Behavioral Problems and Socioemotional Competence at 18 to 22 Months of Extremely Premature Children

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abstract

BACKGROUND: Behavior and socioemotional development are crucial aspects of child development .

METHODS: A total of 2505 children born at <27 weeks' gestation was evaluated at 18 to 22 months' corrected age between January 1, 2008 and December 12, 2012 (86% follow-up). The Brief Infant and Toddler Social and Emotional Assessment was used to evaluate behavioral and socioemotional problems. Cognition and language were evaluated by using the Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III). Logistic regression analysis was used to evaluate for perinatal and demographic factors associated with behavioral problems (≥75th percentile) and delayed socioemotional competence (≤15th percentile). Structural equation modeling with bootstrapping was used to identify possible associated risk factors and Bayley-III scores as mediators.

RESULTS: Thirty-five percent (873) of children had behavioral problems, and 26% (637) displayed deficits in socioemotional competence. Male sex, public insurance, mothers with less than a high school education, and lower maternal age were associated with behavioral problems. Deficits in competence were associated with lower birth weight, public insurance, mothers with less than a high school education, and abnormal neuromotor exam. Bayley-III language and cognitive scores were significant mediators of the relationships between risk factors and both behavioral and competence scores ($P < .05$).

CONCLUSIONS: Extremely premature children are at risk for behavioral problems and deficits in socioemotional competence. Sociodemographic factors were associated with both socioemotional competence and behavioral problems. Deficits in socioemotional competence were also associated with neuromotor abnormalities and cognitive and language function

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WHAT'S KNOWN ON THIS SUBJECT: Extremely premature children are at high risk for developmental problems. Behavior and socioemotional development are crucial aspects of child development.

WHAT THIS STUDY ADDS: This study shows that extremely premature children are at risk for behavioral and socioemotional problems at an early age and that sociodemographic factors and neuromotor abnormalities are associated with these deficits. In addition, cognitive and language functioning mediates these deficits.

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Extremely premature (EP) children are surviving more often and are at high risk for neurodevelopmental problems,[1] although many survive free of neuromotor abnormalities.[2] A substantial proportion of EP children have cognitive and behavioral problems even in the absence of detectable brain abnormalities on neuroimaging.[3,4] Several factors may contribute to behavioral and socioemotional problems in EP children, including the vulnerability of the premature brain during critical periods of development,[5,6] multiple medical problems,[7] and the social and socioeconomic environment.[8] Behavioral and socioemotional growth is a crucial aspect of child development. It influences cognition, motor function, and language, which have major impact on future school performance and overall functional outcomes.[9,10] However, less is known about early behavioral and socioemotional development in EP children.[11,12] Our previous research in 30-month-old corrected age (CA) formerly extremely low birth weight (ELBW) children showed that 46.8% of children had behavioral problems and 20.4% had deficits in socioemotional competence.[13] Given the high rate of these problems evident by 30 months of age, determining if behavior and socioemotional problems are associated with early risk factors is imperative. Identification of early risk factors would enable practitioners to refer children at high risk earlier for behavioral intervention, thereby reducing the negative impact on children and families.[14] In addition, a broader understanding is needed of the biological and social risk factors associated with poor behavioral or socioemotional outcomes in EP children.

The Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Neonatal Research Network (NRN) Follow-Up Program provides a unique opportunity to study behavioral and socioemotional competence problems in the EP population at an early age.

Our study aimed to estimate the rates of behavioral problems and deficits in socioemotional competence among EP children during their follow-up visit at 18 to 22 months' CA. We hypothesized that EP children would have more behavioral problems and greater deficits in socioemotional competence when compared with norms. In addition, we sought to investigate factors associated with these difficulties, as well as mediating factors. This study provides new information concerning the prevalence of behavior and socioemotional problems before the age of 2 years in EP children, unique information concerning the relationship of neonatal and maternal factors to behavioral and socioemotional outcomes, as well as the mediating role of cognitive and language development by using Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III) scores.

METHODS

Study Population

The study population included all EP children <27 weeks' gestation born without a major congenital abnormality in the NICHD NRN centers who had a standard follow-up visit at 18 to 22 months' CA between January 1, 2008 and December 12, 2012 (Fig 1). A total of 5085 children met these criteria. Of these infants, 2187 died, 219 were lost to follow-up, and 90 had no follow-up status information. The remaining 2589 were evaluated at the follow-up visit, and 2505 children had complete data available, representing a follow-up rate of 86%. Those children included and not included did not differ significantly with respect to sex, race, necrotizing enterocolitis, intraventricular hemorrhage (IVH) grade 3 or 4, bronchopulmonary dysplasia (BPD), marital status, or gestational age (GA). There were more multiple births among the children included in the analysis (23% vs 16%; $P < .01$). They were less likely to have public insurance (72% vs 79%; $P = .02$) and fewer of them had mothers with less than a high school (HS) education (17% vs 24%; $P < .01$). Those in the analysis had mothers with a higher maternal age (27.4 ± 6.4 vs 26.6 ± 6.4; $P = .03$) and had a lower mean birth weight (BW) (765 ± 154 g vs 798 ± 198 g; $P < .01$).

Measurements

Pregnancy, delivery, and hospitalization data were obtained prospectively by certified study coordinators until 120 days after birth or hospital discharge using standard definitions from the NRN. At the 18- to 22-month visit, interim medical history and updated social and demographic information were obtained from the parent or primary caregiver. Children underwent a standardized neurologic examination, including the administration of the modified Gross Motor Function Classification Scale,[16] a scale that is scored from 0 (normal walking) to 5 (lower function); cerebral palsy (CP) was diagnosed if abnormalities in neuromotor exam and delayed motor function[17] were found, and was classified depending on Gross Motor Function Classification Scale scores, mild (<2), moderate (2–3), and severe (≥4). Evaluators were certified yearly for the neurologic assessment. Methods for these measures and for establishing interrater reliability on all assessments have been reported previously.[17]

The Brief Infant and Toddler Social and Emotional Assessment (BITSEA) was used to identify potential behavioral problems or delays in socioemotional competence.[15] The BITSEA is a standardized screening

questionnaire consisting of 42 items, derived from the 169-item Infant Toddler Social and Emotional Assessment.[18] The BITSEA is a short, easy-to-administer, and reliable screen for socioemotional assessment that has been validated in the United States[19–21] and in other countries.[22–25] The BITSEA has 2 separate scales: problem and competence. The problem scale includes behaviors that may become problematic (for example, aggression, sadness, or fear). Socioemotional competence items address areas of attention, compliance, mastery motivation, prosocial skills, empathy, imitation/play skills, and social relatedness. Both scales also include atypical behaviors often seen in children with autism spectrum disorder (ASD). The study coordinators assisted primary caregivers in completing the BITSEA by reading the questionnaire verbatim to them during their clinic visit.

Individual BITSEA items are rated on a 3-point scale as not true/rarely (0), somewhat true/sometimes (1), or very true/often (2), yielding a total score and cut points for each scale. Significant behavioral problems were present if the problem score obtained was ≥75th percentile. Competence deficits were present if competence scores were ≤15th percentile. For this study, scores were determined according to CA and sex. Good test-retest reliability has been demonstrated for the BITSEA with intraclass correlations of 0.82 for the problem scale and 0.72 for the competence scale. The BITSEA has been validated against the Child Behavior Checklist and has also been shown to correlate with parents' reports of parental worry, stress, and interference in family life. The BITSEA is also a good predictor for behavioral problems 1 year later[26] and at school age.[21]

The Bayley-III was administered by yearly certified examiners to assess

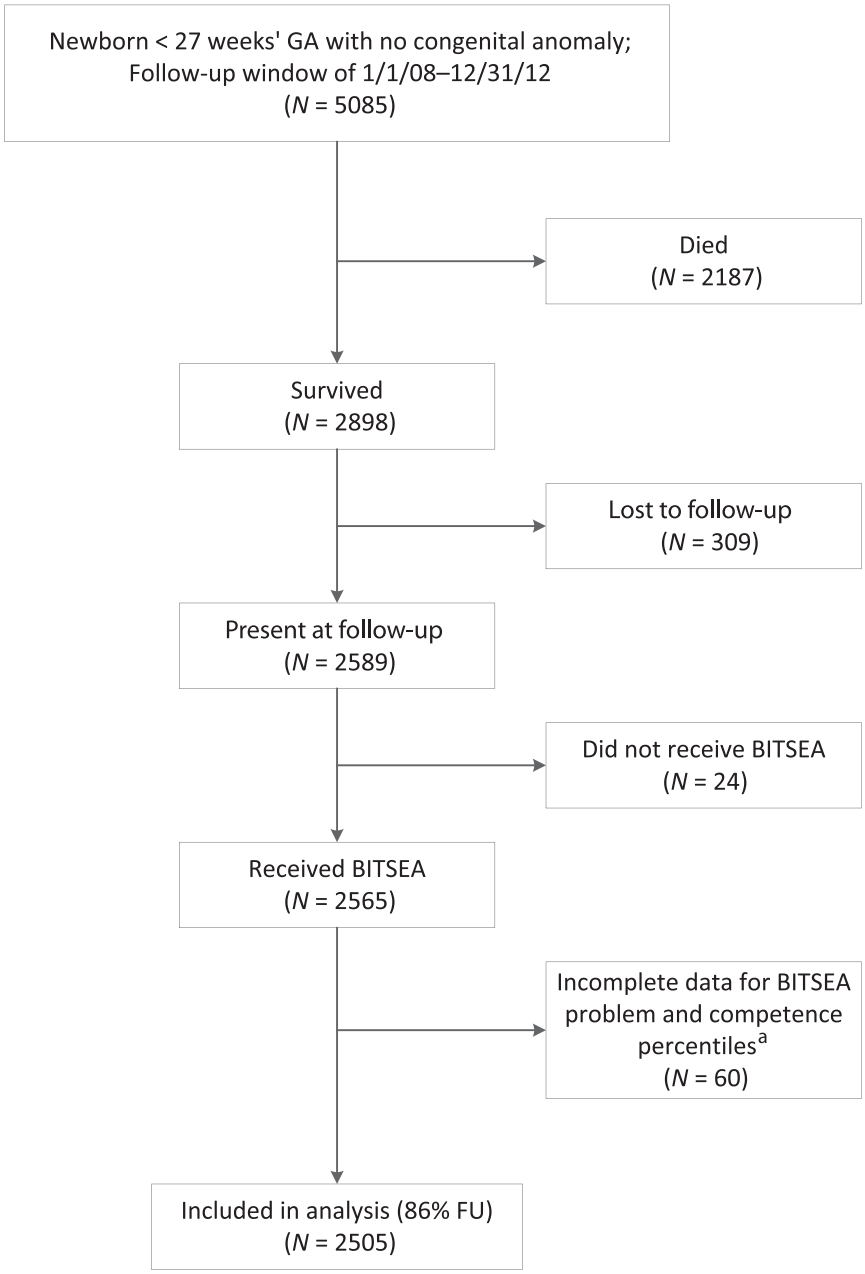

FIGURE 1

Study population. [a]Child could not be classified according to percentiles for BITSEA problem and competence scales due to incomplete data or adjusted age outside of range for percentiles reported by Briggs-Gowan et al.[15]

cognitive and language (composite expressive and receptive) functioning. Bayley-III scores were assessed relative to a standardized mean (±SD) of 100 ± 15, with higher scores indicating better performance.[27]

Analysis

Data from the NICHD NRN are collected in each center on standard forms and are compiled at the data coordinating center, RTI International (Research Triangle Park, NC). Institutional review boards at each center approved the study. RTI personnel assessed data completion and consistency. Data analysis was performed by using SAS version 9.1 (SAS Institute, Inc, Cary, NC). Problem and competence scores,

TABLE 1 Mean and SD Scores on the Overall Sample by Sex Compared With Reference Group

BITSEA Score	Boys			Girls		
	Sample	Reference Group[15]	*P*	Sample	Reference Group[15]	*P*
Scores, mean (SD)						
Behavior problems	12.9 (7.3)	11.1 (6.4)	<.01	11.9 (7.0)	10.2 (7.0)	<.01
Competence	16.1 (3.8)	16.8 (2.8)	.03	17.1 (3.4)	17.9 (2.3)	<.01
Cut point, *n* (%)						
Behavior problem (≥75th percentile)	456 (37)	37 (26)	<.01	417 (33)	35 (23)	.02
Competence deficit (≤15th percentile)	296 (25)	16 (11)	<.01	341 (27)	19 (13)	<.01

P values are based on Student's *t* tests for continuous variables and χ^2 tests for categorical variables.

socioemotional competence scores, and percentage of children meeting the cutoff points for both indices were computed by sex and were compared with a reference group by using Student's *t* tests and χ^2 tests. Bivariate relationships between demographic and medical risk factors and problem and competence scores on the BITSEA were examined by using χ^2 tests for categorical variables and *t* tests for continuous variables. Logistic regression analyses were used to assess the impact of infant (ie, GA, BW, multiple birth, BPD [defined as requiring oxygen at 36 weeks' postmenstrual age], discharge or transfer, whichever came first, IVH grade 3 or 4, periventricular leukomalacia, sex, race, and CP diagnosis or an abnormal neurologic exam at 18 to 22 months' CA) and maternal/demographic (ie, marital status, education, age, public insurance status at 18 to 22 months visit, and household income) risk factors on the presence of behavioral problems and deficits in socioemotional competence. Structural equation modeling was used to test whether Bayley-III cognitive and language development composite scores mediated the relationship between risk factors and behavioral problems and socioemotional competence scores. These models were fit by using the Mplus software program[28] with bootstrapping to calculate the confidence intervals for the mediation effects.[29]

RESULTS

At 18 to 22 months' CA, the EP children scored significantly worse on the problem scale compared with norms for both boys and girls. The percentage of children with behavioral problems or deficits in socioemotional competence using the designated cutoff point was higher than expected based on the reference normative group (Table 1).

Behavioral Problems

In the bivariate analysis (Table 2), child factors associated with behavioral problems ($P < .05$) were multiple birth, male sex, race, and rehospitalization. The maternal characteristics associated with behavioral problems included maternal age, maternal education less than HS, being unmarried, having public health insurance, and living arrangements if living with the biological mother only. Factors independently associated with behavioral problems included male sex, having public medical insurance, lower maternal education, and lower maternal age after controlling for demographic and other factors (Table 3) by using logistic regression models.

Competence Deficits

Using bivariate analysis, child factors associated with competence deficits included lower BW, race, rehospitalization, and abnormal neurologic examination or the diagnosis of CP at 18 to 22 months. Maternal characteristics associated with competence deficits were lower maternal education and having public health insurance. Child characteristics associated with competence deficits included rehospitalization and/or abnormal neurologic exam or moderate to severe CP at 18 to 22 months' CA (Table 2).

Using logistic regression models and controlling for other factors, lower BW, having public medical insurance, maternal education less than HS, and having an abnormal neurologic exam at 18 to 22 months were independently associated with competence problems (Table 3).

Relationship Between BITSEA and Bayley-III

Bayley-III cognitive and language scores were lower in children with behavioral problems or deficits in competence (Table 4). Children with behavioral problems had lower mean Bayley-III cognitive and language composite scores than children without behavioral problems. A higher percentage of children with behavioral problems had cognitive scores <85 and composite language scores <85 and <70. More children with competence deficits had Bayley-III cognitive scores <85 or 70 or language scores <85 or 70 than those without deficits ($P < .05$).

Bayley-III composite language score mediated the relationship between behavioral problems and male sex, public insurance, maternal education less than HS, and lower maternal age; cognitive scores were significant mediators for all of the above except maternal age (Table 5). Both Bayley-III cognitive and composite language scores were mediators of the relationship between competence deficits and low BW, public insurance, maternal education less than HS, and abnormal neurologic exam (Table 6).

TABLE 2 Characteristics of the Study Group

Characteristic	Problem Score		Competence Score		Overall, *N* = 2505
	Behavior Problem (≥75th Percentile), *N* = 873	No Problem (<75th Percentile), *N* = 1630	Competence Deficit (≤15th Percentile), *N* = 637	No Deficit (>15th Percentile), *N* = 1821	
BW (g), mean ± SD	761 ± 154	768 ± 154	747 ± 156*	773 ± 152*	764 ± 154
GA (wk), mean ± SD	25 ± 1	25 ± 1	25 ± 1	25 ± 1	25 ± 1
Multiple birth, %	21*	24*	22	24	23
Boy, %	52*	47*	46	50	49
Race/ethnicity, %					
Non-Hispanic black	44*	36*	43*	38*	39
Non-Hispanic white	30*	43*	31*	41*	39
Hispanic	20*	16*	22*	16*	17
Other	5*	5*	5*	5*	5
Maternal age (y), mean ± SD	26 + 7*	28 + 6*	27 ± 6	28 ± 6	27 ± 6
Maternal education (less than HS), %	24*	13*	23*	15*	17
Mother married, %	43*	57*	48	53	52
Public health insurance, %	82*	66*	80*	69*	72
Living arrangements, %					
Both biological parents	58*	67*	61	65	39
Biological mother only	36*	26*	32	29	29
Other	6*	7*	8	6	7
BPD, %	52	55	55	53	55
IVH grade 3 or 4, %	16	15	17	14	15
NEC, %	10	10	11	9	10
Rehospitalization, %	53*	44*	50*	45*	48
Abnormal neuromotor exam at 18 m, %	31	31	41*	26*	32
CP at 18 mo, %	11	11	15*	8*	12
Moderate/severe CP, %	5	4	6*	3*	6
NDI, %	16	13	27*	9*	16
Adjusted age at assessment (mo), mean ± SD	21 ± 3*	20 ± 3*	20 ± 3*	21 ± 3*	20 ± 3

NDI, neurodevelopmental impairment; NEC, necrotizing enterocolitis.
* $P < .05$.

DISCUSSION

This study evaluated behavioral problems and socioemotional competence and associated risk factors in a large sample of EP children at 18 to 22 months' CA. Our results indicate that children born EP are at increased risk for behavioral problems and deficits in socioemotional competence when compared with population norms and that risk factors that are associated with poor outcomes can be identified at an earlier age.

Research regarding behavioral problems in EP children has been inconsistent and typically has focused on children older than our sample population.[30] Our finding of a substantial proportion of EP children with behavioral problems and socioemotional competence deficits is comparable to another previous study that compared very preterm children to a term sample of children 3 years of age in France by using the Strengths and Difficulties Questionnaire.[31] We previously reported a high prevalence of behavioral and socioemotional

TABLE 3 Logistic Regression Models of Behavioral Problems and Competence Deficits

Variable	Behavioral Problems		Competence Deficits	
	Adjusted OR (95% CI)	*P*	Adjusted OR (95% CI)	*P*
GA (wk), mean ± SD	0.96 (0.88–1.06)	.45	0.95 (0.86–1.05)	.30
BW (*z* score), mean ± SD	0.88 (0.79–0.98)	.02	0.88 (0.78–0.98)	.02
Multiple birth, %	1.04 (0.84–1.29)	.73	1.02 (0.80–1.28)	.90
Boy, %	1.22 (1.02–1.45)	.03	0.86 (0.71–1.04)	.12
Race/ethnicity, %[a]				
Non-Hispanic black	1.43 (1.14–1.79)	.22	1.25 (0.98–1.61)	.28
Hispanic	1.28 (0.96–1.70)	.97	1.33 (0.97–1.82)	.13
Other	1.44 (0.93–2.21)	.44	0.94 (0.58–1.53)	.33
Public medical insurance, %	1.80 (1.43–2.27)	<.01	1.30 (1.01–1.68)	.04
Maternal education (less than HS), %	1.58 (1.25–2.01)	<.01	1.41 (1.09–1.82)	.01
Maternal age (y), mean ± SD	0.97 (0.96–0.99)	<.01	0.99 (0.98–1.01)	.38
BPD, %	0.86 (0.71–1.04)	.12	1.04 (0.84–1.29)	.71
IVH grade 3 or 4, %	1.03 (0.80–1.33)	.81	1.01 (0.77–1.33)	.94
Moderate/severe CP at 18 mo, %	1.11 (0.71–1.74)	.65	1.45 (0.89–2.35)	.13
Abnormal neuro exam at 18 mo, %	0.92 (0.75–1.14)	.45	1.75 (1.41–2.18)	<.01
Adjusted age at assessment (mo), mean ± SD	1.09 (1.05–1.12)	<.01	0.96 (0.93–1.00)	.04

CI, confidence interval; OR, odds ratio.
[a] Non-Hispanic white was the reference category for race/ethnicity.

problems in a similar sample of 30-month-old ELBW children.[13] Previous reports suggest that 46% to 50% of children who had behavioral problems at 3 years of age continue to have behavior problems at 5 years of age.[32,33] Thus, the high rates of behavioral problems and socioemotional deficits already evident by 18 to 22 months are important, because earlier behavioral intervention potentially can be initiated to prevent later problems.

Associated Factors

Certain infant characteristics, such as being a boy, and maternal characteristics, such as young maternal age, lower maternal education, being unmarried, and receiving public health insurance assistance, were associated with behavioral problems and deficits in socioemotional competence. Previous studies have found that socioeconomic status, the quality of the home environment, and maternal education are related to behavioral disorders and cognitive development.[34] The quality of the home environment may support parent-child interactions and assist a child in developing self-regulated behaviors like maintaining attention or inhibiting impulsive responses. Deficits in socioemotional competence were associated with lower maternal education and receiving public health insurance. Several studies have reported that financial and emotional stressors associated with poverty negatively affect parenting behaviors, leading to subsequent cognitive and behavioral problems in children.[35] Male sex was associated with behavioral problems in the current study. Although findings of a higher prevalence of behavior problems in boy preschool-age children has been evident in community samples,[36,37] previous studies of premature children have not been consistent regarding increased behavioral problems in boys. Some studies have demonstrated a higher rate of behavioral problems in premature girls. We reported previously a slight increase in behavioral problems at 30 months of age in girls compared with boys in a group of children who were born at ELBW.[13] A similar finding was also reported in a study of very low BW children at 2 years of age.[38] However, male sex has been associated with overall poorer developmental outcomes in preterm infants.[39–41] Another previous study using the Behavior Rating Scale of the Bayley Scales of Infant and Toddler Development, Second Edition reported more socioemotional problems in boys at 2 years of age.[42] GA has been associated with adverse neurodevelopmental outcomes. In our study, neither behavioral problems nor competence deficits were associated with GA. However, competence deficits were associated with lower BW. Our sample only included children from 23 to <27 weeks' gestation; this narrow range of GA may make it difficult to detect differences related to GA. Our previous study of ELBW children did not find an association

TABLE 4 Bayley-III Composite Scores by Group

Variable	Problem Score		Competence Score		Overall
	Behavior Problem (≥75th Percentile), *N* = 873	No Problem (<75th Percentile), *N* = 1630	Competence Deficit (≤15th Percentile), *N* = 637	No Deficit (>15th Percentile), *N* = 1821	
Cognitive score, mean ± SD	87.7 ± 13.9*	90.7 ± 14.8*	83.2 ± 14.9*	92.5 ± 13.1*	89 ± 15.2
Language score, mean ± SD	81.5 ± 15.6*	87.2 ± 16.7*	76 ± 15.4*	89 ± 15.2*	84.5 ± 17.1
Cognitive score <85, %	30*	26*	45*	20*	29
Cognitive score <70, %	9	7	16*	3*	9
Language score <85, %	58*	43*	33*	10*	49
Language score <70, %	22*	14*	72*	38*	18

χ^2 tests for categorical variables and Student's *t* tests for continuous variables.
* $P < .05$.

TABLE 5 Bayley-III Cognitive and Language Scores as Intervening Variables on Behavioral Problems

Risk Factor	Intervening Variable	Coefficient (SE)	*P*
Male sex	Cognitive	0.03 (0.01)	<.001
	Language	0.08 (0.01)	<.001
Public insurance	Cognitive	0.04 (0.01)	.001
	Language	0.08 (0.01)	<.001
Less than HS education	Cognitive	0.03 (0.01)	.001
	Language	0.08 (0.01)	<.001
Maternal age	Cognitive	−0.001 (0.000)	.13
	Language	−0.001 (0.001)	.05

Bootstrapping approach using structural equation modeling as implemented in Mplus.

TABLE 6 Bayley-III Cognitive and Language Scores as Intervening Variable on Competence Problems

Risk Factor	Intervening Variable	Coefficient (SE)	*P*
BW	Cognitive	−0.47 (0.06)	<.001
	Language	−0.48 (0.07)	<.001
Public insurance	Cognitive	0.16 (0.02)	<.001
	Language	0.20 (0.02)	<.001
Less than HS education	Cognitive	0.10 (0.02)	<.001
	Language	0.19 (0.03)	<.001
Abnormal neurologic exam	Cognitive	0.28 (0.03)	<.001
	Language	0.30 (0.03)	<.001

between BW or GA and behavioral and socioemotional outcomes at 30 months of age.[13] Other studies of behavioral problems at an early age also did not find an effect of GA.[31] Lower BW was associated with competence deficits in our study. Perhaps this reflects the effects of intrauterine growth restriction on children born at lower BW. Others have reported poorer neurodevelopmental outcomes in preterm children born after intrauterine growth restriction.[43,44]

An abnormal neurologic exam at 18 months of age was associated with competence deficits. Cerebral lesions as detected by head ultrasound during the neonatal period did not correlate with behavioral or socioemotional difficulties in our study, although early cranial ultrasound may not detect significant brain abnormalities or predict neurodevelopmental outcome when compared with near-term cranial ultrasound or MRI.[45,46] Despite advances in neuroimaging of preterm infants, few studies have correlated behavioral disorders with brain abnormalities on imaging. However, children with attention-deficit/hyperactivity disorder who were born preterm have been reported to have abnormal neonatal imaging studies.[47] Some studies have reported an association of neuromotor problems with cognitive and behavioral disorders.[42,44]

Mediator Variables

We found that Bayley-III cognitive and composite language scores are significant intervening mediating variables in the occurrence of socioemotional deficits. Self-regulation, a component of socioemotional development, is thought to be associated with positive developmental outcomes in children, including better cognitive abilities. In addition, language development may support the development of self-regulation skills in young children.[48] With increased knowledge of socioemotional development in preterm children, we can identify appropriate targets for effective early intervention.

Previous studies have reported an increased incidence of ASD in children born ELBW.[49] However, interpreting this association is complicated given the increased prevalence of developmental delays in children who were ELBW at birth.[50–52] Both behavioral problems and competence deficits have been associated with ASD.[15] The BITSEA includes items associated with ASD (eg, social relatedness, social withdrawal, and repetitive behaviors). In particular, competence scores have been suggested as an effective tool for ASD screening.[53] The NICHD NRN follow-up cohort study has not evaluated comprehensively for ASD in this group of EP children. The question of whether a possible diagnosis of ASD had been communicated to the parents by a medical professional was added to the data collection form in the last 2 years of the study period.

Limitations

The BITSEA is a screening checklist that is completed only by the primary caregiver or parent. Thus, it reflects only the perception of the primary caregiver,[54] who may be influenced by other factors, such as their own mental health. Indeed, many studies have reported that mothers with mental health problems report more problems in their children than mothers without mental health problems.[55,56] To obtain a comprehensive assessment of children's behavioral and socioemotional functioning, multimodal assessment is recommended using structured diagnostic interviews and checklists from several raters.[57] Some caregivers may have had difficulty understanding the BITSEA items, particularly those that are reverse-keyed. However, to minimize misunderstanding, especially for caregivers with low reading ability, the survey was administered by trained research staff. Second, we did not have a term control group; however, we compared our scores to published norms from the standardization sample of the BITSEA. We acknowledge that the sample used for this standardization sample was likely different than our sample. However, this was a large cohort of EP children drawn from different centers around the United States. Assessments were not completed blinded to perinatal history and varied by center. However, BITSEA results were not usually known by examiners because scores were calculated later. Finally, although the BITSEA is only a screener, it correlates well with the ITSEA, the longer version of the scale, has been tested in different populations, and has been shown to be valid and effective in the detection of behavioral problems and socioemotional deficits in preschool-aged children.

CONCLUSIONS

EP children are at risk not only for general developmental problems, but also for behavioral problems and deficits in socioemotional competence by 18 to 22 months' CA. Early identification of these problems before 2 years of age would enable intervention within the second year of life. If these difficulties persist into school age, they are likely to hinder children's cognitive functioning as well as school performance and overall functional outcomes. Additional research to determine if these behavior problems persist long-term is recommended. Environmental variables, including caregiver education, family functioning, and family social support, have a significant impact on behavioral and socioemotional

outcomes of these children. Because behavioral and socioemotional development can impact the developmental trajectories of children who are born at high risk, socioemotional development should be assessed when these children are clinically evaluated to elucidate targeted interventions to be implemented in this vulnerable population.

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ABBREVIATIONS

ASD: autism spectrum disorder
Bayley-III: Bayley Scales of Infant and Toddler Development, Third Edition
BITSEA: Brief Infant and Toddler Social and Emotional Assessment
BPD: bronchopulmonary dysplasia
BW: birth weight
CA: corrected age
CP: cerebral palsy
ELBW: extremely low birth weight
EP: extremely premature
GA: gestational age
HS: high school
IVH: intraventricular hemorrhage
NICHD: Eunice Kennedy Shriver National Institute of Child Health and Human Development
NRN: Neonatal Research Network

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