Contents

Logistics

- Subjects do not have to be out of PTA in order to perform the BTACT.
  - The overall principle is to present the test items to everyone and only discontinue if the participant is unable to respond at all, responds in a way that has no relationship whatsoever to the actual item (one should interpret this very broadly), or becomes so agitated that examiner or participant safety is a concern.
  - For subjects with severe cognitive impairment start with the Word List and then at least try Backward Counting. If a subject is struggling with the instructions or items, use your best judgement; don't push to complete all items and code appropriately.
- Anyone fully and appropriately trained to collect the BTACT may do so, including but not limited to data collectors and neuropsychologists.
- Don't give the BTACT within 6 hours of another neuropsychological test (i.e., a cognitive test administered as a part of clinical care (including Speech-Language Pathology)).
- Only attempt the BTACT in English or Spanish. If a subject speaks another language use noncompletion code "Not Attempted Due to Limited English/Spanish Fluency."
  - An interpreter may NOT be used.
- Only continue collecting the O-Log if that is how your center determines emergence from PTA.

Administration Guidelines

- Prior to beginning test administration, verify that the participant can hear you well and request they tell you if, at any time, they did not hear what you said.
- If a subtest is interrupted (e.g. nursing staff, phone call) and the interruption spoils the subtest, code "Test Not Completed-Logistical Reasons."
- Don't repeat any test stimuli (i.e. words from word list, digits, etc.).
  - If the test is interrupted due to noise, code "Test Not Completed-Logistical Reasons."
  - If the examiner believes the interruption **interfered with** their ability to hear what was said (e.g. the phone line cut out) the stimuli may be repeated.
- If necessary, repeat instructions to verify the participants can hear you and understand the instructions.
  - If a subject doesn't understand the instructions the first time, and does not complete the practice successfully, repeat the instructions until he/she understands or it is determined that they are unable to understand (whether due to cognitive impairment or English/Spanish language fluency).
- Don't give specific feedback as to which items they got correct/incorrect.
  - If subject asks for repetition or feedback in the middle of a series, say "I am sorry, I can't repeat items (or can't say anymore) right now" then at the end politely explain that is the way the test is set up you are not able to give feedback.
  - If a person expresses concern about performance during a test, the data collector can say things to make the test seem non-threatening and to encourage subjects to continue with testing:
    - "Just do the best you can"
    - "Remember, we do not expect anyone to get all the questions correct"
    - "Don't worry, we have deliberately made these questions challenging. We're trying to find which questions are harder than others"
  - If a person asks for the test results, the data collector can respond:
    - "The information we collect with this test is intended for research purposes only. For that reason, we do not release it. Your scores are not meaningful on their own, they only make sense when we compare them to a larger group of scores. In other words – even if I could tell you your score (e.g., "you got a 5"), it would just be a number. Tests collected for research are not scored or interpreted like they would be in a clinical setting. In addition, the tests we administered for this research study may not be well suited to your particular questions or concerns, and different tests might be required. If you are interested in knowing more about your thinking skills, please talk to your doctor."
- In between tests, can say something like, "now let's try something different" to indicate a shift to a new task.

Recording responses:

- Individual copies of the BTACT can be used by the data collector for scoring while testing
- In addition, it is useful to record a sound file (or audio tape) of the test administration (with appropriate IRB approval) in case it is necessary to check responses to score a subtest.
- If you are unsure of how to score a given response, it is best to note the question and either replay the sound file or take detailed notes to allow discussion with neuropsychologist/supervisor/PI.
- The goal of this cognitive test is to accurately reflect a person's cognitive abilities — in other words, whether the participant is capable of achieving the correct response. So if he/she makes a mistake but immediately corrects it, they should be given credit for the correct response.

Word List

- Goal is to recall words from the list
- Recommended record-keeping (to facilitate scoring) check off each word the participant provides from the list, place two (or more) check marks to indicate a word was repeated, and write intrusions at the end of the list.
- Credit is given if noun is plural (farmers instead of farmer)
- An intrusion error is a word that was clearly not on the list (e.g., refrigerator)
- If a participant provides an intrusion and then repeats that same intrusion, this should be scored as two intrusions.
- Partial words are not correct (farm instead of farmer)
- Words with the same root, but different meaning are not correct (farming instead of farmer)
- Repetition is a failure of self-monitoring (drum, curtain, bell, drum)
- 'Thinking out-loud strategy' is not repetition. It is ok if they are running through the list out loud but are aware they already said the words.
  - Determining this might require clinical judgement
- If they say "drum…I already said drum' that is not scored as a repetition because the participant caught his/her error
- Sometimes you need to listen to the tone of voice to identify a repetition:
  - If someone says "drum, curtain, bell…did I say drum?" or sounds questioning, you need to determine if they are aware they said the word before.
- As the instructions state, if the participant stops before the allotted time is up (1 1/2 minutes for Immediate Recall and 1 minute for Delayed Recall), the data collector is to state, "There's still time left, can you think of any more?" This query is provided only once. If the participant states "no", then the data collector can move on to the next test without waiting the allotted time.
- Short-Delay Word Recall: During the module there was a ~13 minute delay.
  - The original BTACT used in the module contained a subtest that was removed but provided an extra 5 minutes to the delay.
  - For Form I, administer the Pre-Injury History Questionnaire or simply make conversation to preserve the delay of ~13 minutes between initial word list reading and the delayed recall.
  - For Form II the Delayed Recall is administered after Form II questions. Please see page 6 on the new Form II "COMPLETE DELAYED WORD RECALL HERE." Also see "BTACT administration and scoring considerations at Form II" within this SOP.
  - If it takes ~13 minutes to complete the other subtests you do not need to insert other measures to preserve the delay. However, if there is a significant delay (e.g., more than 20 minutes) in completing the Delayed Word Recall, code as not completed.

Backward Digit Span:

- Goal is to repeat the numbers in the correct sequence
- Data collector checks off correct trials and notes incorrect trials with a 0
- When participant gets one trial correct at a level, move on to the next level. If the first trial is incorrect, give a second trial. Discontinue when no correct response is provided for either trial at a given level.

- Please say all digits up to the last one in list intonation, then drop voice on the last one to indicate it is the end and participant should respond. (e.g., "One, two, three, four.")
- If participant immediately self-corrects do not count as an error ("9, 6…no 9, 2, 6)

Category Fluency:
- Goal is for the participant to produce as many unique words as possible. The same ideas re: repetitions and intrusions (in this case, words that do not fit the category) apply as for word list recall.
- The data collector records all responses that are produced on separate lines on the response sheet.
- A temporal breakdown is obtained by dividing the sheet into four sections and noting responses produced every 15 seconds.
- As the instructions state, if the participant stops before the allotted time is up (1 minute), the data collector is to state, "There's still more time, can you think of any more?" This query is provided only once. If the participant states "no", then the data collector is to still wait the full minute for a response, as the purpose of this test is to measure word generation within a set time frame (one minute).
- It may be helpful to audio record and replay later to accurately determine repetitions.
- We accept birds, fish, insects, etc. as correct responses in the "Animal" category. Do not inform the participant of this ahead of time, but if they specifically ask if these are acceptable while they are naming items, say "yes, go ahead."
- If a participant names type of animal such as "bird" then names a specific type of bird (e.g., "robin") credit is given for each response.
- Mythical animals such as dragons or unicorns are intrusions
- Baby animal names (even when adult version has been said) are ok. So "dog" and "puppy" are both correct.
- "Human" is an acceptable 1-point response.
- Dinosaurs and other extinct creatures are ok
- Processed animals (beef, pork) are intrusions
- If a participant is completing the entire BTACT in English, but provides some animals in another language, kindly redirect the participant to provide responses in English only. The data collector would code all repeated words as repetitions and intrusions in accordance with the SOP, regardless of whether they were said in English or another language. For example, if a person says "cat..... gato...." they would get one point for "cat" and "gato" is a repetition. A non-animal word like "agua" is an intrusion. The same logic applies for participants completing the BTACT in Spanish.
- When a participant says a word you can't understand, leave it blank and move onto the next animal. It is not considered an intrusion. You are welcome to go back and query AFTER the subtest is complete (e.g., "you said a word in the beginning I didn't quite catch – it sounded like "gumf"?" and if the participants clarifies with something appropriate like "giraffe" s/he is given credit for the response. The test is designed to test a person's ability to generate ideas in the form of words – not to test articulation.

Number Series:
- Goal is to see if participants can detect the pattern in order to produce the correct number to complete the series.
- Data collector records response given for each item
- If participant immediately self-corrects and gets it right, give credit.
- After each trial take a short break "Okay. Are you ready for another?" or "Great, let's try another one."
- Some participants may be confused by the directions, e.g., "when I say a number, you say 'ok'". You might briefly say, I want to be sure you hear each number so you can figure out the patterns – it helps me if you say "ok" after each number so I know you heard me."
- Any clear indication that the participant has heard each number is acceptable (e.g., "uh-huh," "got it," or a nod of the head (if administering the test in person)).

Backward Counting:

- Goal is to see how quickly participants can count backward from 100 without omitting any numbers in the sequence
- Data collector records "Last Number Reached", which is the lowest (i.e., smallest) number in the subject's response, and keeps track of errors
- If number is omitted entirely it is an error. Each number missed is one error.
  - If a participant skips an entire decade of number (go from 91 to 80) count that as ten errors.
- Repeating the same number (99, 98, 98, 97) is an error.
- If someone makes an error but immediately corrects themselves, it is not an error.
  - "eighty-nine, eighty-se, no eighty-eight, eighty-seven"
  - "eighty-nine, eighty-seven, no eighty-eight, eighty-seven"
- If someone attempts to use a shortcut by cutting out the first portion of the number (e.g., 89, 88, 87, 86, 85, 84, 3, 2, 1, 80, 79, 78, 77, 6, 5, 4, 3, 2, 1, 70), the data collector should state, "Please say the full number."
- Saying the wrong number, but not a skip or repeat, is an error
  - "…92, 91, **80**, 89, 88, 87"
  - just count as one error for 80 (not skipping)
- Total Number of Digits Produced is calculated by the following formula: [100- (last number reached + number of errors)].
- Scoring examples:
  - A participant says: "100, 199, 198, 197, 196, 195, 194, 193, 192, 191, 190, 189." In this case only one correct digit was produced, "100" with the rest of the digits being errors (199 is a reversal, then remaining numbers are >100 so not compliant with instructions).
    - Scoring would be: Last (i.e. lowest) Number Reached = 100. Total Number of Errors = 11. Total Number of Digits Produced = -11. [100- (100 + 11)]
  - A participant says: "100, 99, 98, 97, 96, 95, 96, 97, 98." In this case there are 3 errors (counting upwards instead of backwards)
    - Scoring would be: Last (i.e. lowest) Number Reached = 95. Total Number of Errors = 3. Total Number of Digits Produced = 2. [100- (95 + 3)]
  - A participant says: "99, 98, 97, 96." In this case skipping 100 would count as an error.
    - Scoring would be: Last (i.e. lowest) Number Reached = 96. Total Number of Errors = 1. Total Number of Digits Produced = 3. [100- (96 + 1)]
  - A participant says: "100, 98, 97, 96." In this case skipping 99 would count as 1 error.
    - Scoring would be: Last (i.e. lowest) Number Reached = 96. Total Number of Errors = 1. Total Number of Digits Produced = 3. [100- (96 + 1)]
  - A participant says: "100, 50, 49, 48." In this case all numbers skipped would be counted as errors.
    - Scoring would be: Last (i.e. lowest) Number Reached = 48. Total Number of Errors = 49. Total Number of Digits Produced = 3. [100- (48 + 49)]
  - A participant says: "100, 99, 98, 97, 96, 94, 93, 92, 90." Two numbers (95, 91) were skipped and would be counted as errors.
    - Scoring would be: Last (i.e. lowest) Number Reached = 90. Total Number of Errors = 2. Total Number of Digits Produced = 8. [100- (90 + 2)]
  - A participant says: "100, 99, 98, 96, 95, 96, 97, 98, 97, 96, 95, 94, 93, 92, 91, 90, 89, 88, 87, 86, 85, 84." Scoring errors would be as follows: 100, 99, 98, **[/]**, 96, 95, ~~96~~, ~~97~~, ~~98~~, ~~97~~, ~~96~~, ~~95~~, 94, 93, 92, 91, 90, 89, 88, 87, 86, 85, 84. In this case 1 number was skipped (97 at start of string) and 6 were incorrect responses.
    - Scoring would be: Last (i.e. lowest) Number Reached = 84. Total Number of Errors = 7. Total Number of Digits Produced = 9. [100- (84 + 7)]
- If a subject has severe cognitive impairments, it may be difficult to keep track of the errors. One suggestion is to write verbatim in the margins what the subject is saying, then go back later and fill out the data collection form.

Coding for non-completion

- If the entire BTACT is not completed, or any subtest of the BTACT is not completed, code reasons for non-completion.
- A BTACT is 'complete' if all subtests are coded either 1, 2, or 7.
  - 1: Test administered in full- results valid
  - 2: Attempted BUT not completed (due to cognitive/neurological reasons)
  - 7: Not attempted (due to the severity of cognitive/neurological deficits).
- At sites where the data collector is not the same person who conducts the BTACT, communication is necessary to ensure the accurate non-completion codes are recorded for subtests of the BTACT that are not completed.
- If the BTACT window closes within 2 days after obtaining consent, and testing cannot be completed, data collectors may use the non-completion code, 12: Test not attempted - not consented within window.
- For participants consented right at discharge (leaving no time to administer the BTACT during inpatient stay), centers are to attempt to reach the participant over the phone for the duration of their BTACT window. In cases where the data collector is unable to reach the participant, should code, 11: Test Not Attempted (Logistical Reasons, Other Reasons site-specific).
- Common Questions re: Completion codes
  - English was the patient's second language, but she was fluent before the TBI. Post-injury she had difficulty completing the more challenging BTACT subtests. Should the non-completion code be "non-English speaking" or "severity of cognitive impairment"?
    - Cases in which "cognitive impairment" would be the most appropriate code: If participant performed poorly on the more challenging tasks, but was able to complete the simpler tasks, chances are it is more of a cognitive issue.
    - Cases in which "non-English speaking" would be the most appropriate code: If a participant has difficulty understanding instructions or test stimuli that seem language-based (e.g., what is this word, "repeat?" or "I'm not familiar with the words you just used – what do you mean by "attention?" We want to be careful not to bias our data because we cannot assess non-English or Spanish speaking patients.
    - Particularly for participants who have sufficient language fluency to complete other Form I and II variables independently and consent to the study independently, "severity of cognitive impairment" is often the most appropriate code. But given the nuances in this decision, it is recommended that data collectors flag these types of cases and discuss with supervisor/PI.
  - What are some examples of when completion codes 3 or 8 would be used? (not completed or attempted due to non-neurological Physical reasons)
    - Physical reasons for not completing/attempting the BTACT would be deafness not related to the TBI, having jaws wired shut, vocal cord injury, or physical pain.
  - Form II data collector was not able to get a participant on the phone, what completion code should he/she use?
    - Participant speaks Arabic: Use completion code 10: Test not attempted (Non-English speaking Patient).
    - Participant is not able to communicate over the phone due to severity of cognitive/neurological deficits: Use completion code 7: Test not attempted (Due to severity of Cognitive/Neurological deficits).
      - This can often be determined by speaking with the family member or caregiver who completes the rest of Form II.
    - Code 15 (Not Applicable, No Data from Person with TBI because Unavailable or No Response to Contact) should be used on Form II only. Use this code when a SO answers all the Form II questions and the participant answers no questions because they cannot be contacted directly (eg, have re-located and new contact info is not accessible, do not have a phone, work odd hours and cannot be reached).
  - A participant did the initial word recall, then became upset and said she no longer felt like herself. Refused subsequent tests after the instructions for the next test were read.

- This is an example of a case that requires careful distinction between non-completion codes: "unable due to cognitive impairment" or "refused." The former code ("unable due to cognitive impairment") is designed to allow us to impute low/zero scores when we do data analyses, whereas we would not want to assume a participant who refuses a subtest would have achieved a low/zero score.
- Since this decision requires some clinical judgment, we suggest that data collectors should flag these cases and discuss with supervisor/PI, and possibly discuss with others who have interacted with the participant (e.g., treating neuropsychologist at Form I), per IRB approved protocols.
  - In general, we suggest to err on the side of refusal (more conservative in terms of data analysis, imputations, etc.)
  - When it comes time for data analysis, we can look at other TBIMS scores (DRS, etc.) and perhaps make informed decisions about imputations that could be appropriate for people who were coded as "Refused."
  - At Form II, while administering Word List Recall, a participant appears to be writing down the words.
    - This is expected to be a rare event. Data collectors can use their clinical judgment regarding how to approach the participant. The data collector could ask if the participant is writing down (or typing) the words and then remind them not to use paper and pencil (or other aids) for any of the tests.
    - Both Word List Recall and Short-Delay Recall test completion codes should be coded as "suspect that a participant is writing down answers." No test score should be recorded.
    - The data collector should continue administering the other subtests of the BTACT and use their judgment to determine if there are any other attempts to use outside help to complete the tests.
- Non-completion codes that are considered "Missing" in the NDSC data reports include: blanks, unknown (code 99), and test attempted but not completed or test not attempted (logistical reasons, other reasons- site specific) (codes 6 and 11, respectively).

Training
- New data collectors should complete BTACT training using recorded training session.
  - https://www.tbindsc.org/Members/Training.aspx

BTACT administration and scoring considerations at Form I
- The ideal BTACT data collection window for BTACT is 30 days post-injury +/- 2 weeks.
  - Someone who was discharged from the unit but is coming back in for an outpatient follow up appointment can be given the BTACT as long as they are within the window.
  - The BTACT can be administered over the phone after someone is discharged as long as it's within window.
  - For participants who are initially untestable, data collectors should re-approach them to complete the BTACT at least once, and make more attempts as resources allow.
  - Data collectors should strive to collect BTACT as close to the 30 day post-injury date as possible; in some cases this may mean delaying BTACT collection (e.g., if a participant is admitted to rehab and completes other Form I measures very soon after injury), or it could mean attempting BTACT while patient is still in PTA (e.g., for a participant who is approaching 4-5 weeks post injury and recovering slowly).
  - If the BTACT window closes prior to patient consenting to the TBIMS, clinical judgement should be used to code whether or not BTACT could have been completed at that time (e.g., consult with treating neuropsychologist or other rehab team members). If determined patient would not have been able to complete the BTACT due to cognitive impairment, code as "Not Attempted due to cognitive impairment." Do not attempt to abstract information from the medical record to make this determination.
  - In the rare event that a BTACT is collected outside of window (i.e., for the purposes of another study, by error, etc.), the data collector should confer with their project director, who may seek input from the Databusters, as to whether the data should be entered. In these rare cases (e.g., BTACT completed 4 days after window closes), the data collector may be advised to enter the data.
- The BTACT is not to be used for diagnostic purposes.

- There are norms from the MIDUS study that would allow calculation of standardized scores; these scores reflect an individual participant's performance relative to the MIDUS normative sample.

BTACT administration and scoring considerations at Form II

- This has mostly been successful; during the module we found that many participants who are unable to complete Form II independently are still able to complete at least 1-2 BTACT subtests.
- Administer the BTACT for all Form II's, all years.
- When the Form II questionnaire is completed by a proxy, the data collector should still try to schedule a time to administer the BTACT to the participant.
  - If you can't get the subject on the phone because he/she was not available you can use completion code "15 – Not applicable, No data from person with TBI."
    - e.g., Wife completed the Form II over the phone because the participant works.
- Follow the Form II windows for the BTACT: For Year 1, 2 months before to 2 months after the anniversary of DOI. For Year 2, 3 months before to 3 months after the anniversary of DOI. For follow-up years 5 and thereafter, 6 months before to 6 months after the anniversary of DOI.
  - General policy for Form II collection also applies to BTACT: try to hit closer to anniversary.
  - Ideally, BTACT and Form II will be administered close together, but there will not be a set limit re: how far apart they can be administered.
    - Try to administer the BTACT on the same call as the Form II questionnaire, if this is not possible schedule it at another time as close as possible to Form II questionnaire.
    - Some centers found success by collecting most data via the mailout, and then scheduling a time to collect interview-based data over the phone (i.e. FIM, DRS, GOSE, etc.) along with the BTACT.
- Strategies to manage timing when doing BTACT and Form II on the phone
  - Using an online stopwatch helps manage timing, etc. when conducting over the phone. (e.g. http://www.timeanddate.com/stopwatch/)
- It can be difficult to gauge reaction to tests (frustration, etc.) over the phone. Take notes and seek input from supervisor/PI when there is uncertainty regarding completion coding or scoring.
- Check in with participant frequently (between tests), use encouragement (e.g., "That one is really tough, let's try another one. Great job, let's keep going. Lots of people struggle with this one, let's try a different task…")
- It is acceptable to administer the BTACT in person if necessary, though we anticipate this will happen very rarely. For the pilot only 4% of Form II BTACTs were collected in-person.
- If the participant is driving during Form II data collection, do not attempt to administer the BTACT. Ask to arrange another time to complete the BTACT.