev = 1.0685

Appendix 3

Two-Sample T-Test and CI: K GPA, Minority Yes or No

Two-sample T for K GPA

Minority

Yes or

No	N	Mean	StDev	SE Mean
n	72	2.18	1.04	0.12
y	16	1.000	0.876	0.22

Difference = mu (n) - mu (y)

Estimate for difference: 1.18056

95% lower bound for difference: 0.71528

T-Test of difference = 0 (vs >): T-Value = 4.22 P-Value = 0.000 DF = 86

Both use Pooled StDev = 1.0124

Two-Sample T-Test and CI: 5th TerraNova GPA, Minority Yes or No

Two-sample T for 5th TerraNova GPA

Minority

Yes or

No	N	Mean	StDev	SE Mean
n	72	2.06	1.35	0.16
y	16	0.98	1.20	0.30

Difference = mu (n) - mu (y)

Estimate for difference: 1.08056

95% lower bound for difference: 0.47030

T-Test of difference = 0 (vs >): T-Value = 2.94 P-Value = 0.002 DF = 86

Both use Pooled StDev = 1.3279