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## Chapter 3

### Psychometric Properties

#### *Reliability*

The reliability of an assessment tool like the DECA-C 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). DECA-C scale reliability was assessed using several methods. First, the internal reliability coefficient for each scale was computed. Second, test-retest reliability of each scale was assessed. Finally, interrater reliability (two raters evaluating the same child) for each scale was determined.

**Internal Reliability** - Internal reliability (or internal consistency) refers to the extent to which the items on the same scale or assessment instrument measure the same underlying construct. Internal consistency was determined using Cronbach’s alpha (Cronbach, 1951). The internal reliability coefficients (alphas) were based on the Protective Factors standardization sample for the protective factor scales, and the Behavioral Concerns standardization sample was used for the behavioral concern scales. The internal consistency estimate for each scale was calculated according to rater and are presented in Table 3.1. The results indicate that the DECA-C Total Scales have excellent internal reliability. The Total Protective Factors Scale alpha coefficients for Parent Raters (.91) and Teacher Raters (.94) both exceed the .90 value for a total score suggested by Bracken (1987) and meet the “desirable standard” described by Nunnally (1978, p. 246). Similarly, the Total Behavioral Concerns Scale alpha coefficients for Parent Raters (.88) and Teachers (.93) are above or very close to the recommended standard.

The internal reliability coefficients for the protective factor scales (Initiative, Self-control, and Attachment) range from a low of .76 (Attachment – Parent Raters) to a high of .90 (Initiative and Self-control – Teacher Raters).

The median reliability coefficient across these three scales was .84 for Parent Raters and .90 for Teacher Raters. These median values exceed the .80 minimum suggested by Bracken (1987).

The internal reliability coefficients for the behavioral concern scales (Withdrawal/Depression, Emotional Control Problems, Attention Problems, and Aggression) range from a low of .66 (Withdrawal/Depression – Parent Raters) to a high of .90 (Attention Problems – Teacher Raters). The median reliability coefficient across these four scales was .76 for Parent Raters and .88 for Teacher Raters. These median values meet or approach the .80 minimum suggested by Bracken (1987).

**Table 3.1**

**Internal Reliability (Alpha) Coefficients  
for the DECA-C Scales by Rater**

Scales	Raters	
	Parents	Teachers
<b>Total Protective Factors</b>	<b>.91</b>	<b>.94</b>
<b>Initiative</b>	<b>.84</b>	<b>.90</b>
<b>Self-control</b>	<b>.86</b>	<b>.90</b>
<b>Attachment</b>	<b>.76</b>	<b>.85</b>
<b>Total Behavioral Concerns</b>	<b>.88</b>	<b>.93</b>
<b>Withdrawal/Depression</b>	<b>.66</b>	<b>.80</b>
<b>Emotional Control Problems</b>	<b>.78</b>	<b>.88</b>
<b>Attention Problems</b>	<b>.76</b>	<b>.90</b>
<b>Aggression</b>	<b>.76</b>	<b>.88</b>

*Standard Errors of Measurement* - The standard error of measurement ( $SE_M$ ) is an estimate of the amount of error in observed scores, expressed in standard score units (i.e.,  $T$ -scores). We obtained the  $SE_M$  for each of the DECA-C scale  $T$ -scores directly from the internal reliability coefficients using the formula,

$$SE_M = SD\sqrt{1-reliability}$$

Where SD is the theoretical standard deviation of the  $T$ -score (10) and the

appropriate reliability coefficient is used. The  $SE_M$ s for each DECA-C scale are presented in Table 3.2 according to rater. Note that the values of the  $SE_M$  vary with the size of the reliability coefficient – the higher the reliability, the smaller the standard error of measurement.

**Table 3.2**

**Standard Errors of Measurement  
for the DECA-C Scale T-Scores**

<b>Scales</b>	<b>Raters</b>	
	<b>Parents</b>	<b>Teachers</b>
<b>Total Protective Factors</b>	<b>3.00</b>	<b>2.45</b>
<b>Initiative</b>	<b>4.00</b>	<b>3.16</b>
<b>Self-control</b>	<b>3.74</b>	<b>3.16</b>
<b>Attachment</b>	<b>4.90</b>	<b>3.87</b>
<b>Total Behavioral Concerns</b>	<b>3.46</b>	<b>2.65</b>
<b>Withdrawal/Depression</b>	<b>5.83</b>	<b>4.47</b>
<b>Emotional Control Problems</b>	<b>4.69</b>	<b>3.46</b>
<b>Attention Problems</b>	<b>4.90</b>	<b>3.16</b>
<b>Aggression</b>	<b>4.90</b>	<b>3.46</b>

*Test-Retest Reliability* - The correlation between scores obtained for the same child 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).

To investigate the test-retest reliability of the DECA-C, a group of teachers ( $n = 41$ ) and a group of parents ( $n = 25$ ) rated the same child on two different occasions separated by a 24- to 72-hour interval of time. The children involved in the study attended a variety of preschool programs. The sample was comprised of approximately 70% white children whose parental education levels varied across all categories.

The results of this study are shown in Table 3.3. All of the correlations are significant ( $p < .01$ ) and indicate that the DECA-C scales have good test-retest reliability.

**Table 3.3****Test-Retest Reliability Coefficients for Two DECA-C Ratings by the Same Teacher or Parent for the Same Child over a 24 to 72 Hour Interval**

Scales	Raters	
	Parents	Teachers
<b>Total Protective Factors</b>	<b>.74</b>	<b>.94</b>
<b>Initiative</b>	<b>.80</b>	<b>.91</b>
<b>Self-control</b>	<b>.64</b>	<b>.91</b>
<b>Attachment</b>	<b>.55</b>	<b>.87</b>
<b>Total Behavioral Concerns</b>	<b>.88</b>	<b>.86</b>
<b>Withdrawal/Depression</b>	<b>.85</b>	<b>.78</b>
<b>Emotional Control Problems</b>	<b>.83</b>	<b>.80</b>
<b>Attention Problems</b>	<b>.84</b>	<b>.87</b>
<b>Aggression</b>	<b>.79</b>	<b>.87</b>

*Note.* All correlations are significant at  $p < .01$ .

**Interrater Reliability** - The correlation between scores obtained for the same child at the same time by two different Raters is an indicator of the interrater reliability of an assessment instrument. The magnitude of the correlations between these scores tells us about the degree of similarity in the different Raters' perception of the child's behavior. The optimal condition for evaluating the interrater reliability of an assessment is to have two Raters observing the same child in the same environment at the same time. Therefore we examined the interrater reliability of the DECA-C by comparing ratings obtained from two teachers, or a teacher and teacher aide, who work in the same classroom.

The correlations of a set of ratings obtained for the same children by two teachers (or a teacher and a teacher aide) are provided in Table 3.4. The teacher-teacher data for the protective factor scales were obtained from pairs of ratings on 80 children, and the behavioral concern scales data from pairs of ratings on 43 children. The results indicate that pairs of teachers who saw the children in the same environment at the same time rated the children similarly. All the correlations are significant ( $p < .05$ ). The values range from .32 (Withdrawal/

Depression) to .77 (Self-control). This range of scores suggests that behaviors associated with Withdrawal/Depression may be harder to reliably observe, presumably because of the subtle nature of the behaviors, whereas the more obvious behaviors involving outward expression of emotion are more reliably identified. The data also suggest that protective factors and behavioral concerns scales have about the same level of interrater reliability.

**Table 3.4**

**Interrater Reliability Coefficients for Two DECA-C Ratings by Two Teachers for the Same Child**

<b>Scales</b>	<b>Correlation</b>
<b>Total Protective Factors</b>	<b>.69</b>
<b>Initiative</b>	<b>.59</b>
<b>Self-control</b>	<b>.77</b>
<b>Attachment</b>	<b>.57</b>
<b>Total Behavioral Concerns</b>	<b>.66</b>
<b>Withdrawal/Depression</b>	<b>.32</b>
<b>Emotional Control Problems</b>	<b>.65</b>
<b>Attention Problems</b>	<b>.63</b>
<b>Aggression</b>	<b>.70</b>

*Note.* All correlations are significant at  $p < .05$ .

**Summary** - The results of the several reliability studies of the DECA-C indicated that the instrument is sufficiently reliable for assessing preschool children's protective factors and behavioral concerns. The internal consistency data demonstrated that the DECA-C meets standards suggested by professionals in the field. The test-retest study showed that raters give similar DECA-C scores over time and that day-to-day changes in behavior do not unduly influence ratings. Finally, the results for the interrater reliability study showed that different teachers rate children similarly on behaviors associated with protective factors and behavioral concerns. These results should assure early care and educational professionals that the DECA-C is a reliable instrument that can be used with confidence.

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## 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, 1999), validity evidence can be conceptualized as content-related, criterion-related, and construct-related. We investigated the validity of the DECA-C in regard to each of these three areas.

**Content-Related Validity** - This type of validity assesses the degree to which the domain measured by the test is represented by the test items. With respect to the DECA-C, content-related validity addresses how well the 27 protective factor items represent the domain of within-child behavioral characteristics related to resilience in preschoolers, and how well the 35 behavioral concern items represent the domain of preschool emotional and behavioral problems.

The DECA, which contains the same protective factor items as the DECA-C, was the first standardized, norm-referenced measure of within-child protective factors in preschool children to be published. As such, it is not possible to compare the protective factor item coverage of the DECA-C with other similar instruments – a common method for establishing content-related validity. However, the protective factor items on the DECA and DECA-C were based on a thorough review of the literature as well as focus groups conducted with parents and teachers of preschoolers.

The content-related validity of the behavioral concern items on the DECA-C has been established through a variety of means. These items were developed from information gathered from three sources: 1) parent and teacher focus groups, 2) a thorough review of the developmental psychopathology literature, and 3) the childhood version of the *Devereux Scales of Mental Disorders* (DSMD) (Naglieri, LeBuffe, & Pfeiffer, 1994). The DSMD items were based largely on the diagnostic criteria and associated features for a wide variety of mental disorders as set forth by the American Psychiatric Association in the DSM-IV (*Diagnostic and Statistical Manual of the American Psychiatric Association, Fourth Edition*, 1994). Overall, the final set of items on the

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DECA-C reflect what professionals in the early care and education field and parents of preschooler believe, what the research indicates, and what the American Psychiatric Association asserts to be problematic behavior in early childhood.

**Criterion-Related Validity** - This type of validity measures the degree to which the scores on the assessment instrument predict either an individual's performance on an outcome or criterion measure, or the status or group membership of the individual.

As discussed in the foreword, protective factors buffer children against stress and adversity, resulting in better outcomes than would have been possible in their absence. One important outcome for preschool children is social and emotional health. Consequently, children with high scores on the protective factor scales should have greater social and emotional health than children with low scores on these scales. Conversely, children with high scores on the behavioral concern scales should have poorer mental health outcomes.

To test this hypothesis, we obtained DECA-C ratings on two samples of preschool children. The "identified sample" ( $n = 95$ ) had known emotional and behavioral problems. These children met at least one of the following criteria: 1) a program or plan had been developed to manage their behavior problems, 2) they had been referred to a professional for emotional or behavioral problems, 3) they were currently being treated by a mental health professional, 4) they had been asked to leave a child care or preschool program due to their behavior, or 5) they had been given a psychiatric diagnosis.

Also obtained were DECA-C ratings for a comparison group of typical preschool children, the "community sample" ( $n = 300$ ). The children involved in this study were from 39 different programs in 18 states.

A matched sample of 86 children from the community sample was identified for comparison to the identified sample. These two groups were matched on age, gender, race, and ethnicity. Table 3.5 provides descriptive information on both samples and shows that the two groups were demographically similar.

**Table 3.5****Sample Characteristics  
for the DECA-C Criterion Validity Study**

	<b>Identified Sample</b>		<b>Community Sample</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
<b>Size of Sample</b>	<b>95</b>		<b>86</b>	
<b>Age (years)</b>				
<b>Mean</b>	<b>4.6</b>		<b>4.6</b>	
<b>SD</b>	<b>0.9</b>		<b>0.9</b>	
<b>Gender</b>				
<b>Boys</b>	<b>63</b>	<b>66</b>	<b>58</b>	<b>67</b>
<b>Girls</b>	<b>32</b>	<b>34</b>	<b>28</b>	<b>33</b>
<b>Race</b>				
<b>Asian/Pacific</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>
<b>Black</b>	<b>25</b>	<b>27</b>	<b>28</b>	<b>33</b>
<b>American Indian</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>
<b>White</b>	<b>57</b>	<b>60</b>	<b>50</b>	<b>58</b>
<b>Other</b>	<b>9</b>	<b>10</b>	<b>5</b>	<b>6</b>
<b>Hispanic Ethnicity</b>	<b>9</b>	<b>10</b>	<b>4</b>	<b>5</b>

*Contrasted Groups* – The contrasted groups approach to assessing criterion validity examines scale score differences between groups of individuals who differ on some important characteristic. Multivariate Analysis of Variance (MANOVA) procedures were used to contrast Initiative, Self-control, Attachment, Withdrawal/Depression, Emotional Control Problems, Attention Problems, and Aggression Scale scores for the identified and community samples. Independent *t*-tests were used to compare both the Total Protective Factors and Total Behavioral Concerns Scale scores for the two groups.

Table 3.6 presents the results of this study and documents that there were large and significant differences between the mean scores of the identified and community samples on all DECA-C scales. The mean standard score differences and other results reported in Table 3.6 clearly show that the ratings of the two groups differed significantly despite the similarity in demographic characteristics. All scale comparisons were significant ( $p < .01$ ).



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In addition to being statistically significant, the means of the two groups on each scale differed by approximately half a standard deviation or more (*d*-ratios range from .42 to 1.12). The *d*-ratio is a measure of the size of the difference between the mean scores of two groups expressed in standard deviation units. According to commonly accepted guidelines for interpreting *d*-ratios (Cohen, 1988), *d*-ratios of .2, .5, and .8 are interpreted as small, medium, and large, respectively. Therefore, of the effect sizes reported in Table 3.6, two (Withdrawal/Depression and Attachment) are small, one (Initiative) is medium, and six are large. The mean scale scores of the identified and community samples differed by at least a standard deviation on three scales (Self-control, Attention Problems and Total Behavioral Concerns). These results provide strong evidence of the validity of both the protective factor and behavioral concern scales in discriminating between groups of preschoolers with and without emotional and behavioral problems.

*Examination of Potential Adverse Impact on Minority Children* - The contrasted group approach can also be used to examine group differences on a variable thought to be *irrelevant* to the construct being assessed. Messick (1995) calls this construct irrelevant variance. To evaluate the appropriateness of the DECA-C for use with minority children, we compared the mean scores of the Black and White children and of the Hispanic and Non-Hispanic children included in the Behavioral Concerns standardization sample. The goal was to determine if these groups of children received similar ratings on the DECA-C. The demographic characteristics of these groups of children are shown in Table 3.7. On both the rater and gender variables, the three samples of children were quite similar. There were, however, some differences on region of residence, with more Black children living in the South, more white children living in the Midwest, and more Hispanic children living in the Northeast than the other two groups. There were also differences in socioeconomic status. Nearly half of the Black and Hispanic children received subsidized child care as compared to 13% for White children. Similarly, a larger percentage of Black and Hispanic children's families received public assistance (28.2% and 15.5% respectively) than White children's families (7.3%).

**Table 3.6****Mean T-Scores, Standard Deviations and Difference Statistics for DECA-C Criterion Validity Study**

	<b>Identified Sample (n = 95)</b>	<b>Community Sample (n = 86)</b>
<b>Initiative</b>		
Mean	41.2	48.6
SD	9.8	9.2
F Value		27.3***
d-ratio		.78
<b>Self-control</b>		
Mean	38.9	49.1
SD	10.2	10.1
F Value		46.4***
d-ratio		1.00
<b>Attachment</b>		
Mean	41.9	47.0
SD	10.5	11.2
F Value		10.1**
d-ratio		.47
<b>Total Protective Factors</b>		
Mean	38.5	47.3
SD	9.9	10.0
t Value <sup>a</sup>		-6.00***
d-ratio		.88
<b>Withdrawal/Depression</b>		
Mean	58.5	53.7
SD	12.0	10.6
F Value		8.1**
d-ratio		.42
<b>Emotional Control Problems</b>		
Mean	63.2	54.7
SD	9.9	9.0
F Value		35.9***
d-ratio		.90

Table 3.6 continued

<b>Attention Problems</b>		
<b>Mean</b>	<b>65.1</b>	<b>54.8</b>
<b>SD</b>	<b>10.1</b>	<b>10.2</b>
<b>F Value</b>	<b>47.4***</b>	
<b>d-ratio</b>	<b>1.01</b>	
<b>Aggression</b>		
<b>Mean</b>	<b>63.8</b>	<b>54.5</b>
<b>SD</b>	<b>9.9</b>	<b>9.5</b>
<b>F Value</b>	<b>41.8***</b>	
<b>d-ratio</b>	<b>.96</b>	
<b>Total Behavioral Concerns</b>		
<b>Mean</b>	<b>65.2</b>	<b>54.5</b>
<b>SD</b>	<b>9.1</b>	<b>10.0</b>
<b>t Value<sup>a</sup></b>	<b>7.48***</b>	
<b>d-ratio</b>	<b>1.12</b>	

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

<sup>a</sup>  $t$  test for independent samples

To assess the difference in the DECA-C ratings we compared the means using the  $d$ -ratio statistic. Table 3.8 presents the results of these analyses. The results in Table 3.8 indicate that the DECA-C scores earned by Black, White, and Hispanic children were similar. The differences between Black and White children when, rated by teachers, were negligible ( $d$ -ratio less than .20) for two of the nine comparisons and small ( $d$ -ratio of .20 to .50) for the remaining comparisons according to Cohen's interpretive guidelines. For Parent Raters, six of the nine comparisons were negligible and the remaining three were small.

Similarly, for teachers who rated Hispanic and Non-Hispanic children, four of the comparisons yielded negligible effect sizes and all of the remaining differences were small. For Parent Raters, five effect sizes for Hispanic and Non-Hispanic children were negligible and four small.

**Table 3.7**

**Sample Characteristics for the d-Ratios  
Comparing Minority and Non-Minority Children**

	<b>Black</b>		<b>White</b>		<b>Hispanic</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
<b>Size of Sample</b>	<b>173</b>		<b>806</b>		<b>98</b>	
<b>Rater</b>						
<b>Teacher</b>	<b>108</b>	<b>62.4</b>	<b>379</b>	<b>47.0</b>	<b>59</b>	<b>60.2</b>
<b>Parent</b>	<b>65</b>	<b>37.6</b>	<b>427</b>	<b>53.0</b>	<b>39</b>	<b>39.8</b>
<b>Gender</b>						
<b>Boys</b>	<b>85</b>	<b>49.1</b>	<b>416</b>	<b>51.7</b>	<b>56</b>	<b>57.1</b>
<b>Girls</b>	<b>88</b>	<b>50.9</b>	<b>388</b>	<b>48.3</b>	<b>42</b>	<b>42.9</b>
<b>Region</b>						
<b>Northeast</b>	<b>25</b>	<b>14.5</b>	<b>215</b>	<b>26.7</b>	<b>40</b>	<b>41.2</b>
<b>Midwest</b>	<b>30</b>	<b>17.4</b>	<b>256</b>	<b>31.8</b>	<b>13</b>	<b>13.4</b>
<b>West</b>	<b>15</b>	<b>8.7</b>	<b>173</b>	<b>21.5</b>	<b>23</b>	<b>23.7</b>
<b>South</b>	<b>102</b>	<b>59.3</b>	<b>161</b>	<b>20.0</b>	<b>21</b>	<b>21.6</b>
<b>Subsidized Child Care</b>						
<b>Yes</b>	<b>72</b>	<b>45.3</b>	<b>101</b>	<b>12.9</b>	<b>48</b>	<b>49.5</b>
<b>No</b>	<b>87</b>	<b>54.7</b>	<b>683</b>	<b>87.1</b>	<b>49</b>	<b>50.5</b>
<b>Public Assistance</b>						
<b>Yes</b>	<b>44</b>	<b>28.2</b>	<b>57</b>	<b>7.3</b>	<b>15</b>	<b>15.5</b>
<b>No</b>	<b>112</b>	<b>71.8</b>	<b>720</b>	<b>92.7</b>	<b>82</b>	<b>84.5</b>

**Table 3.8****DECA-C Scale Scores: d-Ratios Comparing Minority and Non-Minority Children**

	<b>Black vs. White</b>	<b>Hispanic vs. Non-Hispanic</b>
<b>Teacher Raters</b>		
<b>Initiative</b>	<b>.32</b>	<b>.20</b>
<b>Self-control</b>	<b>.33</b>	<b>.06</b>
<b>Attachment</b>	<b>.38</b>	<b>.20</b>
<b>Total Protective Factors</b>	<b>.38</b>	<b>.18</b>
<b>Withdrawal/Depression</b>	<b>.47</b>	<b>.13</b>
<b>Emotional Control Problems</b>	<b>.09</b>	<b>.01</b>
<b>Attention Problems</b>	<b>.29</b>	<b>.35</b>
<b>Aggression</b>	<b>.12</b>	<b>.36</b>
<b>Total Behavioral Concerns</b>	<b>.28</b>	<b>.26</b>
<b>Parent Raters</b>		
<b>Initiative</b>	<b>.04</b>	<b>.25</b>
<b>Self-control</b>	<b>.12</b>	<b>.27</b>
<b>Attachment</b>	<b>.38</b>	<b>.16</b>
<b>Total Protective Factors</b>	<b>.17</b>	<b>.27</b>
<b>Withdrawal/Depression</b>	<b>.26</b>	<b>.18</b>
<b>Emotional Control Problems</b>	<b>.02</b>	<b>.03</b>
<b>Attention Problems</b>	<b>.27</b>	<b>.20</b>
<b>Aggression</b>	<b>.17</b>	<b>.19</b>
<b>Total Behavioral Concerns</b>	<b>.05</b>	<b>.19</b>
<b>Total Sample</b>		
<b>Initiative</b>	<b>.18</b>	<b>.23</b>
<b>Self-control</b>	<b>.23</b>	<b>.17</b>
<b>Attachment</b>	<b>.38</b>	<b>.18</b>
<b>Total Protective Factors</b>	<b>.28</b>	<b>.23</b>
<b>Withdrawal/Depression</b>	<b>.39</b>	<b>.14</b>
<b>Emotional Control Problems</b>	<b>.06</b>	<b>.01</b>
<b>Attention Problems</b>	<b>.05</b>	<b>.28</b>
<b>Aggression</b>	<b>.01</b>	<b>.29</b>
<b>Total Behavioral Concerns</b>	<b>.15</b>	<b>.23</b>

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When all raters are considered together, the median effect size for Black compared to White Children was .23 for the three protective factor scales and .06 for the four behavioral concern scales. When Hispanic and Non-Hispanic children are compared, the median effect size for the three protective factors scales was .18, and for the four behavioral concern scales was .21. These results indicate that these groups of children receive very similar mean scale scores on the DECA-C despite the demographic differences noted above.

*Individual Prediction* - The criterion validity of an assessment can also be determined by examining the ability of scale scores to predict accurately group membership. The extent to which both the Total Protective Factors and the Total Behavioral Concerns Scale scores accurately predicted membership in either the identified or the community sample were, therefore, examined.

For the Total Protective Factors 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. For the Total Behavioral Concerns Scale, we predicted that individuals with a *T*-score of greater than or equal to 60 would be members of the identified sample, and those with scores below 60 would be members of the community sample. (Recall that *T*-scores of 40 and below on the protective factor scales and 60 and above on the behavioral concern scales indicate areas of concern.) We then compared these predictions with actual group membership. Table 3.9 presents the results of this study.

As shown in Table 3.9, low Total Protective Factors Scale scores correctly predicted group membership for 67% of the identified sample. Similarly, average to high Total Protective Factors Scale scores correctly predicted 71% of the community sample. Overall, the Total Protective Factors Scale scores correctly predicted group membership for 69% of the 181 children in this study. Significant chi-square analysis results ( $\chi^2 = 26.5$ ,  $df = 1$ ,  $p < .001$ , *phi* coefficient = .38) indicated that the Total Protective Factors Scale scores were significantly related to group membership.

High scores on the Total Behavioral Concerns Scale correctly predicted group membership for 76% of the identified sample. Similarly, average to low scores on this scale correctly predicted group membership for 72% of the children in the community sample. Overall, the Total Behavioral Concerns Scale

**Table 3.9****Actual and Predicted Group Membership  
for the DECA-C Criterion Validity Study**

	<b>Identified Sample</b>		<b>Community Sample</b>	
	<b>n</b>	<b>%</b>	<b>n</b>	<b>%</b>
<b>Actual Group Membership</b>	<b>95</b>		<b>86</b>	
<b>Predicted Group Membership</b>				
<b>Total Protective Factors</b>				
<b>TPF ≤ 40</b>	<b>64</b>	<b>67</b>	<b>25</b>	<b>29</b>
<b>TPF &gt; 40</b>	<b>31</b>	<b>33</b>	<b>61</b>	<b>71</b>
<b>Total Behavioral Concerns</b>				
<b>TBC ≥ 60</b>	<b>72</b>	<b>76</b>	<b>24</b>	<b>28</b>
<b>TBC &lt; 60</b>	<b>23</b>	<b>24</b>	<b>62</b>	<b>72</b>

correctly predicted group membership for 74% of the children in this study. Significant chi-square analysis results ( $X^2 = 41.55$ ,  $df = 1$ ,  $p < .001$ ,  $phi$  coefficient = .48) indicated that the Total Behavioral Concerns Scale scores were significantly related to group membership. The higher  $phi$  coefficient for the Total Behavioral Concerns Scale indicates that this scale is more strongly related to group membership than the Total Protective Factors Scale.

It should be noted that the classification accuracy of any assessment is determined both by the psychometric properties of the assessment and the decision rules (i.e., cut scores) used to make these decisions. A less stringent decision rule will result in more children being identified as having significant emotional and behavioral problems. A more stringent decision rule will result in fewer children being identified. In the case of the DECA-C, we have chosen a relatively stringent decision rule to minimize the chances of children being overidentified as having emotional and behavioral problems.

**Construct-Related Validity** - This type of validity examines the degree to which the assessment instrument measures the theoretical construct of interest. In the case of the DECA-C, construct-related validity concerns the extent to which the protective factor scales scores relate to resilience versus some other

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characteristic of preschool children. Similarly construct-related validity for the behavioral concern scales relates scale scores to emotional and behavioral concerns in young children.

*Protective Factor Construct-Related Validity* – The validity chapter of the DECA Technical Manual (LeBuffe & Naglieri, 1999b) presents a study that examined the construct-related validity of the protective factor scales of the DECA-C. The results of this study indicated that for both high risk and low risk children, high scores on the protective factor scales were associated with significantly fewer behavioral concerns than low scores on these scales. This finding provides evidence that the protective factor scales do measure characteristics of children that decrease the impact of risk factors. Interestingly, the results of this study also indicated that the DECA protective factors were as strongly related to behavioral concerns as a composite of over 60 risk factors.

*Behavioral Concern Construct-Related Validity* – To explore the construct-related validity of the Withdrawal/Depression, Emotional Control Problems, Attention Problems, and Aggression scales, DECA-C assessments were completed on 123 children from 19 sites in six states. Only children who had been given a psychiatric diagnosis were included in this study. Although the DECA-C is not designed to yield a specific psychiatric diagnosis, it is reasonable to expect a relationship between a child's diagnosis and the pattern of DECA-C scores. For instance, children with depressive disorders should have elevated scores on the Withdrawal/Depression Scale. Finding such logical relationships would provide construct-related evidence for the DECA-C scales.

In addition to the DECA-C, the Rater completed a demographic information sheet that requested information about the child's psychiatric disorder(s). These diagnoses had been given by psychiatrists (54%), psychologists (30%), pediatricians/family practitioners (13%), and other professionals (3%). Common diagnoses were Attention-Deficit/Hyperactivity Disorder, Oppositional Defiant Disorder, Pervasive Developmental Disorder, Adjustment Disorder, Reactive Attachment Disorder, and Depression/Dysthymia. These diagnoses were not, however, confirmed by an independent mental health professional. Demographic information on this sample is provided in Table 3.10.

Approximately two-thirds (62%) of the children in this sample fell into three diagnostic groups: Attention Deficit/Hyperactivity Disorder ( $n = 42$ ),



**Table 3.10****Demographic Characteristics of the DECA-C Construct Validity Sample**

	<b>N</b>	<b>%</b>
<b>Size of Sample</b>	<b>123</b>	
<b>Gender</b>		
<b>Boys</b>	<b>90</b>	<b>73</b>
<b>Girls</b>	<b>33</b>	<b>27</b>
<b>Race</b>		
<b>Black</b>	<b>42</b>	<b>34</b>
<b>White</b>	<b>69</b>	<b>56</b>
<b>Other</b>	<b>12</b>	<b>10</b>
<b>Hispanic Ethnicity</b>	<b>12</b>	<b>10</b>

Oppositional Defiant Disorder ( $n = 25$ ), and Depression/Dysthymia ( $n = 10$ ).

The mean DECA-C scale scores and standard deviations for these three groups are found in Table 3.11, and the corresponding DECA-C profiles are presented in Figures 3.1 through 3.3. The percentage of children in each group with a  $T$ -score falling in the concern range for each scale are presented in Table 3.12.

Each diagnostic group is discussed below.

*Attention-Deficit/Hyperactivity Disorder* - As shown in Figure 3.1, the 42 children in the Attention-Deficit/Hyperactivity Disorder (ADHD) group received their highest mean scale score on the Attention Problems Scale ( $T = 62$ ), as would be expected. Furthermore, 67% of the children in this group received a rating on this scale that was in the Concern Range (i.e.,  $T$ -score of 60 or higher). Nearly 20% more children with ADHD had a Concern rating on the Attention Problems Scale than any of the other three behavioral concern scales. The mean scale score on the Withdrawal/Depression scale was also in the Concern Range, as was the Total Behavioral Concerns Scale. The mean scale scores on both Emotional Control Problems and Aggression were in the Typical Range.

Children in this group also had mean scores in the Concern Range on the Attachment and Total Protective Factors Scales. In addition, the mean scores on both Initiative and Self-control were in the lower reaches of the Typical Range.

**Table 3.11****Mean T-scores and Standard Deviations for Different Diagnostic Groups in the DECA-C Construct Validity Sample**

	Diagnostic Group					
	ADHD		ODD		Depression	
	n = 42		n = 25		n = 10	
	mean	SD	mean	SD	mean	SD
<b>Initiative</b>	43	8.5	48	9.9	45	10.9
<b>Self-control</b>	43	10.1	41	9.0	46	8.2
<b>Attachment</b>	40	9.9	42	9.2	43	10.1
<b>Total Protective Factors</b>	40	8.7	43	9.3	42	9.3
<b>Withdrawal/Depression</b>	60	9.8	58	7.8	62	7.9
<b>Emotional Control Problems</b>	56	11.9	60	10.5	58	8.5
<b>Attention Problems</b>	62	7.9	60	8.7	58	12.0
<b>Aggression</b>	56	10.1	60	11.4	53	10.0
<b>Total Behavioral Concerns</b>	60	10.4	62	8.8	59	9.4

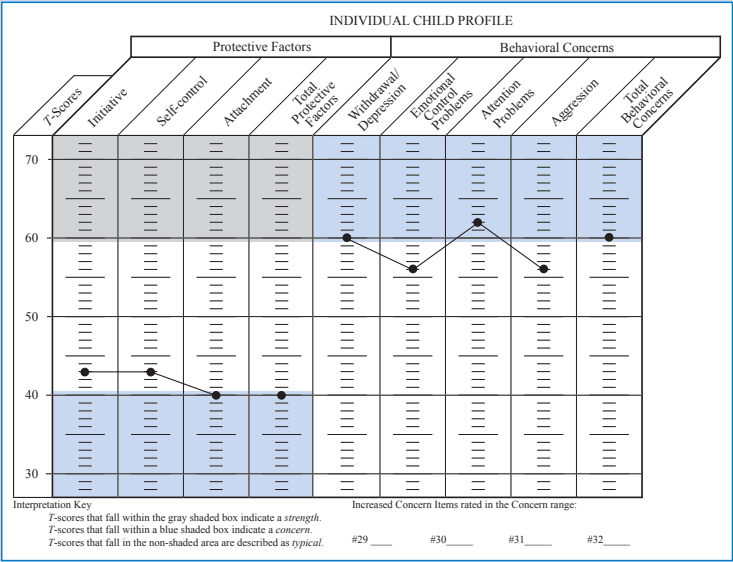
**Table 3.12****Percentage of Children in the Construct Validity Sample Receiving a T-score Rating in the Concern Range for each DECA-C Scale**

	Diagnostic Group		
	ADHD	ODD	Depression
<b>Size of Sample</b>	<b>n = 42</b>	<b>n = 25</b>	<b>n = 10</b>
<b>Initiative</b>	38%	24%	40%
<b>Self-control</b>	43%	44%	40%
<b>Attachment</b>	62%	48%	30%
<b>Total Protective Factors</b>	60%	36%	40%
<b>Withdrawal/Depression</b>	48%	40%	50%
<b>Emotional Control Problems</b>	38%	56%	50%
<b>Attention Problems</b>	67%	56%	50%
<b>Aggression</b>	48%	56%	30%
<b>Total Behavioral Concerns</b>	55%	60%	60%

Children with ADHD, like the children in the other two diagnostic groups, tend to have high scores on the DECA-C behavioral concern scales and low scores on the protective factor scales. In fact, for this group, more children received a Concern rating on the Total Protective Factors Scale (60%) than the Total Behavioral Concerns Scale (55%).

**Figure 3.1**

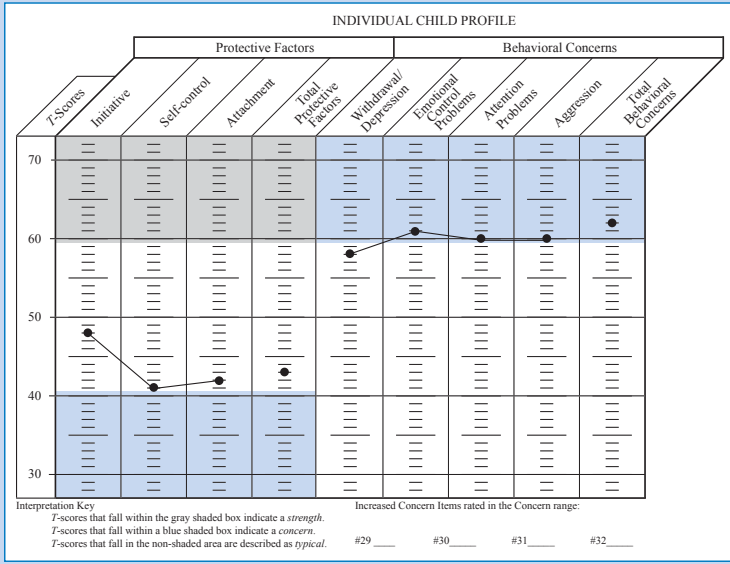
**Profile of Mean T-Scores for the ADHD Sample (n = 42)**



*Oppositional Defiant Disorder* – As shown in Figure 3.2, the 25 children in this group tended to have Typical or low Typical scores on the protective factor scales, and Concern scores on all of the behavioral concern scales except Withdrawal/Depression. Fifty-six percent of the children with ODD received ratings in the Concern Range on Emotional Control Problems, Attention Problems and Aggression; however, only 40% received a rating in the Concern Range on Withdrawal/Depression.

**Figure 3.2**

**Profile of Mean T-Scores for the ODD Sample (n = 25)**

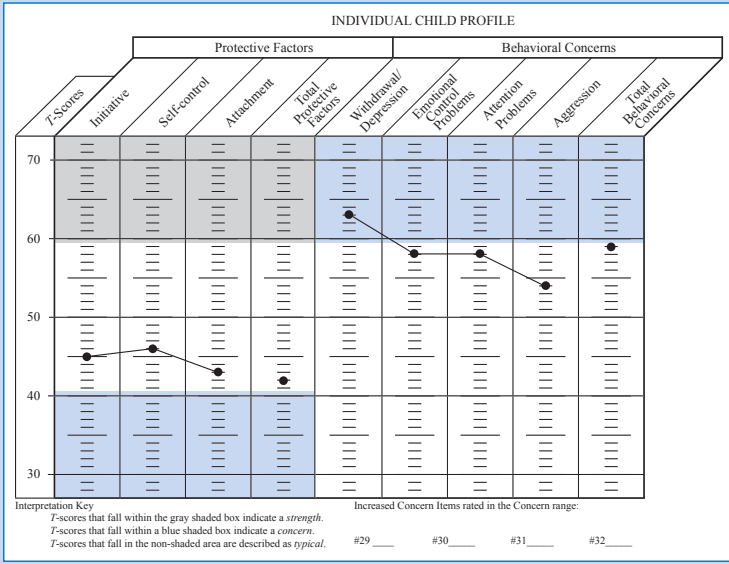


*Depression-* As shown in Figure 3.3, the only mean scale score in the Concern Range for the 10 children in this group was Withdrawal/Depression ( $T = 62$ ). In addition to the elevation on the Withdrawal/Depression Scale, this group of children is characterized by typical protective factor scale scores and relatively low Aggression Scale scores. Only 30% of the children in this group had a Concern Range rating on the Aggression Scale. While these results are consistent with expectations, further examination of these questions is warranted due to the small sample size.

*Relationships Between the Protective Factor and Behavioral Concern Scales* – The interrelationships of the protective factor and behavioral concern scales were investigated as the final step in examining the construct-related validity of the DECA-C. Two approaches were used: examination of scale inter-correlations, and actuarial analysis of the protective factor and behavioral concern scales.

**Figure 3.3**

**Profile of Mean T-Scores for the Depression Sample (n = 10)**



...text continues on page 48

The model underlying the DECA-C would hold that the scales should be positively correlated within their groupings (protective factors versus behavioral concerns), but negatively correlated across groupings. Table 3.13 presents the intercorrelation matrix for the DECA-C scale *T*-scores for the Behavioral Concerns standardization sample ( $N = 1,107$ ).

**Table 3.13**

**Intercorrelation Matrix of DECA-C Scales for the Behavioral Concerns Standardization Sample ( $N = 1,107$ )**

	IN	SC	AT	WD	ECP	AP
SC	.67					
AT	.61	.53				
WD	-.45	-.42	-.44			
ECP	-.34	-.60	-.23	.46		
AP	-.41	-.54	-.26	.44	.55	
AG	-.26	-.53	-.23	.38	.55	.61

Note. All  $ps < .000$

IN = Initiative, SC = Self-control, AT = Attachment, WD = Withdrawal/Depression, ECP = Emotional Control Problems, AP = Attention Problems, AG = Aggression

As expected, all of the protective factor scales correlated positively with each other ( $r$  ranging from .53 to .67) and all the correlations were significant. Similarly, all of the behavioral concern scales correlated positively with each other ( $r$  ranging from .38 to .61) and all of the correlations were significant. The lowest correlation was found between the Aggression and Withdrawal/Depression Scales. This is not surprising in that these scales measure what are generally regarded as two different types of behavioral concerns, internalizing and externalizing problems. In contrast, the highest correlation was found between the Aggression and Attention Problems Scales, which measure two dimensions of externalizing problems.

All of the correlations between protective factor and behavioral concern scales were negative in direction and significant. The correlations ranged from -.23 (Attachment and Emotional Control Problems, Attachment and Aggression)

**Table 3.14****Actuarial Analyses  
of DECA-C Scale Scores**

	<b>Normative Sample (N = 1,107)</b>		<b>Clinical Sample (N = 123)</b>	
	<i>n</i>	%	<i>n</i>	%
<b>Protective Factors</b>				
<b>No Concerns</b>	<b>774</b>	<b>70</b>	<b>39</b>	<b>32</b>
<b>One Concern</b>	<b>184</b>	<b>17</b>	<b>38</b>	<b>31</b>
<b>Two Concerns</b>	<b>93</b>	<b>8</b>	<b>27</b>	<b>22</b>
<b>Three Concerns</b>	<b>56</b>	<b>5</b>	<b>19</b>	<b>15</b>
<b>Behavioral Concerns</b>				
<b>No Concerns</b>	<b>623</b>	<b>57</b>	<b>30</b>	<b>25</b>
<b>One Concern</b>	<b>234</b>	<b>21</b>	<b>20</b>	<b>16</b>
<b>Two Concerns</b>	<b>124</b>	<b>11</b>	<b>15</b>	<b>12</b>
<b>Three Concerns</b>	<b>89</b>	<b>8</b>	<b>22</b>	<b>18</b>
<b>Four Concerns</b>	<b>37</b>	<b>3</b>	<b>36</b>	<b>29</b>

to  $-.60$  (Self-control and Emotional Control Problems). The correlation between the Total Protective Factors and Total Behavioral Concerns Scales was  $-.58$ .

An actuarial analysis of the DECA-C scales was conducted to examine the co-occurrence of ratings in the Concern Range across all of the protective factor and behavioral concern scales. If the three protective factor scales are too closely related (i.e., not measuring somewhat independent constructs), individual children should tend to have concerns on all or none of these scales. Similarly, if the behavioral concern scales lack independence, children should tend to have concerns on all or none of these scales, as well. This analysis was conducted separately for a normative sample (the Behavioral Concerns standardization sample,  $N = 1,107$ ), as well as a clinical sample (the Construct Validity sample,  $N = 123$ ). The results of the actuarial analysis are found in Table 3.14.

The data in Table 3.14 indicate that both the individual protective factor and behavioral concern scales measure related but distinct constructs. For the 1,107 children in the normative sample, 70% had no protective factor concerns.

Of the remaining 30% of the children, 17% had one protective factor concern, 8% had two, and 5% had all three scales rated in the Concern Range. Similarly, 57% of this sample had no concerns noted on the behavioral concern scales. Of the 43% of the children that had at least one scale with a concern, only 3% had concerns on all four scales.

For the clinical sample, 32% of the children did not have a concern noted on any protective factor scale. Of the remaining children, 31% had one scale in the Concern Range, 22% had two scales, and only 15% had all three protective factor scales rated in the Concern Range. Similar results were found with the clinical sample on the behavioral concern scales: 25% had no concerns noted, 16% had one concern, 12% two concerns, 18% three concerns, and 29% had concerns on all four scales.

Table 3.15 presents another way to examine these data. This table presents a crosstabulation of children with and without concerns on the Total Protective Factors and Total Behavioral Concerns Scales. For both samples, more children had concerns on only one total scale than on both (19% vs. 9% for the normative sample and 39% vs. 35% for the clinical sample.)

**Table 3.15**

**Crosstabulations of Total Protective Factors and Total Behavioral Concerns Scales Rated in the Concern Range for both Normative and Clinical Samples**

	<b>Normative Sample (N = 1,107)</b>		<b>Clinical Sample (N = 123)</b>	
	<b>TPF Concern</b>		<b>TPF Concern</b>	
	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
<b>TBC Concern No</b>	<b>72%</b>	<b>9%</b>	<b>26%</b>	<b>14%</b>
<b>TBC Concern Yes</b>	<b>10%</b>	<b>9%</b>	<b>25%</b>	<b>35%</b>

*Summary*

The content-related evidence provided in this chapter established the relationship of the DECA-C items to both the research and practice literature and the perceptions of parents and teachers on social and emotional well being and problems in preschool children. The results of the criterion-related validity stud-



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ies demonstrated that the DECA-C can be useful in making important decisions about children's social and emotional health. DECA-C scale scores are related both to resilience in young children and the presence of social and emotional difficulties.

The construct-related evidence established that the various DECA-C scales do measure somewhat different aspects of children's social and emotional functioning and related these scales to commonly occurring disorders in children.

The authors of the DECA-C welcome any opportunities to assist other researchers in further exploring the validity and utility of the DECA-C in assessing, and ultimately helping, young children at risk for social and emotional problems. The authors can be reached through the Devereux Foundation's Institute of Clinical Training and Research in Villanova, Pennsylvania.