Devereux Early Childhood Assessment for Infants and Toddlers

Technical Manual

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Preface

This manual presents information on the development and standardization of the Devereux Early Childhood Assessment for Infants and Toddlers (DECA-I/T), as well as the results of studies examining its reliability and validity. This information is provided to help the user become better informed about the strengths and proper uses of the DECA-I/T.

Complete information on the administration, scoring and interpretation of the DECA-I/T may be found in the DECA-I/T User's Guide.

Many individuals have contributed to the DECA-I/T. Their names may be found in the acknowledgement section of the DECA-I/T User's Guide.

The authors welcome feedback on the DECA-I/T as well as opportunities for collaboration. They may be reached at the Devereux Early Childhood Initiative of the Devereux Foundation.

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Table of Contents

Tables and Figures

Tables

Figures

1

Development and Standardization

Development of the DECA-I/T Items

As with the original Devereux Early Childhood Assessment (DECA) (LeBuffe & Naglieri, 1999) multiple approaches were used to develop the initial set of items for the Devereux Early Childhood Assessment for Infants and Toddlers (DECA-I/T).

First, we reviewed the literature on resilience and noted behavioral descriptions of resilient children (Egeland, 1997; Gordon-Rouse, 1996; Masten and Coatsworth, 1998; Werner and Smith, 1982, 1992, and 2001; Werner, 1990 and 2000). During this process we reviewed existing measures of infant and toddler social and emotional health.

We also conducted focus groups with parents and teachers of infants and toddlers, early care and education professionals, and mental health professionals. In the focus group sessions, parents and professionals were asked to describe the behaviors of children that "were likely to do well" or indicated that the child was "doing well" in regards to social and emotional health. Conversely, parents and early care and education professionals were also asked to describe behaviors that indicated that the child was "likely to have problems." Behavioral descriptions were used to generate rating scale items.

The items were written as directly observable behaviors requiring little or no inference on the part of the observer. Careful attention was also paid to potential psychometric qualities such as reliability and validity as well as ease of use of the scales. Finally, throughout all phases of item development, the reading level of the items and Rater directions were carefully considered so that the overall readability of the text would be as easy as possible.

The item development phase resulted in a pool of 112 items, which served as the starting point in the development of the DECA-I/T. By conducting a pilot study in the spring of 2005 with 251 participants at 12 sites nationally, it was possible to examine the usefulness of the initial set of items and

their inter-relationships. Children with identified special needs (behavioral, social, emotional) scored statistically significantly lower on protective factors than those children who were not identified as having social emotional concerns. There was also a statistically significant difference between infant and toddler scores.

The results of the pilot study were used to prepare a form consisting of 68 items to be used in the national standardization study described below.

National Standardization

The DECA-I/T was standardized in a way to ensure the sample would closely represent the United States population on important demographic characteristics. The data collection procedures also ensured that a wide variety of children were included for the generation of norms. We collected data from a variety of settings across the United States. Infant and toddler early care and education professionals from childcare settings provided the teacher ratings and will be referred to in all tables as Teacher Raters. Parent (and/or other family member) ratings were obtained not only from these same settings, but also in response to recruitment efforts. To ensure the confidentiality of their responses, parents who chose to participate were able to: 1) place their completed rating form in a sealed envelope to be sent to Devereux for processing or 2) anonymously fill out the standardization form online. The online form was identical to the handwritten copy.

Representativeness of the DECA-I/T Standardization Sample

The DECA-I/T standardization sample consisted of 2,183 infants and toddlers between 4 weeks and 3 years of age (45% infants and 55% toddlers). For this sample an infant was defined as being from 4 weeks up to 18 months and a toddler as being from 18 months up to 3 years of age. Early care and education professionals provided ratings on 52% of these children; parents provided ratings on the remaining 48% of the children. As shown in Table 1.1, the DECA-I/T standardization sample closely approximated the population of the United States with respect to gender. The desired characteristics of the standardization sample were based on the *Statistical Abstract of the United States 2006* 125th edition: *The National Data Book* by the U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. In the tables that follow, the total numbers of children included may not sum to 2,183 due to missing data.

Table 1.1

DECA-I/T Standardization Sample Characteristics: Age and Gender

	Males		Females		Unknown		Total	
Age	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Infants (1-18 Months)	484	49.0%	483	48.9%	20	2.0%	987	45.2%
Toddlers (18-36 Months)	591	49.4%	595	49.7%	10	0.8%	1196	54.8%
Total Sample	1075	49.2%	1078	49.4%	30	1.4%	2183	
U.S. %		51.0%		49.0%				

Note. The U. S. population data are based on "Resident Population, by Sex and Age: 2006 Table No. 16," *Statistical Abstract of the United States 2006* 125th edition: *The National Data Book* by the U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 2006. Washington, DC: Author.

Age and Gender

Table 1.1 presents the numbers and percentages of infants and toddlers by gender. The number of infants was 987 and the number of toddlers was 1,196. These results show that each age was sufficiently sampled. The data also show that the percentages of males and females in the standardization sample as a whole, as well as at each age, very closely approximated the proportions of the U.S. population.

Geographic Region

We collected data from 99 sites in 29 states in the four geographic regions: Northeast, Midwest, West, and South. Table 1.2 shows the numbers and percentages of children for each age and the total sample for each of the four geographic regions. On average, the regional distribution of the DECA-I/T standardization sample was within 6% of the U.S. population for children 4 weeks to 3 years old. These data show that the DECA-I/T standardization sample closely approximated the regional distribution of the U.S. population.

Table 1.2

DECA-I/T Standardization Sample Characteristics: Geographic Region and Age

	Northeast		Midwest		West		South		Unknown		Total	
Age	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Infants (1-18 Months)	165	16.7%	283	28.7%	230	23.3%	302	30.6%	7	0.7%	987	45.2%
Toddlers (18-36 Months)	243	20.3%	301	25.2%	275	23.0%	366	30.6%	11	0.9%	1196	54.8%
Total Sample	408	18.7%	584	26.8%	505	23.1%	668	30.6%	18	0.8%	2183	
U.S. %		18.0%		21.8%		26.2%		33.9%				

Note. The U. S. population data are based on "Resident Population, by Sex and Age: 2006 Table No. 34," *Statistical Abstract of the United States 2006* 125th edition: *The National Data Book* by the U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 2006. Washington, DC: Author.

Race

Table 1.3 provides the DECA-I/T standardization sample composition by geographic region and race. Based on information provided on the rating forms, the children were classified according to the five major race categories used by the U.S. Bureau of the Census: Native American, Asian/Pacific Islander, African American, Hispanic, and Caucasian. The DECA-I/T rating forms also allowed the Rater to describe the race of the child as "Mixed Race" or "Other."

The data in Table 1.3 indicate that the racial composition of the total DECA-I/T standardization sample closely approximated that of the U.S. population (total exceeds 100% due to some respondents making multiple selections). Additionally, sample percentages within each region were also similar to the actual population percentages found in each geographic region.

Table 1.3

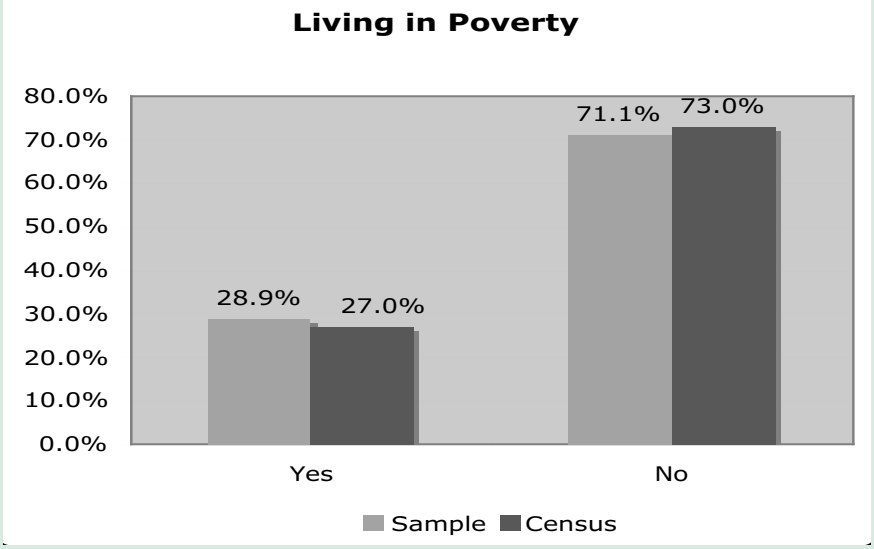
DECA-I/T Standardization Sample Characteristics: Geographic Region and Race

	Native American		Asian Pacific Islander		African American		Hispanic		Caucasian		Other		Mixed Race		Not Reported		Total Sample		
	n	Row %	n	Row %	n	Row %	n	Row %	n	Row %	n	Row %	n	Row %	n	Row %	n	Row %	U.S. %
Northeast	2	0.5%	7	1.7%	55	13.5%	7	1.7%	307	75.2%	4	1.0%	23	5.6%	3	0.7%	408	18.7%	18.1%
Midwest	12	2.1%	1	0.2%	52	8.9%	24	4.1%	406	69.5%	11	1.9%	68	11.6%	10	1.7%	584	26.8%	21.8%
West	26	5.1%	8	1.6%	3	0.6%	116	23.0%	264	52.3%	9	1.8%	71	14.1%	8	1.6%	505	23.1%	26.2%
South	21	3.1%	8	1.2%	84	12.6%	180	26.9%	328	49.1%	9	1.3%	31	4.6%	7	1.0%	668	30.6%	33.9%
Not Reported	1	5.6%	0	0.0%	2	11.1%	3	16.7%	11	61.1%	0	0.0%	1	5.6%	0	0.0%	18	0.8%	
Total	62	2.8%	24	1.1%	196	9.0%	330	15.1%	1316	61.7%	33	1.5%	194	8.9%	28	1.3%	2183		
Adjusted Sample (w/o "Other", "Mixed Race", and "Not Reported"																			
Total	62	3.2%	24	1.2%	196	10.2%	330	17.1%	1316	68.3%							1928		
U.S. %		2.2%		3.4%		16.2%		12.2%		71.3%									

Note. The U. S. population data are based on "Resident Population, by Sex and Age: 2006 Table No. 22," *Statistical Abstract of the United States 2006 125th edition: The National Data Book* by the U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census, 2006. Washington, DC: Author.

Figure 1.1

Poverty Level DECA-I/T Sample



Socioeconomic Status

Determining the number of children receiving either subsidized childcare or enrolled in TANF assessed the socioeconomic status of the DECA-I/T standardization sample. Of the entire sample of over 2,183 children, 29% were either receiving subsidized childcare or public assistance. This very closely approximates the 27% of infants and toddlers living in poverty (Children's Defense Fund, 2005). Figure 1.1 depicts the breakdown of the DECA-I/T sample compared to Census Data (2006).

Organization of Items into Scales

Utilizing the standardization data set, we attempted to organize the DECA-I/T items into statistically and logically derived scales. The Protective Factor Scales were identified through the use of exploratory item factor analysis. We applied this method to the entire set of protective factor items. Careful examination of the factorial results suggested that no single solution would work across the developmental age span and there needed to be two forms (infant and toddler), which became the Devereux Early Childhood Assessment for Infants (DECA-I) and the Devereux Early Childhood Assessment for Toddlers (DECA-T).

Next, we conducted a series of analyses to determine which items should be deleted to obtain the best configuration of scales, for infants and toddlers separately. We based the decisions to delete items on the following goals: 1) to identify the best factor solution from psychometric and interpretability perspectives, 2) to shorten the two forms of the DECA-I/T as much as possible without compromising breadth of coverage, and 3) to ensure that the constructs are measured reliably by the scales. Although this left anchor items common to both scales, it also permitted differing items that were developmentally appropriate either for the infant or the toddler scale. The final results of these analyses are provided in Table 1.4 for the infant form and Table 1.5 for the toddler form.

The DECA-I/T Infant form (DECA-I) ended up with 33 items and the Toddler form (DECA-T) with 36 items reflecting positive behaviors (strengths) typically seen in resilient children. Factor analysis elicited a strong two factor solution for the infants and a strong three factor solution for the toddlers. The infant and the toddler factor solutions, with the individual item descriptions were sent to the National Advisory Team and the DECI Research Advisory Board (see Devereux Early Childhood Assessment for Infants and Toddlers: User's Guide, Appendix D) to advise on naming the protective factor scales. Additionally our literature review provided further guidance in selecting these scale titles. There was strong agreement with both expert opinion and literature which resulted in the titles and their descriptions for the Infant Form as listed below:

Initiative (18 items) assesses the infant's ability to use independent thought and actions to meet her or his needs.

Attachment/Relationships (15 items) assesses the mutual, strong, long lasting relationship between the infant and significant adults such as family members, and teachers.

A *Total Protective Factors scale*, which is a composite of the above two scales, provides an overall indication of the strength of the infant's protective factors.

The DECA-I/T Toddler Form (DECA-T) is comprised of the following scales:

Attachment/Relationships (18 items) assesses the mutual, strong, long lasting relationship between the toddler and significant adults such as family members, and teachers.

Initiative (11 items) assesses the toddler's ability to use independent thought and actions to meet her or his needs.

Self-Regulation (7 items) assesses the toddler's ability to gain control of and manage emotions, and sustain focus and attention.

A *Total Protective Factors scale*, which is a composite of the above three scales, provides an overall indication of the strength of the toddler's protective factors.

Table 1.4

Rotated Factor Analysis Results for DECA-I Scales

Item #	Item	Factors	
		In	A/R
1	try to do new things	.73	
3	imitate actions of others	.72	
5	keep trying when unsuccessful	.72	
7	show interest in what others were doing	.70	
9	notice changes in surroundings	.70	
11	adjust her/his energy level to the type of play	.69	
13	act happy when praised	.67	
15	explore surroundings	.65	
17	express her/his dislikes	.65	
19	reach for a familiar adult	.61	
20	respond to her/his name	.60	
22	react to another child's cry	.60	
21	keep trying to obtain a toy	.59	
26	act in a way that make others smile or show interest	.59	
27	easily go from one activity to another	.58	
28	seek attention when a familiar adult was with another child	.58	
30	enjoy being around other children	.57	
29	look to familiar adult when exploring her/his surroundings	.52	
32	act happy with familiar adults		.76
31	show pleasure when interacting with adults		.73
33	accept comfort from a familiar adult		.72
23	smile at familiar adults		.71
25	act happy		.69
24	respond positively to adult attention		.68
18	smile back at a familiar adult		.67
16	calm down with help from a familiar adult		.66
14	make eye contact with others		.64
12	act in a good mood		.63
10	seek comfort from familiar adults		.61
8	show affection for a familiar adult		.60
6	enjoy being cuddled		.59
4	enjoy interacting with others		.52
2	respond when spoken to		.50

Note: Only Loadings of .50 or above are reported.
(In = Inititiative, A/R = Attachment/Relationships)

Table 1.5

Rotated Factor Analysis Results for DECA-T Scales

Item #	Item	Factors		
		A/R	In	SR
2	show affection for a familiar adult	.76		
21	easily go from one activity to another	.75		
6	act happy with familiar adults	.74		
22	show pleasure when interacting with adults	.73		
15	smile back at a familiar adult	.71		
4	seek comfort from familiar adults	.69		
36	express avariety of emotions (e.g., happy, sad, mad)	.66		
17	reach for a familiar adult	.66		
5	makes needs known to a familiar adult	.66		
25	accept comfort from a familiar adult	.66		
11	act happy when praised	.65		
13	make eye contact with others	.65		
24	makes others aware of her/his needs	.62		
7	show interest in her/his surroundings	.60		
18	respond to her/his name	.59		
8	respond when spoken to	.58		
14	enjoy being cuddled	.58		
1	enjoy interacting with others	.52		
9	show concern for other children		.76	
10	try to comfort others		.75	
26	play make-believe		.67	
29	try to clean up after herself/himself		.67	
28	show preference for a particular playmate		.66	
19	react to another child's cry		.64	
16	ask to do new things		.64	
31	play with other children		.60	
12	participate in group activities		.56	
32	try to do things for herself/himself		.55	
27	follow simple directions		.55	
23	handle frustration well			.72
34	accept another choice when the first choice was not available			.68
3	adjust to changes in routine			.67
33	calm herself/himself			.61
30	easily follow a daily routine			.58
35	have regular sleeping pattern			.56
21	easily go from one activity to another			.56

Note: Only Loadings of .50 or above are reported.
(A/R = Attachment/Relationships, In = Inititiative, SR = Self-Regulation)

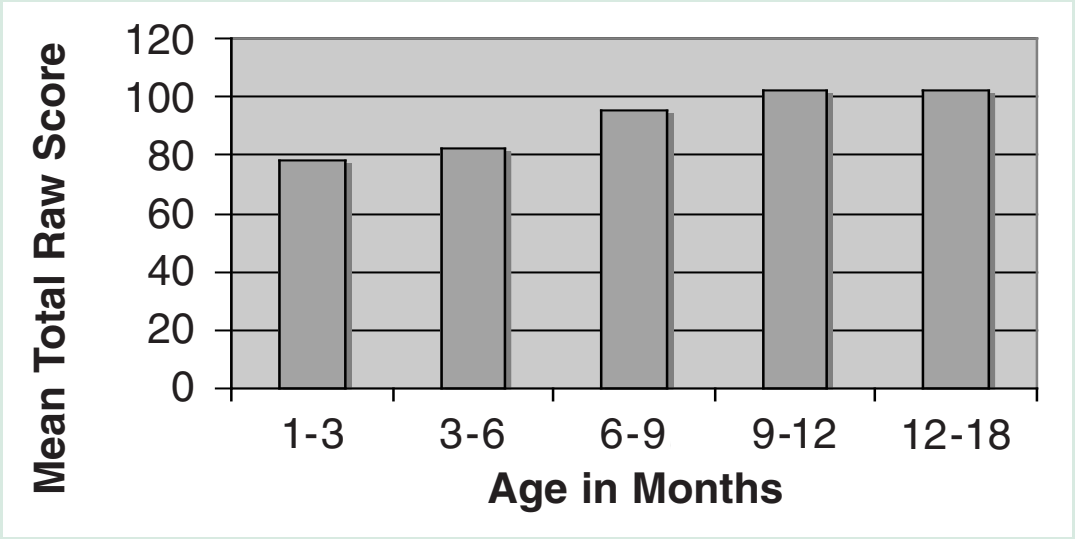
The individual DECA-I/T protective item factor loadings were obtained using principal components extraction with varimax rotation. The Kaiser (1960) rule (i.e., eigenvalues greater than 1.0) and scree plots were initially used to assist in determining the existence of a factor. Subsequently, an iterative procedure was used, based on absolute value of standardized factor loadings of .4, until potential subscales were completely resolved with unique factor loadings. These factor analytic results showed that each of the subscale factors is comprised of items with substantial loadings on the subscale on which they are placed, and which did not have substantial loadings on the subscales on which they were not placed.

Norming Procedures

The first step in preparing the norms was to determine if any trends existed in the data. We examined the children's Total Protective Factors Scale Raw Score means and standard deviations for age, Rater, and gender differences. Figure 1.2 suggests age trends in the total raw score for the infant (1 to 18 months). There were no age trends for the toddlers. Separate norms tables (see Appendix A and B of the DECA-I/T User's Guide) were developed for 1 up to 3 months, 3 up to 6 months, 6 up to 9 months, and 9 up to 18 months (there were no differences for the 9 up to 12, 12 up to 15, and 15 up to 18 months scores) for the infant form and 18 up to 36 months for the toddler form.

Figure 1.2

Infant Mean Total Raw Scores by Age



We also found the need to construct norms by Rater (parents/family members and early care and education professionals) because initial analyses showed significant differences in the scores. These differences were most likely due to the different environments in which these different Raters see the children. After determining that Rater norms would be constructed, we examined the distributions of raw scores for normality. The cumulative frequency distributions for the derived scales (see Tables 1.4 and 1.5 on pages 8 and 9) all approached normality but were slightly positively skewed. For this reason we decided to compute the separate norms tables using classical normalization procedures.

To accomplish this, we fit the obtained frequency distribution for each scale to normal probability standard scores using Blom's (Blom, 1958) algorithm of

$$\frac{r-\frac{3}{8}}{w+\frac{1}{4}}$$

where r is the rank of the score and w is the sum of weight. These procedures were followed for all of the protective factor scales.

T Scores

We computed standard scores separately for each of the scales based on their individual raw score distributions. We determined the standard scores corresponding to the percentiles for which they are theoretically associated based on the normal curve. T scores for each scale were set at a mean of 50 and a standard deviation of 10. We selected this metric because of its familiarity to professionals, its previous use with the DECA, and because it facilitates interpretation of the results and comparison with T scores from other similar scales.

In order to maintain this metric for Total Protective Factors scores, and in order to equalize the weights due to the different numbers of items per subscale, a second normalization was required. That is, we added together the T scores for the subscales (two for the Infant form and three for the Toddler form). This sum was then normalized using Blom's algorithm (Blom, 1958), and transformed with the T score formula of (10 x *Z*) + 50.

2

Reliability

The reliability of assessments like the DECA-I/T is defined as, "the consistency of scores obtained by the same person when reexamined with the same test on different occasions, or with different sets of equivalent items, or under other variable examining conditions" (Anastasi, 1988, p. 102). We assessed the reliability of both the DECA-I and the DECA-T using several methods. First, we computed the internal reliability coefficients for each scale. Second, we assessed standard error of measurement (SE_M). Third, we assessed the test-retest reliability of each scale. Finally, we determined the interrater reliability for each scale.

Internal Reliability

Internal reliability (also known as internal consistency) refers to the extent to which the items on the same scale or assessment instrument measure the same underlying construct. High internal reliability, which is desirable, indicates that the items assess the same characteristic of the child (i.e., construct) and, therefore, truly comprise a single scale. In contrast, low internal reliability indicates that the items measure a variety of different child characteristics and, therefore, do not comprise a single scale.

We determined the internal reliability of each scale and for each form using Cronbach's alpha (Cronbach, 1951). In practice, this statistic can vary from .00 (low) to .99 (high). The internal reliability coefficients (alphas) were based on the DECA-I/T standardization sample and estimates for each were calculated separately for each Rater (parent/family member or early care and education professional) and are presented in Table 2.1a (Infants) and Table 2.1b (Toddlers).

The results in these tables indicate that both the DECA-I and the DECA-T have high internal reliability. For the infant form (DECA-I) the Total Protective Factors Scale alpha for both Parent Raters (.90 to .94) and Teacher Raters (.93 to .94) met or exceeded the .90 minimum for a total score suggested by Bracken (1987) in each age group. In addition, these values met the "desirable standard" described by Nunnally (1978, p.246). The same was true for the toddler form (DECA-T) with Parent Raters at .94 and Teacher Raters at .95.

Table 2.1a

Internal Reliability (Alpha) Estimates for DECA-I Scales by Rater

	Raters	
Scale	**Parents**	**Teachers**
1-3 Months		
Initiative	.87	.87
Attachment/Relationships	.80	.93
Total Protective Factors	.90	.93
3-6 Months		
Initiative	.86	.91
Attachment/Relationships	.87	.91
Total Protective Factors	.90	.94
6-9 Months		
Initiative	.90	.89
Attachment/Relationships	.89	.89
Total Protective Factors	.94	.93
9-18 Months		
Initiative	.87	.90
Attachment/Relationships	.92	.91
Total Protective Factors	.93	.94

The internal reliability coefficients for the DECA-I scales (Initiative and Attachment/Relationships) were also high. These ranged from a low of .80 (1 to 3 Months Attachment/Relationships Parent Rater) to a high of .93 (1 to 3 Months Attachment/Relationships Teacher Rater). The median reliability coefficient across both scales was .87 for Parent Raters and .90 for Teacher Raters. These median values met or exceeded the .80 minimum for scale scores suggested by Bracken (1987).

Table 2.1b

Internal Reliability (Alpha) Estimates for DECA-T Scales by Rater

	Raters	
Scale	**Parents**	**Teachers**
Attachment/Relationships	.87	.90
Initiative	.92	.94
Self-Regulation	.79	.83
Total Protective Factors	.94	.95

The internal reliability coefficients for the DECA-T remaining scales (Attachment/Relationships, Initiative and Self-Regulation) were high as well. These ranged from a low of .79 (Self-Regulation Parent Rater) to a high of .94 (Initiative Teacher Rater). The median reliability coefficient across these three scales was .87 for Parent Raters and .90 for Teacher Raters. These median values also met or exceeded the .80 minimum for scale scores suggested by Bracken (1987).

Standard Errors of Measurement

The standard error of measurement (SE_M) is another index of the reliability of test scores. It is an estimate of the amount of error in the observed score, expressed in standard score units (i.e., T scores). We obtained the SE_M for each of the DECA-I/T Scale T scores directly from the internal reliability coefficient (r) using the formula,

$$SE_M = \sigma\sqrt{1-r}$$

where σ is the theoretical standard deviation of the T score (10) and the appropriate reliability coefficient (r) is used (Atkinson, 1991). The SE_M for each DECA-I and DECA-T scale according to Rater are presented in Table 2.2a and Table 2.2b. The SE_{MS} varied with the size of the internal reliability coefficient reported in Tables 2.1a and 2.1b—the higher the reliability, the smaller the standard error of measurement.

Table 2.2a

Standard Errors of Measurement for the DECA-I Scale T Scores by Rater

	Raters	
Scale	**Parents**	**Teachers**
1-3 Months		
Initiative	3.61	3.61
Attachment/Relationships	4.47	2.65
Total Protective Factors	3.16	2.65
3-6 Months		
Initiative	3.74	3.00
Attachment/Relationships	3.61	3.00
Total Protective Factors	3.16	2.45
6-9 Months		
Initiative	3.16	3.32
Attachment/Relationships	3.32	3.32
Total Protective Factors	2.45	2.65
9-18 Months		
Initiative	3.61	3.16
Attachment/Relationships	2.83	3.00
Total Protective Factors	2.65	2.45

Test-Retest Reliability

The correlation between scores obtained for the same child by the same Rater on two separate occasions is another indicator of the reliability of an assessment instrument. The correlation of this pair of scores is the test-retest reliability coefficient (*r*), and the magnitude of the obtained value informs us about the degree to which random changes influence the scores (Anastasi, 1988).

Table 2.2b

Standard Errors of Measurement for the DECA-T Scale T Scores by Rater

	Raters	
Scale	**Parents**	**Teachers**
Attachment/Relationships	3.61	3.16
Initiative	2.83	2.45
Self-Regulation	4.58	4.12
Total Protective Factors	2.45	2.24

Table 2.3a

Characteristics of DECA-I Test-Retest Reliability Sample

	Raters	
Characteristic	**Parents**	**Teachers**
Size of Sample (*n*)	20	23
Age (Months)		
Mean	7.9	9.3
SD	3.8	3.8
Gender		
Boys	40%	44%
Girls	60%	56%
Race		
Native American	5%	5%
Asian/Pacific Islander	5%	5%
African American		5%
Hispanic	5%	5%
Caucasian	80%	75%
Mixed Race	5%	5%
Other		

Table 2.3b

Characteristics of DECA-T Test-Retest Reliability Sample

	Raters	
Characteristic	**Parents**	**Teachers**
Size of Sample (*n*)	22	20
Age (Months)		
Mean	26.1	26.2
SD	4.8	4.6
Gender		
Boys	50%	50%
Girls	50%	50%
Race		
Native American		
Asian/Pacific Islander		
African American	5%	5%
Hispanic		
Caucasian	90%	95%
Mixed Race		
Other	5%	

To investigate the test-retest reliability of the DECA-I/T, a group of parents (*n*=20 for DECA-I and *n*=22 for DECA-T) and a group of teachers (*n*=23) for DECA-I and *n*=20 for DECA-T) rated the same child on two different occasions separated by a minimum of 24 hours and a maximum of 72 hours. Descriptive information on the children rated in this study is provided in Table 2.3a and Table 2.3b.

Table 2.4a presents the results of Test-Retest Reliability Study for the DECA-I. All of the correlation coefficients were statistically significant ($p < .001$), which indicates the scales have very good test-retest reliability. Overall, parents were more consistent in their evaluation of the children's behavior across time. For parents, the higher correlation was found on the Initiative Scale (.94), and the lower on the Attachment/Relationships Scale (.86). The higher correlation for early care and education professionals was found on the Attachment/Relationships and Total Protective Factor Scales (.84) and the lowest on the Initiative Scale (.83).

Table 2.4a

Test-Retest Reliability Coefficients for DECA-I Scores Obtained at a 24- to 72-Hour Interval

Scale	Parents	Teachers	Overall
Initiative	.94***	.83***	.87***
Attachment/Relationships	.86***	.84***	.83***
Total Protective Factors	.91***	.84***	.85***

*** ($p \leq .001$)

Table 2.4b

Test-Retest Reliability Coefficients for DECA-T Scores Obtained at a 24- to 72-Hour Interval

Scale	Parents	Teachers	Overall
Attachment/Relationships	.97***	.96***	.97***
Initiative	.99***	.98***	.98***
Self-Regulation	.92***	.72***	.85***
Total Protective Factors	.99***	.91***	.97***

*** ($p \leq .001$)

Table 2.4b presents the results of Test-Retest Reliability Study for the DECA-T. All of the correlation coefficients were also statistically significant ($p < .001$), which indicates the scales have very good test-retest reliability. As was the case with infants, parents were somewhat more consistent in their assessment of toddlers than teachers, although both raters are highly reliable. For parents, the highest correlation was found on the Initiative Scale (.99), and the lowest on the Self-Regulation Scale (.92). The highest correlation for early care and education professionals was found on the Initiative Scale (.98) and the lowest on the Self-Regulation Scale (.72).

Interrater Reliability

The correlation between scores obtained for the same child at the same time by two different Raters is another indicator of the reliability of an assessment instrument. The magnitude of the obtained value informs us about the degree of similarity in the different Raters' perceptions of the child's behavior.

A set of ratings included two independent ratings of the same child completed on the same day. The ratings were provided by either two early care and education professionals or two parents (or other family members).

Table 2.5a

Characteristics of DECA-I Interrater Reliability Sample

	Raters	
Characteristic	**Parents**	**Teachers**
Size of Sample (*n*)	45	63
Age (Months)		
Mean	9.9	9.8
SD	4.5	4.3
Gender		
Boys	21 (46.7%)	34 (54.0%)
Girls	24 (53.3%)	29 (46.0%)
Race		
Native American		
Asian/Pacific Islander		
African American	8 (17.8%)	18 (28.6%)
Hispanic	4 (8.9%)	5 (7.9%)
Caucasian	33 (73.3%)	40 (63.5%)
Other		

Table 2.5b

Characteristics of DECA-T Interrater Reliability Sample

	Raters	
Characteristic	**Parents**	**Teachers**
Size of Sample (*n*)	49	60
Age (Months)		
Mean	29.7	25.3
SD	5.0	5.5
Gender		
Boys	37 (75.5%)	26 (43.3%)
Girls	12 (24.5%)	34 (56.7%)
Race		
Native American		
Asian/Pacific Islander		4 (6.7%)
African American	3 (6.1%)	24 (40.0%)
Hispanic		2 (3.3%)
Caucasian	46 (93.9%)	30 (50.0%)
Other		

Two different comparisons were made: 1) Teacher Rater-Teacher Rater and 2) Parent Rater-Parent Rater. We collected Teacher Rater-Teacher Rater pairs of ratings on 63 infants and 60 toddlers. We also collected Parent Rater-Parent Rater pairs of ratings on 45 infants and 49 toddlers. Demographic information on the children rated is provided in Table 2.5a and Table 2.5b.

Table 2.6a presents the results of this study for the infants. The interrater reliability coefficients for Parent Rater pairs and Teacher Rater pairs who saw the child in the same environment were both high and statistically significant (all $p \leq .01$). The coefficient for Total Protective Factors was .68 for Parent Raters and .72 for Teacher Raters. These results indicate that different pairs of parents or teachers rate the same child very similarly on the DECA-I when observing the child in the same environment.

Table 2.6a

Interrater Reliability Coefficients for DECA-I Scores

Scale	Parent-Parent	Teacher-Teacher
Initiative	.76**	.64**
Attachment/Relationships	.59**	.71**
Total Protective Factors	.68**	.72**

** ($p \leq .01$)

Table 2.6b presents the results of this study for toddlers. As was the case with infants, all of the interrater reliability coefficients were high and statistically significant (all $p \leq .01$). The interrater reliability coefficients for the three protective factor scales ranged from .62 for Parent Raters on the Attachment/Relationships scale to .72 for Parent Raters on the Self-Regulation scale. The median reliability coefficient across both Parent and Teacher Raters on the three protective factor scales was .68. Parent and Teacher Raters obtained coefficients of .70 and .74 respectively on the Total Protective Factors scale. Again these results demonstrate that different pairs of parents or teachers rate the same child very similarly on the DECA-T when observing that child in the same environment.

Table 2.6b

Interrater Reliability Coefficients for DECA-T Scores

Scale	Parent-Parent	Teacher-Teacher
Attachment/Relationships	.62**	.71**
Initiative	.64**	.66**
Self-Regulation	.72**	.71**
Total Protective Factors	.70**	.74**

** ($p \leq .01$)

Stability of DECA-I/T Ratings

The correlation coefficients reported for the test-retest reliability studies indicate that the pairs of raters ranked the infants and toddlers similarly. However, the coefficients do not indicate the actual similarity in the scores. Tables 2.7a through 2.7d provide the pretest and posttest mean scale T-scores and standard deviations received by the infants and toddlers in the test-retest study as rated by parents and teachers.

Table 2.7a

DECA-I Pretest and Posttest Mean Scale T-Scores and Standard Deviations—Parent Raters

Scales	Pretest Mean (SD)	Posttest Mean (SD)
Initiative	54.5 (9.3)	52.8 (8.9)
Attachment/Relationships	52.1 (7.9)	52.3 (8.6)
Total Protective Factors	53.8 (8.7)	52.7 (9.3)

Table 2.7b

DECA-I Pretest and Posttest Mean Scale T-Scores and Standard Deviations—Teacher Raters

Scales	Pretest Mean (SD)	Posttest Mean (SD)
Initiative	57.4 (8.4)	56.2 (7.3)
Attachment/Relationships	54.4 (6.1)	53.6 (6.9)
Total Protective Factors	56.3 (7.5)	55.2 (7.2)

For parents, when rating infants, on average, the absolute value of the test-retest difference on the Initiative and Attachment/Relationship scales was less than one T-score point (0.92). The Total Protective Factors scale test-retest absolute value difference for parents was also approximately one T-score point (1.1). The results for Teacher Raters were very similar. On the Initiative and Attachment/Relationship scales, the mean absolute value of the test-retest difference was one T-score point (1.00). The absolute value of the test-retest difference for the Total Protective Factors scale was also about one T-score point (1.1). These results demonstrate that the DECA Infant Form ratings are very stable across a one- to three-day interval for both parent and teacher raters.

Tables 2.7c and 2.7d present the pretest and posttest mean scale T-scores and standard deviations received by toddlers in the test-retest study as rated by parents and teachers. Pairs of parent raters differed, on average, by less than three T-score points (2.5) across the three protective factor scales as well as the Total Protective Factor Scale (2.6). Teachers were even more consistent in their ratings, differing by an average of average of 0.8 T-score points on the three protective factor scales and 0.9 T-score points on the Total Protective Factors scale. These results demonstrate that the DECA Toddler Form ratings are very stable across a one- to three-day interval for both parent and teacher raters.

Table 2.7c

DECA-T Pretest and Posttest Mean Scale T-Scores and Standard Deviations—Parent Raters

Scales	Pretest Mean (SD)	Posttest Mean (SD)
Attachment/Relationships	53.5 (11.2)	50.5 (8.5)
Initiative	50.2 (10.7)	48.3 (9.1)
Self-Regulation	51.6 (9.7)	48.9 (10.0)
Total Protective Factors	51.8 (10.9)	49.2 (9.3)

Table 2.7d

DECA-T Pretest and Posttest Mean Scale T-Scores and Standard Deviations—Teacher Raters

Scales	Pretest Mean (SD)	Posttest Mean (SD)
Attachment/Relationships	45.0 (9.3)	42.7 (7.3)
Initiative	45.5 (7.1)	45.6 (8.4)
Self-Regulation	45.3 (9.5)	45.2 (10.2)
Total Protective Factors	44.4 (7.5)	43.5 (8.2)

Summary

The results of the internal consistency, test-retest, and interrater reliability studies indicate that the DECA-I/T is a reliable tool for assessing infant and toddler protective factors. The results of the internal consistency study demonstrated that the DECA-I/T meets the desirable standards that measurement and testing professionals have recommended. The test-retest study showed that Raters give very similar ratings on the same child across relatively short periods. This indicates that the DECA-I/T is not easily impacted by random changes, but tends to provide a consistent assessment of the child within a single setting, and stability of multiple assessments over time. The results of the interrater reliability studies demonstrate that pairs of parents and teachers have similar perceptions of both infants and toddlers. These results should assure parents and early care and educational professionals alike that the DECA-I/T is a reliable assessment package that can be used with confidence.

3

Validity

The validity of a test "concerns what the test measures and how well it does so" (Anastasi, 1988, p. 139). More specifically, validity studies investigate the evidence that supports the conclusions or inferences that are made based on test results and the interpretive guidelines presented in the test manual. According to the Standards for Educational and Psychological Testing (APA, 1985), validity evidence can be conceptualized as related to content, prediction (criterion), and construct. We investigated the validity of the DECA-I/T in regard to each of these three areas, and convergence in the case of the DECA and DECA-I/T.

Content Validity

Content validity assesses the degree to which the domain measured by the test is represented by the test items. With respect to the DECA-I/T, content validity addresses how well the protective factor items represent the entire domain of within-child behavioral characteristics related to resilience in infants and toddlers.

As detailed in Chapter 1 of this manual, the content of the DECA-I/T was based on a thorough review of the resilience literature related to young children; results of national focus groups conducted with parents, teachers and infant and early childhood mental health professionals; and careful review of other infant and toddler social and emotional instruments. This resulted in a large initial pool of 112 distinct strength-based behaviors. The authors and DECI (Devereux Early Childhood Initiative) staff critically reviewed this set of potential items. Specifically, they were asked if they thought any content pertaining to within-child protective factors for infants and toddlers was missing. The consensus was that there was ample coverage of content with no skills/topics missing.

The 112-item protocol was piloted with a small national sample of 251 children prior to standardization. This protocol was further refined based on feedback from DECI staff and the National Advisory Team as well as pilot study results. The final standardization form consisted of 68 items and was sent out nationally.

The standardization data set was further reduced by ridding the sample of cases that had critical information missing, such as the date of birth of the child. The final data set was 2,183 children. Utilizing this final data set and the analytic techniques described in Chapter 1, a large number of the items were eliminated, resulting in a final 2-factor solution with 33 items for the DECA-I and a 3-factor solution with 36 items for the DECA-T. It is noteworthy that the items and scales on both the DECA-I and the DECA-T have striking similarities to the within-child protective factor scales on the DECA. All three scales include the constructs of Initiative and Attachment/Relationships. In addition, the construct of Self-Regulation on the DECA-T is quite similar to the construct of Self-Control on the DECA. The overlap and similarities also signify an important developmental trajectory that the scales follow from infancy through the preschool age. The similarity of the factor structure and scale content on the DECA and the DECA-I/T, despite the fact that they were developed with two entirely different samples, lends credence to the importance of these constructs in the social and emotional development of children from birth through age five.

Criterion Validity

Criterion validity measures the degree to which the scores on the assessment instrument predict either 1) an individual's performance on an outcome or criterion measure, or 2) the status or group membership of an individual.

Protective factors buffer children against stress and adversity, resulting in better outcomes than would have been possible in their absence. One important outcome for young children is social and emotional health. Consequently, children with high scores on the DECA-I/T Protective Factor Scales should have greater social and emotional health than children with low scores on these scales.

To test this hypothesis, we obtained DECA-I and DECA-T ratings on two samples of infants and toddlers. The "Identified" sample had known emotional and behavioral problems. These children met at least one of the two following criteria: 1) they had been referred to a mental health professional due to social and emotional challenges, or 2) they had been asked to leave a childcare setting due to their behavior.

We also obtained DECA-I and DECA-T ratings for a matched comparison group of typical infants and toddlers, the "Community" sample. Matching variables included age, gender, and race. Table 3.1a and 3.1b provide descriptive information on the samples for the DECA-I and the DECA-T showing that the two groups were demographically similar.

Table 3.1a

Characteristics of the DECA-I Validity Study Sample

	Identified Sample		Community Sample	
Characteristic		%		%
Size of Sample (*n*)	15		15	
Age (Months)				
Mean	10.6		11.7	
SD	5.2		4.5	
Gender				
Boys	8	53.0%	8	53.0%
Girls	7	47.0%	7	47.0%
Race*				
Native American	1	6.7%	1	6.7%
African American	3	20.0%	4	26.6%
Hispanic	4	26.6%	5	33.3%
Caucasian	6	40.0%	7	46.6%
Missing	3	20.0%		

*Totals do not add up to 100% due to multiple race

Contrasted Groups

The contrasted groups approach to assessing criterion validity examines scale score differences between groups of individuals who differ on some important variable. Multivariate Analysis of Variance (MANOVA) procedures were used to contrast scale scores for the identified and community samples. Preliminary tests of homogeneity of variance and normality were conducted, and no adverse violations of assumptions were found. Subsequently, independent *t*-tests were used to compare the Total Protective Factors scores for the two groups.

Table 3.2a presents the results of this study with the DECA-I and documents that there were significant and meaningful differences between the "Identified" and the "Community" samples on all three scales. The mean standard score differences and other results reported in Table 3.2a indicate that the ratings of the two groups differ significantly despite the similarity in demographic characteristics ($p < .01$).

Table 3.1b

Characteristics of the DECA-T Validity Study Sample

	Identified Sample		Community Sample	
Characteristic		**%**		**%**
Size of Sample (*n*)	69		69	
Age (Months)				
Mean	27.3		27.5	
SD	4.6		5.2	
Gender				
Boys	43	62.3%	38	55.1%
Girls	26	37.7%	31	44.9%
Race*				
Native American	8	6.7%	2	2.9%
African American	9	20.0%	7	10.1%
Hispanic	15	26.6%	19	27.5%
Caucasian	45	40.0%	43	62.3%
Asian/Pacific Islander	1	20.0%	1	1.4%
Other	3	4.3%	2	2.9%

*Totals do not add up to 100% due to multiple race

Similarly, Table 3.2b presents the results of this study with the DECA-T and documents that there were significant and meaningful differences between the "Identified" and the "Community" samples on all four scales. The mean standard score differences and other results reported in Table 3.2b strongly indicate that the ratings of the two groups differed significantly despite the similarity in demographic characteristics ($p < .01$).

Besides being statistically significant, the means of the two groups on each instrument and on each scale differed by approximately one standard deviation (*d*-ratios range from .75 to 1.52). The *d*-ratio is a measure of the size of the difference between the mean scores expressed in standard deviation units. Widely accepted guidelines for interpreting *d*-ratios (Cohen, 1988) in comparing two groups indicate that the magnitudes of .2, .5, and .8 are interpreted as small, medium, and large, respectively. Therefore, the effect sizes in Tables 3.2a and 3.2b would all be characterized as large except Initiative on the toddler scale, which would be characterized as a medium effect size. These findings provide evidence of the validity of the DECA-I/T scales in discriminating between groups of infants and toddlers with and without social and emotional concerns.

Table 3.2a

Mean T Scores and Difference Statistics for DECA-I Validity Study

	Identified Sample (*n*=15)		Community Sample (*n*=15)
Initiative			
Mean	45.3		54.4
SD	8.6		11.8
***F* Value**		6.20***	
***d*-Ratio**		.89	
Attachment/Relationships			
Mean	41.6		54.4
SD	9.6		7.2
***F* Value**		18.89***	
***d*-Ratio**		1.52	
Total Protective Factors			
Mean	42.9		53.2
SD	9.3		9.6
t* Value		3.71**	
***d*-Ratio**		1.09	

* *t*-test for independent means
** $p < .01$
*** $p < .001$

Examination of Potential Adverse Impact on Minority Children

The contrasted group approach can also be used to show that groups that differ on a variable thought to be irrelevant to the purpose of the instrument do *not* differ on scale scores. To evaluate the appropriateness of the DECA-I/T for use with minority children, we compared the mean scores of African American and Caucasian children and Hispanic and Caucasian children in the standardization sample. The goal was to determine if these groups of children received similar ratings on the DECA-I/T. To assess the difference in ratings we compared the means using the *d*-ratio statistic. It should be noted that *d*-ratios following non-significant hypothesis tests should be interpreted as being not statistically significantly different from zero (Sawilowsky & Yoon, 2002).

Table 3.2b

Mean T Scores and Difference Statistics for DECA-T Validity Study

	Identified Sample (*n*=69)		Community Sample (*n*=69)
Attachment/Relationships			
Mean	42.6		50.3
SD	9.4		9.6
***F* Value**		31.01***	
***d*-Ratio**		.81	
Initiative			
Mean	42.7		50.4
SD	10.7		9.7
***F* Value**		37.42***	
***d*-Ratio**		.75	
Self-Regulation			
Mean	41.0		50.5
SD	9.7		9.7
***F* Value**		35.25***	
***d*-Ratio**		.98	
Total Protective Factors			
Mean	40.9		50.5
SD	8.9		9.8
t* Value		7.07**	
***d*-Ratio**		1.03	

* *t*-test for independent means
** $p < .01$
*** $p < .001$

Table 3.3a presents the results of these analyses for the DECA-I. As shown in Table 3.3a, 19 of 12 of the mean score differences were negligible. Two of the remaining three mean score differences would be characterized as "small" and one "medium." The average *d*-ratio when comparing scores earned by African American and Caucasian children was .09. The average *d*-ratio when comparing scores earned by Hispanic and Caucasian children was .26.

Table 3.3a

DECA-I Scale Scores: *d*-Ratios Comparing Minority and Non-Minority Children

	African-American vs. Caucasian	Hispanic vs. Caucasian
Teacher Raters		
Initiative	.08	.11
Attachment/Relationships	.01	.07
Total Protective Factors	.05	.11
Parent Raters		
Initiative	.19	.21
Attachment/Relationships	.15	.67
Total Protective Factors	.08	.41

Table 3.3b presents the results of these analyses for the DECA-T. As shown in Table 3.3b, 9 of 16 of the mean score differences were negligible. Six of the remaining mean score differences would be characterized as "small" and one as "medium." The average *d*-ratio when comparing scores earned by African American and Caucasian children was .20. The average *d*-ratio when comparing scores earned by Hispanic and Caucasian children was .24.

Table 3.3b

DECA-T Scale Scores: *d*-Ratios Comparing Minority and Non-Minority Children

	African-American vs. Caucasian	Hispanic vs. Caucasian
Teacher Raters		
Attachment/Relationships	.07	.02
Initiative	.33	.14
Self-Regulation	.05	.10
Total Protective Factors	.11	.06
Parent Raters		
Attachment/Relationships	.30	.68
Initiative	.06	.17
Self-Regulation	.42	.29
Total Protective Factors	.27	.47

Individual Prediction

The criterion validity of a test can also be determined by examining the ability of scale scores to predict accurately group membership for individual study participants. Therefore, we investigated the extent to which the DECA-I/T scale scores accurately predicted membership in either the identified or the community sample.

For each scale, we predicted that individuals with a T score of less than or equal to 40 would be members of the identified sample, and those with scores above 40 would be members of the community sample. (Recall that T scores of 40 and below on the protective factor scales indicate Areas of Need.) We then compared the accuracy of these predictions with actual group membership. Tables 3.4a and 3.4b present the results of this study for infants and toddlers respectively.

There are a number of ways to evaluate the accuracy of the predictions shown in Tables 3.4a and 3.4b. The first is to examine the *sensitivity* of the scale scores. Sensitivity is defined as the percentage of individuals in the identified sample who would be predicted by the scale T scores to be part of that group (i.e., who obtained scale T scores of less than or equal to 40). As shown in Table 3.4a, for the 15 infants in the identified sample, the Attachment/Relationships scale had the highest sensitivity at 46.7%. Total Protective Factors correctly predicted 40% of the identified sample and Initiative 26.7%.

Another common measure of the accuracy of scale predictions is *specificity*, or the percentage of individuals in the Community Sample that would be predicted to be in that group (i.e., have scale scores of greater than or equal to 40). The results in Table 3.4a indicate that the specificity of the DECA-I is quite high. For each scale, 86.7% of the infants in the Community Sample had scale T scores greater than 40.

Sensitivity and specificity can be combined to yield the *total correct predictions*. This is calculated by dividing the number of individuals in the two correct prediction categories (Identified Sample infants with T scores less than or equal to 40, and Community Sample infants with T scores greater than 40) by the total number of individuals in both samples. Using the Total Protective Factors scale T scores we would achieve a total correct prediction of 63.3%.

Another way to evaluate the predictive validity of an assessment is to examine the *positive predictive value*, which is the percentage of individuals receiving a positive score (in the case of the DECA-I, a T score of less than or equal to 40) that are part of the identified sample. An examination of Table 3.4a reveals that six of the eight infants receiving a T score of less

Table 3.4a

Actual and Predicted Group Membership for the DECA-I Validity Study

	Identified Sample		Community Sample	
Characteristic	***n***	**%**	***n***	**%**
Actual Group Membership	15		15	
Predicted Group Membership				
Initiative				
≤40	4	26.7%	2	13.3%
> 40	11	73.3%	13	86.7%
Attachment/Relationships				
≤40	7	46.7%	2	13.3%
> 40	8	53.3%	13	86.7%
Total Protective Factors				
≤ 40	6	40%	2	13.3%
> 40	9	60%	13	86.7%

than or equal to 40 were from the identified sample, resulting in a positive predictive value of 75%. In other words, based on the results of this study, 75% of the time, when an infant receives a Total Protective Factors score that is in the Area of Need range, that child will be found to have significant behavioral challenges.

The results for toddlers, shown in Table 3.4b, are even stronger. Sensitivity ranged from 40.6% for Attachment/Relationships to 56.6% for Total Protective Factors. Sensitivity ranged from 79.7% for Attachment/Relationships to 87% for Initiative. Using the Total Protective Factors scale, the total correct classification in this study was 70.3%. Finally, the positive predictive value for toddlers based on the Total Protective Factors scale was 78%.

Table 3.4b

Actual and Predicted Group Membership for the DECA-T Validity Study

	Identified Sample		Community Sample	
Characteristic	***n***	**%**	***n***	**%**
Actual Group Membership	69		69	
Predicted Group Membership				
Attachment/Relationships				
≤40	28	40.6%	14	20.3%
> 40	41	59.4%	55	79.7%
Initiative				
≤40	34	49.3%	9	13.0%
> 40	35	50.7%	60	87.0%
Self-Regulation				
≤40	34	49.3%	13	18.8%
> 40	35	50.7%	56	81.2%
Total Protective Factors				
≤40	39	56.6%	11	15.9%
> 40	30	43.4%	58	84.1%

The results of the individual prediction study indicate that the DECA-I/T can provide very useful information in identifying infants and toddlers who have significant behavioral challenges. It should also be noted that sensitivity and specificity cannot both be maximized—they are a trade off. As one increases sensitivity, one necessarily decreases specificity and vice versa. Therefore, the authors of a test have to choose which category of correct prediction to maximize. In the DECA-I/T, we have chosen to maximize specificity. What this means is that comparatively few young children who do not have significant emotional and behavioral challenges will achieve

low scores on the DECA-I/T. That is, there will be very few false positive findings. This will help ensure that mental health promotion resources, which are often quite scarce, will be devoted to those infants and toddlers that truly need them. Caution should be used, since some children will still need additional support and should not be ignored. This underscores the importance of not rigidly using the recommended cut-score of 40 and considering many sources of information in making important decisions about the child.

Construct Validity

Convergent Validity

Construct-related validity ascertains the degree to which the assessment instrument measures the theoretical construct of interest. One of the primary methods of contributing evidence of construct validity is to demonstrate convergence with previously established constructs of a similar nature. In the case of the DECA-I/T, the construct generally pertains to the extent to which the DECA-I/T captures evidence of resilience versus some other characteristic of infants and toddlers.

Typically, convergence evidence is demonstrated by high correlations between scores on the instrument under investigation and scores on previously established measures of the same construct. Because of the overlap in ages between the DECA (LeBuffe & Naglieri, 1999) and the DECA-T, and the similarity of the factors, it was possible to test the convergence of the constructs on the two measures.

A sample (*n*=35) of toddlers of age 2 years to 3 years old was assessed using both the DECA and the DECA-T. The DECA scales (Initiative, Self-Control, Attachment, and Total Protective Factors) and the DECA-T scales (Attachment/Relationships, Initiative, Self-Regulation, and Total Protective Factors) are conceptually the same. Table 3.5 presents the results of this study.

These results were examined and all found to be statistically significant, as would be expected if there were convergence evidence. Thus, these findings provide evidence that DECA-T does measure protective factors similarly as when compared to the DECA. Furthermore, due to anchor and similar core items, albeit differing factor analytic structure, there is a level of confidence regarding convergence evidence of the DECA-I as well.

Table 3.5

Convergent Validity Results (DECA and DECA-T)

			DECA-T			
			A/R	In	SR	TPF
DECA	AT	Pearson Correlation	.877(**)	.725(**)	.646(**)	.844(**)
		N	35	34	33	33
	In	Pearson Correlation	.687(**)	.831(**)	.639(**)	.799(**)
		N	35	34	33	33
	SC	Pearson Correlation	.637(**)	.605(**)	.868(**)	.712(**)
		N	35	34	33	33
	TPF	Pearson Correlation	.848(**)	.851(**)	.769(**)	.907(**)
		N	35	34	33	33

** Correlation is significant at the 0.01 level (2-tailed).

DECA-T Factors

A/R = Attachment/Relationships / In = Initiative / SR = Self-Regulation / TPF = Total Protective Factors

DECA Factors

AT = Attachment / In = Initiative / SC = Self-Control / TPF = Total Protective Factors

The subscales (Attachment/Relationships, Initiative, Self-Regulation) of the DECA-T should not be orthogonal, and all the more so negatively related, which would be counter evidence to their relationship to the same resiliency construct. Nevertheless, they should not be perfectly related to each other, which would be counter evidence that they are independent factors of the same construct. Therefore, they should present intercorrelations that are positive and moderately high in magnitude. The intercorrelations in Table 3.5 provide ample evidence of this interrelationship between the subscales.

Protective Factor Study

An alternative approach to establishing construct validity is to demonstrate that the assessment instrument yields data that are consistent with predictions derived from the theory underlying the instrument. This approach was also used in demonstrating the construct validity of the DECA-I/T. Protective factors are defined as "characteristics that are thought to moderate or buffer the negative effects of stress and result in more positive behavioral and psychological outcomes in at-risk children than would have possible in their absence" (Masten & Garmezy, 1985). Therefore, for similar levels of stress or risk, children with high protective factors as measured by the DECA-I/T should have more positive behavioral outcomes. To test this hypothesis, measures of early childhood risk factors and family stress were obtained on 56 infants and 109 toddlers. Demographic information on this sample is provided in Table 3.6.

Table 3.6

Sample Characteristics for the DECA-IT Protective Factor Study

	n	%
Age		
Infants	56	35
Toddlers	109	65
Gender		
Male	94	57
Female	71	43
Race		
American Indian/Alaska Native	3	2
Asian	5	3
Black/African American	14	8
Native Hawaiian	1	1
White	137	83
Other	4	2
Hispanic Ethnicity	18	11

A commonly used approach to measuring stress and risk in children and families is to inventory the major life events that the child has experienced such as death of a parent, homelessness or major illness. An alternative approach to measuring stress and risk is to assess daily hassles, which are repetitive difficulties in daily living such as transportation problems, family conflict or financial difficulties. Both approaches were used in this study. Parents and family caregivers who provided the DECA-I/T ratings on the 165 participants in this study were also asked to complete a questionnaire that included demographic information about the child and his/her family, as well as information about daily hassles and major life events which may contribute to the child's level of risk. The parents answered each question "Yes" or "No." The daily hassles and major life events questions on this form were based on a previously used "Preschool Major Life Events Checklist" ((adapted with permission from the Life Events Checklist (Work, Cowen, Parker & Wyman, 1990) and the Sources of Stress Inventory (Chandler, 1981) and a "Preschool Daily Hassles Checklist" adapted with permission from the Daily Hassles Scale (Kanner, Coyne, Schaefer & Lazarus, 1981)).

Parents and family caregivers also rated their infant or toddler on the Temperament and Atypical Behavior Scale (TABS; Neisworth, Bagnato, Salvia & Hunt, 1999). The TABS is a questionnaire on which parents rate the presence of 55 behaviors in their child, marking either "Yes" or "No." Parents are also invited to mark "Need Help" for behaviors that they feel pose a problem. The TABS is composed of four scales, including Detached, Hyper-sensitive/Active, Underreactive, and Dysregulated. Raw scores are calculated on each of the four subscales by adding the number of items marked "Yes" and/or "Need Help." The TABS also includes a summary scale, the Temperament and Regulatory Index (TRI), which is based on the sum of the item scores. The TRI was used as the dependent variable in this study. The TRI has a mean of 100 and a standard deviation of 15. It should be noted that on the TRI, lower standard scores are associated with more problematic behaviors and higher scores are desirable.

Data for infants and toddlers were combined for all analyses in this study. First, the raw scores from the family risk measure were converted to Total Risk Index T-scores. A median split of the Total Risk Index T-scores was used to assign the 165 participants in the study to a High Risk Group or a Low Risk Group. Similarly, a median split of the Total Protective Factors T-score was used to assign participants to a Low Protective Factors Group or a High Protective Factors Group. This procedure resulted in four groups: (a) High Risk-High Protective Factors (n = 40); (b) High Risk- Low Protective Factors (n = 42); (c) Low Risk-High Protective Factors (n = 39); and (d) Low Risk-Low Protective Factors (n = 44). The relationships of Total Risk and Total Protective Factors scores to the Temperament and Regulatory Index scores are presented in Table 3.7 and Figure 3.1.

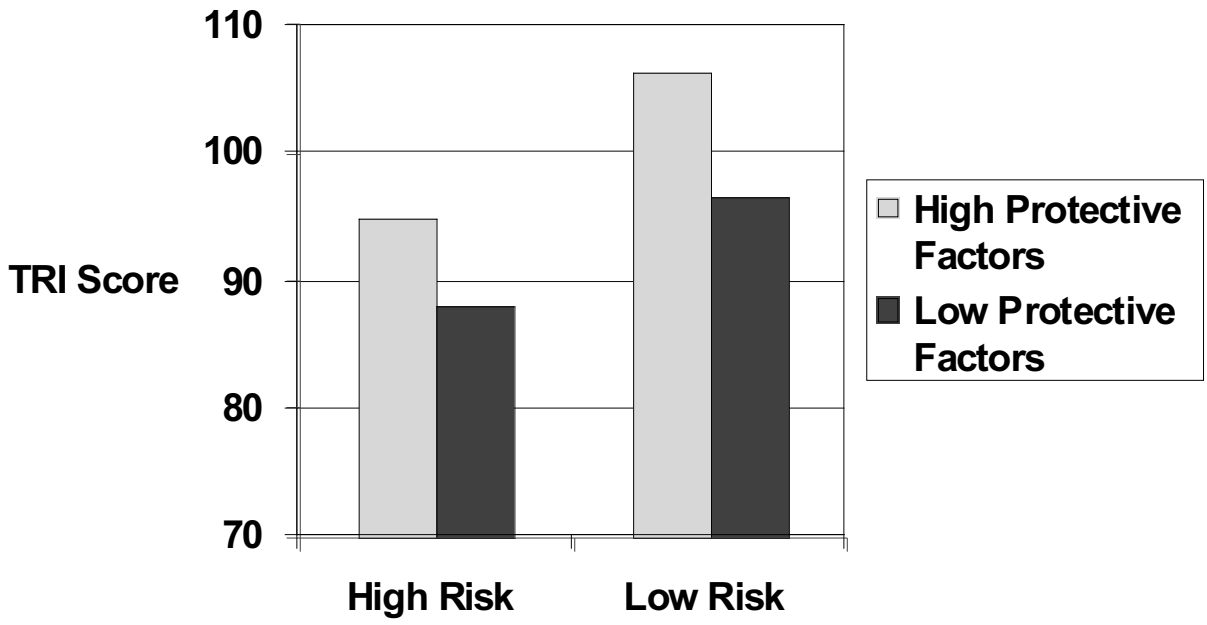
Table 3.7

Mean Temperament and Regulatory Index Scores for Risk and Protective Factor Groups in DECA Protective Factor Study

	Low Risk	High Risk
Low Protective Factors	96.7	88.0
High Protective Factors	106.3	94.9

Figure 3.1

Mean Temperament and Regulatory Index Scores for Risk and Protective Factor Groups



Consistent with resilience theory, the High Risk-Low Protective Factor group had the lowest mean score (x = 88.0). The High Risk- High Protective Factor group's mean score (x = 94.9) was 6.9 points, or nearly half a standard deviation higher. The Low Risk-High Protective Factor group had the highest mean score, 106.3 more than a full standard deviation higher than the High-Risk-Low Protective group mean. These results were examined using a 2-way ANOVA (Analysis of Variance). Main effects of both Total Risk ($F = 19.4$, $p < .0001$ and Total Protective Factors ($F = 13.1$, $p < .00$) were found, and there was no interaction ($F = 0.4$, $p = .54$). These findings indicate that Protective Factors, as measured by the DECA-I/T, do indeed moderate risk. For children at both levels of risk, higher protective factors were associated with better outcomes than low protective factors. These findings provide evidence that the DECA-I/T does indeed measure protective factors related to resilience in infants and toddlers.

Summary

The studies reported in this chapter, when taken as a whole, provide evidence that the DECA-I/T provides useful information about the social and emotional strengths of infancts and toddlers that can be used to inform practice. In the cross-sectional research studies reported here, protective factor scale scores were significantly associated with either the presence or absence of social emotional concerns for children from both a statistical and practical perspective. Parents and early care and education professionals now have a psychometrically sound measure, which can be used to support a strength-based system for all infants and toddlers. With the ability to recognize risk and support key protective factors, children will have an increased potential for school and life success.

The authors of the DECA-I/T and their colleagues at the Devereux Early Childhood Initiative are planning a series of multi-year longitudinal research studies to clarify further the role of identified protective factors, as measured by the DECA-I/T, in buffering children from risk and in fostering healthy social and emotional growth. Until those results are available, however, the DECA-I/T can be utilized with confidence based on the studies reported here.

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