Experience with the Rapid Interactive Test for Autism in Toddlers in an Autism Spectrum Disorder Diagnostic Clinic

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ABSTRACT: ***Objective:*** **To examine the psychometric properties of the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T) in an autism spectrum disorder (ASD) clinic for children aged 18 to 36 months.** ***Methods:*** **The RITA-T (level 2 screening instrument) was integrated into an ASD screening and diagnostic process for evaluating children aged 18 to 36 months who were referred to a pediatric tertiary care center. Scoring of the RITA-T to differentiate ASD from non-ASD developmental concerns was evaluated. Screening instrument measurements included sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), positive likelihood ratio (LR+), and negative likelihood ratio (LR−).** ***Results:*** **From a total of 239 participants aged 18 to 36 months (males = 78% and females = 22%), 201 (84%) were diagnosed with ASD (4:1 male-to-female ratio). An ASD diagnosis was significantly associated with RITA-T scores, with ASD patients scoring higher than non-ASD patients [F (1,235) = 170, mean difference: males 9.21, mean difference: females 12.4, $p < 0.001$]. The RITA-T score was not statistically correlated with age or sex. The optimal cutoff score of ≥14 was determined from a receiver operator curve analysis (area under the curve = 0.953). In the study group, with a cutoff score of ≥14, the RITA-T showed a sensitivity of 0.97, specificity of 0.71, PPV of 0.95, NPV of 0.79, LR+ of 3.33, and LR− of 0.05.** ***Conclusion:*** **The RITA-T, as a level 2 screening instrument for ASD, exhibits discriminative psychometric properties similar to previously published results. When integrated into an ASD screening and diagnostic process for families for whom concerns about ASD have been raised with their children aged 18 to 36 months, the RITA-T helps to predict a best-estimate clinical diagnosis of ASD.**

(*J Dev Behav Pediatr* 00:1–9, 2019) **Index terms:** autism spectrum disorders, developmental disabilities, screening tools, psychometrics.

Autism spectrum disorder (ASD) is a behaviorally defined disorder characterized by impairments in social interaction and communication, as well as unusually restricted, repetitive interests and stereotypic patterns of behavior.[1] Although the potential cause remains elusive, recent studies report changes in default mode network connectivity and high heritability as contributing factors.[2,3] The prevalence of ASD has increased worldwide over the past 2 decades. The most recently reported estimate in the United States of 1 in 40 also cites variance in ASD-specific treatment usage by children's sociodemographic and co-occurring conditions.[4] Recent studies of Canadian children have shown comparable findings.[5]

Raising a child with ASD presents unique challenges for most families. The core deficits of ASD are pervasive and affect individuals across their life span.[6] Intuitively, parents often perceive an early awareness of something being "wrong or different" with their child by 18 to 24 months.[6] Even so, the age at which ASD is initially identified and diagnosed varies. Delays in diagnosis are more apparent for children from minority groups, low socioeconomic status groups, and/or those with milder ASD symptoms.[7–10]

Adding to this challenge is the process of diagnosing ASD by the professionals involved in assessing the child. The heterogeneity of clinical presentation of ASD leads to a resource-intensive and time-consuming process for both children and families hoping to achieve diagnostic confirmation. Subsequent delays can lead to low levels of parental satisfaction, hindering the implementation of effective support or intervention strategies.[11] Parents who experience a long diagnostic delay may lose confidence in the health care professionals involved.[6,11]

Early identification of children with ASD and other developmental disorders has become an important priority in the health care system. Based on research, the diagnosis of ASD can be made reliably by 18 to 24 months.[12,13] In addition, there is growing evidence suggesting that early identification and early intervention programs have the potential to achieve more positive outcomes in communication, social interaction, and cognitive development.[14,15]

Pediatricians and family physicians are often the first to be consulted by parents regarding developmental concerns of ASD.[16] In an effort to assist with early diagnosis, the American Academy of Pediatrics continues to recommend universal ASD screening at ages 18 and 24

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Received May 2018; accepted August 2019.

Disclosure: The authors declare no conflict of interest.

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months despite US Preventive Services Task Force draft recommendations that question the value of its utility.[17,18] Screening instruments can take the form of standardized observations, interviews, or rating scales and can be separated into 2 levels (level 1 screening instruments are used to screen all children, and level 2 screening instruments are used to screen children for whom there is already a concern about a possible diagnosis). Sensitivity of a screening test, or the ability of the screening test to identify a high proportion of children suspected of having the disorder, should be relatively high to ensure children with ASD will not be overlooked. Specificity, or the extent to which the measure correctly classifies those who do not have the disorder, should also be high. It is also desirable to have a relatively low false-positive rate and, therefore, a high positive predictive value (PPV).

Level 1 screening, also called universal screening, is designed to identify children at risk of disorders in an unselected or low-risk population. There may be no family history and no specific concerns raised by parents or clinicians. By definition, the level 1 screening test should be quick, easy to use, and readily interpretable.[19] Level 2 screening instruments typically require more time than universal screening to administer and interpret because many are intended to be observational rather than questionnaire based. In addition, these instruments generally require practice and expertise to administer, although many can be learned readily with training. In ASD, level 2 screening has been developed to help confirm specific symptoms that place a child at risk of ASD and may be useful to enhance the clinic assessment process.[20] Examples of this increased risk include parent reporting of "red flag" symptoms, identification of a positive screen on universal screening, or a positive family history.[14] The level 2 ASD observational and interactive screening tests that are currently available include the following: the Systematic Observation of Red Flags (SORF), the Screening Tool for Autism in Toddlers and Young Children (STAT), the Autism Detection in Early Childhood (ADEC), and the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T).[21–24] The SORF has been validated in a sample of 16- to 24-month-old toddlers who have been referred because of communication difficulties. A recent study revealed that when the optimal cutoff for the composite score was 20, the SORF displayed a sensitivity of 0.80, specificity of 0.78, PPV of 0.81, and negative predictive value of 0.78.[25] The STAT has been assessed in clinical samples of 2-year-old children referred for suspected ASD with a sensitivity and specificity as high as 0.92 and 0.85, respectively.[22] Administration can be done in 20 minutes with previous workshop training completed in approximately 1.5 days. The ADEC is suitable for children as young as 12 months and can be completed in approximately 10 to 15 minutes by assessors who do not have extensive experience in the diagnosis of ASD. To achieve a best estimate clinical diagnosis of ASD, the ADEC showed good sensitivity (0.93–0.94) but poorer specificity (0.62–0.65).[23] The RITA-T (currently validated for children aged 18–36 months) includes developmental constructs known to represent early signs of ASD in children, including joint attention, social awareness, reaction to emotion, awareness of human agency, and object permanence. Psychometric properties of the RITA-T (at a cutoff score of >14) revealed a sensitivity of 1.0, specificity of 0.84, and PPV of 0.88 for identifying ASD risk in a high-risk group.[24] The RITA-T is designed to identify children who are at risk of neurodevelopmental disorders in an unselected or low-risk population. Furthermore, 2 potential advantages of using the RITA-T when compared with other level 2 screening instruments include reduced administration and scoring time (achieved in approximately 10 minutes) and reliability training completed in 3 hours.

In the fall of 2013, the current study's ASD clinic was struggling with a waitlist greater than 12 months for children aged 18 to 36 months awaiting diagnostic assessment for ASD. Increases in ASD referrals, a disproportionate growth in population, and fiscal restraints resulted in the inability to keep pace with demand. Contributing to the ballooning waitlist was no accompanying increase in resources to support the resource-intensive patient assessments. Coinciding with these factors was a newly announced provincial government service recommendation for ambulatory care clinics, suggesting targets of 30 days from receipt of referral to appointment.

In 2014, the ASD team initiated a quality improvement project (QIP) to address the delays in diagnostic assessments and to find efficiencies aimed at meeting service demand with existing resources. The principal objective of the QIP was to create an efficient, sustainable, evidence-based ASD diagnostic evaluation process for children younger than 36 months and one that could also effectively incorporate a screening component into that process. One of the implemented changes in the redesigned model was the integration of a screening component, the RITA-T.[26] The decision to use this particular level 2 screening instrument was based on multiple factors as follows: (1) it correlates well with autism diagnostic measures, (2) reliable training is easily obtained, (3) the discriminatory properties of the test between children with developmental delay/non-ASD and ASD were promising, and (4) the administration time of 10 minutes could potentially use limited resources efficiently and balance existing time constraints.

The current study examines the psychometric properties of the RITA-T for a referred sample population of children (aged 18–36 months) with concerns related to ASD. Based on previously reported psychometric properties in the literature, the study anticipated that the use of the RITA-T in its clinical population would help predict a best-estimate clinical diagnosis of ASD with similar psychometric properties to those initially described by Choueiri and Wagner.[24]

METHODS

Figure 1 summarizes the current autism spectrum disorder (ASD) screening and diagnostic process at our pediatric tertiary care center (PTCC).[26]

Referral Process

Early in the quality improvement project (QIP), it was apparent that the referral process, criteria, and forms required revision to align with the service model updates and to reflect the updated ASD standards in the newly published *Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition (DSM-5) criteria. A total of 160 referrals were systematically reviewed, referral sources were consulted before creating the new referral forms, and of critical importance was the creation of a central

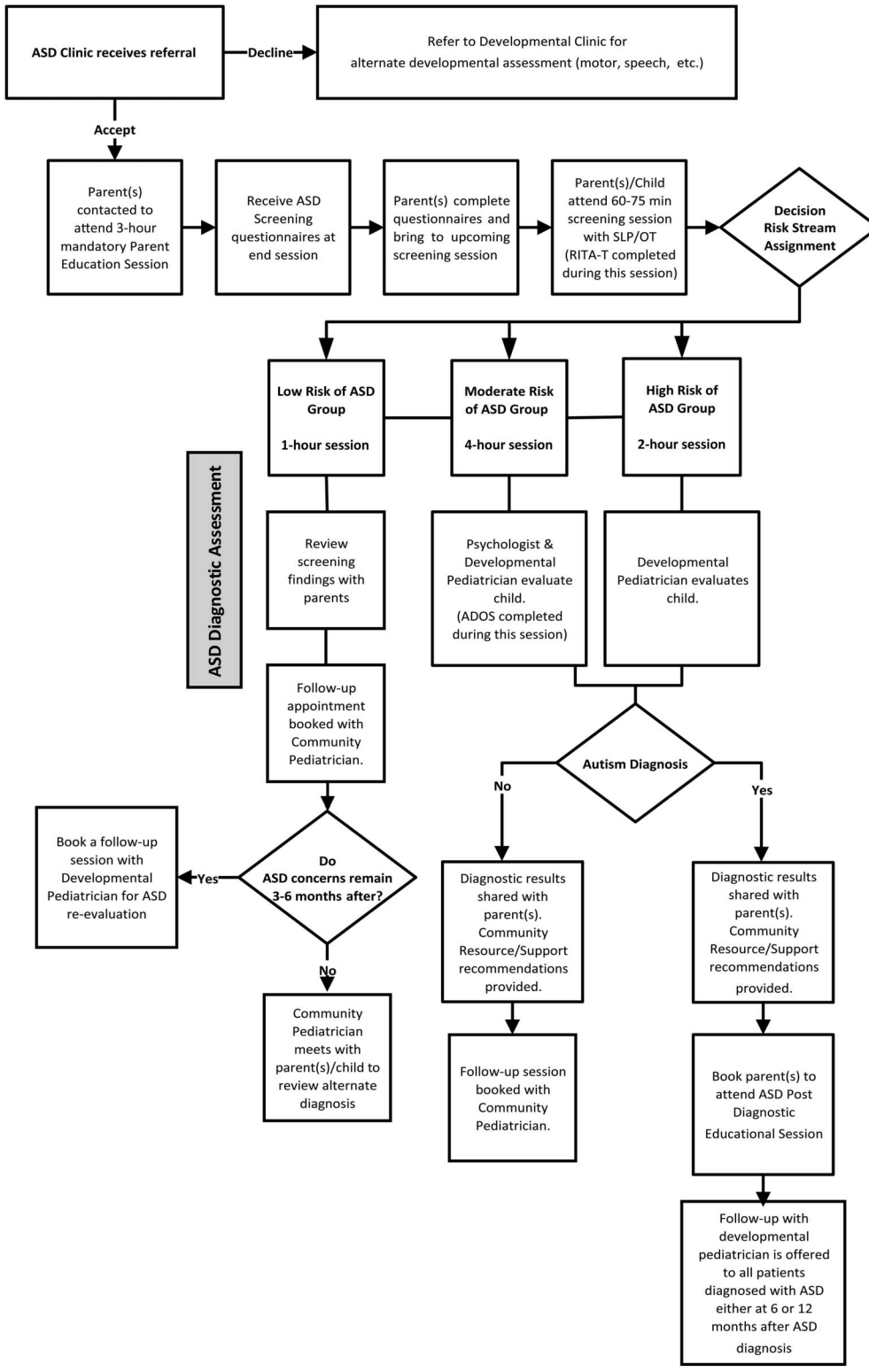

Figure 1. Autism screening and diagnostic assessment process for children aged 18 to 36 months with suspicion of autism or ASD. ADOS, Autism Diagnostic Observation Schedule; ASD, autism spectrum disorder; OT, occupational therapist; RITA-T, Rapid Interactive Screening Test for Autism in Toddlers; SLP, speech language pathologist.

access and referral model to coordinate resources to ensure greater referral efficiency.

Typically, referrals to ASD diagnostic services are received from family physicians, community pediatricians, and psychologists, as well as speech and language pathologists practicing within the service catchment area of the PTCC. Referrals to ASD diagnostic services were declined and redirected if the referral was requesting an alternative developmental assessment. Parents whose child's referral has been accepted receive an intake call that includes verification of referral details, information on specific programs and process details, and scheduling the parent(s) to attend an ASD information session(s). Upon completion of the information session(s), an appointment is scheduled for ASD screening assessment. In our study group, none of the children had existing ASD diagnoses. All were referred for ASD diagnostic assessment.

Autism Spectrum Disorder Educational Session in the Newly Redesigned Program

Anecdotally, members of the QIP team remarked that parents who had prior knowledge of or had received education regarding ASD were better prepared for their child's diagnostic evaluation. This observation led to inclusion of pre-educational sessions for families in the redesigned ASD program. This preceded their child's screening appointment. The parent sessions included the following 3 topics: (1) defining ASD and the diagnostic process, (2) strategies to enhance their child's communication and socialization skills, and (3) resources and supports available.

Screening Assessment Session

The 60- to 75-minute screening appointment included (1) initial play to familiarize the child with the clinician and the surroundings, (2) review of parent-completed questionnaires (Modified Checklist for Autism in Toddlers, Child Development Inventory, and a medical/developmental history questionnaire), (3) developmental history obtained from the parents based on DSM-5 criteria (A category and B category), (4) informal play-based observation to gather additional functional and ASD-related behavioral symptoms, and finally (5) the use of the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T).

The RITA-T includes 9 semistructured, play-based scenarios, which examine constructs that have been described to be delayed in children with ASD. Each play-based scenario looks at the integration of 1 or 2 constructs, including joint attention, visual problem-solving human agency, social awareness, communication, and self-awareness.[24] The maximum score is 30. Higher scores reflect greater atypicality. The RITA-T administration training was developed based on a workshop created by Choueiri, one of the authors of the RITA-T instrument. A total of 4 speech and language pathologists, 2 occupational therapists, and 1 developmental-behavioral pediatrician (DBP) were trained in the administration and scoring of the RITA-T at the PTCC. To establish intrarater reliability, training consisted of consensus scoring of 3 videotaped administrations of the RITA-T, group discussions, and 3 additional taped iterations per clinician scored by the designers of the RITA-T in the first 3 months after the training session. Each reviewer, when assessing the RITA-T score, used videotaping to review their scoring assessment. Interreliability and intrareliability showed 94% and 95%, respectively, for all participants in the study. The RITA-T score and videotaping were reviewed by the screening assessor and a DBP. In an effort to reduce false-negative screening results, discrepancies were resolved by selecting the result with the highest score assigned to the participant. No differences greater than 2 points were encountered for participants who were evaluated.

Autism Spectrum Disorder Diagnostic Assessment

To streamline the assessment time required to come to a best estimate clinical diagnostic conclusion, the following 3 clinical appointment pathways (based on the RITA-T scores that were extrapolated from a pilot study completed between January and April 2015) were created: low-, moderate-, and high-risk groups. All participants in each of the 3 groups received clinical evaluations consisting of developmental and medical histories, observations of play and behavior, and a physical examination. In addition, the DSM-5 checklist was completed for each participant. The low- (a score under 12) and high-risk (a score of 17 and above) groups were assessed and evaluated by a DBP and an allied health care professional. The final diagnosis of ASD was made by a DBP. The moderate-risk group (a score of 12–16) received the same assessment as the other groups (low and high) but with the addition of the Autism Diagnostic Observation Schedule because it was reasonable to predict that this group would require the most intensive assessment to discriminate children with ASD from those with non-ASD developmental concerns. The final diagnosis for the moderate-risk group was made collaboratively by a DBP and a clinical psychologist.

In all groups, the RITA-T score was not considered in the final diagnostic process; however, clinicians did have access to the clinical observations noted during the screening appointment. If a diagnosis of ASD was made, parents of the child were strongly encouraged to attend an ASD postdiagnostic session with possible home visits depending on family needs. All families with ASD diagnoses were called within 6 months to verify whether they had been able to connect with agencies and acquire service supports for their child. If an ASD diagnosis was ruled out, families were offered the assistance of a social worker to help them access other appropriate community resources.

Study Design

After institutional ethics board approval, use of the RITA-T during the ASD assessment process was studied between May 2015 and August 2017. Children aged 18 to

36 months and who were referred to the PTCC were eligible for enrollment in the study. Before assessment, children with intractable seizures or for whom neither parent spoke English were excluded.

Statistical Analyses

Study participants were divided into 2 groups based on the diagnosis received of either ASD or non-ASD. Two-way analyses of variance were conducted to examine the effects of sex, clinical ASD diagnoses, chronological age, and RITA-T scores. Sensitivity, specificity, positive predictive value, negative predictive value, positive likelihood ratio, and negative likelihood ratio of the RITA-T score in predicting the final diagnosis were computed for each possible threshold score of the RITA-T. A receiver operator curve analysis was used to determine the cutoff score that would optimize sensitivity and specificity of the RITA-T. The area under the curve was also calculated. Data were analyzed using GraphPad Prism 6.07 and SPSS Version 19.

RESULTS

Study Participants

Two hundred fifty-one children aged 18 to 36 months were referred, of which 12 were not included based on the exclusion criteria (n = 4 with intractable seizures), resulting in a total of 239 participants who met the criteria and were enrolled in this study [187 (78%) males and 52 (22%) females]. Of the 239 participants, 201 (84%) were diagnosed with autism spectrum disorder (ASD) (Table 1). The proportion of males to females diagnosed with ASD was 4:1. There were no significant statistical age differences between males (M = 29.8 months, SD = 4.1) and females (M = 29.6 months, SD = 4.0). The majority exhibited significant clinical delays in language (82%), with no statistical differences in sex.

Mean Group Differences

The mean Rapid Interactive Screening Test for Autism in Toddlers (RITA-T) score in each group (ASD vs. non-ASD) is presented in Table 1. A scatter plot distribution of the ASD scores for each study participant is shown in Figure 2. A total of 11 were false positives; 7 were false negatives. The RITA-T score did not correlate with chronological age across all groups; there were no significant differences in mean chronological age by sex [F (1,235) = 0.0111, $p = 0.916$] or ASD diagnosis [F (1,235) = 0.0003, $p = 0.985$]. The effect of sex on the RITA-T score was not significant. There were no statistically significant interactions between the effects of sex and clinical diagnosis on the RITA-T score. The 2-way analysis of variance with Tukey multiple comparison tests yielded a significant effect of ASD diagnosis on the RITA-T score [F (1,235) = 170, $p < 0.001$] and mean differences between boys with ASD and those without [mean difference = 9.2; 95% confidence interval (CI) 7.0–11.5, $p < 0.001$] and girls with ASD and those without (mean difference = 12.4; 95% CI, 8.8–16.1, $p < 0.001$). The RITA-T scores stratified by the risk group are presented in Table 2. No child with a score of 12 or less on the RITA-T demonstrated ASD. In moderate- and high-risk groups, 68.3% and 97.7%, respectively, were diagnosed with ASD.

Assessment of the Psychometric Performance

The results of a receiver operator curve analysis showed that a cutoff score of 14 (RITA-T total score of ≥14) optimized sensitivity and specificity (Fig. 3). Using a cutoff score of ≥14, the sensitivity was 0.97, specificity 0.71, positive predictive value 0.95, negative predictive value 0.79, positive likelihood ratio 3.33, and negative likelihood ratio 0.05. The area under the curve was 0.953 (95% CI, 0.919–0.987), which is considered in the excellent range. Based on pre-established standards, the area under the curve values are deemed to be poor (<0.70), fair (0.7–0.79), good (0.8–0.89), or excellent (0.9–1).[27] Although the receiver operator curve analysis resulted in this study's selection of 14 and above as the cutoff score, when establishing a threshold score at 13, this study found a sensitivity of 1.0 and a specificity that fell to 0.66; when using a threshold score at 15, sensitivity was at 0.94 and specificity at 0.79. This study concluded that a threshold score of 14 was the best predictor of sensitivity and specificity.

DISCUSSION

Compared with the original validation study completed by Choueiri and Wagner in 2015, the current

Table 1. Mean RITA-T Scores and Age of Males and Females with and Without ASD

	All	All ASD	All Non-ASD	Male	Male ASD	Male Non-ASD	Female	Female ASD	Female Non-ASD
N	239	201	38	187	160	27	52	41	11
RITA-T score									
Mean	20.5	22.1[a]	12.1	20.6	22.0[a]	12.7	20.2	22.8[a]	10.4
SD	5.6	4.3	3.5	5.4	4.4	3.8	6.2	3.8	1.9
Chronological age (mo)									
Mean	29.7	29.8	29.6	29.8	29.9	29.4	29.6	29.5	29.9
SD	4.0	4.0	4.5	4.1	4.0	4.6	4.0	3.9	4.2

[a] $p < 0.001$ between ASD vs. non-ASD subgroups. ASD, autism spectrum disorder; RITA-T, Rapid Interactive Screening Test for Autism in Toddlers.

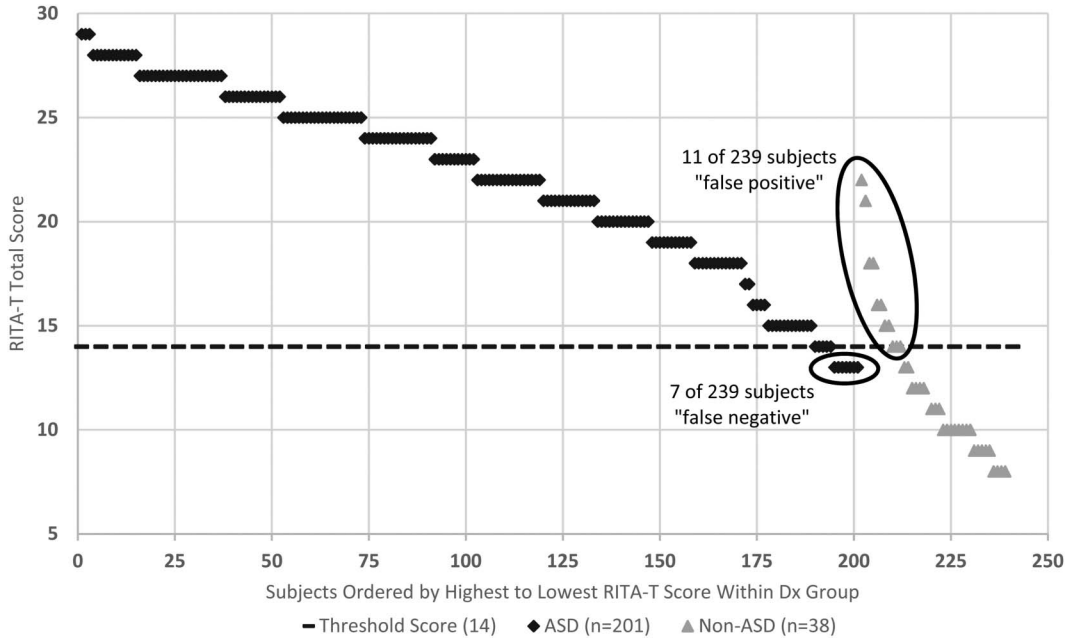

Figure 2. RITA-T scores for all patients ordered by descending score arranged by the diagnosis of ASD or non-ASD. The dashed line represents the cutoff score. ASD, autism spectrum disorder; Dx, diagnosis; RITA-T, Rapid Interactive Screening Test for Autism in Toddlers.

study used a larger sample of participants and was able to show that the Rapid Interactive Screening Test for Autism in Toddlers (RITA-T) has similar psychometric properties using the same cutoff score. The RITA-T was able to differentiate children with autism spectrum disorder (ASD) from those with non-ASD and demonstrated reliable sensitivity and specificity. The study sample provided consistent results similar to the original validation study while enhancing the validity of this test as a useful ASD screening instrument. In addition, a referred population with ASD-related concerns raised by primary care providers demonstrated its utility in clinical practice. The original validation study was based on children in an experimental group who had been referred with a broader question of "developmental concerns.[24]" At a higher cutoff score of >15, increased specificity could be increased to 0.79. However, because the RITA-T is being used as a level 2 screening test rather than as a diagnostic instrument, this study deemed that sensitivity should be maximized.

Additional benefits of the RITA-T included low-intensity training to score reliably and accurately and the short administration time integrated seamlessly within a screening appointment. During the ASD assessment and diagnostic process, the study team was able to gather important clinical information that facilitated a streamlined assessment process. Although the purpose of this study was not to compare the RITA-T with existing level 2 screening instruments, it is valuable to note potential advantages. Unlike the Systematic Observation of Red Flags, the RITA-T does not require videotaping and is potentially briefer than the Screening Tool for Autism in Toddlers and Young Children if administered in isolation outside of a screening appointment.[24] During the clinical assessments, the Autism Diagnostic Observation Schedule (ADOS) was not administered to all children. Although this study does not propose that the RITA-T be a replacement for a formal ASD diagnostic observation instrument, the RITA-T as an interactive and abbreviated observation tool was successful in evaluating some of the ASD-specific observable symptoms, which reduced assessment time. This reduced assessment time was not deemed to be a limiting factor in coming to a best-estimate clinical diagnosis. It is recognized that even after in-depth evaluations, the conclusions reached may still have limitations.[28]

The study team continued to follow up the 11 confirmed participants with false-positive results on the RITA-T for 6 months after the study period. Common characteristics exhibited by these children included global developmental delays and limited peer exposure. Because the RITA-T items include social communication and social referencing rather than language skills, it is possible that limited peer exposure may account for some elevated scoring. Following additional peer exposure and with supplementary early interventions, these children demonstrated improvements in social and language skills. Many, however, continued to have non-ASD

Table 2. RITA-T Scores Stratified by the Risk Group

Risk Group by the RITA-T Score	ASD (n = 201)	Non-ASD (n = 38)	Total (n = 239)
Low (<12)	0 (0%)	21 (100%)	21
Moderate (12–16)	28 (68.3%)	13 (31.7%)	41
High (>16)	173 (97.7%)	4 (2.3%)	177

ASD, autism spectrum disorder; RITA-T, Rapid Interactive Screening Test for Autism in Toddlers.

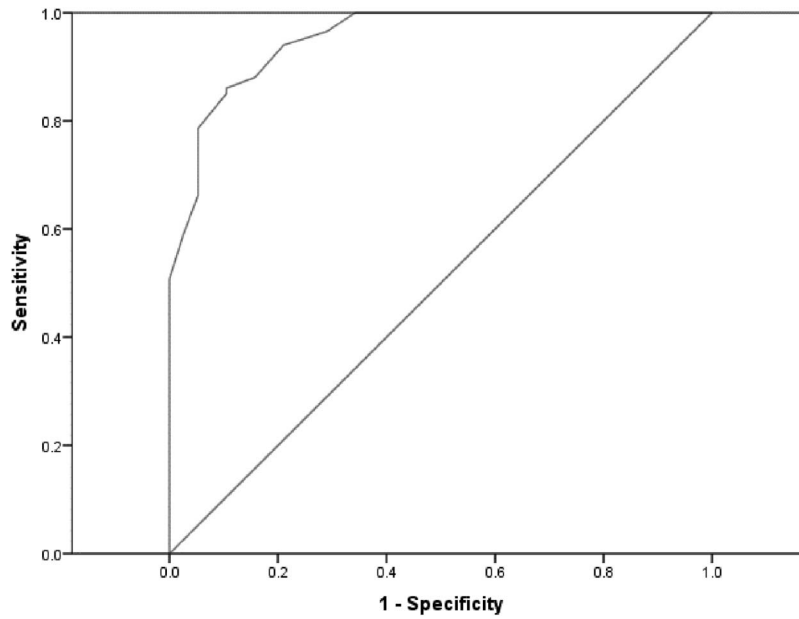

Figure 3. ROC curve demonstrating that a RITA-T total score of 14 and higher optimized sensitivity and specificity. AUC 0.953 (95% CI, 0.919-0.987). AUC, area under the curve; RITA-T, Rapid Interactive Screening Test for Autism in Toddlers; ROC, receiver operating characteristic.

developmental concerns. The 7 false negatives all received an ADOS as part of their assessment. False negatives are the most vulnerable to the negative impacts of a screening protocol. The children receiving false-negative predictions, based on the RITA-T, presented with limited follow-through in their social communication efforts, which were noted during the longer ADOS appointment. Although false positives and false negatives will always be present in a screening process, the use of the RITA-T provided the most in-depth assessment time for those who needed the most careful evaluation. As an outcome of our statistical analysis for the current study, we adjusted our RITA-T threshold scores for the 3 assignment groups to further minimize the risk of false-positive and false-negative cases.

Contributing to the successful outcomes of this study were the application of the RITA-T to a larger sample size than the original validation study and the integration of the instrument within the clinical process. Also, the integration of a moderate-risk group was useful in capturing potential participants who were screened as "false negatives." This was the group in which using additional evaluations added specificity to the diagnostic assessment. In addition, the study team strove to minimize factors that could lead to inaccurate conclusions by capturing parent concerns and developmental observations, integrating parent education sessions to increase awareness of possible symptoms and create exposure to multiple clinicians while not increasing appointment time, and streamlining appointments based on the degree of screening risk identified. With respect to wait times, we achieved the turnover of 28 days from parents' sessions to screening appointments and a cycle time of 3 weeks from screening to diagnosis within 12 months of implementing the redesigned model. This was successfully accomplished without additional human resources and has remained sustainable.

The pediatric tertiary care center is a single center, and although it serves a diverse population with a geographically large referral base, the current study might have benefited from the inclusion of other centers. A limitation of this study was the institutional ethics approval process, which prevented the study from providing sociodemographic data. Although the purpose of the study was not to compare it with the ADOS, but rather to provide a best estimate clinical diagnosis, additional resources would have allowed for an expanded comparison of the RITA-T to gold-standard instruments in clarifying its strengths and weaknesses. This study also recognizes that differences can occur in referral populations between ASD clinics, as well as integration of the RITA-T within a secondary screening appointment rather than in isolation. A study comparing screening appointments with and without the RITA-T would more accurately assess its psychometric properties. It would be ideal to develop a follow-up longitudinal study beyond a 6-month timeframe; however, it must be noted that within the 6-month period following the current study, there were no re-referred patients because of diagnostic questions. One of the innovative components of our redesigned ASD process was the inclusion of mandatory parental ASD educational sessions before child screening and diagnostic assessment. The impact and utility of the educational sessions has not been previously studied, to the best of our knowledge. The subsequent influence on parental reporting of their child's behavior, when exposed to ASD education before their child's ASD assessment, is also not known. However, anecdotally, our team felt that parent(s) displayed an enhanced ability to recognize ASD symptoms, but we

cannot definitively say that it did not influence parents to an overreporting or an avoidance of reporting symptoms. The impact on parents of ASD sessions before screening and diagnostic assessment presents an opportunity for future study. Finally, the study may have been subject to verification bias, with a large proportion of the referral population ultimately being diagnosed with ASD (84%). Although this may limit the generalization of the results, diagnoses were made independently of the RITA-T score.

Recommendations for future study include evaluating the RITA-T in isolation from a broader secondary screening appointment and comparing the RITA-T directly with more broadly validated ASD-specific diagnostic instruments, such as the ADOS. Further work could evaluate the longitudinal stability of this study's best-estimate clinical diagnoses, which consisted of reduced assessment time (with no ADOS) for some children. As reported by Davidovich, it is not an irregular occurrence for older children who receive a diagnosis of ASD to have a previous comprehensive multidisciplinary assessment that concluded ASD was not the correct diagnosis.[28] Future study would also provide an important contribution to understanding how using the RITA-T in primary care pediatric practices could further maximize efficiency and the allocation of time to families and children who have more complex assessment concerns.

In conclusion, the RITA-T showed psychometric properties similar to previously published results. The RITA-T screening tool improved the efficiency of the ASD screening and diagnostic process for families with young children for whom concerns about ASD have been raised. When integrated into an ASD screening and diagnostic process for families for whom concerns about ASD have been raised with their children aged 18 to 36 months, the RITA-T helps to predict a best-estimate clinical diagnosis of ASD. In a recognized resource-intensive process, such as ASD clinical assessments, a reliable level 2 screening instrument may assist with appropriate allocation of specialized resources and time, helping to reserve capacity for children requiring extra resources with the diagnostic assessment process.

ACKNOWLEDGMENTS

The authors thank Susan Crawford for statistical assistance, as well as Linda Beatty, Elizabeth Carmichael, and Jennifer Bourne for administrative and editing support during the writing of this manuscript.

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