



# Response to Name in Infants Developing Autism Spectrum Disorder: A Prospective Study

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**Objective** To examine longitudinal patterns of response to name from 6-24 months of age in infants at high and low risk for autism spectrum disorder (ASD).

**Study design** A response to name task was tested at 6, 9, 12, 15, 18, and 24 months of age in 156 infant siblings of children with ASD (high-risk) or typical development (low-risk). At 36 months of age, participants were classified into 1 of 3 outcome groups: group with ASD (n = 20), high-risk group without ASD (n = 76), or low-risk group without ASD (n = 60). Differences in longitudinal performance were assessed using generalized estimating equations, and sensitivity and specificity for identifying ASD were calculated. Differences in age 36-month functioning were examined between infants who developed ASD and repeatedly vs infrequently failed to respond to name.

**Results** At 9 months of age, infants developing ASD were more likely to fail to orient to their names, persisting through 24 months. Sensitivity/specificity for identifying ASD based on at least 1 failure between 12 and 24 months were estimated at .70 in this sample. One-half of the infants who developed ASD had repeated failures in this timeframe, and demonstrated lower age 36-month receptive language, and earlier diagnosis of ASD than infants with ASD who had infrequent failures.

**Conclusions** In addition to recommended routine broad-based and ASD-specific screening, response to name should be regularly monitored in infants at risk for ASD. Infants who consistently fail to respond to their names in the second year of life may be at risk not only for ASD but also for greater impairment by age 3 years. (*J Pediatr* 2017;183:141-6).

Infants as young as 4-6 months of age listen significantly longer to their own names than to other names,<sup>1,2</sup> suggesting that sound patterns of infants' names are internalized early in life. Neural mechanisms underlying response to name likely involve a pre-attentive "detection" stage followed by an evaluation stage, during which attention is shifted only if the detected event is deemed meaningful.<sup>3</sup> Infants use their names as social cues to orient their attention to salient aspects of their environments.<sup>2,4</sup> Because of the centrality of this behavior in the development of social-communication skills, the assessment of response to name may be useful in the early identification of autism spectrum disorder (ASD). Indeed, retrospective studies of infants who developed ASD have demonstrated diminished response to name as early as 12 months of age,<sup>5-8</sup> and response to name is included in all diagnostic measures for ASD. However, many widely used screening tools rely solely on parent report, and little is known regarding developmental progressions of this behavior via direct observation.

Recent prospective studies, in which infants are recruited before diagnosis and followed longitudinally, have examined response to name in controlled environments using standardized procedures, finding reduced frequency of this behavior in toddlers diagnosed with ASD compared with those with developmental delays or typical development.<sup>9</sup> One such study found that infants with family histories of ASD were less likely to respond than infant siblings of typically developing children by 12 months of age.<sup>10</sup> Few studies have measured response to name behavior at multiple ages, however, making it difficult to determine when affected children first begin to fail the task, whether differences persist over the first years of life, and how early the behavior distinguishes children with ASD from unaffected children.

The present study examined differences in the longitudinal course of response to name among infants at high- and low-risk for ASD. We hypothesized that the group with ASD outcomes would exhibit reduced responding by 12 months of age relative to infants with non-ASD outcomes. We also evaluated, within the group with ASD, whether patterns of response to name between 12 and 24 months of age were related to age 36-month functioning.

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ADOS Autism Diagnostic Observation Schedule  
ASD Autism spectrum disorder  
PPV Positive predictive value

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## Methods

This study uses data from a prospective longitudinal study of infants at risk for ASD and was conducted under the approval of the university's Institutional Review Board. Informed consent was obtained from parents before assessments. Infants were evaluated by examiners unaware of group membership, with ongoing administration/scoring fidelity procedures in place to ensure minimal cross-examiner differences. The primary measure of interest, the "orients to name" task, was administered as part of a larger assessment battery with visits occurring at 6, 9, 12, 15, 18, and 24 months of age. At 36 months of age, participants were classified into 1 of 3 outcome groups: group with ASD, high-risk group without ASD, and low-risk group without ASD.

The sample was drawn from a larger longitudinal study of infant siblings of children with ASD (high-risk group) or typical development (low-risk group). The primary inclusion criterion for the high-risk group was status as a younger sibling of a child with ASD. Diagnosis of the older sibling (proband) was confirmed using the Autism Diagnostic Observation Schedule (ADOS<sup>11</sup>) and the Social Communication Questionnaire.<sup>12</sup> Exclusion criteria for the high-risk group included birth before 32 weeks gestation and a known genetic disorder in the infant or proband. The primary inclusion criterion for the low-risk group was status as a younger sibling of a child with typical development, confirmed by an intake screening questionnaire and proband scores below the ASD range on the Social Communication Questionnaire. Exclusion criteria for the low-risk group were birth before 36 weeks gestation; developmental, learning, or medical conditions in any older sibling; and ASD in any first-, second-, or third-degree relative.

Participants were enrolled by 9 months of age, with 76% having their first visit at 6 months of age. The sample consisted of 156 participants: 20 with ASD ( $n = 19$  high-risk, 1 low-risk), 76 high-risk without ASD, and 60 low-risk without ASD, as determined at the age 36-month outcome assessment.

Consistent with prior reports,<sup>13</sup> ASD outcomes at the 36-month visit required that ADOS scores be at or above the ASD cut-off and that the child meet Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision criteria for Autistic Disorder or Pervasive Developmental Disorder-Not Otherwise Specified. Diagnoses were determined by a licensed psychologist or pediatrician. Outcomes were finalized at 36 months of age, but if a child met criteria for ASD at an earlier visit, the diagnosis was made and referrals for intervention provided. Of the children with ASD outcomes, 87% had received services for autism or other developmental delays before age 3 years (average hours per week = 17.80, SD = 9.57; data missing for 5 children). **Table I** displays sample characteristics by outcome group.

## Measures

All measures in the present study met applicable psychometric standards for standardization, reliability, and validity.

**Orients to Name.** This task, adapted from the Autism Observation Scale for Infants,<sup>14</sup> was administered at 6, 9, 12, 15, 18, and 24 months of age. It involves calling the infant's name in a clear voice at a normal volume up to 2 times (constituting a "press") while the infant is engaged with toys and seated in the parent's lap, at least 2 feet from (and not facing) the examiner. A total of 2 presses are administered, with each press consisting of 2 trials. Participant behavior was scored as follows, consistent with the Autism Observation Scale for Infants scoring guidelines<sup>14</sup>: 0 = orients to name with eye contact on both presses, at least one of which is on the first trial; 1 = orients with eye contact at least once; or 2 = does not orient on any trial. For this study, we consider a score of 0 or 1 to be "passing," and a 2 to constitute a "failure," resulting in a dichotomous measure of the orienting response.

**ADOS.** The ADOS is a semistructured interaction and observation that measures symptoms of autism. It has 2

**Table I. Participant characteristics**

|   | Low-risk group without ASD<br>(n = 60) | High-risk group without ASD<br>(n = 76) | ASD<br>(n = 20)            | P value* |
|---|--|---|----------------------------|----------|
| Male sex (n, %)   | 36 (60%)                               | 45 (59%)                                | 15 (75%)                   | ns       |
| Age at first visit (n, % first visit at 6 mo)                           | 48 (80%) <sup>a</sup>                  | 55 (72%) <sup>a</sup>                   | 16 (80%)                   | ns       |
| Ethnicity (n, % non-white) <sup>†,‡,§</sup>                             | 20 (34%)                               | 28 (38%)                                | 6 (32%)                    | ns       |
| Household income (n, %)   |  |   |                            | ns       |
| ≤\$80 000   | 19 (32%)                               | 17 (22%)                                | 6 (30%)                    |          |
| >\$80 000   | 35 (58%)                               | 51 (67%)                                | 9 (45%)                    |          |
| Decline to state/missing  | 6 (10%)                                | 8 (11%)                                 | 5 (25%)                    |          |
| Mullen Scales of Early Learning, 36 mo of age (mean, SD)                |  |   |                            |          |
| Visual reception <sup>†</sup>   | 62.15 (11.21) <sup>a</sup>             | 58.76 (14.61) <sup>a</sup>              | 43.95 (16.42) <sup>b</sup> | <.001    |
| Fine motor  | 48.50 (9.81) <sup>a</sup>              | 48.37 (13.53) <sup>a</sup>              | 37.50 (12.73) <sup>b</sup> | <.01     |
| Receptive language <sup>§,¶</sup>                                       | 52.83 (9.15) <sup>a</sup>              | 47.78 (9.32) <sup>b</sup>               | 38.38 (9.09) <sup>c</sup>  | <.001    |
| Expressive language <sup>**</sup>                                       | 54.71 (7.32) <sup>a</sup>              | 49.88 (9.74) <sup>a</sup>               | 37.56 (11.40) <sup>b</sup> | <.001    |
| Early learning composite <sup>§,¶</sup>                                 | 109.36 (13.83) <sup>a</sup>            | 102.75 (18.84) <sup>b</sup>             | 84.13 (16.81) <sup>c</sup> | <.001    |
| ADOS social affect + repetitive behavior Total, 36 mo of age (mean, SD) | 2.62 (1.66) <sup>a</sup>               | 3.58 (2.22) <sup>a</sup>                | 14.85 (5.03) <sup>b</sup>  | <.001    |

ns, not significant.

\*Overall group differences assessed using logistic regression for sex, ethnicity, and household income (excluding decline to state/missing values), and 1-way ANOVA for remaining variables. P values of <.05 were followed by post-hoc comparisons between groups; groups with different superscript letters differ significantly after Tukey-Kramer adjustment for multiple comparisons. Frequency missing †n = 1 in group with ASD, ‡n = 3 in high-risk group without ASD, §n = 2 in low-risk group without ASD, ¶n = 4 in group with ASD, and \*\*n = 2 in group with ASD.

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