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The Brief Early Childhood Screening Assessment: Preliminary Validity in Pediatric Primary Care

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ABSTRACT: *Objective:* Brief, well-validated instruments are needed to facilitate screening for early childhood behavioral and emotional problems (BEPs). The objectives of this study were to empirically reduce the length of the Early Childhood Screening Assessment (ECSA) and to assess the validity and reliability of this shorter tool. *Methods:* Using caregiver ECSA responses for 2467 children aged 36 to 60 months seen in primary care, individual ECSA items were ranked on a scale ranging from “absolutely retain” to “absolutely delete.” Items were deleted sequentially beginning with “absolutely delete” and going up the item prioritization list, resulting in 35 shorter versions of the ECSA. A separate primary care sample (n = 69) of mothers of children aged 18 to 60 months was used to determine the sensitivity and specificity of each shorter ECSA version using psychiatric diagnosis on the Diagnostic Infant and Preschool Assessment as the gold standard. The version with the optimal balance of sensitivity, specificity, and length was selected as the Brief ECSA. Associations between Brief ECSA scores and other pertinent measures were evaluated to estimate reliability and validity. *Results:* A 22-item measure reflected the best combination of brevity, sensitivity and specificity. A cutoff score of 9 or higher on the 22-item Brief ECSA demonstrated acceptable sensitivity (89%) and specificity (85%) for predicting a psychiatric diagnosis. Brief ECSA scores correlated significantly and in expected directions with scores on pertinent measures and with demographic variables. *Conclusion:* The results indicate that the Brief ECSA has sound psychometric properties for identifying young children with BEPs in primary care.

(*J Dev Behav Pediatr* 38:89–98, 2017) **Index terms:** early childhood, screening, ECSA, validation, behavioral problems, emotional problems, primary care.

Approximately, 9% to 12% of children aged 24 to 60 months old suffer from behavioral and emotional problems (BEPs) that cause significant suffering and impairment at home, at school, and in child care settings.^{1,2} More often than not, severe early childhood BEPs persist and can be associated with negative long-term outcomes.^{3–5} Early identification offers the opportunity to access effective, evidence-based treatments which can positively change the trajectory of a young child’s emotional and behavioral development.^{6–10} Studies examining the long-term effects of evidence-based treatments in

young children demonstrate substantial durability, with positive effects that persist and sometimes increase even after treatment has ended.^{9,10}

To promote early identification and intervention for BEPs, both the American Academy of Pediatrics (AAP) and the Society for Developmental and Behavioral Pediatrics recommend primary care screening for BEP to identify children who could benefit from further evaluation and possible intervention.^{11,12} Yet systematic primary care screening for BEP is limited, leaving many young children with BEP underrecognized in primary care.^{12–14} One major barrier to universal implementation of validated screening tools is limited time during well-visits.^{12,15} In light of time constraints, an ideal screening tool is well-validated and brief, simple to complete and score, and easily integrated into a busy primary care practice. The AAP’s Mental Health Tool Kit includes a number of measures to identify early childhood BEPs, including the Early Childhood Screening Assessment (ECSA).¹⁶ The ECSA is a 40-item instrument that identifies children aged 18 to 60 months at risk of mental health problems. Of the measures in the tool kit, the ECSA is the only early childhood measure that has been validated using a formal psychiatric diagnostic interview.^{16,17} It is written at a fifth grade reading level, is simple to score and interpret, and is nonproprietary. The ECSA is unique among early childhood screening tools

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because it detects both children at risk for clinically significant BEPs during early childhood and caregivers with signs of depression.¹⁷ Assessing caregiver well-being in the pediatric primary care setting is important because of the strong influences of caregiver mental health on child well-being.¹⁸ The ECSA has been shown to be feasible for use in pediatric primary care, and resulted in high rates of screening implementation in a community sample of 27 pediatric primary care providers.¹⁹ However, the time required for caregivers to complete the 40-item instrument (i.e., 5–10 min) has been cited by pediatric primary care providers as a potential limitation as a previsit screening questionnaire.¹⁹ This consideration may be particularly salient for caregivers of young children with BEPs, who are the target for this screen, who may be challenged to devote their attention to an instrument of this length while also supervising their symptomatic preschooler. Acknowledging the potential caregiver burden and responding to specific requests from our PCP partners about the time constraints during a well-child visit, we sought to develop and validate a shorter version of the ECSA for use in pediatric primary care.

The objectives of this study were to (1) use empiric approaches to reduce the length of the ECSA and (2) assess the validity and reliability of the shorter tool. The overarching aim was to develop and validate a brief

version of the ECSA that could be even more feasible for use in pediatric primary care, thus facilitating widespread implementation of screening.

METHODS

See Figure 1 for an overview of the study design.

Study Participants

The work reported in this article analyzed screening data, obtained in pediatric primary care clinics, from 2 separate cohorts: one cohort in Florida (Cohort A, n = 2467 children; Table 1) and another in Rhode Island and Louisiana (Cohort B, n = 310 children; Table 2). Caregivers provided written consent to allow their anonymous data to be used for research purposes. As Cohort A data did not contain identifying information, the institutional review board (IRB) ruled that this study was exempt for Cohort A. The IRB approved Cohort B data collection which did involve Health insurance and Portability and Accountability Act-protected information.

Cohort A

See Table 1 for a description of Cohort A. Briefly, Cohort A comprised 2467 caregivers of children aged 36 to 60 months seen in 4 large, urban, pediatric primary care practices (31 primary care providers) in the Southeastern United States that served a mix of privately (70%) and publicly (30%) insured families.

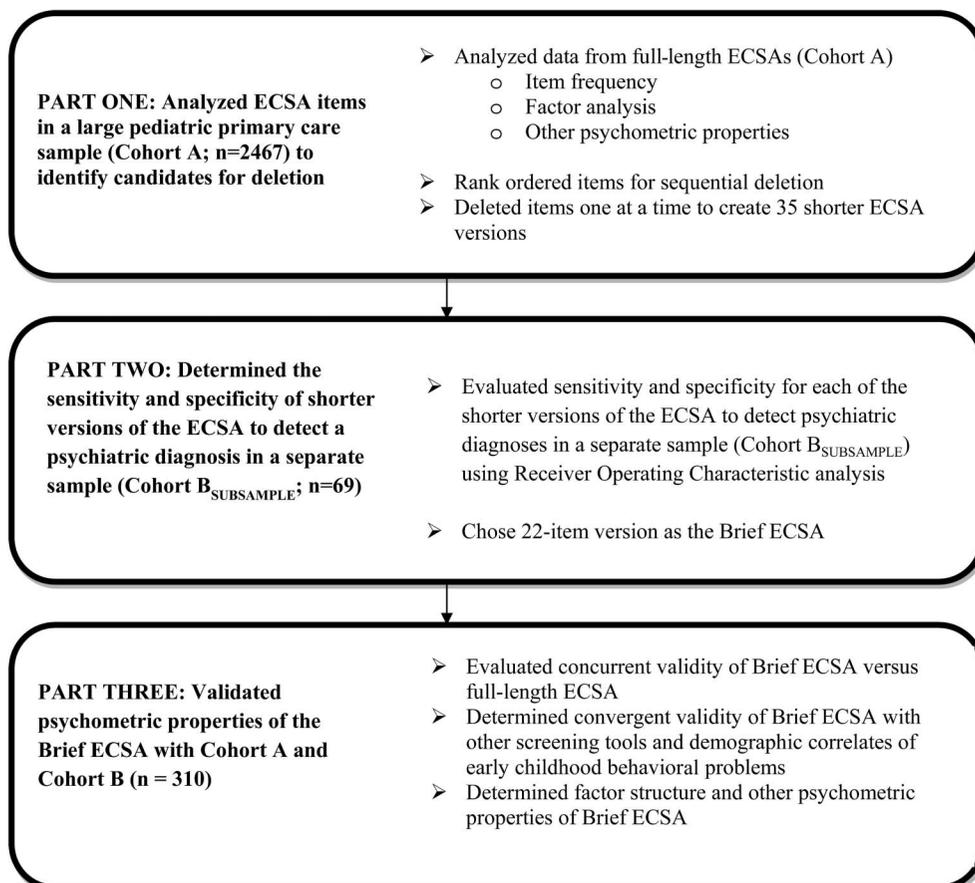


Figure 1. Summary of steps taken in reducing the ECSA from 36 items to a psychometrically sound 22-item Brief ECSA.

Table 1. Demographics of the Pediatric Primary Care Sample Used to Identify ECSA Items that Were Candidates for Deletion (Cohort A; N = 2467)

	N (%)
Caregiver	
Mother	1421 (81)
Father	242 (14)
Grandmother	30 (1.7)
Grandfather	3 (0.2)
Other	42 (2.4)
Child	
Sex	
Male	1273 (54)
Female	1100 (46)
Race	
White	1879 (81.3)
African-American	194 (8.4)
Mixed Race	134 (5.8)
Asian	80 (3.5)
Other	24 (1)
Ethnicity	
Hispanic	137 (5.8)
Non-Hispanic	2195 (94)
Age, mo	
36–47	713 (29)
48–59	1005 (41)
60–71	679 (28)
Age, mo (M ± SD)	46.8 ± 0.76

Caregivers completed the ECSA as a part of a separate study examining the feasibility of administering the ECSA in pediatric primary care.¹⁹ In Cohort A, the mean ECSA score was 8.94 (7.73 SD), and 14% of children scored higher than the clinical cutoff, indicating that they required further evaluation of behavioral and emotional problems (BEPs).

Cohort B

See Table 2 for details regarding Cohort B. Mothers for Cohort B (n = 310) were recruited from urban pediatric waiting rooms where they completed demographic information as well as the ECSA, the Child Behavioral Checklist,²⁰ and either the Pediatric Symptom Checklist (PSC)²¹ or the Brief Infant-Toddler Social Emotional Assessment (BITSEA),²² depending on the child's age. Nearly half (46%) of the families were eligible for Women, Infant, and Children's (WIC) nutritional support, which was used as a marker for family income. The mean full-length ECSA score for Cohort B was 15.0 (SD = 9.9), and 29% of children scored above the clinical cutoff.

Cohort B_{SUBSAMPLE}

A subgroup of Cohort B (n = 69) was intentionally selected to oversample for children with significant BEPs

Table 2. Demographics of the Pediatric Primary Care Samples Used for Validation of the Brief ECSA (Cohorts B and B_{SUBSAMPLE})

	Cohort B (n = 310), N (%)	Cohort B _{SUBSAMPLE} (n = 69), N (%)
Caregiver		
Mother	310 (100)	69 (100)
Child		
Sex		
Female	135 (43.3)	26 (37.7)
Male	175 (56.1)	43 (62.3)
Race/Ethnicity		
White	119 (38.1)	19 (27.5)
African-American	137 (43.9)	28 (40.6)
Hispanic	25 (8.0)	10 (14.5)
Asian	4 (1.3)	0 (0)
Other	19 (6.1)	11 (15.9)
Age, mo		
18–23	61 (19.8)	16 (23.2)
24–35	103 (33.4)	21 (30.4)
36–47	71 (23.1)	15 (21.7)
48–59	73 (23.7)	17 (24.6)
Age, mo (M ± SD)	36.2 (12.8)	36.7 (13.4)

(defined on the basis of elevated Child Behavior Checklist [CBCL] scores). Randomly selected parents in addition to parents of children with elevated CBCL scores were invited to complete the Diagnostic Infant and Preschool Assessment (DIPA),²³ a reliable and validated, structured caregiver interview for psychiatric disorders in children aged 9 to 60 months. This procedure, which was part of a larger study of the validity and reliability of the full-length ECSA, has been described in detail previously.¹⁷ See Table 2 for details regarding Cohort B_{SUBSAMPLE}. More than half (65.2%) of Cohort B_{SUBSAMPLE} were WIC recipients. The mean full-length ECSA score for Cohort B_{SUBSAMPLE}, which was intentionally enriched for symptomatology, was 18.3 (SD = 12.1), and 44% of children scored above the clinical cutoff. In Cohort B_{SUBSAMPLE}, 34% had a CBCL T-score of at least 65 and 40.6% met criteria for a DIPA diagnosis.

Measures

The Early Childhood Screening Assessment (ECSA)

The full-length ECSA is a parent-report instrument that contains 36-child items assessing child emotional and behavioral problems and 2 items from the Patient Health Questionnaire-2 (PHQ-2) that screen for caregiver depression as well as 2 other caregiver distress items.¹⁷ Items are scored on a Likert scale ranging from 0 (never/rarely) to 2 (always/almost always) and a clinical cutoff score of 18 results in strong sensitivity and specificity.

Item stems are written at a fifth grade reading level, and the instrument is available in English, Spanish, Romanian, German, and Arabic (<http://www2.tulane.edu/som/tecc/mental-health-screening.cfm>). The ECSA has demonstrated convergent and criterion validity in the pediatric setting.¹⁷ A previous study has demonstrated that the instrument shows 86% sensitivity and 83% specificity for detecting children with any DIPA diagnosis.¹⁷ Results correlate highly with the CBCL, BITSEA, and PSC, and test-retest reliability is strong.¹⁷ The Cronbach's alpha for the total scale is .91.¹⁷

Diagnostic Infant and Preschool Assessment (DIPA)

The DIPA is a structured diagnostic interview designed to detect psychiatric diagnoses in young children aged 9 to 60 months.²³ Diagnoses assessed include attention-deficit hyperactivity disorder, posttraumatic stress disorder, major depressive disorder, bipolar disorder, oppositional defiant disorder, conduct disorder, separation anxiety disorder, specific phobias, social phobia, generalized anxiety disorder, obsessive compulsive disorder, reactive attachment disorder, and sleep disorders. Interviews with caregivers typically take between 45 and 90 minutes to assess child symptoms and related impairment. The DIPA has demonstrated criterion validity when compared with scores on the Child Behavioral Checklist, as well as satisfactory test-retest reliability.²³

The Child Behavior Checklist (1½–5)

The CBCL 1½–5 is a 99-item parent-report questionnaire used to identify BEPs in children aged 18 to 60 months. Parents rate child symptoms on a 3-point Likert scale (0 = not true, 1 = somewhat or sometimes true, and 2 = very true or often true). The CBCL has acceptable internal validity, test-retest reliability, and convergent reliability and is widely used.²⁰

Pediatric Symptom Checklist

The PSC is a 35-item parent report screening tool designed to recognize cognitive and BEPs in children aged 4 to 18 years. Items are scored on a 3-point Likert scale (0 = never, 1 = sometimes, and 2 = often). Validity has been established with the CBCL.²¹

Brief Infant-Toddler Social Emotional Assessment

The BITSEA is a 42-item social emotional developmental screening tool for children aged 12 to 36 months. It is scored on a 3-point Likert scale (0 = not true/rarely, 1 = somewhat true/sometimes, and 2 = very true/often). The BITSEA has been validated using the CBCL with strong sensitivity and specificity.²²

Data Analysis—Part 1: Rank-Ordering ECSA Items to Identify Candidates for Deletion Using Cohort A

Item Frequency in Cohort A

First, item frequency distributions of responses were calculated for each item because items endorsed very often might not differentiate abnormal from normal behavior. Items which were endorsed as occurring “sometimes” or “almost always” by at least one-third of

caregivers were considered less likely to be specific for significant BEPs and more likely to be normal developmental variants of child behavior. As such, high-item frequency (i.e., endorsed by >33% caregivers) was one criterion that influenced an item's priority for deletion.

Factor Analysis in Cohort A

The factor structure and factor loadings of individual items were calculated and used to ensure that a Brief ECSA would capture the same diversity of emotional and behavior disorders as the full-length ECSA. Principal component factor analysis with varimax rotation was used to determine the factor structure and each individual item's factor loading. Low factor loading (i.e., factor loading <0.40 for all factors) was another criterion that was considered when determining an item's priority for deletion.

Other Psychometric Properties

Partial pairwise correlations were calculated for individual items within each factor, and items with high partial pairwise correlations (i.e., ≥ 0.2) were considered less important for retention due to redundancy. When 2 items were highly correlated, one item of the pair was prioritized for retention, with the decision based on the other analyses and authors' combined clinical experience. Then, item-total correlations were determined for each individual item. Those items with low item-total correlations (i.e., <0.40) were also considered to have lower retention priority. In addition to statistical contributions, characteristics including clarity of wording, clinical experience with the items, and the importance of retaining the clinically important factors were considered.

Rank-Ordering ECSA Items

Using a summary table of these item analyses from Cohort A and the ECSA itself, a team of experts in early childhood mental health and integration of mental health in primary care (E.M.F., T.W., M.M.G.) independently rank ordered each ECSA item on a scale ranging from “absolutely retain” to “absolutely delete,” thus forming 35 shorter versions of the ECSA ranging in length from 35 items to 1 item. Then, the team met to resolve discrepancies and to derive a consensus priority rank list of items for retention.

Although the purpose of the study was to reduce the number of child items, the team also considered the ECSA items assessing caregiver depression (2 items) and stress (2 items) for deletion.¹⁷ The 2 items from the PHQ-2 that assessed for caregiver depression had previously demonstrated acceptable validity and feasibility for use in primary care (including pediatric primary care) and offer substantial information about the caregiving relationship, and therefore were retained.^{24,25}

Data Analysis—Part 2: Used Sensitivity/Specificity to Select Items for Brief ECSA

The priority rank list was used to develop 35 shorter versions of the ECSA ranging in length from 35 items to 1 item. Each version of the ECSA (i.e., 35 items, 34 items,

etc.) was subsequently evaluated with the Cohort B_{SUBSAMPLE} data to identify the version of the ECSA that included the fewest items while retaining acceptable sensitivity and specificity for detection of any psychiatric diagnosis as identified by the DIPA.

Sensitivity/Specificity of Progressively Shorter Versions of the ECSA

Data obtained from Cohort B_{SUBSAMPLE} were used to determine the sensitivity and specificity of each shorter version of the ECSA to predict a DIPA score indicative of a psychiatric diagnosis. Receiver operating characteristic (ROC) analysis was conducted to evaluate the predictive capabilities of each version of the ECSA (35 items to 1 item) to detect any DIPA diagnosis. Specifically, ROC analysis was used on the full-length ECSA, and then the next item from the priority rank list which had the highest priority for deletion was removed and the ROC analysis re-run. This process was continued until only one item (Item #3) was included in the model. For each model fit, sensitivity, specificity, score cutoff, and the area under the curve were calculated. ROC was weighted at 0.7 to prioritize sensitivity for detecting a psychiatric diagnosis in a primary care screening setting. The study team then selected the version with the optimal balance of high sensitivity, high specificity, and shorter length. This version is referred to as the Brief ECSA.

Data Analysis—Part 3: Assessed Validity and Reliability of the Brief ECSA

Concurrent Validity

Concurrent validity was assessed by calculating the percentage of children identified with “positive” and “negative” total scores on the full-length ECSA who were also identified by the Brief ECSA in Cohorts A and B.

Convergent Validity

The convergent validity of the Brief ECSA was determined by calculating the correlations between total scores on the Brief ECSA and on 3 other screening tools: the Child Behavior Checklist 1½-5 (for $n = 270$ children aged 18–60 mo), the BITSEA problem score (for $n = 117$ children aged 18–36 mo), and the PSC (for $n = 80$ children older than 48 mo) in Cohort B. Convergent validity was also assessed by determining the correlations between positive total Brief ECSA scores and demographic indices of risk status including caregiver depressive symptoms in both Cohort A and Cohort B. Caregiver depressive symptoms were dichotomized as present (score ≥ 1 on 2 Patient Health Questionnaire items)²⁵ or absent.

Factor Structure

The factor structure of the Brief ECSA was determined and compared with the factor structure of the full-length ECSA.

Other Psychometric Properties

The internal consistency (Cronbach’s alpha) of the Brief ECSA was calculated. Item-total correlations were also calculated.

RESULTS

Part 1: Priority Rank List of Individual ECSA Items

The priority rank list for the 22 child items retained in the Brief ECSA is shown in Table 3.

Item Frequency in Cohort A

Six ECSA items were endorsed by over one-third of caregivers in Cohort A. Four of these items were deleted: “is always on the go” (endorsed by 56% of caregivers); “is easily distracted” (45%); “interrupts frequently” (43%); and “avoids foods that have specific feelings or tastes” (34%). Two of the frequently endorsed items were retained as they represented unique constructs not found in other retained items: “battles over food and eating” (36%); and “avoids situations that remind of scary events” (35%).

Factor Analysis of the ECSA

Principal component analysis with varimax rotation revealed 5 primary measurement factors with eigenvalues over 1.0 (range 1.5–7.8) accounting for 35% of total ECSA variance. These 5 primary factors could be labeled: “Hyperactivity/Inattention/Impulsivity,” “Irritability/Oppositionality/Aggression,” “Anxiety/Trauma,” “Developmental Delay,” and “Picky eating.” Sixteen of the 22 retained items loaded >0.4 on at least 1 of the 5 factors. Several items with less satisfactory factor loadings were retained because of clinical importance and other quantitative strengths.

Other Psychometric Properties

Fourteen of the 22 items retained had partial pairwise correlations <0.2 . Sixteen of the 22 retained items were identified as having item-total correlations ≥ 0.4 , suggesting their inclusion contributes to measurement of primary ECSA construct(s). Other items with higher partial pairwise and/or lower item-total correlations were retained as they had other quantitative strengths and/or clinical value.

Part 2: Selection of the Brief ECSA Items Based on Sensitivity/Specificity Data

Using the priority rank list to guide sequential deletion of items from the ECSA in Cohort B_{SUBSAMPLE}, the receiver operating characteristic analysis demonstrated that the 22-item measure was the shortest version that reflected the best combination of acceptable sensitivity and specificity in Cohort B_{SUBSAMPLE} (Table 4 and Fig. 2). A cutoff score of 9 or higher on the 22-item Brief ECSA demonstrated acceptable sensitivity (89%) and specificity (85%) for predicting a DIPA diagnosis. Shorter versions produced lower sensitivity and/or specificity. In both Cohort A and Cohort B, sensitivity and specificity exceeded 88% for each age group (18–23 mo, 24–35 mo, 36–47 mo, and 48–60 mo) in predicting positive full-length ECSA scores. In Cohort B_{SUBSAMPLE}, sensitivity and specificity for predicting a DIPA diagnosis were also fairly similar for each age group. Specifically, sensitivity and specificity were respectively 100% and 91% at 18 to 23 months, 91% and 78% at 24 to 35 months, 67% and 82% at 36 to 47 months, and 89% and 100% at 47 to 60

Table 3. Child Items Retained in Brief ECSA and Objective Criteria for Retention

Priority Rank	ECSA Item	Frequency ≤ 33%	Factor Loading ≥ 0.40	Item-Total Correlation ≥ 0.40
1	Loses temper too much	X	X	X
2	Reacts too emotionally to small things	X		X
3	Seems sad, cries a lot	X		
4	Is irritable, easily annoyed	X	X	X
5	Runs around in settings when should sit still (school, worship)	X	X	X
6	Is easily startled or scared	X	X	X
7	Breaks things during tantrums	X	X	X
8	Seems nervous or worries a lot	X	X	
9	Has a hard time paying attention to tasks or activities	X	X	X
10	Is difficult to comfort when hurt or distressed	X	X	
11	Hurts others on purpose (biting, hitting, and kicking)	X	X	X
12	Avoids situations that remind of scary events		X	
13	Fidgets, cannot sit quietly	X	X	X
14	Has unusual repetitive behaviors (rocking, flapping)	X		
15	Does not seem to listen to adults talking to him/her	X	X	X
16	Has trouble interacting with other children	X		X
17	Argues with adults	X	X	X
18	Battles over food and eating		X	X
19	Is clingy, does not want to separate from parent	X	X	X
20	Does not seem to have much fun	X		
21	Is very disobedient	X	X	X
22	Blames other people for mistakes	X		X

X indicates characteristic supporting retention of item.

months. Please note that in Cohort B_{SUBSAMPLE}, there were only 3 children in the 36 to 47 month age group with DIPA diagnoses, so it is difficult to interpret the sensitivity in this age group.

Part 3: Validity and Reliability of the Brief ECSA

Mean Brief ECSA scores from Cohort A were 4.84 (SD 4.81) with a range from 0 to 36. In Cohort A, 18% would be identified as having a positive score on the Brief ECSA. In Cohort B, the mean score of the Brief ECSA was 8.5 (SD 6.3; range of 0–38), and 32% would have a positive Brief ECSA total score.

Concurrent Validity: Brief ECSA Versus Full-Length ECSA

Concurrent validity was established between the Brief ECSA and the full-length ECSA in both Cohorts A and B. In Cohort A, the Brief ECSA identified 92% (323/350) of children identified with the full version of the ECSA and classified 95% (2002/2117) of children with negative scores on the full length ECSA. Likewise, in Cohort B, the Brief ECSA identified 91% (89/98) of children identified with the full version of the ECSA and classified 92% (186/203) of children with negative scores on the full length ECSA.

Convergent Validity

Convergent validity was demonstrated by high correlations with the Child Behavior Checklist total

score ($r = .82, p \leq .001$). Brief ECSA scores correlated with the Brief Infant-Toddler Social Emotional Assessment problem score for children 18 to 36 months ($r = .65, p \leq .001$) and the Pediatric Symptom Checklist for children greater than 48 months ($r = .67, p \leq .001$). In addition, convergent validity was demonstrated by strong correlations between the Brief ECSA and demographic factors associated with greater risk for early childhood behavioral and emotional problems. In both Cohort A and Cohort B, mean Brief ECSA scores were higher in children whose caregiver reported depressive symptoms (Cohort A: 11.66 vs 4.57; $t(78.73) = -8.17, p \leq .001$; Cohort B: 13.4 vs 7.4; $t(67.5) = 5.3; p \leq .001$). As further support of convergent validity, mean Brief ECSA scores were higher in Cohort B for children whose parents wanted help for their children's mental health (16.9 vs 7.9; $t(22.1) = 4.3, p \leq .001$); those with a family history of psychiatric disorders (9.9 vs 7.8; $t(169.5) = 2.6; p \leq .01$); parents with lower educational attainment (10.6 vs 8.0; $t(79.6) = 2.4; p \leq .02$); children who had witnessed violence or abuse (14.1 vs 8.3; $t(7.1) = 2.5, p \leq .01$); and those children with language delays (13.7 vs 8.1; $t(23.9) = 3.1; p \leq .005$). Every child in Cohort B whose parent reported a history of referral to early childhood mental health

Table 4. Sensitivity and Specificity of Shorter Versions of the ECSA to Detect a Psychiatric Diagnosis

No. Items	Item Removed	Score Cutoff	Sensitivity (%)	Specificity (%)	Area Under the ROC Curve (%)
36	Full List	16.5	82.1	87.8	90.2
35	36	16.5	82.1	90.2	90.1
34	35	16.5	82.1	90.2	90.2
33	34	15.5	82.1	90.2	90.7
32	31	14.5	82.1	90.2	91.2
31	17	13.5	82.1	87.8	91.7
30	22	13.5	82.1	90.2	91.7
29	29	13	82.1	90.2	91.7
28	20	13	82.1	90.2	92.2
27	26	12.5	82.1	90.2	91.5
26	25	12.5	82.1	90.2	90.9
25	21	11.5	82.1	90.2	90.5
24	32	10.5	82.1	90.2	90.5
23	13	10	85.7	85.4	90.0
22	5	8.5	89.3	85.4	90.3
21	19	8.5	85.4	85.7	89.1
20	28	8.5	85.7	85.4	89.1
19	33	8.5	78.6	90.2	89.1
18	16	8.5	78.6	90.2	89.2
17	8	8.5	78.6	92.7	89.5
16	10	8.5	75.0	92.7	89.5
15	14	6.5	82.1	85.4	90.2
14	7	6.5	82.1	85.4	89.6
13	30	6.5	78.6	90.2	89.3
12	15	6.5	78.6	90.2	88.1
11	4	6.5	71.4	92.7	88.4
10	6	5.5	71.4	92.7	88.2
9	2	4.5	78.6	82.9	87.9
8	24	4.5	64.3	90.2	85.2
7	18	4.5	64.3	92.7	85.7
6	11	2.5	89.3	68.3	86.0
5	12	3.5	67.9	92.7	85.6
4	23	2.5	71.4	85.4	81.9
3	9	1.5	75.0	65.9	75.1
2	1	1.5	57.1	78.0	71.4
1	27	1.5	42.9	95.1	66.9

ROC, receiver operating characteristic.

services scored positively on the Brief ECSA, with a mean score of 18.4 (SD 5.5). Although mean Brief ECSA scores were higher in boys (5.21 vs girls 4.43; $t(2360) = -4.0, p < .001$) in Cohort A, there was no significant difference in scores by sex (8.3 vs 7.4; $t(298) = 0.6, NS$) in Cohort B. There were no differences in Brief ECSA scores for children with medical problems or those born prematurely.

Factor Structure

The Brief ECSA showed 4 primary factors in Cohort A. These 4 primary factors included caregiver reports

of child problems with “Hyperactivity/Inattention,” “Irritability/Oppositionality,” “Anxiety/Trauma,” and “Aggression” (eigenvalues ranged from 1.1 to 5.5). These 4 primary measurement factors accounted for 32% of the variance of the full scale.

Other Psychometric Properties

The Brief ECSA showed strong internal consistency (Cronbach’s $\alpha = .86$). In addition, item-total correlations from the Brief ECSA were all positive and statistically significant, ranging from 0.22 to 0.63 in Cohort A.

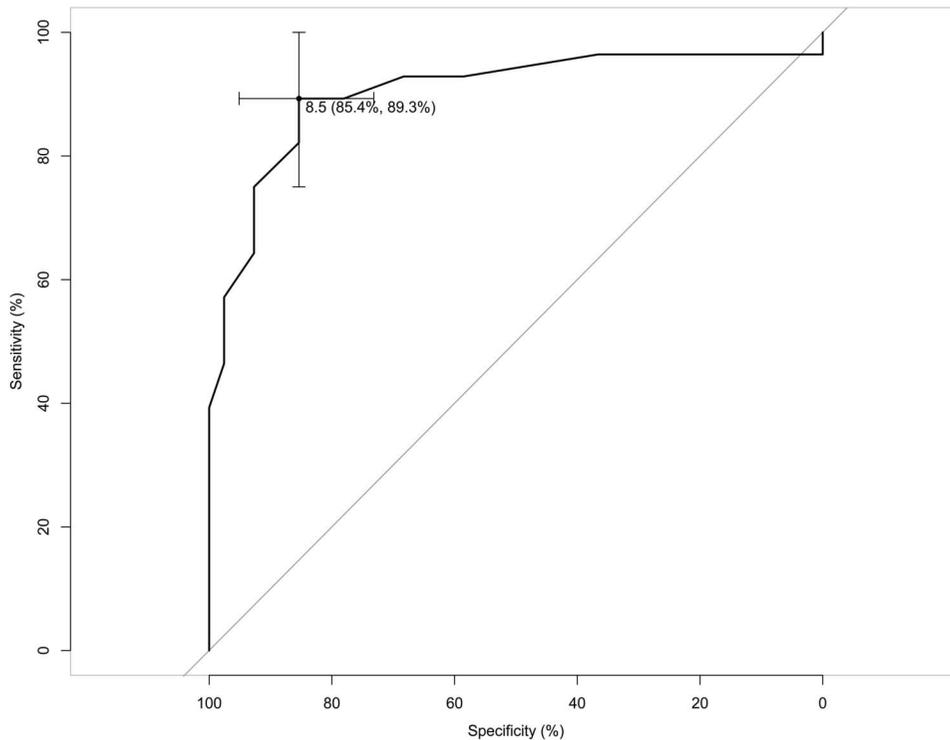


Figure 2. Receiver operating characteristic analysis of the Brief ECSA.

DISCUSSION

The Brief ECSA is an early childhood screening tool that can be used to identify young children (aged 18–60 mo) who require further evaluation for emotional and behavioral problems. It is sensitive in detecting common early childhood psychiatric diagnoses identified with the DIPA, a gold standard semistructured clinical interview. In addition to demonstrating strong sensitivity (89%), the Brief ECSA achieved 85% specificity, meaning it can be clinically useful in distinguishing between children with and without clinically concerning behavioral and emotional problems (BEPs). The Brief ECSA scores correlated at high levels with other longer parent-report measures of early BEPs, including the Child Behavior Checklist,²⁰ the Pediatric Symptom Checklist (PSC),²¹ the Brief Infant-Toddler Social Emotional Assessment,²² and the full-length ECSA.¹⁷ In addition, the Brief ECSA demonstrated an association with known markers of child or family risk status, providing further support for its validity. Finally, the Brief ECSA assessed symptoms in multiple domains (represented by separate factors) similar to those determined using the longer measure.

In previous studies, brief versions of mental health screening tools have demonstrated lower sensitivity or specificity when compared with the full-length versions.^{21,26,27} For example, Jellinek et al.²¹ reported 95% sensitivity for the 35-item PSC, whereas the shorter PSC-17 resulted in 82% sensitivity.²⁶ Similarly, the Patient Health Questionnaire-9 (PHQ-9) demonstrated reduced specificity when items were deleted to create the PHQ-2; 91% and 78% respectively.^{28,29} In contrast, the Brief

ECSA maintained both strong sensitivity, specificity, and other psychometric properties comparable with what has been reported for the full-length ECSA.¹⁷ Although even shorter versions of the ECSA were considered, they would have yielded lower sensitivity, thus reducing the benefit of the measure compared with standard clinical practice.

Because of the extraordinarily low rates of identification of mental health problems in young children in clinical practice and low utilization of standardized measures, it is particularly important for PCPs to have access to a feasible measure that provides valuable and useful clinical information. The increasing time pressure on PCPs during well-visits calls for the development of even more efficient, brief screening tools such as the Brief ECSA. Reducing the length of the measure by 40% would be expected to proportionately decrease completion time and ease the burden on caregivers who must complete the measure in the context of a brief well-child visit. Minimizing caregiver burden is especially important given that caregivers may be tasked with completing the screening tool while also supervising their young children in the clinic. The Brief ECSA may also be simpler for PCPs to score and interpret than the full-length version. The development of web-based screening could further decrease practice time for clinic staff engaged in administration and scoring of screening tools, and should be considered in future studies of the Brief ECSA.

Although the ultimate goal of early childhood screening is to facilitate access to evidence-based treatments for children at risk, screening may offer other benefits even before consideration of referral. Negative screens can

provide valuable validation to parents of young children. Universal primary care screening also opens the door for caregivers to discuss their concerns about their child's BEP, which is especially important given that few caregivers will spontaneously discuss these concerns with their child's PCP.¹³ Once early childhood BEPs are identified through screening, PCPs play an important role in communicating to families that the child's problematic emotional or behavioral symptoms represent a treatable mental health condition, rather than a failure of either the parent or the child, which is often the default interpretation of BEPs in young children. Effective provider communication that involves partnering with families to develop a family-centered plan to seek further evaluation and treatment of BEPs, even in the absence of other interventions, has been shown to reduce family distress about symptoms and increase referral success.³⁰ Using a common factors approach,³⁰ PCPs may also implement first-line strategies such as encouraging differential attention, with positive attention to positive behaviors. Furthermore, the information gathered from screening programs can inform assessments of community needs for early childhood services. Thus, the lack of easy access to specialized care in many parts of the country should not deter PCPs from screening and providing education and support about the child's BEP. Access to quality assessments and evidence-based treatments is, of course, the optimal outcome for children with impairing BEPs.³¹

The study design has many strengths. First, this study used a diagnostic interview (i.e., DIPA) as a benchmark for measuring criterion validity. This offers a higher standard of validation than simply comparing the ECSA with other screening tools to confirm its convergent validity. This distinguishes the ECSA's validation from that of some other primary care screening tools for early childhood BEPs.^{22,32,33} In addition, the Brief ECSA was also validated using 3 other screening tools. Another strength of this study is that the validation of the Brief ECSA was performed in a cohort with an intentional overrepresentation of symptomatic children. The strong sensitivity and specificity of the Brief ECSA under such circumstances are noteworthy. An additional strength is that the study sample includes caregivers and young children from diverse geographic regions and racial/ethnic backgrounds. It should be noted that Cohort B included a relatively high risk status group with regard to public insurance status, parental depression, and other factors. Differences in distributions of Brief ECSA scores and rates of positive screens in each population may be attributable to differences in risk status among these samples.

As with all studies, the results should be interpreted in the light of study limitations. First, although the ECSA is validated for children aged 18 to 60 months, Cohort A included children 36 to 60 months, perhaps skewing the items retained in favor of patterns seen in older children. However, the validation population (Cohort B_{SUBSAMPLE}) included children aged 18 to 36 months and functioned well with that age cohort, demonstrating 94% sensitivity

and 85% specificity. In both cohorts, the Brief ECSA demonstrated similar sensitivity and specificity across age groups. Although the participants represent multiple geographical and demographic populations, they may not be representative of the general US population. Cohort A was recruited from pediatric primary care settings serving patients primarily with private insurance. Cohort B_{SUBSAMPLE} included a larger proportion of families eligible for WIC but was otherwise representative of the communities from which the participants were drawn. In addition, Cohort B was the original validation cohort for the ECSA validation study. Further study should examine the validity of the Brief ECSA in an independent, nationally representative cohort and with parents of high- and low-risk children participating in the criterion validity study examining the Brief ECSA as a predictor of diagnostic interview findings. Another potential limitation of the study is the use of some subjective criteria (i.e., the study team's clinical experience with the items in specialty and primary care settings, clarity of wording) for prioritizing full-length ECSA items for deletion. This could be seen as a possible strength, as it incorporated practical factors that influence the clinical utility of each item. Regardless, the systematic process of prioritizing items for deletion resulted in a psychometrically sound, brief measure. In examining convergent validity, a single reporter, the female primary caregiver, described the child's BEP and the risk factors, which may increase the association among these factors.

In addition, it is notable that 18% of caregivers reported clinical range scores in this large pediatric primary care sample of preschool-aged children. Although at first glance this rate seems high, this reaction warrants some consideration. According to large epidemiologic studies from pediatric primary care populations,¹ between 14 to 26% of preschool-aged children met criteria for any psychiatric disorder, and 9 to 12% of the samples had significant impairment related to their psychiatric disorder.¹ Another study has shown that 29% of 3-year-old children in primary care screened positive using a measure with similar goals, the Ages and Stages Questionnaire—Social Emotional.³⁴ Taken together with data about the sensitivity and specificity of the Brief ECSA, these data suggest that the Brief ECSA is detecting most children with significant impairment, as well as some of those whose psychiatric symptoms have yet to cross the threshold for significant impairment. Screens should prioritize sensitivity over specificity to minimize the risk that children with serious BEPs will not be identified and to increase opportunities for children to receive further assessment, and possibly treatment. This principle is particularly salient in young children, when neuroplasticity offers the potential for early childhood interventions to substantially influence the neurodevelopmental trajectory for children with BEPs. Positive screens without obvious impairment may not require immediate referral, but offer the opportunity for discussion and anticipatory guidance by the PCP. This type of discussion about child BEP concerns is often desired by parents, but often does not

happen.¹³ Some have raised concerns about the time that would be required to address positive screens with these families. To prepare for these conversations, PCPs can collect information about local referral resources as well as practical tips for screening and hand-outs about early childhood mental health to share with families,¹² some of which can be found online at www.healthychildren.org.

In conclusion, the Brief ECSA demonstrates sound validity and reliability for identifying young children with BEPs in a primary care setting. The Brief ECSA's concise length and psychometric properties are promising, making it a good option for PCPs seeking to reduce time and maximize the value of their early childhood screening practices.

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REFERENCES

1. Egger HL, Angold A. Common emotional and behavioral disorders in preschool children: presentation, nosology, and epidemiology. *J Child Psychol Psychiatry*. 2006;47:313-337.
2. Lavigne JV, Gibbons RD, Christoffel KK, et al. Prevalence rates and correlates of psychiatric disorders among preschool children. *J Am Acad Child Adolesc Psychiatry*. 1996;35:204-214.
3. Bufferd SJ, Dougherty LR, Carlson GA, et al. Psychiatric disorders in preschoolers: continuity from ages 3 to 6. *Am J Psychiatry*. 2012;169:1157-1164.
4. Briggs-Gowan MJ, Carter AS. Social-emotional screening status in early childhood predicts elementary school outcomes. *Pediatrics*. 2008;121:957-962.
5. Lavigne JV, Arend R, Rosenbaum D, et al. Psychiatric disorders with onset in the preschool years: I. Stability of diagnoses. *J Am Acad Child Adolesc Psychiatry*. 1998;37:1246-1254.
6. Eyberg SM, Nelson MM, Boggs SR. Evidence-based psychosocial treatments for children and adolescents with disruptive behavior. *J Clin Child Adolesc Psychol*. 2008;37:215-237.
7. Charach A, Carson P, Fox S, et al. Interventions for preschool children at high risk for ADHD: a comparative effectiveness review. *Pediatrics*. 2013;131:1-21.
8. Gleason MM, Egger HL, Emslie GJ, et al. Psychopharmacological treatment for very young children: contexts and guidelines. *J Am Acad Child Adolesc Psychiatry*. 2007;46:1532-1572.
9. Scheeringa MS, Weems CF, Cohen JA, et al. Trauma-focused cognitive-behavioral therapy for posttraumatic stress disorder in three-through six year-old children: a randomized clinical trial. *J Child Psychol Psychiatry*. 2011;52:853-860.
10. Hood KK, Eyberg SM. Outcomes of parent-child interaction therapy: mothers' reports of maintenance three to six years after treatment. *J Clin Child Adolesc Psychol*. 2003;32:419-429.
11. American Academy of Pediatrics, Committee on Practice and Ambulatory Medicine, Bright Futures Periodicity Scheduled Workgroup. 2014 recommendations for pediatric preventive health care. *Pediatrics*. 2014;133:568-570.
12. Weitzman C, Wegner L, Blum NJ, et al. Promoting optimal development: screening for behavioral and emotional problems. *Pediatrics*. 2015;135:384-395.
13. Weitzman CC, Leventhal JM. Screening for behavioral health problems in primary care. *Curr Opin Pediatr*. 2006;18:641-648.
14. Gardner W, Kelleher KJ, Pajer KA, et al. Primary care clinicians' use of standardized tools to assess child psychosocial problems. *Ambul Pediatr*. 2003;3:191-195.
15. Horwitz SM, Storfer-Isser A, Kerker BD, et al. Barriers to the identification and management of psychosocial problems: changes from 2004 to 2013. *Acad Pediatr*. 2015;15:613-620.
16. American Academy of Pediatrics. *Addressing Mental Health Concerns in Primary Care: A Clinician's Toolkit*. Elk Grove Village, IL: American Academy of Pediatrics; 2010.
17. Gleason MM, Zeanah CH, Dickstein S. Recognizing young children in need of mental health assessment: development and preliminary validity of the Early Childhood Screening Assessment. *Infant Ment Health J*. 2010;31:335-357.
18. Goodman SH, Rouse MH, Connell AM, et al. Maternal depression and child psychopathology: a meta-analytic review. *Clin Child Fam Psychol Rev*. 2011;14:1-27.
19. Fallucco EM, Blackmore ER, Bejarano CM, et al. Feasibility of screening for preschool behavioral and emotional problems in primary care using the early childhood screening assessment. *Clin Pediatr (Phila)*. 2016;56:37-45.
20. Achenbach TM, Rescorla LA. *Manual for the ASEBA Preschool Forms & Profiles: An Integrated System of Multi-informant Assessment; Child Behavior Checklist for Ages 1½-5; Language Development Survey; Caregiver-Teacher Report Form*. Burlington, Vermont: University of Vermont; 2000.
21. Jellinek MS, Murphy JM, Robinson J, et al. Pediatric Symptom Checklist: screening school-age children for psychosocial dysfunction. *J Pediatr*. 1988;112:201-209.
22. Briggs-Gowan MJ, Carter AS, Irwin JR, et al. The brief infant-toddler social and emotional assessment: screening for social-emotional problems and delays in competence. *J Child Psychol Psychiatry*. 2004;29:143-155.
23. Scheeringa MS, Haslett N. The reliability and criterion validity of the Diagnostic Infant and Preschool Assessment: a new diagnostic instrument for young children. *Child Psychiatry Hum Dev*. 2010;41:299-312.
24. Olson AL, Dietrich AJ, Prazar G, et al. Brief maternal depression screening at well-child visits. *Pediatrics*. 2006;118:207-216.
25. Arroll B, Goodyear-Smith F, Crengle S, et al. Validation of PHQ-2 and PHQ-9 to screen for major depression in the primary care population. *Ann Fam Med*. 2010;8:348-353.
26. Gardner W, Murphy M, Childs G, et al. The PSC-17: a brief pediatric symptom checklist with psychosocial problem subscales. A report from PROS and ASPN. *Ambul Child Health*. 1999;5:225.
27. Gardner W, Lucas A, Kolko DJ, et al. Comparison of the PSC-17 and alternative mental health screens in an at-risk primary care sample. *J Am Acad Child Adolesc Psychiatry*. 2007;46:611-618.
28. Richardson LP, Rockhill C, Russo JE, et al. Evaluation of the PHQ-2 as a brief screen for detecting major depression among adolescents. *Pediatrics*. 2010;125:e1097-e1103.
29. Richardson LP, McCauley E, Grossman DC, et al. Evaluation of the Patient Health Questionnaire-9 Item for detecting major depression among adolescents. *Pediatrics*. 2010;126:1117-1123.
30. Wissow LS, Gadomski A, Roter D, et al. Improving child and parent mental health in primary care: a cluster-randomized trial of communication skills training. *Pediatrics*. 2008;121:266-275.
31. Gleason MM, Goldson E, Yogman MW, Council on early childhood, committee on psychosocial aspects of child and family health, section on developmental and behavioral pediatrics. Addressing early childhood emotional and behavioral problems. *Pediatrics*. 2016;138:e20163025.
32. Sheldrick RC, Henson BS, Merchant S, et al. The Preschool Pediatric Symptom Checklist (PPSC): development and initial validation of a new social/emotional screening instrument. *Acad Pediatr*. 2012;12:456-467.
33. Koshy AJ, Mautone JA, Pendergast LL, et al. Validation of the Behavioral Health Checklist in diverse pediatric primary care settings. *J Dev Beh Pediatr*. 2016;37:132-139.
34. Briggs RD, Stettler EM, Johnson Silver E, et al. Social-emotional screening for infants and toddlers in primary care. *Pediatrics*. 2012;129:e377-384.