TBI STAC Procedures: Touchscreen Tablet-Based Cognitive Assessment versus Paper-Based Assessments for Traumatic Brain Injury

Sarah E. Wallace CCC-SLP  
_Duquesne University_, wallaces@duq.edu

Elena V. Donoso Brown OTR/L  
_Duquesne University_, donosobrowne@duq.edu

James B. Schreiber Ph.D.  
_Duquesne University_

Sarah Diehl M.S., CF-SLP  
_Vanderbilt University_

Joanne Kinney M.S., CCC-SLP  
_Lehigh Valley Health Network_

See next page for additional authors

Follow this and additional works at: https://dsc.duq.edu/slp-faculty-scholarship

Part of the _Occupational Therapy Commons_, and the _Speech Pathology and Audiology Commons_

Repository Citation

This Supplemental Material is brought to you for free and open access by the Department of Speech-Language Pathology at Duquesne Scholarship Collection. It has been accepted for inclusion in Speech-Language Pathology Faculty Scholarship by an authorized administrator of Duquesne Scholarship Collection. For more information, please contact phillipsg@duq.edu.
Touchscreen Tablet-Based Cognitive Assessment versus Paper-Based Assessments for Traumatic Brain Injury

Sarah E. Wallace, Ph.D., CCC-SLP
Associate Professor, Department of Speech-Language Pathology, Duquesne University, Pittsburgh, PA

Elena V. Donoso Brown, Ph.D., OTR/L
Assistant Professor, Department of Occupational Therapy, Duquesne University Pittsburgh, PA

James B. Schreiber, Ph.D.
Professor of Epidemiology and Statistics, School of Nursing, Duquesne University, Pittsburgh, PA

Sarah Diehl, M.S., CF-SLP
Doctoral student, Department of Hearing and Speech Sciences, Vanderbilt University

Joanne Kinney, M.S., CCC-SLP
Speech-Language Pathologist, Lehigh Valley Health Network

Lani Zangara, M.S., OTR/L
Occupational Therapist, Pediatric Therapy Specialists, Inc., Avonworth School District

Corresponding Author Contact Information:
Sarah E. Wallace
Duquesne University
410 Fisher Hall
Pittsburgh, PA 15282
Fax: 412-396-4196
Phone: 412-396-4219
Email: wallaces@duq.edu

Acknowledgements: First, the authors thank the study participants for their time and contributions to this project. The authors also thank Dr. Andrea Fairman for her assistance with early study conceptualization and institutional review board submission. Additionally, the authors thank Heather Coles and Simon Carson for their guidance in this area of research. The authors are grateful for the invaluable recruitment assistance provided by Dr. Jeffery Snell and his colleagues at Quality Living, Inc. Lauren Matthews provided assistance with data management and editing.

Declaration of Interest: This study was funded by the Duquesne University Faculty Development Fund (Wallace, PI). Dr. Wallace, Dr. Donoso Brown, and Dr. Schreiber are employees of Duquesne University which provided funding support for this project.
TBI STAC PROCEDURES

Participant ID #_______ Examiner _______________ Date ______

Order of Assessments (CLQT, STAC, MoCA) - Check randomization sheet to determine what order the three main assessments should be given.
   First: ______________
   Second:______________
   Third:______________

Informed Consent: Provide participant with a consent form (one to read and one to keep). Review the consent form with the participant stopping after each section to answer any potential questions. If appropriate, ask legal guardian to review consent form and the participant complete the assent form. Then, sign and date the consent form.

   ____ Consent Form Only (if participant is his/her own legal guardian)
   ____ Assent (participant) & Consent Forms (legal guardian) (for person with a legal guardian)
   ____ Consent Form for proxy (regardless of guardianship)

Medical History/Demographics Form: Complete the medical history form below with the participant. Form should be completed in an interview style. If appropriate, review the medical history form with the legal guardian. The examiner should then complete the screening measures with the participant.
TBI STAC PROCEDURES

STAC Participant Medical History Form (completed via interview)
For each question below, please mark the answer that best describes you or fill in the blank. You do not need to answer any questions you do not want to answer

Participant Information
Date of Birth: ___________  Age: _______  Gender: ___Male ___ Female
Date of Injury: ___________ Time post onset (months): ___________ (> 6 months post)
Cause of Injury: ___________________________
History of language or neurological impairment: ___Yes ___No Describe:_________
History of drug or alcohol abuse: _____Yes _______ No
History of depression requiring hospitalization (in past 6 months): _____Yes _____ No
Primary Language: _______________________
Education Level: check all that apply and, if applicable, fill in number of years.
   _____ Less than High School: Number of Years of School Completed: ___________
   _____ High School Diploma
   _____ Some College: Number of Years: _______
   _____ Associate’s Degree
   _____ Bachelor’s Degree
   _____ Master’s
   _____ Doctoral Degree

Length of coma (days):_____
Length of post traumatic amnesia (PTA) (hrs or days)____ Length of hospitalization:_____

(Clinical Observation – see information below) *at least 5 required to participate
Current Rancho Los Amigos Level:______ 8-point scale  10-point scale

Screening Information
Vision Screening: _____ Pass _____Fail
Corrected vision: _____ Yes _____ No   (corrected is okay) Describe:
Hearing Impairment: _____ Yes _____ No   (corrected is okay) Describe:
Motor Screening: _____ Pass _____ Fail  Time to complete:_________Within Norms Yes/No? (circle)
Language Screening: _______ Pass _______ Fail (90% accuracy on naming subtest)
Additional Information

1. Racial / ethnic group:
   ___ American Indian / Alaskan Native
   ___ Asian
   ___ Native Hawaiian or other Pacific Islander
   ___ Black or African American
   ___ White (Caucasian)
   ___ Hispanic or Latino

2. What is your current work status? Check ALL that apply
   ___ Working full time for pay outside the home (at least 35 hours per week)
   ___ Working part time for pay outside the home
   ___ Working for pay in a home-based business
   ___ Working as a volunteer
   ___ Working at home as a homemaker, stay-at-home parent, or care provider for other family members
   ___ Attending school or job training
   ___ Retired, and retirement was NOT related to current medical diagnosis
   ___ Not working or retired early because of medical condition
   ___ Not working for other reasons. Please describe: ______________________

3. What is your occupation (or what was your occupation when you stopped working)?
   _______________________________________________________________________

4. With whom do you currently live?
   ___ I live alone
   ___ Family (spouse or domestic partner, children, parents, other relatives)
   ___ Friends / Roommate
   ___ Assisted Living or Adult Family Home
   ___ Other, Please describe: ________________________________________________

5. What is your marital status?
   ___ Married / Committed relationship
   ___ Single
   ___ Divorced
   ___ Widowed
6. Do you use a touch screen tablet (not including a cell phone)?
   ___ No
   ___ Yes

7. On average, how many hours per week do you use a touch screen tablet (not including a cell phone)?
   ___ Less than 1 hour
   ___ 1-2 hours
   ___ 3-5 hours
   ___ 6-10 hours
   ___ More than 10 hours

8. For how many months have you been using a touch screen tablet (not including a cell phone) for more than 5 hours per week?
   ___ less than 1 month
   ___ 1 - 2 months
   ___ 3 – 6 months
   ___ 7 – 12 months
   ___ 1 – 2 years
   ___ more than 2 years

9. Do you use a touch screen cell phone?
   ___ No
   ___ Yes

10. On average, how many hours per week do you use a touch screen cell phone?
    ___ Less than 1 hour
    ___ 1-2 hours
    ___ 3-5 hours
    ___ 6-10 hours
    ___ More than 10 hours

11. For how many months have you been using a touch screen cell phone for more than 5 hours per week?
    ___ less than 1 month
    ___ 1 - 2 months
    ___ 3 – 6 months
    ___ 7 – 12 months
    ___ 1 – 2 years
    ___ more than 2 years
Screening

___ CLQT Confrontation Naming Subtest: Examiner will show participant 10 line drawings of familiar objects and ask him/her to name the pictures. Participants must receive 90% accuracy (9/10) to be enrolled in the study.

___ Nine-Hole Peg Test (Motor Screening): Determines the presence or absence of severe fine motor or dexterity impairment. For the purpose of this screening the participant should complete the task using their dominant hand, only one trial will be conducted. The participant must pick up nine pegs from the table, individually, and place them into a hole in any order. Then, he or she must take the pegs out of the holes one at a time. The participant may stabilize the container using untested hand. This test is timed. Record the time to determine how long the participant takes with this task. Administration and scoring guidelines appear below. The participant passes the screening if he or she can complete the task, regardless of the amount of time it takes.

___ Vision Screening: Ask participants to indicate which direction an “E” is pointing to determine if vision is adequate. They can point in the direction or verbalize the direction of the prongs. To screen for adequate near vision, you should hold the “E” sheet 14 inches from the participant’s face using the attached string. Use the largest “E”s on the top line as a practice. Then, ask the participants to complete the smallest “E”s on the lowest line. They need to correctly identify the direction of the “E”s on the last line with 100% to participate in the study.

___ Ranchos Los Amigos Scale of Cognitive Functioning: The researcher should observe the participant during screening tasks and determine if the participant reaches at least a RLA Level V. RLA Level V the participants should be alert, able to follow simple commands appropriately, and able to converse at an automatic level when provided with cues or support. Please indicate the level of each participant (see descriptions below).
TBI STAC PROCEDURES

Participant ID #_____

Nine Hole Peg Test  R / L  Dominant* (Circle One)

*Only test the dominant hand, this could be the different from the client’s dominant hand prior to injury.

The standarized protocol for this test was used.

**Check randomization sheet to determine what order the three main assessments (STAC, CLQT & MOCA) should be given.

____ CLQT – used standardized test protocol

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score</th>
<th>Cognitive Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Facts</td>
<td>/8</td>
<td>Memory; Language</td>
</tr>
<tr>
<td>Symbol Cancellation</td>
<td>/12</td>
<td>Attention; Executive Function</td>
</tr>
<tr>
<td>Confrontation Naming</td>
<td>/10</td>
<td>Language</td>
</tr>
<tr>
<td>Clock Drawing</td>
<td>/13</td>
<td>Attention; Memory; Executive Function; Language; Visuospatial Skills</td>
</tr>
<tr>
<td>Story Retelling</td>
<td>/8</td>
<td>Attention; Memory; Language</td>
</tr>
<tr>
<td>Symbol Trials</td>
<td>/10</td>
<td>Attention; Executive Function; Visuospatial Skills</td>
</tr>
<tr>
<td>Generative Naming</td>
<td>/9</td>
<td>Memory; Executive Function; Language</td>
</tr>
<tr>
<td>Design Memory</td>
<td>/6</td>
<td>Attention; Memory Visuospatial Skills</td>
</tr>
<tr>
<td>Mazes</td>
<td>/8</td>
<td>Attention; Executive Function; Visuospatial Skills</td>
</tr>
<tr>
<td>Design Generation</td>
<td>/13</td>
<td>Attention; Executive Function; Visuospatial Skills</td>
</tr>
</tbody>
</table>

____ MOCA – used standardized test protocol

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visuospatial/Executive</td>
<td>/5</td>
</tr>
<tr>
<td>Naming</td>
<td>/3</td>
</tr>
<tr>
<td>Memory</td>
<td>NA</td>
</tr>
<tr>
<td>Attention</td>
<td>/6</td>
</tr>
<tr>
<td>Language</td>
<td>/3</td>
</tr>
<tr>
<td>Abstraction</td>
<td>/2</td>
</tr>
<tr>
<td>Delayed Recall</td>
<td>/5</td>
</tr>
<tr>
<td>Orientation</td>
<td>/6</td>
</tr>
<tr>
<td>TOTAL SCORE</td>
<td></td>
</tr>
</tbody>
</table>
TBI STAC PROCEDURES

Participant ID #_____

---

**Instructions:**

Turn on iPad, open STAC application and click New Test. Examiner should set up STAC by first entering her own information on the first screen. On the next screen enter the participant’s demographic information (excluding first and last name). In the box titled First Name: enter “subject”. In the box titled Last Name: enter the Participant ID #. In the box titled participant ID enter their Participant ID # again. When prompted select Test A to administer.

Review the iPad rating scale and help participant select the appropriate choice. Once the demographics section is completed click the next button on the top right hand corner of the screen.

Give the iPad to the participant so they can view the short training video regarding how to use the touchscreen keyboard for this assessment. Then, the participant should follow auditory instructions to complete each task using the touch-screen keyboard. Have participant complete all subtests of the STAC using the iPad. Once the assessment has been completed the participant will be instructed to hand the iPad back to the examiner. Enter the four-digit password when prompted on the screen (7890). Next, mark items correct such as name and location, which were not entered on the demographic screen. Then, select the amount of assistance required by this particular participant (options given at bottom of screen). The application will then ask if you would like to e-mail results, select yes. Type in your email address.

* Do not use participants first or last name on any of the testing forms. Participant number should be used only.
POST ASSESSMENT USER SATISFACTION QUESTIONNAIRE

1. I felt comfortable doing this assessment using the iPad.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________

2. The quality and clarity of the pictures was acceptable.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________

3. The quality and clarity of the audio (sound) was acceptable.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________

4. Being assessed using the iPad provides a true picture of how I am able to do things.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Strongly Disagree</th>
</tr>
</thead>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________
5. There were things I was unable to do/say because of the iPad that I was able to do/say using the pencil paper assessments.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________

6. If I had to have assessments or tests in the future, I would be willing to do them using an iPad.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
____________________________________________________________________________________
____________________________________________________________________________________

7. Which type of administration did you prefer?

☐ Greatly prefer pencil and paper
☐ Slightly prefer pencil and paper
☐ No preference
☐ Slightly prefer iPad
☐ Greatly prefer iPad

Other Comments:
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

___ CHART-SF – Should be complete via interview.
WHAT ASSISTANCE DO YOU NEED?

People with disabilities often need assistance. We would like to differentiate between personal care for physical disabilities and supervision for cognitive problems. First, focus on physical "hands on" assistance: This includes help with eating, grooming, bathing, dressing, management of a ventilator or other equipment, transfers etc. Keeping in mind these daily activities...

1. How many hours in a typical 24-hour day do you have someone with you to provide physical assistance for personal care activities such as eating, bathing, dressing, toileting and mobility?
   __________ hours paid assistance __________ hours unpaid (family, others)

Now, focus on supervision for cognitive problems instead of physical assistance. This includes remembering, decision making, judgment, etc.

2. How much time is someone with you in your home to assist you with activities that require remembering, decision making, or judgment?
   1. [1] _____ Someone else is always with me to observe or supervise.
   2. [2] _____ Someone else is always around, but they only check on me now and then.
   3. [3] _____ Sometimes I am left alone for an hour or two.
   4. [4] _____ Sometimes I am left alone for most of the day
   5. [5] _____ I have been left alone all day and all night, but someone checks in on me.

3. How much when you go away from your home?
   1. [1] _____ I am restricted from leaving, even with someone else.
   2. [2] _____ Someone is always with me to help with remembering, decision making or judgment when I go anywhere.
   3. [3] _____ I go to places on my own as long as they are familiar.

Now, I have a series of questions about your typical activities.
TBI STAC PROCEDURES

Participant ID #_____

ARE YOU UP AND ABOUT REGULARLY?

4. On a typical day, how many hours are you out of bed? _____ hours
5. In a typical week, how many days do you get out of your house and go somewhere? _____ days
6. In the last year, how many nights have you spent away from your home (excluding hospitalizations)?
   [0]________ none [1]_______ 1-2 [3]_______3-4 [5]_______5 or more

HOW DO YOU SPEND YOUR TIME?

7. How many hours per week do you spend working in a job for which you get paid? hours ________
   (occupation: )
8. How many hours per week do you spend in school toward a degree or in an accredited technical
   training program (including hours in class and studying)? _______ Hours
9. How many hours per week do you spend in active homemaking including parenting, housekeeping, and
   food preparation? _____ Hours
10. How many hours per week do you spend in home maintenance activities such as gardening, house repairs
    or home improvement? _______ Hours
11. How many hours per week do you spend in recreational activities such as sports, exercise, playing cards,
    or going to movies? Please do not include time spent watching TV or listening to the radio.
    _______ Hours

WITH WHOM DO YOU SPEND TIME?

12. How many people do you live with? _____
13. Is one of them your spouse or significant other? [1]____ Yes [0]____ No [9]____ Not applicable (subject
    lives alone)
14. Of the people you live with how many are relatives? _____
15. How many business or organizational associates do you visit, phone, or write to at least once a month?
    _______ associates
16. How many friends (non-relatives contacted outside business or organizational settings) do you visit,
    phone, or write to at least once a month? _______ friends
17. With how many strangers have you initiated a conversation in the last month (for example, to ask
    information or place an order)?

WHAT FINANCIAL RESOURCES DO YOU HAVE?

18. Approximately what was the combined annual income, in the last year, of all family members in your
    household? (consider all sources including wages and earnings, disability benefits, pensions and
    retirement income, income from court settlements, investments and trust funds, child support and
    alimony, contributions from relatives, and any other source.)
   a. Less than 25,000 - If no ask c; if yes ask b
   b. Less than 20,000 - If no code 22500; if yes ask c
   c. Less than 15,000 - If no code 17500; if yes ask d
   d. Less than 10,000 - If no code 12500; if yes code 5000
19. Approximately how much did you pay last year for medical care expenses? (Consider any amounts paid by yourself or the family members in your household and not reimbursed by insurance or benefits.)

"Would you say your unreimbursed medical expenses are...."

a. Less than 1000 if "no" ask b if "yes" code 500.
b. Less than 2500 if "no" ask c if "yes" code 1750.
c. Less than 5000 if "no" ask d if "yes" code 3750.
d. Less than 10000 if "no" code e if "yes" code 7500. e. 10000 or more code 15000