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# **Deriving and Using the AEPS<sup>®</sup> Cutoff Scores to Assist in Determining Eligibility for Services<sup>1</sup>**

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## INTRODUCTION

According to a number of early intervention/early childhood special education (EI/ECSE) experts (e.g., Neisworth & Bagnato, 2004; Bricker, Yovanoff, Capt, & Allen, 2003) as well as the President's Commission on Excellence in Special Education (2002), many aspects of the traditional assessment process for determining eligibility for Individuals with Disabilities Education Improvement Act (IDEA) Part C and Part B, Section 619 services do not enhance services to children and their families. Historically, the purpose of eligibility assessment has been to document a child's delay or disability and produce a label or diagnosis with little, if any, attention given to the relevance of the findings to the development of quality services for that child or the appropriateness of the measures/procedures used (Macey, Lehman, Salaway, & Bagnato, 2007; Bagnato, 2008). Further, traditional eligibility assessment is a costly enterprise because the time and effort of a cadre of highly trained professionals are often required to complete the process. The significant cost combined with its yielding of little useful data has resulted in many authorities arguing that the traditional process of determining eligibility for services requires major changes if it is to become relevant and pertinent to the development of quality intervention services (Neisworth & Bagnato, 2004).

EI/ECSE services can be divided into two distinct phases: 1) evaluation process to determine eligibility and 2) the delivery of intervention services to eligible children. Most states have developed systems that require an evaluation team to assess children to determine if they meet the state's criteria for publicly funded services. Although states' eligibility requirements may differ (Danaher, 2001; Shakelford, 2002), most states currently require the administration of a standardized norm-referenced test, and many require gathering data about a child's performance from more than one source. As noted, the cost of this evaluation process is significant and might be justified if the outcomes could be used to formulate high quality goals and intervention content.<sup>2</sup> However, in most cases, the data that have been gathered about the child using standardized tests cannot be used for developing appropriate and functional individualized family service plan (IFSP) and individualized education program (IEP) goals or intervention content. Consequently, the use of standardized tests with children who have disabilities is a target of growing criticism. Today, many experts and professional organizations argue that the use of standardized tests is counter to best practice (President's Commission on Excellence in Special Education, 2002; Sandall, Hemmeter, Smith, & McLean, 2005).

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<sup>2</sup> See Neisworth & Bagnato, 2004 for a discussion of the problems associated with the use of standardized norm-referenced tests with children who have disabilities.

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## **AN ALTERNATIVE PROCESS FOR DETERMINING ELIGIBILITY**

An appealing alternative to the use of norm-referenced standardized tests for determining eligibility is the use of curriculum-based assessments (CBAs) such as the *Assessment, Evaluation, and Programming System for Infants and Children (AEPS®)* (Bricker, 2002). AEPS is designed to produce a comprehensive and detailed picture of children's behaviors and skills by gathering observational data as children play and participate in daily activities. Gathering information in this manner permits the development of a clear and accurate picture of what children can and cannot do. This information then can be used to formulate developmentally appropriate IFSP/IEP goals and objectives and intervention content. The AEPS Test is particularly useful for these purposes because only items that target critical educational and developmental skills have been included in the test. Therefore, every AEPS Test item has the potential to serve as a functional educational goal. In addition, modifications can be made to test items (e.g., using sign language or communication boards rather than words) to accommodate children's disabilities and interests.

Replacing or adding to standardized tests with AEPS for eligibility determination produces two important benefits. First, AEPS Test results can be used for the dual purposes of establishing eligibility and developing educationally and therapeutically relevant goals and intervention content. Using a curriculum-based assessment for both purposes saves time and resources, which in turn means that the valuable time and effort of caregivers and service delivery personnel can be directed to other important activities (i.e., intervention). Second, outcomes from AEPS are functional and relevant to children and families' daily lives, which permits programs' closer adherence to IDEA guidelines, recommendations made by the President's Commission on Excellence in Special Education (Office of Special Education and Rehabilitative Services, 2002), and the Division of Early Childhood's guidelines for best practices (Sandall et al., 2005).

## **THE DEVELOPMENT OF THE AEPS CUTOFF SCORES FOR DETERMINING ELIGIBILITY**

The need to find functional alternatives to the use of standardized assessments to determine eligibility provided the developers of AEPS strong impetus to explore ways that AEPS might serve to help establish eligibility for services. Most currently used norm-referenced tests provide users with age-equivalent scores based on ages assigned to items. There are a number

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of inherent problems with this practice. First, for many tests the age associated with a given item is not determined empirically; rather, the item is assigned an age based on how ages are assigned in other tests or generally agreed on developmental milestones. Second, age-equivalent scores do not inform teams as to a child's strengths, emerging skills, or needs, which is the charge of a team. Third, having chronological ages assigned to items may lead interventionists and caregivers to select intervention targets based on the age level of an item rather than selecting items that address children's individual developmental needs. Rather than assigning age equivalencies to AEPS Test items, the developers of AEPS created empirically derived cutoff scores based on the performance of typically developing children on the AEPS Test. These cutoff scores provide comparison points; if a child's score falls at or below the cutoff score at his or her age interval, he or she may be eligible for services.

Item Response Theory measurement modeling, specifically the Rasch dichotomous one-parameter logistic (1PL) model, was used to derive the AEPS cutoff scores for determining eligibility. The rationale for the use of this model and procedures for its use are described in detail in Bricker, Yovanoff, Capt, and Allen (2003) and Bricker et al. (in press). Analyses were conducted separately for AEPS Test Level I (for children 0–36 months) and Level II (for children 37–72 months). Each of these samples was divided into two groups: 1) children who were classified as developing typically (“ineligible group”) and 2) children who had already been determined to be eligible for IDEA services (“eligible group”). Each analysis included the following steps:

1. *Goals scored.* Each AEPS Test goal-level item in each of the six AEPS Test Areas (Fine Motor, Gross Motor, Adaptive, Cognitive, Social-Communication, and Social) was scored a 2 if the child met all specified criteria for the item, a 1 if the child partially or sometimes met the specified criteria, or a 0 if the criteria were not met. For Level I, 68 goals were scored, and for Level II, 54 goals were scored. The number of goals varies for each Area. All AEPS Area Goal Scores (i.e., the sum of the scores for all goal-level items in an Area) were significantly correlated with chronological age for ineligible children in Levels I and II.
2. *1 PL Rasch Model Fit and Test dimensionality computed.* The Rasch estimation software Winsteps 3.5 (Linacre, 2002) was used to fit the 1 PL model to the AEPS data. The procedure provided AEPS item calibrations, model fit statistics, and conditional standard error of measurement (conditional on ability). Measurement error and a test of dimensionality were computed using the calibration sample of children in the ineligible

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group. The 1PL Rasch model item fit statistics were used as a test of dimensionality. Generally, these item level fit statistics indicate that the Rasch partial credit model fit the AEPS data well and provide support for the use of the model statistics to estimate cut off scores.

3. *Age intervals created.* The samples for the ineligible and eligible groups of each of the AEPS Test Levels were divided into 3-month age intervals for Level I (e.g., 0–3 months, 4–6 months) and 6-month age intervals for Level II (e.g., 37–42 months, 43–48 months).
4. *Average performance computed.* The average level of performance as measured by AEPS Area Goal Score was computed for the ineligible group for each age interval.
5. *Standard error of measurement computed.* Based on the 1PL Rasch model item calibrations, the standard error of measurement was computed for the ineligible group for each 3-month age interval for Level I and 6-month age interval for Level II. This standard error of measurement is unique to the specific ability (i.e., average level of performance) determined in Step 4. Furthermore, IRT-based standard error estimates are sample invariant (i.e., approximately the same irrespective of the sample).
6. *Cutoff Score Estimates.* Using the standard error of measurement for the average performance at each age interval, the lower confidence bounds at 95% were calculated. Using the standard error of measurement to estimate confidence bounds, the procedure provided a reliable identification with respect to below average performance. As noted above, the IRT based conditional standard error estimates are considered sample invariant. Therefore, this procedure is quite different than the usual reliance on standard deviation estimates, which are dependent on the accuracy of population samples. The procedure does, however, rely on the sampling since it references the mean score per age interval. For each age interval, the standard error associated with the mean score was used to estimate cutoff scores. The lower confidence bounds effectively provided the cutoff scores, with 95% confidence. These cutoff scores were used to identify children who are “probably” not performing typically for their chronological age and are approximately 2.33 standard error of measurement below the average performance of children in the ineligible group.

7. *Cross-classification tables computed.* Using the cutoff scores generated in Step 6, sensitivity and specificity were calculated. Specificity is the ability of the cutoff score to identify accurately children who are ineligible for services. Sensitivity refers to the ability of the cutoff score to identify accurately children who are eligible for services (Fleiss, 1981). Classification as eligible for services was based on children scoring at or below the cutoff score in two or more Areas of the AEPS Test. The AEPS Test is designed to be sensitive to non-typical development. The goal scoring process, which requires that a child meet specified criteria, increases the likelihood that the cutoff scores are sensitive. The cutoff scores, however, could also result in overidentification (i.e., children who are developing typically might be classified as meeting eligibility criteria).

## THE AEPS CUTOFF SCORES

Using the procedure outlined above, cutoff scores were derived for Level I (i.e., birth to 3 years) and Level II (i.e., 3 to 6 years) of the AEPS Test. These cutoff scores for Level I and Level II are shown in Tables 1 and 2. In each table the far left column displays the age interval followed by a separate column for each developmental area addressed by the AEPS: fine motor, gross motor, adaptive, cognitive, social communication and social. The number in each box is the actual cutoff score for that particular age interval by developmental area.

**Table 1.** Cutoff scores for AEPS Test Level I by 3-month age intervals for each AEPS Test Area

Age Interval	Fine Motor	Gross Motor	Adaptive	Cognitive	Social-Communication	Social
4-6	2	2	0	2	1.5	0
7-9	3.5	4	1	4	3	1
10-12	6	7	2	5	4	2
13-15	7	10	4	7.5	5	4
16-18	9	13.5	5	11	7	5
19-21	11	16	8	14	10	9
22-24	12	17	9	20	12	9
25-27	13	18	9.5	20	13	9
28-30	13	19	11	25	15	9.5
31-33	15.5	20	12	29	15.5	10
34-36	16	21	13	30	16.5	10

*Note:* AEPS cutoff scores are not provided for the 0-3 month interval because sufficient data were not available to derive valid cutoff scores.

**Table 2.** Cutoff scores for AEPS Test Level II by 6-month age intervals for each AEPS Test Area

Age Interval	Fine Motor	Gross Motor	Adaptive	Cognitive	Social-Communication	Social
37–42	2.5	5	7	10.5	8	11.5
43–48	3	5.5	8	14	9	13.5
49–54	5	6.5	9	18	10	15
55–60	6	7	9	19	11	16
61–66	6.5	8	9.5	22	12	16.5

*Note:* Cutoff scores for the 67–72 month age interval were not developed because sufficient data were not available to derive valid cutoff scores. Evaluation of children this age for EI/ECSE services occurs rarely because most eligible children have already been identified.

The correlations between chronological age for the ineligible sample of children and AEPS Area Goal Scores were examined as was the sensitivity and specificity of the AEPS cutoff scores in comparison to their predetermined classification as children who are eligible for IDEA services and those who were not eligible. Correlations between chronological age and AEPS Area Goal Scores for Level I and Level II of the AEPS Test are shown in Table 3. Correlations are generally good for Level I, which indicates a strong relationship between AEPS Area Goal Scores and chronological age. Correlations for Level II are less robust but nonetheless significant, which indicates a moderate relationship between AEPS Area Goal Scores and chronological age.

**Table 3.** Correlations between AEPS Area Goal Scores and chronological age for AEPS Test Level I ( $N=418$ ) and Level II ( $N=301$ ).

Area	Level I	Level II
Fine Motor	.86	.60
Gross Motor	.89	.46
Adaptive	.90	.30
Cognitive	.85	.41
Social-Communication	.87	.31
Social	.85	.42

*Note:* All correlations are significant at the 0.01 level (2-tailed).

Tables 4 and 5 present the sensitivity and specificity rates for each of the age intervals for AEPS Test Levels I and II. For Level I, sensitivity ranged from a low of 85% at the 16–18 month age interval to a high of 100% at the 31–33 month age interval. Specificity ranged from a low of 55% at the 22–24 month age interval to a high of 80% at the 28–30 month age interval. For Level II, sensitivity ranged from a low of 76% at the 43–48 month age interval to a high of 87% at the 61–66 month age interval. Specificity ranged from a low of 67% at the

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37–42, 43–48, and 49–54 month age intervals to a high of 78% at the 61–66 month age interval.

**Table 4.** Sensitivity and specificity of the cutoff scores for AEPS Test Level I by age interval.

<b>Age Interval</b>	<b>N</b>	<b>Sensitivity</b>	<b>Specificity</b>
4–6	62	94%	72%
7–9	76	91%	57%
10–12	61	94%	77%
13–15	73	92%	77%
16–18	53	85%	64%
19–21	46	91%	64%
22–24	66	96%	55%
25–27	72	95%	63%
28–30	59	97%	80%
31–33	71	100%	77%
34–36	54	97%	63%
<b>Total/Average</b>	<b>693</b>	<b>94%</b>	<b>68%</b>

**Table 5.** Sensitivity and specificity of the cutoff scores for AEPS Test Level II by age interval

<b>Age Interval</b>	<b>N</b>	<b>Sensitivity</b>	<b>Specificity</b>
37–42	97	77%	67%
43–48	132	76%	67%
49–54	167	83%	67%
55–60	156	78%	70%
61–66	97	87%	78%
<b>Total/Average</b>	<b>649</b>	<b>80%</b>	<b>70%</b>

## **HOW TO USE THE AEPS CUTOFF SCORES FOR DETERMINING ELIGIBILITY**

Children who have AEPS Area Goal Scores at or below the cutoff scores for their age intervals are performing significantly below age expectations and therefore may be eligible for IDEA services. The procedure for using the cutoff scores is simple and requires completing the following steps:

1. Complete the AEPS Test (either Level I or Level II depending on the child's chronological age). The team may score all items of the test or may score only the goal-level items.

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2. Compute the child's AEPS Area Goal Score for each of the six AEPS Test Areas by adding all scores of 2s and 1s received on the goal-level items. (Scores on objective-level items should not be included in the AEPS Area Goal Score.)
  3. Calculate the child's chronological age in months to identify the child's age interval.
  4. Compare the child's AEPS Area Goal Scores with the appropriate age interval cutoff scores for each AEPS Test Area. If one or more of the child's AEPS Area Goal Scores is at or below the cutoff score, the child may be eligible for services.

## **EXAMPLES OF USING THE AEPS CUTOFF SCORES FOR ELIGIBILITY DETERMINATION**

### **Jamie**

Jamie is an 18-month-old who was referred for an eligibility assessment because of slow motor development. The evaluation team completed all of the goal-level items of Level I of the AEPS Test, seeking input from his parents to complete items that were not observed. The team then summed the 2 and 1 scores that Jamie received in each AEPS Test Area and compared them to the cutoff scores for the 16–18 month age interval.

<b>Area</b>	<b>Jamie's AEPS Area Goal Score</b>	<b>Cutoff Score for the 16–18 Month Age Interval</b>
Fine Motor	5	9
Gross Motor	7	13.5
Adaptive	4	5
Cognitive	6	11
Social-Communication	6	7
Social	4	5

Comparing Jamie's AEPS Area Goal Scores with the cutoff scores reveals that his performance is below the cutoff score in all six AEPS Test Areas. It is highly likely that Jamie is eligible to receive IDEA services.

### **Luann**

Luann is a 44-month-old who was referred for an eligibility assessment after being dismissed from her preschool program for aggressive behavior. The evaluation team completed all items

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of the AEPS Test Level II, seeking input from Luann’s parents and preschool teacher to complete items that were not observed. The team then summed the 2 and 1 scores Luann received for all goal-level items in each AEPS Test Area and compared them to the cutoff scores for the 43–48 month age interval.

Area	Luann’s AEPS Area Goal Score	Cutoff Score for the 43–48 Month Age Interval
Fine Motor	4	3
Gross Motor	7	5.5
Adaptive	8	8
Cognitive	15	14
Social-Communication	8	9
Social	9	13.5

Comparing Luann’s AEPS Area Goal Scores with the cutoff scores reveals that her performance is at or below the cutoff score in the Adaptive, Social-Communication, and Social areas. Depending upon her state’s criteria, Luann is likely to be eligible to receive IDEA services.

## SUMMARY

The need to replace and/or supplement standardized norm-referenced tests to determine eligibility for IDEA services is of great concern to many EI/ECSE professionals. This paper describes how AEPS, an authentic curriculum-based assessment, can be used to assist in establishing the need for EI/ECSE for services. The mechanism chosen for enabling AEPS Test results to be used to assist in eligibility determination was the development of cutoff scores. Comparing a child’s AEPS Area Goal Scores to these cutoff scores permits determining whether a child’s performance is below the performance of his or her chronological age mates in a particular developmental area. The comparison provides a mechanism for using AEPS to assist in determining a child’s eligibility for IDEA services and enables children and programs to reap the benefits of using an assessment for eligibility that yields valuable data for the development of IFSP/IEP goals and intervention content.

## REFERENCES

Bagnato, S.J. (2008, February). *Research foundations of assessment for early childhood intervention? What exists; What's needed*. Research panel presentation at the Conference for Research Innovations in Early Intervention, San Diego, CA.

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- Bricker, D. (Series Ed.). (2002). *Assessment, Evaluation, and Programming System for Infants and Children (AEPS®)* (2nd ed., 4 vols.). Baltimore: Paul H. Brookes Publishing Co.
- Bricker, D., Clifford, J., Yovanoff, P., Waddell, M., Allan, D., Pretti-Frontczak, K., & Hoselton, R. (in press). Eligibility determination using a curriculum-based assessment measure: a further examination. *Journal of Early Intervention*.
- Bricker, D., Yovanoff, P., Capt, B., & Allan, D. (2003). Use of a curriculum-based measure to corroborate eligibility decisions. *Journal of Early Intervention*, 26(1), 20–30.
- Danaher, J. (2001). Eligibility policies and practices for young children under Part B of IDEA (NECTAS Notes No. 9). Chapel Hill: University of North Carolina, Frank Porter Graham Child Development Institute.
- Fleiss, J. (1981). *Statistical methods for rates and proportions* (2nd ed.). New York: John Wiley & Sons.
- Linacre, M. (2002). Winsteps (Version 3.5) [Computer software]. Chicago: Mesa Press.
- Macey, M., Lehman, C., Salaway, J., & Bagnato, S.J. (2007). Research foundations for conventional tests and testing for early intervention eligibility determination. *TRACE Cornerstones*, 3(2), 1-22.
- Neisworth, J., & Bagnato, S. (2004). The mismeasure of young children. *Infants and Young Children*, 17(3), 198–212.
- President's Commission on Excellence in Special Education. (2002). Office of Special Education and Rehabilitative Services, U.S. Office of Education, Washington, DC.
- Sandall, S., Hemmeter, M., Smith, B., & McLean, M. (2005). *DEC recommended practices: A comprehensive guide for practical application*. Longmont, CO: Sopris West.
- Shakelford, J. (2002). State and jurisdictional eligibility definitions for infants and toddlers with disabilities under IDEA (NECTAS Notes No. 11). Chapel Hill: University of North Carolina, Frank Porter Graham Child Development Institute.