The RITA-T (Rapid Interactive (Screening) Test for Autism in Toddlers: A New Level 2 Autism Screening Tool

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RITA-T OVERVIEW

- Interactive Play-based Autism Screening Tool
- Currently validated for toddlers 18-36 months
- Can be administered by Clinicians, Nurses, Early Intervention & Early Childhood Educators
- Assesses developmental constructs delayed in early ASD such as: Joint Attention (JA); Reaction to Emotions; Awareness of Human Agency
- Administration and scoring time is within 10 minutes
- Consists in 9-interactive play-settings
- Toddlers reaction to examiner’s “presses” are scored on an ordinal scale of typical to atypical (0-2,3, or 4) and total score generated.
- Training to Reliability achieved in 3 hours
- The RITA-T is language-free; only language is “Look” with a point gesture.
- Goal is to have the RITA-T and its training available in the Public Domain
  - @Tufts @UmassMedicalSchool
  - [http://www.umassmed.edu/autismrita-t/rita-t/](http://www.umassmed.edu/autismrita-t/rita-t/)
Current Screening Methods for ASD

- Level 1- Universal Screen
  - Autism screen recommended by American Academy of Pediatrics at 18 and 24 mos.
  - Example: MCHAT R/F
    - Low Positive Predictive Value (PPV) for ASD (0.54)
    - High PPV for Developmental Delay (0.98)

→ Over-referral for ASD evaluations
→ Longer wait delaying those who really need diagnosis
Current Screening Methods for ASD

• Level 2 – Disorder-specific screener

• Differentiates between ASD and other delays
  ➔ Referrals for ASD evaluations more appropriate

  ❖ Interactive Level 2 ASD screeners preferred
  ➔ Triggers atypical behaviors
Two-Level ASD Screening

- Well Child Visits or high risk (Early Intervention)
- Risk for Developmental Delays/ASD
- Risk ASD+++
Ideal ASD Level 2 screener

This model would allow improved access and two different clinical pathways

Toddlers with high risk of ASD would not be delayed for diagnostic confirmation

Early Intervention, Early Childhood educators can then do MCHAT R/F and RITA-T

Reliable in 18-36 months
Easy to train and learn

Discriminates well between toddlers with ASD and those with Delays that are non ASD

And most importantly: FITS WELL INTO BUSY PRACTICE FLOW
STAT:
• 20 minutes to administer and score
• At cut off score of 2:
• Psychometrics better in 2-3 y than in <2y
• Can miss ASD vs. Autism
• Expensive $500
DESCRIPTION of the RITA-T
Description of the RITA-T (Journal of Pediatrics, August 2015)

- 9 interactive presses
- Assesses developmental constructs delayed in early ASD such as:
  - Joint Attention (JA)
  - Reaction to Emotions
  - Awareness of Human Agency

- Each item coded from 0 to 2, 3 or 4 (typical to atypical)
- Total score generated; maximum: **30**
- The lower the score, the **more typical** the reaction

- Administration and scoring time: **10 minutes**
<table>
<thead>
<tr>
<th>Item</th>
<th>Constructs</th>
<th>Materials</th>
<th>Administration</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A-Blocked exploration of a toy (TL:11s)</strong></td>
<td>SA; JA; HA</td>
<td>Toy phone</td>
<td>Child explores toy. Examiner blocks it, 3 times. Observe EC and latency to EC for 11 s.</td>
<td>0-4 for EC; time to EC; or giving up</td>
</tr>
<tr>
<td><strong>B-Object Tease</strong></td>
<td>SA; JA; HA</td>
<td>Toy Phone</td>
<td>Examiner pretends to give toy to child then pulls back, 3 times. Observe EC to examiner or parent.</td>
<td>0-2 for EC to parent, examiner or both</td>
</tr>
<tr>
<td><strong>C-Blocked Vision (TL: 11 s)</strong></td>
<td>SA; JA; HA</td>
<td>Opaque screen</td>
<td>Child explores toy; examiner blocks toy from behind the child using a screen for 11s. Observe EC, JA.</td>
<td>0-3 for EC; Time to EC</td>
</tr>
<tr>
<td><strong>D-Magic Ball</strong></td>
<td>Cog JA</td>
<td>“Magic” cup &amp; ball</td>
<td>Ball in magic cup shown to child then examiner makes it disappear, 3 times. Observe surprise; JA to examiner &amp; parent.</td>
<td>0-3 for reaction of surprise; EC to parent and/or examiner</td>
</tr>
<tr>
<td><strong>E-Color Constancy</strong></td>
<td>Cog JA</td>
<td>“Magic” scarf</td>
<td>Examiner shows double-sided magic scarf on one side initially then examiner changes color abruptly. Observe surprise; JA to examiner or parent.</td>
<td>0-2 for reaction of surprise; JA to parent or examiner</td>
</tr>
<tr>
<td><strong>F-Object vs. Face (TL:15s)</strong></td>
<td>SA</td>
<td>Pictures of train &amp; baby</td>
<td>A foam circle with pictures of a baby and of a train on either side is presented to the child 5s each side. Observe picture preference for 5s.</td>
<td>0-2 for preference to baby (0), train pictures (1), or no interest at all (2)</td>
</tr>
<tr>
<td><strong>G-Rapid JA</strong></td>
<td>JA</td>
<td>Ceiling light</td>
<td>Examiner calls child suddenly and points at ceiling light. Observe JA.</td>
<td>0-1 for JA</td>
</tr>
<tr>
<td><em><em>H</em>-Sad Face, Still Face (TL:10s each)</em>*</td>
<td>SA</td>
<td>Caregiver</td>
<td>Caregiver is asked to pretend to cry: Observe: distress, EC, proximity seeking or no interest for 10s. Then caregiver is asked to have a neutral expression; Observe same for 10s.</td>
<td>0-4 each: 0-1 score provided to each reaction observed.</td>
</tr>
<tr>
<td><strong>I-Recognition</strong></td>
<td>Cog SR</td>
<td>Marker Mirror</td>
<td>A red dot is marked on forehead with removable non-allergenic marker. Examiner holds small mirror to child. Observe reaction to recognizing dot and taking it away.</td>
<td>0-2 for recognizes the red dot; attempts to remove it</td>
</tr>
</tbody>
</table>
The RITA-T Scoring Sheet

RITA-T (Rapid Interactive screening Test for Autism in Toddlers) Scoring Sheet

Patient ID: DOB: Examiner:
At the beginning of the test, mark the child’s forehead with a circular red dot. JA=Joint Attention; SA=Social Awareness; HA=Human Agency; C= Cognition.

A. Blocking of Phone: 3 times - Take best score.
   1. Looks at examiner’s eyes: Y (0) N (1)
   2. Latency to look at examiner’s eyes: 0-5s = (0); 6-10s = (1); 11s or more = (2)
   3. Abandonment (gives up): Y (1) N (0)
      (0-4)

B. Toy Tease: 3 times.
   1. Looks at examiner’s eyes: Y (0) N (1)
   2. Looks at parent’s eyes: Y (0) N (1)
   3. Looks at both: Y (0) N (1)
      (0-3)

C. Blocked Vision.
   1. Looks at examiner’s eyes: Y (0) N (1)
   2. Latency to look: 0-5s = (0); 6-10s = (1); 11s or more = (2)
      (0-3)

D. Magic Ball: 3 times
   1. Reaction (surprise): Y (0) N (1)
   2. Seeking object: Y (0) N (1)
   3. Joint attention to parent or examiner: Y (0) N (1)
      (0-3)

E. Color Constancy (Scarf): 3 times.
   1. Surprise: Y (0) N (1)
   2. Joint attention to parent (immediate): Y (0) N (1)
   3. Joint attention to examiner (immediate): Y (0) N (1)
   4. Joint attention to both (simultaneously): Y (0) N (1)
      (0-4)

F. Object vs. Face: 10 seconds.
   1. Preference for face: Y (0)
   2. Preference of object: Y (2)
   3. No interest, preference or awareness: Y (1)
      (0-2)

G. Reaction to Rapid Joint Attention (look to overhead light): Two times
   1. Child looks same direction: Y (0) N (1)
      (0-1)

H. Still Face - Caregiver’s face: 10 second each.
   1. Proximity seeking: Y (0) N (1)
   2. Eye contact: Y (0) N (1)
   3. Distress: Y (0) N (1)
   4. Interest: Y (0) N (1)
      (0-4)

I. Neutral (No emotion):
   1. Proximity seeking: Y (0) N (1)
   2. Eye contact: Y (0) N (1)
   3. Distress: Y (0) N (1)
   4. Interest: Y (0) N (1)
      (0-4)

J. Self-Recognition.
   1. Child looks at mirror and self: Y (0) N (1)
   2. Child recognizes dot AND tries to take it off: Y (0) N (1)
      (0-2)

TOTAL SCORE

<table>
<thead>
<tr>
<th>Hyperactivity</th>
<th>Sensory Seeking Behaviors</th>
<th>Repetitive Behaviors</th>
<th>Difficulty to get attention</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0-30)</td>
</tr>
</tbody>
</table>
Eye Contact and JA

“Checking in” to share interest/surprise to a magical change in colors or to disappearing ball
| Child aware of person blocking object not just “the hand” | Child aware of others 'emotions and reacts |
Videos of the RITA-T
VALIDATION

1- Develop a Replicable Training Module and Establish Scoring Reliability

2- Establish Criterion-Related Validity with other ASD Measures, e.g., the Autism Diagnostic Observation Schedule (ADOS)

3- Generalize the RITA-T to other clinic populations and to other Developmental Evaluation Centers and study psychometrics and effect on wait times

4- Test new models of early screening for ASD with Early Intervention and Early Education Centers to improve early identification
Validation - Reliability Training

- Scoring algorithm, Manual and training developed and tested. Training consists of:
  - Observation & Scoring of videos of RITA-T administration
  - Group discussion of scoring
  - Scoring of videos independently
  - Inter-Rater Reliability (IRR) calculation

- Initial and subsequent trainings:
  - IRR: Kappa= 0.8-1.0 (very good to excellent)

Current training module: Two sessions of 90 minutes each
Initial validation Sample  
(J of Pediatrics, 2015)

• 74 toddlers were enrolled  
• 13 were excluded  
  »61 continued the study

• 23 had ASD

• 19 had DD (Developmental Delay)/Non-ASD diagnoses
• Language Delay (LD) in 12
• Global Developmental Delay (GDD) in 7

• 19 were “TD” (NCR: No Concerns Raised)
# Results - Demographics

<table>
<thead>
<tr>
<th></th>
<th>ASD (N=23)</th>
<th>NonASD (N=19)</th>
<th>NCR (N=19)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female N (%)</td>
<td>1 (4)</td>
<td>8 (36)</td>
<td>12 (63)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age months Mean (SD)</td>
<td>27.77 (5.7)</td>
<td>29.46 (6)</td>
<td>21.7 (6.5)</td>
<td>0.001</td>
</tr>
<tr>
<td>Race N (%)</td>
<td></td>
<td></td>
<td></td>
<td>0.07</td>
</tr>
<tr>
<td>White N (%)</td>
<td>11 (47.8)</td>
<td>15 (79)</td>
<td>8 (42.1)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>8 (34.7)</td>
<td>3 (15.8)</td>
<td>4 (21)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4 (17.3)</td>
<td>1 (5.2)</td>
<td>7 (36.8)</td>
<td></td>
</tr>
<tr>
<td>Income N (%)</td>
<td></td>
<td></td>
<td></td>
<td>NS</td>
</tr>
<tr>
<td>&gt;$50,000</td>
<td>7 (30.4)</td>
<td>8 (42.1)</td>
<td>6 (31.5)</td>
<td></td>
</tr>
<tr>
<td>&lt;$50,000</td>
<td>16 (69.5)</td>
<td>11 (58)</td>
<td>13 (68.4)</td>
<td></td>
</tr>
</tbody>
</table>

*P-values for group differences are based on ANOVA for continuous variables and chi-square tests for categorical variables.*
## Results - Mean Scores (SD) by Diagnoses

<table>
<thead>
<tr>
<th></th>
<th>ASD</th>
<th>DD/NON-ASD</th>
<th>NCR</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RITA-T</strong></td>
<td>20.8 (3.6)</td>
<td>13 (2.5)</td>
<td>10.9 (2.12)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>M-CHAT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Items failed (SD)</td>
<td>8.7 (4.9)</td>
<td>4 (3.6)</td>
<td>1.3 (1.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>M-CHAT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean critical failed (SD)</td>
<td>2.87 (2.3)</td>
<td>1.42 (1.6)</td>
<td>0.11 (0.31)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>DSM IV</td>
<td>8.96 (1.99)</td>
<td>0.89 (1.15)</td>
<td>N/A</td>
<td>&lt;0.0001</td>
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<tr>
<td>DSM 5</td>
<td>6.04 (0.88)</td>
<td>0.75 (1.15)</td>
<td>N/A</td>
<td>&lt;0.0001</td>
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<tr>
<td><strong>MULLEN Receptive Language</strong></td>
<td>29.7 (12.3)</td>
<td>33.8 (15.2)</td>
<td>N/A</td>
<td>NS</td>
</tr>
<tr>
<td><strong>MULLEN Expressive Language</strong></td>
<td>28.4 (13.2)</td>
<td>29.6 (13.4)</td>
<td>N/A</td>
<td>NS</td>
</tr>
<tr>
<td><strong>MULLEN Visual Reception</strong></td>
<td>32.8 (10.7)</td>
<td>40 (14.65)</td>
<td>N/A</td>
<td>NS</td>
</tr>
</tbody>
</table>
# Results - Correlations of RITA-T with Autism measures

<table>
<thead>
<tr>
<th>Correlations</th>
<th>DSM IV criteria checked</th>
<th>DSM5 criteria checked</th>
<th>ADOS Composite Score</th>
</tr>
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<tbody>
<tr>
<td>r=</td>
<td>0.78</td>
<td>0.76</td>
<td>0.79</td>
</tr>
<tr>
<td>N=</td>
<td>42</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>t=</td>
<td>7.81</td>
<td>7.37</td>
<td>6.14</td>
</tr>
<tr>
<td>p= (two-tailed)</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
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</tbody>
</table>
## Sensitivity & Specificity for all cut-off scores

<table>
<thead>
<tr>
<th>RITA-T Total score</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
</tr>
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<tbody>
<tr>
<td>8</td>
<td>1</td>
<td>0.05</td>
<td>0.56</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0.11</td>
<td>0.58</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0.16</td>
<td>0.59</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0.26</td>
<td>0.62</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>0.37</td>
<td>0.66</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>0.53</td>
<td>0.72</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td><strong>0.84</strong></td>
<td><strong>0.88</strong></td>
<td><strong>1</strong></td>
</tr>
<tr>
<td>15</td>
<td>0.96</td>
<td>0.84</td>
<td>0.88</td>
<td>0.94</td>
</tr>
<tr>
<td>16</td>
<td>0.83</td>
<td>0.89</td>
<td>0.90</td>
<td>0.81</td>
</tr>
<tr>
<td>17</td>
<td>0.74</td>
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<td>0.94</td>
<td>0.75</td>
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<tr>
<td>18</td>
<td>0.65</td>
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<td>1</td>
<td>0.70</td>
</tr>
<tr>
<td>19</td>
<td>0.61</td>
<td>1</td>
<td>1</td>
<td>0.68</td>
</tr>
<tr>
<td>21</td>
<td>0.48</td>
<td>1</td>
<td>1</td>
<td>0.61</td>
</tr>
<tr>
<td>22</td>
<td>0.35</td>
<td>1</td>
<td>1</td>
<td>0.56</td>
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<tr>
<td>23</td>
<td>0.30</td>
<td>1</td>
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<td>0.54</td>
</tr>
<tr>
<td>24</td>
<td>0.13</td>
<td>1</td>
<td>1</td>
<td>0.49</td>
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<tr>
<td>25</td>
<td>0.09</td>
<td>1</td>
<td>1</td>
<td>0.48</td>
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<tr>
<td>26</td>
<td>0.04</td>
<td>1</td>
<td>1</td>
<td>0.46</td>
</tr>
<tr>
<td>27</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0.45</td>
</tr>
</tbody>
</table>
FALSE POSITIVE RATE by TRUE POSITIVE RATE FOR DIFFERENT RITA-T CUT-OFF SCORES (ROC CURVE)
Current Validation Studies

Generalization & New models
Testing the two-level ASD screening model

• **Aim 1**
  Study the RITA-T in a 2 level screening model to improve early identification (in specialized clinics; in Early Intervention)

• **Aim 2**
  Apply RITA-T psychometrics to a different population and generalize/refine findings
a- Collaboration with Alberta Children’s Hospital

• Division of Developmental and Behavioral Pediatrics (Jean Francois Lemay, MD FRCPC; two speech therapists, psychologist)

• Goal: Reduce patient wait-list time for toddlers 18-39 months referred for diagnostic evaluations for possible ASD

• October, 2013: wait to be evaluated was 12 months

• New model and triage with RITA-T: Parent meeting; MCHAT & RITA-T administration then triage to specific testing group
Triage Groups Based on RITA–T Score

**Low Risk:** score < under 12
Vineland; DSM5

**Medium Risk:** score is between 12-16
Vineland; ADOS2; DSM5

**High Risk:** score > above 16
Vineland; DSM5
Results

• **173** toddlers tested
• RITA-T average administration time: 9 minutes
• New model improved wait time and patient flow
• Preliminary results
  – Consistent
  – Cannot be shared yet publicly
# Results of New Triage Protocol

<table>
<thead>
<tr>
<th>DATE</th>
<th>NUMBER of toddlers</th>
<th>WAIT TIME TO DIAGNOSTIC VISIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCT, 2013</td>
<td>104</td>
<td>12-13 MONTHS</td>
</tr>
<tr>
<td>MAY, 2014</td>
<td>29</td>
<td>6 MONTHS</td>
</tr>
<tr>
<td>SEPT, 2014</td>
<td>11</td>
<td>2 MONTHS</td>
</tr>
<tr>
<td>JAN, 2016</td>
<td></td>
<td>28 days</td>
</tr>
</tbody>
</table>
b- Studies ongoing at UMass in Worcester (Developmental and Behavioral Pediatrics- DBP)
a- Testing model with Early Intervention

The THOM Early Intervention program in Worcester:
- EI providers all trained on the MCHAT-R/F
- Three EI providers from Autism team trained reliably on the RITA-T
- Pediatric clinics (UMass; Child Health) informed about study. MCHAT R/F completed by pediatricians.
- All toddlers enrolled in EI program receive MCHAT-R/F
- Those with concerns on MCHAT R/F or concerns clinically are administered the RITA-T
- They are then referred to diagnostic team in DBP at UMass in Worcester
Diagnostic evaluation team at UMass:
- The Autism Diagnostic Observation Schedule (ADOS)-2
- The Mullen Scales of Early Learning
- Diagnoses discussed with families
- Study approved by IRB
b- Collecting further validation data

• ALL Referrals to DBP for ages 0-3 (from community; families; other EI programs)
  
  – Evaluated by DBP directly
  – Evaluated part of clinical project:
  – Toddler receives MCHAT R/F; RITA-T; ADOS 2; MSEL
  – Diagnoses discussed
  – Study approved by IRB
c- Results

- Wait time from EI study program: within 1 month

- Wait time from community: 1-3 months

  - Currently

- 77 toddlers enrolled so far (as of April 22, 2016)

  - Study ongoing; stay tuned for results...
SUMMARY: The RITA-T

- Correlates well with Autism diagnostic measures
- Reliable training is easily obtained
- Discriminates well between toddlers with DD/NonASD & ASD
- At 5-10 minutes, it fits very well into clinic flow
- The RITA-T is a reliable and reasonably valid Level 2 interactive ASD screening test for toddlers
- Facilitates earlier detection and two-level screening models
Future steps

• Continuing to collect data; results available summer 2016

• Website, training tapes and CME in progress; summer 2016

• Test will be available in public domain at low costs

• Website: http://www.umassmed.edu/AutismRITA-T/

• For information or questions:
  • Roula.choueiri@umassmemorial.org
Acknowledgements

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- Sheldon Wagner, PhD
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- Jean Francois Lemay, MD: Co-PI

**UMass team**
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- Martha Castro; Margaret Manning, PhD
- Worcester Thom Early Intervention program

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Thank you
The families who participated
Thank You!