

COGNITIVE VITALITY SUBSTUDY**TABLE OF CONTENTS**

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COGNITIVE VITALITY SUBSTUDY

1. Background and Rationale

While existing research suggests that social and behavioral factors, independent of disease processes and aging, contribute to the maintenance of cognitive function in old age, the paucity of longitudinal data; inadequate and/or incomplete assessments of health status, fitness, physical and social activity; and small and/or convenience or highly selective samples limits the generalizability of results and confidence in the findings. Furthermore, personality, which is known to influence behavior and lifestyle choices, and its relationship to maintenance of cognitive function has rarely been examined. No other study, to date, has put all of these factors together.

This study will address two major research questions: (1) What are the relative contributions of cardiovascular fitness; physical activity; personality; and social, recreational and intellectual activity to the maintenance of cognitive function in old age? (2) Do these factors affect different dimensions of cognition?

Hypotheses

1. Cardiovascular fitness will be positively associated with all measures of cognitive performance and most strongly with timed tests.
2. Independent of fitness, both physical activity and social, recreational and intellectual activity will be positively and independently associated with cognitive performance.
3. Physical activity and social, recreational and intellectual activity will show differential associations with neuropsychological function, with physical activity more strongly related to psychomotor speed and social, recreational and intellectual activity more strongly related to central processing speed and measures of memory.
4. The personality dimensions of conscientiousness and openness to experience will be positively associated with cognitive performance. Being high on both dimensions will show a synergistic relationship to cognition. These aspects of personality will be associated with both the type and amount of activity pursued and the value derived from activity participation. For example, those with high openness will be more likely to read and among those who read, those with high openness will show better cognitive performance.

Design

The study population will consist of a subset of the Health ABC cohort available for a clinic examination in Year 3. The objective is to recruit 800 participants, 400 of which

have a high level of physical fitness as determined from performance on the Long Distance Corridor Walk (LDCW) in Year 2. Fifty participants will be recruited from among the top 65 performers in each of eight groups defined by race, sex, and site. Another 400 participants will be selected randomly - 50 persons each from among those remaining in the eight groups. Performance on the LDCW serves as selection criteria for half the sample to assure inclusion of a sufficient number of participants with a high level of physical fitness and good cardiovascular health. The Cognitive Vitality (CV) subsample will be administered the following tests and assessments in the order listed. The cognitive tests and activity assessment will be re-administered in Years 5 and 7.

Measures and Instruments

1. Buschke Selective Reminding Test (SRT) of verbal learning and memory	10 minutes
2. Social, recreational and intellectual activity assessment (Activity Assessment; Social Contact)	6 minutes
3. Assessment of conscientiousness and openness with the NEO FFI (Personality Assessment)	7 minutes
4. Assessment of speed and reaction time with the Salthouse battery: a. Boxes Test b. Digit Copying Test c. Pattern Comparison Test d. Letter Comparison Test e. Reaction Time – Simple Reaction Time Test, Digit Digit Test, and Digit Symbol Test	12 minutes
5. SRT delayed (20 to 30-minute) recall	2 minutes
Total estimated time	37 minutes

Buschke Selective Reminding Test (SRT)

Memory is a critical component of cognitive function, and memory impairment is a strong indicator of cognitive decline and subclinical dementia. The SRT is a well-

established, highly reliable measure of verbal learning and memory. Normative data for older adults are available. Although several dimensions of learning and memory can be assessed by the SRT, the numerous scores derived are highly intercorrelated. Thus, to streamline scoring, only sum of recall, delayed recall, sixth trial long term retrieval, which show the best predictive and discriminatory validity for SDAT, will be recorded.

Social, recreational and intellectual activity assessment

Participation in social, recreational, and intellectually stimulating activities will be assessed by a brief questionnaire developed for Health ABC from the activity questionnaire used in the Iowa EPESE with input from the Cognitive Vitality Working Group.

Personality assessment

The personality dimensions of conscientiousness and openness to experience will be assessed with the C and O scales, respectively, of the NEO Five-Factor Inventory (NEO-FFI), a well-validated short version of the Revised NEO Personality Inventory (NEO-PI-R) developed by Costa and MacCrae.

Sensory-motor and Perceptual Speed and Reaction Time

There is growing evidence that loss of speed with increasing age is an important contributor to the age-associated decline observed in a wide range of cognitive tasks, including memory. Timothy Salthouse, a leading investigator in this area, has developed a brief battery of reliable tests designed to measure sensory-motor, perceptual and reaction time speed. The Boxes and Digit Copying Tests assess sensory-motor speed and Pattern Comparison and Letter Comparison Tests assess perceptual speed. These four tests use a paper-and-pen format, with a 30 second time limit to complete as many items as possible. The Digit Digit and Digit Symbol are computer-administered choice reaction time tasks. A simple reaction time task is also included.

2. Equipment and Supplies

- pens
- laminated cards with SRT words
- timer with bell or chime
- response options cards (activity assessment and personality assessment)

- stopwatch
- test forms (Boxes, Digit Copying, Pattern Comparison and Letter Comparison)
- Digit Digit and Digit Symbol display illustration sheet
- “surplus” or “old” computer that can run DOS, loaded with test software

3. Safety Issues and Exclusions

Persons with severe vision problems and persons who are unable to grasp and write with a pen are excluded from participating.

4. Participant Preparation

Testing should be performed in a quiet, well-illuminated room with the participant seated.

5. Detailed Measurement Procedures

5.1 Population Selection

Population selection for the CV substudy will follow, essentially, a case control design, with the “cases” consisting of participants with a high level of fitness and the “controls”, a random race-, sex-, site-matched sample of remaining participants. Cases will be identified on the basis of their performance on the LDCW in Year 2. Using age-adjusted time on the 400 meter walk, the 65 fastest participants from each of eight groups defined by race, sex, and site will be identified and invited to participate in a *study of memory and reaction time, personality and leisure activity*. The objective is to recruit exactly 50 participants from each group, but since we anticipate only 80% will be available and interested, the top 65 will be identified. Controls will be identified at random within the eight subgroups defined by race, sex, and site following procedures used for the knee osteoarthritis substudy.

5.1.1 Eligibility assessment

Prior to administering the Cognitive Vitality Substudy tests, all selected participants (“cases” and “controls”) will be asked if they have difficulty seeing large print or if they have a health or physical problem that makes it impossible for them to grasp and use a pen. The first page after the Cognitive Vitality Substudy Procedure Checklist is a Screener form that includes the eligibility questions:

1. Script: “Do you have difficulty seeing large print?”
2. Script: “Do you have a health or physical problem that makes it impossible for you to grasp and use a pen?”

If the participant answers “Yes” to either of these questions, mark “No” for Question 3 (“Is the participant eligible for the Cognitive Vitality Substudy”) and do not administer the Cognitive Vitality Substudy tests. If the participant answers “No” to both of these questions, mark “Yes” for Question 3, and administer the Cognitive Vitality Substudy tests.

5.2 Test Administration

The CV substudy battery will generally be administered at the end of the regular Year 3 clinic visit (although the exam can be administered earlier in the day as long as all of the tests are administered together). Participants should be offered a snack or light lunch before proceeding with the CV battery. Since the SRT has a delayed recall component, it needs to be administered first. The activity and personality assessments and speed battery should be administered next, in the order listed above, if possible. Since the delayed recall component of the SRT, should be administered 20 to 30 minutes following trial 6, if time is running short, you may need to postpone administration of one or both questionnaires or one or more components of the speed battery until after the delayed recall.

Rarely, it may be necessary to administer the CV substudy battery earlier in the day rather than at the end of the Year 3 clinic visit or possibly on another day within a week or so of the Year 3 clinic visit.

5.2.1 Buschke Selective Reminding Test (SRT)

Have the participant sit comfortably at a desk or table.

Script: “For this task, I am going to read you a list of 12 words. I want you to listen carefully, because when I stop, I want you to tell me as many of the words as you can recall. The words do not have to be in any particular order. When you have given me all the words you can, I will tell you the words you didn't give me from the list; then I want you to give me as many words as you can from the entire list. We do this 6 times (that is, you get 6 chances to learn as many of the words you can). We want you to try to learn all 12 words, even though it is very unusual for anyone to recall all of them. Many people learn and remember only about half of the words.”

Place a laminated card (show Card #1) with the first word on the list in front of the participant. Say the word aloud. After 5 seconds, repeat this procedure with the second word (show Card #2). Repeat this procedure for all 12 words, showing one card every 5 seconds (show Cards #3 through #12). After the last word is shown, ask the participant to recall as many words as they can.

Script: *"I want you to tell me as many of the words as you can."*

Place an "X" next to each word recalled under the column headed Trial 1. After 60 seconds, read the list of words at the rate of one word per 2 seconds skipping over the words that were recalled correctly on the preceding trial. Always present the words in order beginning with the top of the list and working to the bottom. Give the participant 60 seconds for each trial. Mark with an "X" all words correctly recalled for each trial. If the participant is able to recall correctly all 12 words on three consecutive trials, discontinue, but score as if all trials had been given. That is, give the participant a score of 12 for each of the remaining trials, and a score of 12 for the long-term storage (LTS) component (see below). If the participant recalls words not on the list, inform the participant, by saying something like *"cat is not one of the words."*

The final learning trial is Trial 6. Count the number of words recalled at least twice in a row that were also recalled in Trial 6. If the second time a word is recalled twice in a row is Trial 6, it still counts as an LTS (long-term storage).

Immediately following the sixth trial, set the timer for 28 minutes, then administer the Activity Assessment.

After at least 20 minutes but no more than 30 minutes, ask the participant to recall all 12 words.

Script: *"Remember the list of words I gave you earlier? I want you to tell me as many of the words as you can recall."*

During the 20 to 30-minute delay, the other components of the Cognitive Vitality Substudy should be administered.

Scoring instructions:

Record all of the scores described below on the Cognitive Vitality Substudy Buschke Selective Reminding Test (SRT) data collection form in the Cognitive Vitality Substudy Workbook (page 4).

- a) Trial 1: Count the number of words recalled in Trial 1 (maximum=12).
- b) Total Recall: Count the number of words recalled over the first six trials (maximum=72).
- c) Trial 6 LTS: Count the number of words in long-term storage in the final learning trial (Trial 6 LTS). Count the number of words recalled at least twice in a row that were also recalled in Trial 6 (the final learning trial). If the second time a word is recalled twice in a row is trial 6, it still counts as an LTS (maximum=12).
- d) Record the time of start of 20 to 30 minute recall period (time when timer is set for 28 minutes).
- e) Record the time of end of 20 to 30 minute recall period.
- f) 20 to 30-minute Recall: Count the number of words recalled after 20 to 30 minute delay (maximum=12).
- g) Record whether or not the complete Buschke Selective Reminding Test was administered.

5.2.2 Activity Assessment

Immediately following the sixth trial of the SRT administer the Activity Assessment and record responses on the Activity Assessment data collection form. If the activity is sporadic (e.g., several days in a row, a few times a year) and the participant cannot choose a response, choose once a month as the response.

Script: "For each of the following activities, please tell me how often you did them in the past year: [Show Card #13] Not at all (0), Once or twice only (1), Less than once a month (2), At least monthly (3), Less than once a week (4), At least every week (5), Several times a week (6), or Daily (7)." "You can just say the number next to your choice if you want."

In the past 12 months how often did you . . . ?

1. Do a crossword or other word puzzle.
2. Work on a jigsaw puzzle.
3. Read a newspaper or magazine article.
4. Read a novel or other fiction.
5. Read non-fiction, like a biography or history book.
6. Play board games, bingo, bridge or other card games.
7. Use a computer.
8. Go to the library.
9. Play a musical instrument.
10. Participate in recreational games like darts, pool, horseshoes, etc.

11. Write a letter, article, poem, or story.
12. Travel 100 miles or more from your home.
13. Do handcrafts, sewing, or needlework.
14. Do carpentry, wood working, or model building.
15. Do art projects, sketching or drawing, photography, or painting.
16. Go out to a movie.
17. Attend a concert or the theater.
18. Visit a museum, zoo, aquarium, or science center.
19. Attend a sports event like a baseball, football, or basketball game.
20. Take a class or adult education course.
21. Attend a lecture, discussion, or public meeting.
22. Participate in church, community, or social club activities (in addition to those mentioned above).

Show Card #14.

Script: “Please tell me, in a typical week, how often do you get together with friends or neighbors?”

At least once a day, 4-6 times/week, 2-3 times/week, 1 time/week, or Less than once/week

Script: “In a typical week, how often do you get together with children or other relatives?”

At least once a day, 4-6 times/week, 2-3 times/week, 1 time/week, or Less than once/week

5.2.3 Personality Assessment

Administer the Personality Assessment next and record responses on the Personality Assessment data collection form. If the participant is not familiar with a word used in a statement, you may give them a synonym for the unfamiliar word. For example, for the word “methodical,” “systematic” or “orderly” may be substituted. Appropriate substitutions are listed below in parentheses next to the more problematic words or phrases. These substitutions should only be used if the participant says they do not understand a word or phrase.

Script: “Now I’m going to read some statements. Listen carefully. For each statement, choose the response on this card that best represents your opinion. [Show Card #15] Choose **Strongly disagree** (1) if the statement is definitely false for you, choose **Disagree** (2) if the statement is mostly false, choose **Neutral** (3) if you can’t decide, choose **Agree** (4) if the statement is mostly true, and choose **Strongly agree** (5) if the statement is definitely true for you. For example, if the

statement was “I laugh easily”, and this was definitely true for you, you would say “Strongly agree” (or choose Category 5).”

1. I don't like to waste my time daydreaming.
2. I keep my belongings neat and clean.
3. Once I find the right way to do something, I stick to it.
4. I'm pretty good about pacing myself so as to get things done on time.
5. I am intrigued (*fascinated, interested*) by the patterns I find in art and nature.
6. I am not a very methodical (*systematic, orderly*) person.
7. I believe letting students hear controversial speakers (*people with new or different ideas*) can only confuse and mislead them.
8. I try to perform all the tasks assigned to me conscientiously (*responsibly, dutifully*).
9. Poetry has little or no effect on me.
10. I have a clear set of goals and work toward them in an orderly fashion.
11. I often try new and foreign foods.
12. I waste a lot of time before settling down to work.
13. I seldom notice the moods or feelings that different environments produce.
14. I work hard to accomplish my goals.
15. I believe we should look to our religious authorities (*ministers, priests, rabbis*) for decisions on moral issues (*right and wrong*).
16. When I make a commitment, I can always be counted on to follow through.
17. Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.
18. Sometimes I'm not as dependable or reliable as I should be.
19. I have little interest in speculating on (*thinking about*) the nature of the universe or the human condition (*meaning of life*).
20. I am a productive person who always gets the job done.
21. I have a lot of intellectual curiosity.
22. I never seem to be able to get organized.
23. I often enjoy playing with theories or abstract ideas.
24. I strive for excellence in everything I do.

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5.2.4 Speed Battery

The speed battery consists of five brief tests that should be administered in the order listed below. Boxes and Digit Copying assess sensory-motor speed and Pattern Comparison and Letter Comparison assess perceptual speed. These four tests are paper-and-pen, timed tasks. The reaction time test, consisting of simple reaction time and choice reaction time tasks (Digit Digit and Digit Symbol) is computer administered.

5.2.4.1 Boxes Test

Give the participant a pen and place the Boxes Test worksheet on the desk or table in front of the participant. Using the first three boxes at the top of the Boxes Test worksheet, demonstrate the task to the participant. Have the participant practice the test with the remaining seven boxes.

Script: "Please complete as many boxes as you can, like this."

[Demonstrate, working rapidly. Use the first three boxes].

"Now, you try the rest of the boxes above the line."

[After the participant completes the practice boxes, show the participant where to begin the test.]

"Start here. You can work across or down. Please work as rapidly as you can. You will have 30 seconds. Ready? Go."

Start timing. After 30 seconds, say: *"STOP. Thank you."*

For scoring, count the number of successfully completed boxes below the line, and record this number on the Boxes Test data collection form (page 8 of the Cognitive Vitality Substudy Workbook). Go on to the next test.

5.2.4.2 Digit Copying Test

Give the participant a pen and place the Digit Copying Test worksheet on the desk or table in front of the participant. Using the boxes at the top of the Digit Copying Test worksheet, demonstrate the task to the participant.

Script: "Please copy the number that appears in the top box in the bottom box, like this."

[Demonstrate, working rapidly. Use the first three boxes].

“Now, you try the rest of the boxes above the line.”

[Note: If the participant appears to be trying to copy the numbers exactly, or if the participant asks if they need to copy the numbers exactly, tell the participant: “Copy the numbers as you would normally write them.”

After the participant completes the practice boxes, show the participant where to begin the test.]

“Start here. You can work across or down. Please work as rapidly as you can. You will have 30 seconds. Ready? Go.”

Start timing. After 30 seconds, say: *“STOP. Thank you.”* For scoring, count the number of digits correctly copied onto the Digit Copying Test worksheet (below the line), and record this number on the Digit Copying Test data collection form (page 10 of the Cognitive Vitality Substudy Workbook). Go on to the next test.

5.2.4.3 Pattern Comparison Test

Give the participant a pen and place the Pattern Comparison Practice worksheet on the desk or table in front of the participant.

Script: *“In this test you will be asked to determine whether two patterns of lines are the same or different. If the two patterns are the SAME, put an “X” in the box labeled “Same.” If they are DIFFERENT, put an “X” in the box marked “Different.” Please try to work as rapidly as you can, choosing “Same” or “Different” for each pair of line patterns. Try the following examples.”*

Rarely, a participant may say that they are having trouble seeing the figures. Offer the participant a magnifying glass. If they continue to have trouble, tell them to skip those they cannot see.

As the participant tries the practice examples, make sure they understand the instructions before continuing. Place the Pattern Comparison Test worksheet face down in front of the participant, then say:

Script: *“You will have 30 seconds to compare as many line patterns as possible. When I say go, turn the worksheet over and start. Ready? Go.”*

Start timing immediately after the participant turns the test worksheet over. After 30 seconds, say: *“STOP. Thank you.”*

Look over the Pattern Comparison Test worksheet. Any answers that are marked by the participant after you say "Stop" should be crossed out and initialed so that it is clear

to the data managers that these answers are not to be counted as completed. Go on to the next test. Later, you may have to go over incompletely drawn “X’s” to enable the scanner to correctly read the participant’s responses.

5.2.4.4 Letter Comparison Test

Give the participant a pen and place the Letter Comparison Practice worksheet on the desk or table in front of the participant.

Script: *“In this test you will be asked to determine whether two strings of letters are the same or different. If the letters in the two strings are the SAME, put an “X” in the box labeled “Same.” If they are DIFFERENT, put an “X” in the box labeled “Different.” Please try to work as rapidly as you can, choosing “Same” or “Different” for each pair of letter strings. Try the following examples.”*

As the participant tries the practice examples, make sure they understand the instructions before continuing. Place the Letter Comparison Test worksheet face down in front of the participant then say:

Script: *“You will have 30 seconds to compare as many pairs of letter strings as possible. When I say go, turn the worksheet over and start. Ready? Go.”*

Start timing immediately after the participant turns the test worksheet over. After 30 seconds, say: *“STOP. Thank you.”*

Look over the Letter Comparison Test worksheet. Any answers that are marked by the participant after you say “Stop” should be crossed out and initialed so that it is clear to the data managers that these answers are not to be counted as completed. Go on to the next test. Later, you may have to go over incompletely drawn “X’s” to enable the scanner to correctly read the participant’s responses.

5.2.4.5 Reaction Time Test

Installing the software

The Coordinating Center will supply the software containing the necessary files for the reaction time test. Create a subdirectory called “digtime” on the c: drive of the hard disk of the computer that will be used for the test. Copy the contents of the diskette into the subdirectory. These 6 files must be copied to the subdirectory.

Go.bat

Steve.exe
Cga.bgi
Digsym00.sym
Digsym09.sym
Digsymx.exe

Explanation of the files

Digsymx is the software for the digit-digit and digit-symbol test.

Digsym00 and **Digsym09** are resource files for the program.

Go is a program to run the Health ABC battery

Steve displays the results of all seven components for a given participant.

Running the software

The software must be run in DOS mode on the computer. If the computer displays a window screen, select shutdown from the Start menu. Select “**Restart in MS-DOS mode**” from the display and press the **YES** button at the bottom of the window. At the c:\ prompt change to the **Digtime** subdirectory by typing “**cd**” then “**cd\digtime.**”

To run the full battery of tests type “GO”

The following tests will be administered in the order listed.

1. Simple Reaction Time Practice Trial and Test
2. Digit Digit practice trial
3. Digit Digit first test trial
4. Digit Digit second test trial
5. Digit Symbol practice trial
6. Digit Symbol first test trial
7. Digit Symbol second test trial

The screen will display the **name of the current test** and “**press any key to continue**”

Press <Enter>

The screen will display: **Enter subject number:**

Type the last 2 digits of participant's ID <ENTER>

The screen will display: **Press <ENTER> to continue, or <SPACE BAR> to correct.**
<ENTER>

The screen will display: **Initializing**

Press <ENTER> to start experiment

The Pictures to begin the trial will appear momentarily.

At the end of a trial, the screen will display: **Recording Data . . . and End of Experiment.** The program will then cue you to begin the next test in the series with the name of the test and the “**press any key to continue**” message. As you continue you must re-enter the participant’s ID for every trial. It is important that the same ID number be entered each time.

After all trials are completed, the results for 7 trials will be listed. The data values for Trials 1, 3, 4, 6 & 7 should be recorded on the data collection form. Trials 2 & 5 are practice trials.

If for some reason the tests can not be completed press <CNTRL-C> (or <CNTRL-Break> depending on your computer) when “**Press any key to continue**” appears.

To examine the results of an individual trial enter: **TYPE digsym0[1-7].[ID]** where the number 1-7 is the number of the trial you want to examine and ID is the participant’s id number. For example, if you wished to see the values for the first trial of the digit-symbol test (trial 6 as numbered above) for participant 88 you would enter: **Type digsym06.88.**

Each of the tests can be run individually if necessary, or particular tests can be repeated. The commands to run a particular test are as follows.

For Reaction time test and practice trial type:

DIGSYM 1 U=09 S=09 R=2

For Digit Digit practice trial type:

DIGSYM 2 U=09 S=09 R=2

For Digit Digit first test trial type:

DIGSYM 3 U=09 S=09 R=5

For Digit Digit second test trial type:

DIGSYM 4 U=09 S=09 R=5

For Digit Symbol practice trial type:

DIGSYMx 5 U=09 S=00 R=2

For Digit Symbol first test trial type:

DIGSYMx 6 U=09 S=00 R=5

For Digit Symbol second test trial type:

DIGSYMx 7 U=09 S=00 R=5

Deleting files

At the end of the study day you will want to delete the examination files. To do this type `del *.[ID]` at the “digtime>” prompt. ID is the ID number you used for a participant that day. You would run this command for each participant examined. For example, to delete participant 10, type `del *.10` at the digtime> prompt.

Participant Instructions:

For testing, briefly describe the reaction time tests to the participant.

Script: “The next set of tests measure reaction time and are done using a computer screen and keyboard.”

Have the participant sit comfortably facing a computer screen and keyboard, then sit down next to and to the right of the participant. Make sure the computer is running in DOS mode and the directory is set to the **digtime** directory. **Type in “GO.”**

Administer Simple Reaction Time Test

Script: “For the first test, all you need to do is press the “/” key with your right index finger, like this [**demonstrate**], whenever any images appear on the screen. Please respond as quickly as you can. The images will appear very quickly. Ignore the numbers and words on the screen for now. Just, hit the “/” key as quickly as you can. The first test is for practice. Are you ready?”

[Note: if a participant has difficulty understanding the directions, the examiner should demonstrate the procedure in the following way: The examiner points to the number box on the screen that changes with the “/” keystroke and makes the numbers change.

Script: “In this task you hit the “/” key anytime the numbers in this box change, like this.”
Hit / key several times.

Script: “Now you try it.”

Make sure the participants understand and if needed demonstrate again.

Occasionally a participant may press the slash key too hard and cause the slash to

automatically be repeated. If this happens, instruct the participant to hit the key correctly (by demonstrating a second time), and begin the reaction time tests again.]

Script: “Ready? Go.”

then press <ENTER> to start the test. After one practice trial, repeat the Simple Reaction Time Test.

Script: “Now, let’s do the test for real. Please respond as quickly as you can. Ready? Go.”

press <ENTER> to start the test. When finished, thank the participant.

Administer Digit Digit Test

Script: “For this test, a box will appear with two numbers, as shown here. **[Show Card #16]**. When the numbers in the box are the same, press the “/.” If the numbers are different, press the “Z.” You will get one short practice then two longer test trials.”

[Note: if a participant has difficulty understanding the directions, the examiner should give an example using the hand card.]

Script: “For example, on this card the numbers are 2 and 7 and that is not the same so you would need to push the Z key for different. Now you try a few examples.”

Before beginning the test, make up to three attempts to confirm understanding.]

Set-up screen and instruct participant to place their left index finger over the “Z” and their right finger over the “/.”

Script: “Please respond as quickly and accurately as you can. Do not worry if you press the wrong key; just keep going. Ready? Go,”

then press <ENTER> to start the test. Continue with the test trials. When finished, thank the participant.

Administer Digit Symbol Test

Script: “For this test, a box will appear with a number in the top and a symbol in the bottom, as shown here. **[Show Card #17]**. When the number and symbol in the box match the key displayed at the top of the screen, press the “/.” If the number and symbol do not match the key, press the “Z.” You will get one short practice then two longer test trials.”

[Note: if a participant has difficulty understanding the directions, the examiner should give an example using the hand card.]

Script: “For example, on this card the 2 and carat symbol do not match the 2 and upside down T in the key here, therefore you would hit the Z key for different. Now you try a few examples.”

Before beginning the test, make up to three attempts to confirm understanding.]

Set-up screen and instruct participant to place their left index finger over the “Z” and their right finger over the “/.”

Script: “Please respond as quickly and accurately as you can. Do not worry if you press the wrong key; just keep going. Ready? Go,”

then press <ENTER> to start the test. Continue with the test trials. When finished, thank the participant.

When testing is completed, record test results on the Simple Reaction Time, Digit Digit, and Digit Symbol Test data collection forms (pages 18, 19, and 20 of the Cognitive Vitality Substudy Workbook).

6. Procedures for Performing the Measurement at Home

Not applicable

7. Alert Values/Follow-up/Reporting to Participants

None

8. Quality Assurance

8.1 Training Requirements

The examiner requires no special qualifications or prior experience to perform this assessment. Training should include:

- Reading and studying manual
- Attending Health ABC examiner training session or observing administration by experienced examiner
- Practicing on volunteers

8.2 Certification Requirements/ Quality Assurance Checklist

- Completes training requirements
- Conducts exam on four participants while being observed by the QC officer using the QC checklist

All tests:

- Exam performed in quiet, private area without interruptions
- Stopwatch used discreetly

Buschke Selective Reminding Test (SRT)

- Correct instructions given in clear, slow speaking voice
- Laminated cards presented every 5 seconds
- Cards shown in correct order
- Participant given 60 seconds for each trial
- Timer set at appropriate time
- Trials correctly scored

Activity Assessment

- Administers Activity Assessment immediately after SRT
- Recites instructions correctly
- Shows response option cards

Personality Assessment

- Recites instructions correctly
- Pays attention to participant's ability to understand words used in the statements
- Shows response option cards

Boxes Test

- Recites instructions correctly
- Demonstrates completion of boxes rapidly and correctly
- Test stopped after 30 seconds
- Boxes test correctly scored

Digit Copying Test

- Recites instructions correctly
- Demonstrates digit copying test rapidly and correctly
- Test stopped after 30 seconds
- Digit copying test correctly scored

Pattern Comparison Test

- Recites instructions correctly
- Determines that participant understands instructions and completes the sample/practice page
- Test stopped after 30 seconds
- Answers marked after 30 seconds are crossed out and initialed.

Letter Comparison Test

- Recites instructions correctly
- Determines that participant understands instructions and completes the sample/practice page
- Test stopped after 30 seconds
- Answers marked after 30 seconds are crossed out and initialed.

Reaction time tests

- Recites instructions correctly
- Determines that participant understands instructions and performs the practice simple reaction time, digit digit, and digit symbol tests
- Simple reaction time, digit digit, and digit symbol tests correctly scored

9. References

Arbuckle TY, Gold D, Andres D. Cognitive functioning of older people in relation to social and personality variables. *J Psychology Aging* 1986;1:55-62.

Christensen H, Mackinnon A. The association between mental, social and physical activity and cognitive performance in young and old subjects. *Age Ageing* 1993;22:175-182.

Costa, Jr PT, McCrae RR. Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual. 1992 Odessa, FL:Psychological Assessment Resources, Inc.

Earles JL, Salthouse TA. Interrelations of age, health, and speed. *J Gerontol Psychol Sci* 1995;50B:P33-P41.

Jones KJ, Albert MS, Duffy FH, Hyde MR, Naeser M, Aldwin C. Modeling age, using cognitive, psychosocial and physiological variables: The Boston Normative Aging Study. *Experimental Aging Research* 1991;17:227-242.

Luszcz MA, Bryan J, Kent P. Predicting episodic memory performance of very old men and women: Contributions from age, depression, activity, cognitive ability, and speed. *Psychology Aging* 1997;12:340-351.

Masur DM, Fuld PA, Blau AD, Thal LJ, Levin HS, Aronson MK. Distinguishing normal and demented elderly with the Selective Reminding Test. *J Clin Experimental Neuropsychol* 1989;11:615-630.

Masur DM, Sliwinski M, Lipton RB, Blau AD, Crystal HA. Neuropsychological prediction of dementia and the absence of dementia in healthy elderly persons. *Neurology* 1994;44:1427-1432.

Mobily KE, Leslie DK, Lemke JH, Wallace RB, Kohout FJ. Leisure patterns and attitudes of the rural elderly. *J Applied Gerontol* 1986;5:201-214.

Salthouse TA. General and specific speed mediation of adult age differences in memory. *J Gerontol Psychol Sci* 1996;51B:P30-P42.

Salthouse TA, Coon VE. Interpretation of differential deficits: The case of aging and mental arithmetic. *J Experimental Psychology: Learning, Memory, and Cognition* 1994;20:1172-1182.

Schaie KW. Midlife influences upon intellectual functioning in old age. *International Journal of Behavioral Development* 1984;7:463-478.

Schooler C. Psychological effects of complex environments during the life span: A review and theory. *Intelligence* 1984;8:259-281.

Spren O, Strauss E. *A Compendium of Neuropsychological Tests: Administration, Norms, and Commentary* (2nd, ed). 1998; New York: Oxford University Press.

Wiederholt WC, Cahn D, Butters NM, Salmon DP, Kritz-Silverstein D, Barrett-Conor E. Effects of age, gender, education on selected neuropsychological tests in an elderly community cohort. *J Am Geriatr Soc* 1993;41:639-647.