

Early Indicators of Autism Spectrum Disorders in the Second Year of Life

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There is now mounting evidence demonstrating the effectiveness of intensive early intervention using a range of behavioral and naturalistic approaches with a substantial proportion of young children with autism spectrum disorders (ASD). Research indicates that intervention provided before age 3½ has a much greater impact than that after age 5, which underscores the importance of improving early identification. In spite of the severity of the behavioral characteristics of most children with ASD, the average age for diagnosis in the United States is not until 3 to 4 years. Although there have been significant advances in genetic and biomedical research on ASD, there is currently no biological marker for either autism or ASD, therefore screening and diagnosis must be based on behavioral features.

Purpose

The purpose of this prospective, longitudinal study was to identify precise early indicators of autism spectrum disorders (ASD) during the second year of life by examining videotaped communication samples. Specific research objectives were:

- ❑ To examine the accuracy of the *Communication and Symbolic Behavior Scales Developmental Profile* (CSBS DP) Infant-Toddler Checklist as a 1st stage screening tool for children with ASD; and
- ❑ To identify red flags for ASD from archival videotapes collected during the second year of life.

Method

PARTICIPANTS: Three groups of children participated in this study: one with ASD (n = 18), one with developmental delays in which ASD was ruled out (DD; n = 18), and one with typical development (TD; n = 18). The participants in this study were drawn from a pool of children who are part of an ongoing longitudinal study of the FIRST WORDS® Project. Children were recruited to the

Project by having parents complete the CSBS DP Infant-Toddler Checklist distributed by childcare and healthcare agencies and by staff in public places that serve families of young children. The target population for screening is children who have not yet been identified as having a developmental delay. This investigation is reporting on findings of participants drawn from a pool of 3,021 children who were not previously identified (NPI) as having a developmental delay and were screened with the Infant-Toddler Checklist under two years of age. Additionally, five children who were developmentally delayed and had been identified (DDI) under the age of 2 years when referred to the Project were included in this study, three who received a diagnosis of ASD from a pediatric neurologist and two who had Down syndrome. These five DDI children were also screened with the Infant-Toddler Checklist under two years of age.

Children were assigned to groups based on the results of a follow-up diagnostic evaluation for ASD, which included the *Autism Diagnostic Observation Schedule*, the *Social Communication Questionnaire*, the *Vineland Adaptive Behavior Scales*, and the *Mullen Scales of Early Learning* (MSEL). Eighteen children were selected from the participant pool who displayed performance above the 25th percentile on the CSBS DP in the second year of life for the TD group. On the MSEL, the ASD and DD groups did not differ on their nonverbal developmental quotient, $t = -.44, p = .667$, or on their verbal developmental quotient, $t = -1.46, p = .155$.

Participant Characteristics

	ASD	DD	TD
Sample Size	18	18	18
CSBS DP Age	21 mos	18 mos	20 mos
Total SS	69.3	75.2	101.8
Follow-up Age	33.4 mos	30.7 mos	31.1 mos
Mullen LCSS	71.7	78.6	106.4
Nonverbal DQ	78.0	81.8	105.4
Verbal DQ	61.0	78.0	100.5

PROCEDURES: To examine the accuracy of the Infant-Toddler Checklist for early identification of ASD, the agreement between children's screening outcomes on the Checklist was compared with their developmental outcomes. Additionally, responses to the question of whether parents were concerned about their child's development on the Checklist were compared for the three groups.

To identify more precise red flags for ASD during the second year of life, the archival videotapes of the CSBS DP Behavior Samples were recoded for participants in this study using the *Systematic Observation of Red Flags for Autism Spectrum Disorders in Young Children* (SORF, Wetherby & Woods, 2002). The SORF includes the following 29 items in five composite areas:

Reciprocal Social Interaction:

- aversion to social touch or proximity
- lack of appropriate gaze
- lack of warm, joyful expressions with directed gaze
- lack of sharing interest or enjoyment
- lack of anticipatory posture or movement in response to interaction
- lack of response to contextual cues
- lack of response to name when called
- lack of coordination of gaze, facial expression, gestures, and sounds

Unconventional Gestures:

- using person's hand as a tool without directed gaze
- lack of pointing
- lack of showing

Unconventional Sounds and Words:

- atypical vocalizations
- unusual syllable strings
- unusual prosody
- immediate echolalia
- idiosyncratic or repetitive use of words or phrases
- lack of communicative vocalizations

Repetitive Behaviors and Restricted Interest:

- repetitive movements or posturing of body, arms, hands, or fingers
- repetitive movements with objects
- unusual sensory interest or explorations with objects
- excessive interest in or focus on particular toys
- lack of playing with a variety of toys and objects

Emotional Regulation:

- fear or distress about particular objects
- distress over removing particular objects
- difficulty calming when distressed
- abrupt shifts in emotional or behavioral state
- heightened alertness and response to stimuli or situations
- flat affect or unresponsive to interactions
- challenging behavior

The SORF score ranges from 0 to 58; a higher score indicates that more red flags of ASD were observed.

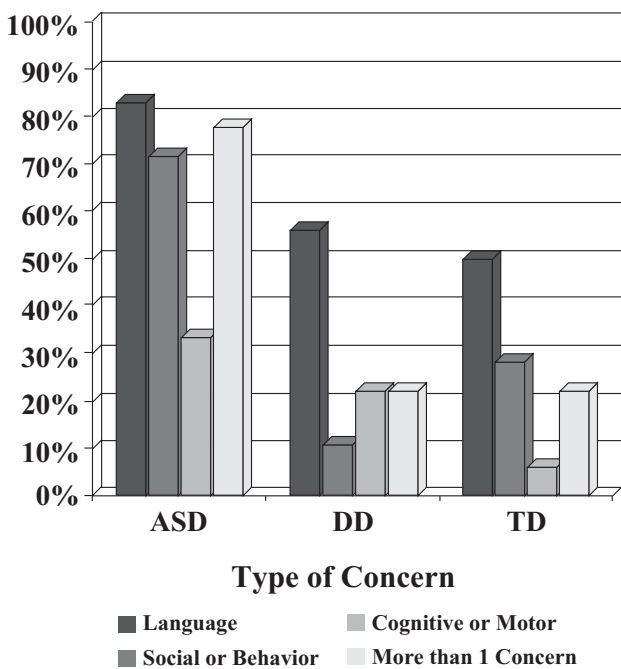
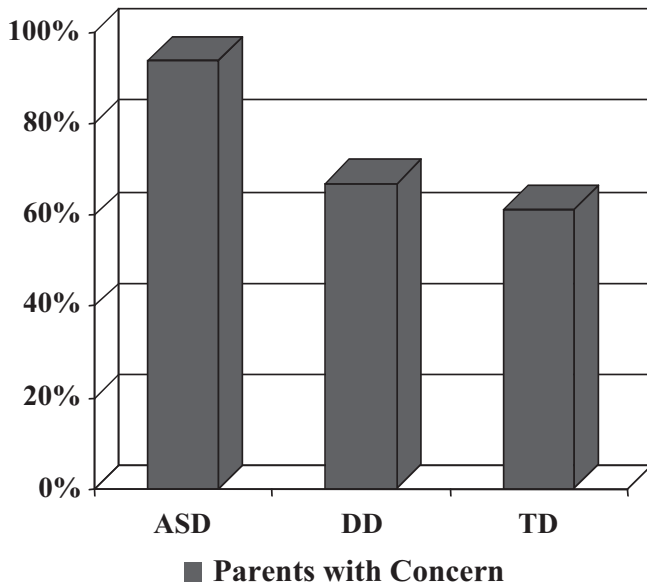
INTERRATER RELIABILITY: Interrater reliability for the CSBS DP Behavior Sample was calculated using generalizability (*g*) coefficients for pairs of five independent raters on randomly selected videotapes of the Behavior Sample for at least 20% of the samples scored by each rater. The *g* coefficients ranged from .92 to .97 for the composites and total, which indicate that CSBS DP raters exhibited very high inter-rater reliability. Interrater reliability for the SORF was calculated using the percent agreement between the two raters who independently scored the videotapes of 12 randomly selected children. The mean percent agreement was 97.1%, and ranged from 89.7% to 100% across children and from 83.0% to 100% across items.

Results

To examine the accuracy of the Infant-Toddler Checklist for early identification of ASD, the agreement between children's screening outcomes on the Checklist was compared with their developmental outcomes. Using the criteria established by Wetherby and Prizant (2002) for identifying children at risk who need to be evaluated

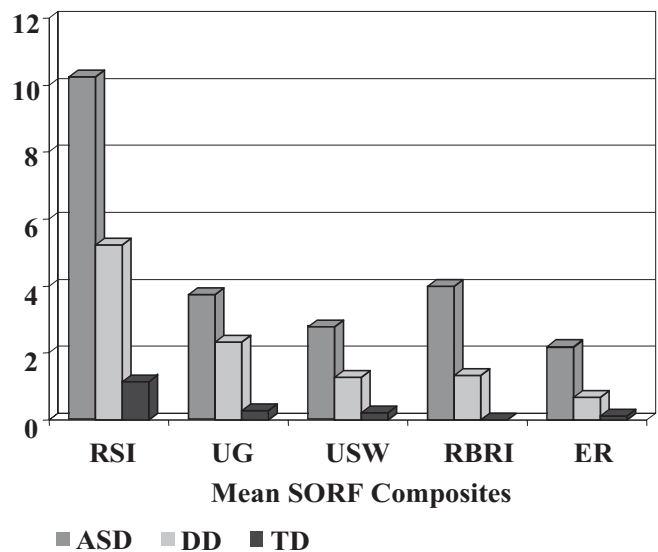
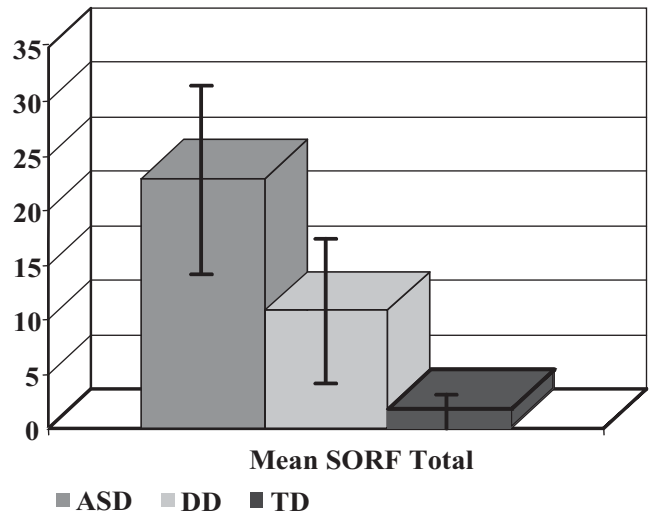
based on the Checklist scores (i.e., “fail” the Checklist), 17 of the 18 children in the ASD group or 94.4% were at risk, 15 in the DD group or 83.3%, and 2 in the TD group or 11.1%. Sensitivity was 88.9% when the ASD and DD groups were combined and increased to 94.4% when only the ASD group was examined with the TD group. Specificity was 88.9%.

The results of responses to the question of whether parents were concerned about their child’s development on the Infant-Toddler Checklist are presented below.



The percentage of parents who expressed concerns was significantly greater for the ASD group than the TD group ($\chi^2=5.79$, $p=.016$) but did not differ significantly for the ASD and DD groups ($\chi^2=3.20$, $p=.074$). The percentage of parents who expressed concerns in more than one category was significantly greater for the ASD group than for either the DD group ($\chi^2=11.11$, $p=.001$) or the TD group ($\chi^2=13.49$, $p<.001$) and did not differ significantly for the DD and TD groups ($\chi^2=0.18$, $p=.674$).

A series of one-way analyses of variance (ANOVA) were conducted to evaluate the differences between the three groups on the SORF composites and total. Significant group differences with large effect sizes were found for the total and all five composites.



Next, a series of one-way ANOVA were conducted to evaluate the differences between the three groups on the SORF items. There were significant differences between the ASD and DD groups and the ASD and TD groups on the following nine items:

- 1) lack of appropriate gaze
- 2) lack of warm, joyful expressions with gaze
- 3) lack of sharing enjoyment or interest
- 4) lack of response to name
- 5) lack of coordination of gaze, facial expression, gesture, and sound
- 6) lack of showing
- 7) unusual prosody
- 8) repetitive movements or posturing of body, arms, hands, or fingers
- 9) repetitive movements with objects

There were significant differences between the ASD and TD groups but not the ASD and DD groups on the following six items:

- 1) lack of anticipatory posture or movement
- 2) lack of response to contextual cues
- 3) lack of pointing
- 4) lack of vocalizations with consonants
- 5) lack of playing with a variety of toys conventionally
- 6) difficulty calming when distressed.

A discriminant analysis was conducted using the 15 items that the ASD group was significantly different from the DD or TD groups, and demonstrated significant results, $\Lambda = .07$, $\chi^2(30, N = 54) = 119.04$, $p < .001$.

Predicted Group Membership

Actual Group Membership	ASD	DD	TD
ASD	18 (100%)	0 (0%)	0 (0%)
DD	0 (0%)	15 (83%)	3 (17%)
TD	0 (0%)	0 (0%)	18 (100%)

Conclusions

- ❑ Children with ASD in the second year of life can be distinguished from those with DD and TD through systematic observation.
- ❑ The combination of 1st stage screening for delay with the CSBS DP Infant-Toddler Checklist and 2nd stage screening for ASD with the SORF was effective for early identification.
- ❑ The 15 red flags identified in this study include a combination of lack of typical behaviors and presence of atypical behaviors and contrast from those that have been identified in older children.

This poster was presented at the 2003 meeting of the Society for Research in Child Development. This work was supported by two grants from the U.S. Department of Education, Office of Special Education and Rehabilitation Services (H324M980173 and H324M010071) and a grant from the U.S. Department of Education, Institute of Education Sciences (R305T010262).