MIDUS Refresher 2 Cognitive Project

Data File Notes
Cognitive Test Battery

Brief Test of Adult Cognition by Telephone (BTACT)
Montreal Cognitive Assessment (MoCA-BLIND)

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MIDUS
Midlife in the United States

Brief Test of Adult Cognition by Telephone (BTACT)

- The BTACT includes 7 subtests that provide an index of cognitive function in domains of key importance in cognitive aging.
- Six of the BTACT subtests provide accuracy data.
- The Stop and Go Switch Task (SGST), which is a dual executive-function reaction time test, yields both accuracy and latency data.
- The cognitive battery was developed, processed, cleaned, and scored by Cognitive Project. The battery was administered in a telephone interview. The data are labeled with "RB3" which corresponds to MIDUS Refresher (R)/Wave 2 (B)/Cognitive Project (3).

For more information about the BTACT instrument see:

- Lifespan Lab Website*:*

http://www.brandeis.edu/departments/psych/lachman/instruments/index.html

- Monitoring cognitive functioning: Psychometric properties of the Brief Test of Adult Cognition by Telephone (published article; doi: 10.1177/1073191113508807)

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4050038/

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- **BTACT Subtests:**

1. Immediate word list recall *(tests episodic verbal memory)*

Although participants hear only 15 words, the data fields for the immediate and delayed word recall tests each include 26 variables to allow for 15 list words and up to 11 possible repetitions (reporting a list item more than once) and intrusions (reporting non-list items). We use '90' as a code for intrusions (a measure of interest) to distinguish these from inapplicable responses. We measure total number of unique responses up to 15 (RB3TWLITU), as well as total number of repetitions (RB3TWLITR) and intrusions (RB3TWLITI).

2. Digits backward span *(tests working memory)*

The measure is the highest number of digits recalled up to 8 (RB3TDBS).

3. Category fluency *(tests verbal ability and speed and executive functioning)*

The primary measure of interest is total number of unique responses (RB3TCTFLU).

4. The Stop and Go Switch Task *(tests reaction time, attention, tasks-witching, inhibitory control)*

The primary measure of interest is the mean latency of switch and non-switch trials (RB3TSMXBB).

RB3TSMXBB = mean (RB3TSMXBO, RB3TSMXBS) *where*
RB3TSMXBO = median RT of all mixed-task nonswitch
RB3TSMXBS = median RT of all mixed-task switch

5. Number series *(tests fluid intelligence/reasoning)*

We give the actual number of the answer given for each of the 5 items (RB3TNS1, RB3TNS2, RB3TNS3, RB3TNS4, RB3TNS5), the accuracy of each response (RB3TNS1C, RB3TNS2C, RB3TNS3C, RB3TNS4C, RB3TNS5C), as well as total correct (RB3TNSTOT).

6. Backward counting *(tests speed of processing)*

The primary measure of interest is the number of items correctly reported (RB3TBKTOT). This is derived from the last number reached (RB3BKCT), taking off points for errors (numbers omitted or reported erroneously, out of the correct sequence; RB3BKERR). The total correct is calculated as RB3TBKTOT = (100 – (RB3BKCT + RB3BKERR)).

7. Delayed word list recall *(tests episodic verbal memory/forgetting)*

This is given as the last subtest. As with immediate recall there are 26 fields to allow for repetitions and intrusions. Measures of interest are total number of unique items

recalled up to 15 (RB3TWLDTU), as well as repetitions (RB3TWLDTR) and intrusions (RB3TWLDTI).

- **Composites:**

1. Forgetting

We provide a measure of forgetting (RB3TWLF) calculated as the proportion forgotten between immediate and delayed word list recall [(Word List Immediate: Tot Unique Items - Word List Delayed: Tot Unique Item)/ Word List Immediate: Tot Unique Items] = [(RB3TWLITU – RB3TWLDTU)/RB3TWLITU].

2. BTACT Composite (This score includes all tests except for the Stop and Go Switch Task. It can be used instead of the Episodic Memory and Executive Functioning factors, if only one overall cognitive measure is desired).

We provide a composite measure (RB3TCOMPZ) that is calculated as the mean of z- scores for five subtests: word list recall (sum of immediate and delayed tests), digits backward, category fluency, number series, and backward counting. First, we computed the z-scores for all tests (i.e., word list recall, digits backward, category fluency, number series, and backward counting) and then we averaged them.

Notes:

1. For some participants, one or more cognitive tests were defined as problematic using the variables (RB3TWLIFP = 1; RB3TDBFP = 1; RB3TCTFFP = 1; RB3TNSFP = 1; RB3TBKFP = 1; RB3TWLDFP = 1; see the document *MR2_P3_BTACT+MOCA_VariableNaming.doc* for more information). Please note that to compute the BTACT composite we included the problematic cognitive tests. However, the composite was calculated only for participants who had at least 1 EM test and 3 EF tests.

2. Data from 235 Milwaukee respondents are included in this dataset. These cases can be identified by using the SAMPLMAJ variable.

3. Factor Scores: Episodic Memory & Executive Functioning

We conducted exploratory and confirmatory factor analysis of the BTACT including latencies from the Stop & Go Tasks' switch and nonswitch trials (Lachman, Agrigoroaei, Tun, & Weaver, 2014). We included the measures from the above- mentioned "BTACT Composite" (Word List Immediate, Digits Backward, Category Fluency, Number Series, Backward Counting, and Word List Delayed) as well as the mean of switch and non-switch trial latencies (multiplied by -1 to ensure higher scores indicated faster response times).

A principal axis factor analysis with oblique rotation yielded two factors with eigenvalues greater than one. We also found a good fit for the two-factor model using

confirmatory factor analysis. The first factor represented Episodic Memory (RB3TEMZ) and was comprised of Word List Immediate and Word List Delayed. The second factor, Executive Functioning (RB3TEFCZ), was made up of the remaining variables. Each factor was computed as a mean of the z-scores for the respective tests. The two factor means were also standardized to z-scores, with a mean of zero and a standard deviation of one (RB3TEMZ and RB3TEFCZ). The Executive Functioning factor includes a variable from the Stop & Go Switch Task (SGST). Given that the SGST latency values vary as a function of phone type (see section Filters and Phone Adjustments for Stop & Go Switch Task, below), we computed two scores for the Executive Functioning factor: the first was created using the unadjusted SGST variable (RB3TEFZ), while the second was corrected based on the metronome values (RB3TEFCZ). Because the Executive Functioning factor includes a variable from the Stop & Go Switch Task, please also see the note concerning filter use at the end of this document.

Note: All participants with word list data (immediate and/or delayed) received an EM factor score. Only participants that had 3 or more executive function subtests received an EF factor score.

▪ Stop & Go Switch Task (SGST)

The Stop & Go Switch Task (SGST) is a dual executive-function test that was administered as part of the MIDUS telephone cognitive battery to assess important control functions including task-switching and inhibitory control. It provides both accuracy and latency measures.

The test includes 2 single-task blocks and a mixed-task block that required alternating between 2 tasks. In the single-task blocks participants give a vocal response as quickly as possible to the stimulus words “RED” and “GREEN”; the first block follows a “NORMAL” (congruent) response rule (say "STOP" to "RED", and "GO" to "GREEN"), then the second block follows a “REVERSE” (incongruent) response rule (say "GO" to RED", and "STOP" to "GREEN”). In the mixed-task block the cues “NORMAL” and “REVERSE” are given at unpredictable intervals, requiring the participant to switch between the congruent and incongruent response rules. Task-switching ability is reflected by the difference between performance on non-switch trials and switch trials. Inhibitory control function is reflected by poorer performance on incongruent trials as compared to congruent trials.

1. Trial Types

This speeded task produces accuracy and latencies (in seconds) for 3 blocks of trials:

A. A *congruent* ("NORMAL") *single-task* measure (20 trials) in which the participant is expected to respond "STOP" to stimulus "RED", and "GO" to stimulus "GREEN".

B. An *incongruent* ("REVERSE") *single-task* measure (20 trials) in which the participant is expected to respond "GO" to stimulus "RED", and "STOP" to stimulus "GREEN".
C. A *mixed-task* that alternates between normal and reverse responses rules, depending on cue "NORMAL" or "REVERSE". Cue changes occur at random intervals after runs of 2, 3, 4, 5, or 6 trials of the same type. The first trial after a cue change is designated as a SWITCH trial. Subsequent trials in the run that do not involve a cue change are designated as NONSWITCH trials. There are 32 trials; however, trials 1-3 are considered a warm-up prior to the first switch and are not included in summary statistics.

2. Individual Trials

Raw scores for individual trials encode latency in seconds (to 2 decimal places).

3. Composite Scores

Summary statistics include the following:

A. **Accuracy**: percent correct aggregated over conditions.
B. **Latency**: median reaction time, in seconds, for correct trials aggregated over conditions. We have chosen to use medians to avoid right-skewing of means with long response times.
C. **Costs**: we provide two measures of switch cost that give an estimate of the difference in performance on trials that require switching response rule and trials that do not require a switch. (1) General switch costs compare latencies on mixed-task trials to single-task trials. (2) Local switch costs compare mixed-task switch trials to mixed-task non-switch trials. For both general and local switch costs, *absolute* costs represent a simple difference score between the easier and more difficult condition (e.g., A – B). *Relative* costs give the proportional decline in performance from the easier to the harder condition, and thus control for differences in baseline performance (e.g., (A-B)/A).

4. Filters and Phone Adjustments for Stop & Go Switch Task

We provide two levels of filters. Researchers who wish to use all valid files can choose to select the Valid filter (i.e., RB3TSFV - cases in which there were no technical malfunctions, the participant understood the task and was not distracted by external events, and successfully completed the metronome task). The descriptive data for the SGST in the codebook were calculated using this 'Valid' filter. In our analyses, in addition to using only valid cases we have used a criterion of 75% accuracy in each condition to ensure that participants were performing the task correctly; researchers who wish to

use this approach can select cases based on the 'Clean' filter (RB3TSFC). Note that the BTACT Executive Functioning Factor is computed using a variable from the SGST, and therefore the 'Clean' filter should be applied when using this factor.

The SGST latency values vary as a function of phone type (see variable RB3PHONTYPE = landline (1) vs. cell phone (2)). In order to adjust for the cell phone and landline delays[1], we administered a metronome task at the beginning of the SGST. Please see the file R2_P3_BTACT_ReadmeFirst. This task generated 10 time lags between metronome clicks and the numbers. All available lags were used to compute a score for each participant that measures the phone delays at the beginning of the SGST. That is, if the participant had all 10 lags, we took the median of those 10 values, whereas if the participant only had 5 lags (e.g., due to audio issues), we took the median of the 5 available values. In order to adjust for the phone delays, we recommend subtracting this median (RB3TSMMM) from the SGST latency composite scores (see file MR2_P3_BTAC+MOCA_VariableNaming). These adjustment scores (RB3TSMMM) are only provided for the phones in which there was a lag between the counting and the metronome clicks[2]. A score of 0 indicates the absence of a lag between the counting and the metronome clicks.

[1] For Refresher 1, we only corrected for cell phone delays. Due to changes in how landlines operate, we now correct for both landline and cell phones in Refresher 2.

[2] For 72 cases the phone adjustments were not performed because of missing metronome data.

Montreal Cognitive Assessment (MoCA)- BLIND 8.1

- The Montreal Cognitive Assessment (MoCA)- BLIND is an adapted version of the original MoCA, a rapid screening instrument for mild cognitive dysfunction.
- The MoCA-BLIND includes 7 subtests that assess different cognitive domains: attention and concentration, memory, language, conceptual thinking, calculations, and orientation.
- The tasks where visual abilities are required are removed. The total possible score is 22 points; a score of 19 or above is considered normal. The cutoff score is suggestive, as it has not been validated thus far.
- An additional point is added to cases with less than 12 years or fewer of formal education. The highest total score possible including the education adjustment is 22.
- The cognitive battery was developed, processed, cleaned, and scored by Project 3. The battery was administered in a telephone interview. The data are labeled with “RB3” which corresponds to: MIDUS Refresher (R)/Wave 2 (B)/Cognitive Project (3).

For more information about the MoCA instrument see:

https://mocacognition.com

- **MoCA-BLIND Subtests**

1. Immediate word list recall

Participants hear a list of 5 words and are asked to recall. The data field for the immediate word recall test includes 13 variables (RB3MIR1T1 through RB3MIR1T13) to allow for 5 list words and up to 8 possible repetitions (reporting a list item more than once) and intrusions (reporting non-list items). We use '90' as a code for intrusions to distinguish these from applicable responses. We use the value '80' for BTACT intrusions, classified as a word recalled from the BTACT 15-word list. The 5-word list is then read again, with the same protocol. This is denoted by variables RB3MIR2T1 through RB3MIR2T13. The participant is read the 5-word list and is again asked to recall (RB3MIR2T1 through RB3MIR2T2). This test is not included in the final score. Though no points are derived from the immediate recall, we measure total number of unique responses up to 5 (RB3MIR1TU and RB3MIR2TU) as well as total number of repetitions (RB3MIR1TR and RB3MIR2T), total intrusions (RB3MIR1TI and RB3MIR2TI) and total BTACT intrusions (RB3MIR1BTACT and RB3MIR2BTACT).

2. Digit Span

The primary measure of interest is the correct repetition of a forward digit span (2-1-8-5-4) and a backward digit span (2-4-7). We provide the accuracy of each response (RB3MFDS, RB3MBDS, RB3MFDSC, RB3MBDSC) as well as the sub score (RB3MDSTOT) 1 point is awarded for each correct repetition. There are 2 points possible.

3. Vigilance

The primary measure of interest total number of errors (RB3MVIGERR), such as an incorrect or missing 'tap'. If 1 or fewer errors are made, 1 point is awarded (RB2MVIGTOT). There is 1 point possible.

4. Serial 7s

The primary measure of interest is the total of correct subtractions (RB3MS7TOT). We provide the actual numbers of the answers given (RB3MS71, RB3MS72, RB3MS73, RB3MS74, RB3MS75) as well as the accuracy of each response (RB3MS71C, RB3MS72C, RB3MS73C, RB3MS74C, RB3MS75C). 1 point is awarded for one correct subtraction, 2 points is awarded for 2-3 correct subtractions, and 3 points are awarded for 4-5 correct subtractions. There are 3 points possible.

5. Sentence repetition

The primary measure of interest is the total of correct repetitions (RB3MSREPTOT). We provide the accuracy of each response (RB3MSREP1, RB3MSREP2, RB3MSREP1C, RB3MSREP2C). 1 point is awarded for each correct repetition. There are 2 points possible.

6. Verbal Fluency

The primary measure of interest is total correct words (RB3MVBFTOT). The data field for the Verbal Fluency Task includes 40 variables, (RB3MVBFL1 through RB3MVBFL40) to

allow for 40 entries. We use the value '0' as a code for invalid word (e.g., proper nouns, different word forms) and '2' for repetitions (both measures of interest) to distinguish these from inapplicable responses. 1 point is awarded for 11 or more unique and valid words provided. There is 1 point possible. We also provide the total unique and total valid words (RB3MVBFTU), the total invalids (RB3MVBFTI), and the total repetitions (RB3MVBFTR).

7. Abstraction

The primary measure of interest is the number of items categories correctly reported (RB3MABTOT). We provide the accuracy of each response (RB3MAB1, RB3MAB2, RB3MAB1C, RB3MAB2C). 1 point is awarded for each correct response. There are 2 points possible.

8. Delayed word list recall

The primary measure of interest is total words recalled (RB3MDRTOT). As with immediate recall, there are 13 fields to allow for repetitions and intrusions (RB3MDR1, RB3MDR2, RB3MDR3, RB3MDR4, RB3MDR5, RB3MDR6, RB3MDR7, RB3MDR8, RB3MDR9, RB3MDR10, RB3MDR11, RB3MDR12, RB3MDR13). Total intrusions (RB3MDRTI, RB3MDRBTACT) and total repetitions (RB3MDRTR) are also measures of interest. 1 point is awarded for each word recalled. A total of 5 points is possible.

9. Memory Index Score

The Memory Index test is only given if the participant does not get a perfect score on the Delayed Recall task. For every word not recalled, a specific hint is given (e.g., 'red' was not recalled, so the hint "One of the words was a color" is provided). If the participant does not recall the word with a hint, then a multiple-choice opportunity is provided (e.g., "Which of the following words do you think it was, red, blue, or green?"). 3 points are provided for every word provided spontaneously. If a word is recalled after being given the hint, 2 points is awarded. If a word is recalled after being given the multiple-choice cue, 1 point is provided. 15 points are possible. If a participant received a 5 on the delayed recall, they would have 15 points on the memory index score.

10.Orientation

This is given as the last test in the MoCA. The primary measure of interest is total correct (RB3MORTOT). The participant is asked to state the present date, day of week, month, year, and the city and state they live in. We provide the actual answers given (RB3MDATE, RB3MWKDY, RB3MMTH, RB3MYEAR) as well as the accuracy of each response given (RB3MDATEC, RB3MWKDYC, RB3MMTHC, RB3MYEARC, RB3MCITYC, RB3MSTATEC). As we are unable to verify the city and state of each participant during the time of the cognitive interview, points are awarded if a valid city and state is named. 1 point is awarded for each correct answer. A total of 6 points are possible.

- **Total Score:**

The total score is the sum of all MoCA variables ending in TOT (RB3MDSTOT, RB3MVIGTOT, RB3MS7TOT, RB3MSREPTOT, RB3MVBFTOT, RB3MABTOT, RB3MDRTOT, RB3MORTOT). The

variable RB3MEDUCADJ is used to denote an education adjustment. An additional point is given to anyone with 12 or fewer years of education (RB3MEDUCADJ). We include the total without the education adjustment (RB3MOCATOT) and the total score with the education adjustment (RB3MOCATOTADJ). 117 participants have missing MoCA data and did not receive a total MoCA score. Instead, they received a partial MoCA score, which is the sum of all available cases.

Partial MoCA Score Cases: 30001 30022 30309 30516 30655 30676 30720 31045 31057 31061 31062 31191 31196 31215 31385 31513 31539 31543 31567 31606 31730 31915 31978 32047 32181 32276 32310 32383 32421 32423 32440 32573 32577 32670 32689 32838 32844 33108 33146 33246 33284 33300 33311 33339 33419 33425 33530 33548 33555 33738 33753 33799 33808 33943 34171 34378 34394 34495 34537 34545 34725 34756 34791 34853 34944 35095 35153 35233 35310 35410 35479 35617 35679 35781 35870 36005 36016 36072 36138 36150 36176 36320 36424 36475 36559 36615 36667 36826 36841 36877 36918 36956 37012 37197 37290 37314 37422 37448 37473 37546 37706 37813 37929 37996 38091 38149 38266 38622 38709 38895 38951 39136 39343 39458 39582 39965 39980.

- **Flagged as Problematic:**

Each task has a designated “flagged as problematic” variable. If there is a value of 1, the interviewers at University of Wisconsin Survey Center deemed the task problematic for reasons such as problems hearing, recording, confusion, or other. These issues were checked and corrected by the Brandeis cognitive team, but if some problems with hearing/understanding still remain on individual items, they are marked accordingly 96 for RB3TWLI and RB3TWLD items in BTACT and 96/996 for MoCA items (see 'Variable Naming Document for the Cognitive Test Battery).

- Word List Immediate: RB3TWLIFP
- Digits Backward: RB3TDBFP
- Category Fluency: RB3TCTFFP
- Number Series: RB3TNSFP
- Backward Counting: RB3TWLDFP
- Word List Delayed: RB3TBKFP
- Immediate Recall: RB3MIRFP
- Digit Span: RB3MDSFP
- Vigilance: RB3MVIGFP
- Serial 7s: RB3MS7FP
- Sentence Repetition: RB3MSREPFP

- Verbal Fluency: RB3MVBFFP
- Abstraction: RB3MABSFP
- Delayed Recall: RB3MDRFP
- Orientation: RB3MORFP