



# A New Interactive Screening Test for Autism Spectrum Disorders in Toddlers

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**Objective** To develop a clinically valid interactive level 2 screening assessment for autism spectrum disorders (ASD) in toddlers that is brief, easily administered, and scored by clinicians.

**Study design** We describe the development, training, standardization, and validation of the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T) with ASD-specific diagnostic instruments. The RITA-T can be administered and scored in 10 minutes. We studied the validity of the RITA-T to distinguish between toddlers with ASD from toddlers with developmental delay (DD)/non-ASD in an early childhood clinic. We also evaluated the test's performance in toddlers with no developmental concerns. We identified a cutoff score based on sensitivity, specificity, and positive predictive value of the RITA-T that best differentiates between ASD and DD/non-ASD.

**Results** A total of 61 toddlers were enrolled. RITA-T scores were correlated with ASD-specific diagnostic tools ( $r = 0.79$ ;  $P < .01$ ) and ASD clinical diagnoses ( $r = 0.77$ ;  $P < .01$ ). Mean scores were significantly different in subjects with ASD, those with DD/non-ASD, and those with no developmental concerns (20.8 vs 13 vs 10.6, respectively;  $P < .0001$ ). At a cutoff score of  $>14$ , the RITA-T had a sensitivity of 1.00, specificity of 0.84, and positive predictive value of 0.88 for identifying ASD risk in a high-risk group.

**Conclusion** The RITA-T is a promising new level 2 interactive screening tool for improving the early identification of ASD in toddlers in general pediatric and early intervention settings and allowing access to treatment. (*J Pediatr* 2015;167:460-6).

Autism spectrum disorders (ASD) are characterized by deficits in social communication skills and restricted, repetitive behaviors or interests.<sup>1</sup> Clinical signs sometimes are evident by as early as age 12 months.<sup>2</sup> Early identification leads to earlier and more effective interventions, which often can significantly reduce the severity of the disorder.<sup>3</sup> Unfortunately, the average age of ASD diagnosis in the US is around 4 years<sup>4</sup>; thus, there is an urgent public health need for more efficient early identification.

The American Academy of Pediatrics recommends universal (level 1) ASD screening at age 18 and 24 months.<sup>5</sup> Level 1 tests, such as the Modified Checklist for Autism in Toddlers (M-CHAT),<sup>6</sup> have by design high rates of false-positive results. The positive predictive value (PPV) for ASD of the M-CHAT revised with follow-up<sup>7</sup> is 0.54, compared with 0.99 for children with developmental delay (DD). This discrepancy leads to overreferrals for ASD evaluations, delays in treatment, increased parental anxiety, and burdens on scarce resources. A second stage or a level 2 assessment after a positive initial screen provides confirmation of ASD-specific risk.<sup>8</sup>

There are currently 2 interactive level 2 ASD screening tests: the Systematic Observation for Red Flags (SORF)<sup>9</sup> and the Screening Tool for Autism in Two-Year-Olds (STAT)<sup>10</sup>. The SORF requires videotaping and does not easily fit into the clinical flow. The STAT takes 20 minutes to administer. It has excellent sensitivity (0.92) and specificity (0.85) in identifying ASD between age 2 years and 3 years, but may miss the diagnosis in toddlers younger than 2 years of age, and its psychometric properties are weaker in those children.<sup>11</sup>

Here we report results of a new interactive, level 2 ASD screening test, the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T). This brief interactive test (5-10 minutes to administer and score) can be administered after a positive level 1 test to identify those toddlers with ASD risk. We believe that use of the RITA-T could greatly expand the availability of

AD	Autistic disorder	NCR	No concerns raised
ADOS-G	Autism Diagnostic Observation Schedule-Generic	NPV	Negative predictive value
ASD	Autism spectrum disorders	PPV	Positive predictive value
DD	Developmental delay	RA	Research assistant
DSM	<i>Diagnostic and Statistical Manual of Mental Disorders</i>	RITA-T	Rapid Interactive Screening Test for Autism in Toddlers
ECC	Early Childhood Clinic	RL	Receptive language
EL	Expressive language	SORF	Systematic Observation for Red Flags
M-CHAT	Modified Checklist for Autism in Toddlers	STAT	Screening Tool for Autism in Two-Year-Olds
MSEL	Mullen Scales of Early Learning	VR	Visual reception

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effective level 2 ASD screening measures, which would lead to earlier diagnosis of ASD and access to treatment. In the present study, we aimed to assess the validity and study the discriminative properties of the RITA-T in differentiating toddlers with true ASD risk from toddlers with other forms of DD/non-ASD.

## Methods

The RITA-T consists of 9 interactive activities (“items”) designed to evaluate developmental constructs known to represent early signs of ASD in toddlers aged 18–36 months: joint attention,<sup>12</sup> social awareness, reaction to emotions,<sup>2</sup> awareness of human agency, and some fundamental cognitive skills. Each of the 9 activities (Table I) probes for 1 or more constructs based on observations of specific behaviors “triggered” by the activity and scored as “yes” (= 0; expected behavior observed) or “no” (= 1; expected behavior not observed). The sum determines the score for each of the 9 activities. The RITA-T total score is computed by adding all 9 scores, with a maximum score of 30. Higher scores reflect

greater atypicality. The tool can be administered and scored within 10 minutes. Four items are timed.

Several items in the RITA-T probe for the response to and initiation of joint attention. We evaluate the toddler’s response to the parent’s “feigned neutral and sad” emotions. Toddlers usually respond with distress to neutral maternal faces,<sup>13</sup> whereas toddlers with ASD may react with less distress. We also probe for “self-recognition,” a well-known social cognition skill that emerges between ages 18 and 24 months<sup>14</sup> but is reportedly disordered in children with autism.<sup>15</sup> Other items probe for a construct that we term “awareness of human agency.”<sup>16</sup> We can see this when we manually interrupt toddlers during their explorations of objects. We query which draws their attention, the “thwarting hand” or the person doing the thwarting. The items come from our own personal, clinical interactions (eg, blocking activities). The RITA-T also includes cognitive tests based on “naive physics” (eg, “object permanence,” “color and shape constancy”). We measure the toddler’s awareness of what is “possible” and what is “impossible,” along with the reaction of surprise when “impossible” events occur.

**Table I.** RITA-T: items, constructs measured, materials, and scoring range

Items	Constructs	Materials	Administration	Score
*A, Blocked exploration of a toy (TL: 11 s)	SA; JA; HA	Toy phone	Child explores toy. Examiner blocks it, 3 times. Observe EC and latency to EC for 11 s.	0-4 for EC; time to EC; or giving up
B, Object tease	SA; JA; HA	Toy phone	Examiner pretends to give toy to child then pulls back, 3 times. Observe EC to examiner or parent.	0-2 for EC to parent, examiner, or both
*C, Blocked vision (TL: 11 s)	SA; JA; HA	Toy and opaque screen	Child explores toy; examiner blocks toy from behind the child using a screen for 11 s. Observe EC and JA.	0-3 for EC; time to EC
D, Object permanence	Cognition; JA	“Magic” cup and ball	Examiner shows ball in magic cup to child, then makes it disappear, 3 times. Observe surprise; JA to examiner and parent.	0-3 for reaction of surprise; EC to parent and/or examiner
E, Color constancy	Cognition; JA	“Magic” scarf	Examiner shows double-sided magic scarf on one side initially then changes color abruptly. Observe surprise; JA to examiner or parent.	0-2 for reaction of surprise; JA to parent or examiner
F, *Object vs face (TL: 15 s)	SA	Pictures of train and baby	Examiner presents a foam circle with pictures of a baby on 1 side and a train on the other side to the child for 5 s each side. Observe picture preference for 5 s.	0-2 for preference for baby picture (0), train picture (1), or no interest at all (2)
G, Rapid JA	JA	Ceiling light	Examiner calls child suddenly and points at ceiling light. Observe JA.	0-1 for JA
H*, Sad face, still face (TL: 10 s each)	SA	Caregiver	Caregiver is asked to pretend to cry. Observe distress, EC, proximity seeking, or no interest for 10 s. Then caregiver is asked to assume a neutral expression. Observe same for 10 s.	0-4 each; score of 0-1 for each reaction observed.
I, Recognition	Cognition; SR	Marker mirror	Examiner marks a red dot on the child’s forehead with a removable, nonallergenic marker. Examiner holds small mirror to child. Observe reaction to recognizing dot and taking it away.	0-2 for recognizing the red dot and attempting to remove it

EC, eye contact; HA, human agency; JA, joint attention; SA, social awareness; SR, self recognition; TL, time limit.

For each score, 0 represents the skill being expressed, and higher scores represent the skill not expressed.

\*Timed test.

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