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Cognition and Aging in the USA (CogUSA) 2007-2009

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Original P.I. Documentation

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ICPSR PROCESSING NOTES FOR #36053

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1. **File Names:** Please note that the file names mentioned in the section of this document entitled “CogUSA Data Files” differ from the names of the data files released by ICPSR. However, Dataset 1 contains demographic data, and Dataset 2 contains score data.

CogUSA Study Overview and Data Description

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I. Introduction

America's demographic profile is undergoing a dramatic change. Over the next several decades, lengthening life spans combined with the aging of the population bulge–those born during the "baby boom" years of 1946-1965—will transform the United States from a youthful society to a middle-aged and elderly society. This "new age America" will impose major new challenges to the nation's health and economic institutions.

II. Background

In 1992, the University of Michigan's Survey Research Center launched the largest data collection effort in its history. The Health and Retirement Study (see Juster & Suzman, 1994) is viewed as one of the most valuable and innovative studies ever undertaken to better understand how people fare as they age. The Health and Retirement Study (HRS) was designed to provide academic researchers, policy analysts and program managers with reliable, current data on the economic and physical well-being of men and women 51 years of age and older in America. As this population ages, assessing their cognitive skills is becoming increasingly important. These data are publicly available from the HRS website:hrsonline.isr.umich.edu.

John J. McArdle at the University of Southern California, who was the Principal Investigator of the National Growth and Change Studies (NGCS), a program designed to use all available collections of psychological tests to better describe and understand the many changes that occur to people over the adult life-span (ages 18-95; see, for example, McArdle et al, 2001), launched a new study called Cognition and Aging in the USA (CogUSA) in collaboration with two of the co-investigators of the HRS, Dr. Robert J. Willis and Dr. Willard L. Rodgers. This research was funded by the NIA under research grant number AG-07137 to the first author.

CogUSA Goals

The aim of the CogUSA Study was to evaluate the effectiveness of a variety of tests in assessing cognitive skills on a sample mirroring the main HRS sample (see McArdle, Smith & Willis, 2009). The project also assessed interviewer effort and respondent burden involved in administering these tests. As such, this information was used to make recommendations for a more parsimonious battery of tests to be administered to HRS participants. This national longitudinal study of cognition focused on the age-related changes in cognition across cohorts, and also on the impact of cognition on key health and economic outcomes.

The CogUSA Study has two ultimate goals:

1. To identify measures for possible inclusion in future waves of the HRS project (starting in HRS 2010). One of the goals of CogUSA was to develop efficient methods of assessing well-recognized components of intelligence and personality that can be administered by surveys using either face-to-face or telephone administration. For example, McArdle, Rodgers, Fisher, Horn, & Woodcock (2008) have developed an adaptive number series test that has already been piloted in HRS experimental modules in 2004 and 2006. The number series test asks a person to fill in the missing number in a sequence. An adaptive test can dramatically reduce the number of items

needed to assess a person's ability by asking questions that are of most relevance to a person's ability. The adaptive number series test covers the same range of ability covered by 47 items in the standard Woodcock-Johnson test in about four minutes and no more than six questions. This adaptive test was repeated in the CogUSA Wave 1 and Wave 3 telephone interviews, but the full WJ-III number series test is conducted in the Wave 2 in-person interview. (The 47-item test is "somewhat adaptive," so that few respondents answer all 47 items.) See Section III – CogUSA Survey Content for a full description of these measures.

2. To collect multivariate information to better understand how various cognitive abilities change with age.

III. CogUSA Methodology

Sample

The initial sample of respondents for the CogUSA study consisted of 3,224 individuals obtained from a two-stage RDD sample supplemented with information from a Genesys database to target a sample of households with individuals located in 28 primary sampling units (PSUs) across the nation. These PSUs were chosen to correspond to PSUs where HRS interviews are conducted so that we could employ HRS interviewers for this study. Eligible sample members included individuals born in 1956 or earlier (i.e., age 51+) and their significant others, regardless of age. Respondents were also required to 1) be able to complete the cognitive interview, and 2) do the interview in English. We do not have any other data on the non-respondents from the Genesys database.

Procedure

The original CogUSA study plan included two telephone interviews and two in-person interviews. But this plan proved to be too costly. So the available CogUSA Study consists of three survey components, as depicted in Figure 1. Initial contact was established by telephone calls to selected households, and the study began with a 40-minute telephone interview (Wave 1) that replicated the sections of the HRS questionnaire on demography, health and cognition, and added a few brief cognitive tests. This Wave 1 telephone survey was followed as quickly as possible—ideally, within a week—by a 3 hour face-to-face cognitive assessment (Wave 2) of the cognitive abilities of respondents on a large number of different tasks measuring components of "fluid and crystallized intelligence" (after Horn & McArdle, 2007). Respondents were paid $20 for participation in the Wave 1 interview and $60 for the longer Wave 2 interview. Data collection for Wave 1 took place between June and December, 2007. A second telephone survey (Wave 3) took place at a randomized interval of 1 to 24 months following the personal interview (following the *Timelag* strategy of McArdle & Woodcock, 1997). Randomizations for the Wave 3 telephone interview were done at the respondent, not household, level. Respondents were randomly assigned to one of eight follow-up target dates. Wave 3 telephone interviews began in January, 2008 and continued through September, 2009. In

the original plan we proposed a Wave 4 FTF repeated testing, but not enough funding was secured for this to take place.

Response Rates

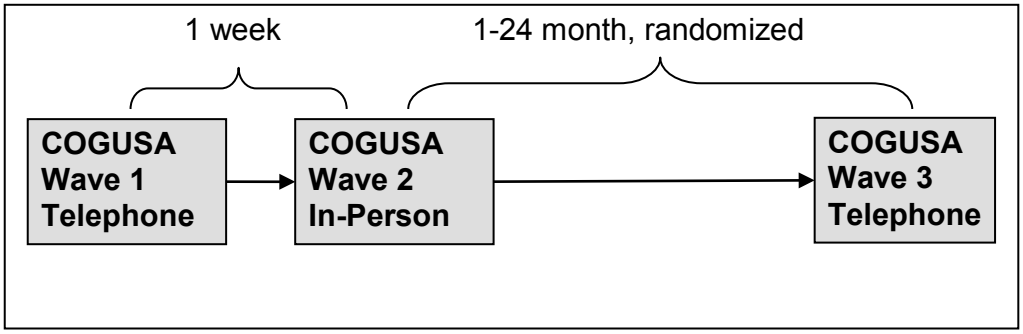
Among the 3,224 individuals asked to participate in the telephone interview, a total of 1,514 individuals completed the Wave 1 interview, for an unadjusted initial response rate of 47%. This response rate is on target for an RDD sample methodology. Based on the DECISIONS Study (Zikmund-Fisher, 2010) and consultation with the Survey Research Center Statistical Design Group, the CogUSA research team anticipated a 45% response rate with this telephone list methodology, so the 47% response rate is on target and slightly higher than anticipated.

Among the 1,514 individuals who completed a telephone interview in Wave 1, a total of 1,230 individuals completed a face-to-face interview, for a longitudinal response rate of 81%. Several "non-response analyses" were conducted to examine the characteristics of respondents vs. non-respondents, and these indicated that completion of the Wave 2 interview was largely unrelated to cognition (Word Recall and Serial 7s performance in the telephone interview), Age, Gender, Race, Dyad status, and overall self-rated health status ($p > .05$). Educational level was considered statistically significant in some analyses. Among the 1,230 individuals who completed a Wave 2 interview, 1,224 were eligible for Wave 3. (Six of the original CogUSA participants were, by coincidence, also HRS participants and excluded from future waves in order to not overburden HRS panel respondents.)Wave 3 interviews were completed with 1,125 respondents, for a new unadjusted longitudinal response rate of 92%. Another non-response analysis comparing those who completed a Wave 3 telephone interview vs. those who completed a Wave 2 FTF interview but did not complete a Wave 3 telephone interview indicated no bivariate differences by Age, Gender, or Race. However, those who completed the Wave 3 interview were more highly educated and more likely to be a member of a dyad compared to those who did not complete a Wave 3 telephone interview.

Sample Weights

Sample weights for use with the CogUSA data were constructed to post-stratify the CogUSA Wave 1 sample to the HRS. Multiple steps were taken to construct the sample weights. First, we constructed base weights using the probability of selection into the sample from the set of 28 primary sampling units used for deriving the national CogUSA sample. Second, the sample of Wave 1 CogUSA participants was compared to the sample of HRS 2004 participants. The 2004 wave of the HRS was selected as the basis for comparison because both groups of individuals were based on the same age of eligibility (i.e., age 51 or older in the year in which their first interview was conducted). Because we found that participants in CogUSA had more years of education, were more likely to be female, and were more likely to reside in an urban area when compared to the HRS sample, the post-stratification to the HRS 2004 wave was based on these three factors (education, gender, and urban/rural status).

Figure 1: Fieldwork Timing of the Cognition Study



CogUSA Survey Content

Wave 1 Telephone Survey

The Wave 1 telephone survey (average length = 37.8 minutes) includes questions taken from HRS 2006 as well as a few new cognitive tests developed for telephone administration (following the lead of Boker & McArdle, 1998). The HRS measures were primarily included to provide respondents with a context similar to what is in the HRS. Data from the Wave 1 telephone survey include basic demographics, self-rated health status (health and depressive symptoms) and cognitive variables. The cognitive measures include the HRS Episodic Memory and Mental Status questions, Numeracy, and a few brief cognitive measures designed to assess fluid reasoning, including a telephone adaptive version of the Woodcock-Johnson III (WJ-III) Number Series test, and WJ-III retrieval fluency. (For more information on the HRS cognition measures, see Ofstedal, Fisher, & Herzog, 2005; McArdle, Fisher & Kadlec, 2007; McArdle, 2010a, 2010b). The final questions in the interview were designed to create an easy ending to the interview. We asked about respondents' (a) political orientation, (b) whether the respondent regularly uses the internet, and about their (c) favorite pizza topping.

Wave 2 Face-to-Face Interview

The Wave 2 face-to-face interview took an average of 180.85 minutes. Wave 2 content included:

I. An **extensive cognitive battery**, which included:

1) The *STOP and GO switching task* to measure attention, reaction time, processing speed, task switching, and inhibitory control. This is a speeded auditory task previously used in MIDUS (Tun & Lachman, 2006).

2) A speeded *vigilance task* (McArdle & Woodcock, 2006) to measure attention and processing speed, based on the well-known task of "crossing out As." Participants were first presented with an 8.5 x 11 inch sheet of paper printed with rows of numbers. Participants were instructed to locate a specific number (7) each time it appeared and say the number which came after this number in the series. The second trial was similar but consisted only of letters. Participants found a specific letter (G) and reported the name of each letter that came immediately after this letter. In the third trial, participants were presented with a sheet of paper printed with numbers and letters and were asked to locate the number or letter after a specific letter and the number or letter after a specific number. This test was included as a potential telephone test.
3) A number of tests from the *Woodcock Johnson Psychoeducational Test Battery* (WJ-III; Woodcock, McGrew, & Mather, 2001; Woodcock & Mather, 2001)
    a. *Number Series* – intended to measure quantitative reasoning. This ability involves reasoning with concepts that depend upon mathematical relationships. The task requires the Respondent to look at a series of numbers with a number missing from the series. The Respondent must determine the numerical pattern, and then provide the missing number in the series.
    b. *Retrieval Fluency* – intended to measure an aspect of long-term retrieval. This test measures fluency of retrieval from stored knowledge. The Respondent is asked to name as many examples as possible from a given category within a 1-minute time period. The task consists of three different categories: things that are blue, animals, and things that are round. (This is very similar to the task in the telephone interview, except that the categories are different, and the time limit is longer in the Wave 2 in-person interview.)
    c. *Verbal Analogies* – intended to measure the Respondent's ability to reason using lexical knowledge. The task requires listening to three words of an analogy and then completing the analogy with an appropriate fourth word.
    d. *Spatial Relations* - intended to measure the Respondent's visual-spatial thinking. This visualization-of-spatial-relationships task requires the Respondent to identify the two or three pieces that form a complete target shape. The difficulty increases as the drawings of the pieces are flipped, rotated, and become more similar in appearance.
    e. *Picture Vocabulary* - intended to measure the Respondent's aspects of lexical knowledge. The task requires the person to identify pictures of familiar and unfamiliar objects by naming or pointing to the items. The items become increasingly difficult as the selected pictures appear less frequently in the environment or represent less familiar concepts.
    f. *Auditory Working Memory* - intended to measure the Respondent's short-term auditory memory span. It can also be classified as a measure of working memory or divided attention. The Respondent is asked to listen to

a series that contains digits and words, such as "dog, 1, shoe, 8, 2, apple." The Respondent then attempts to reorder the information, repeating first the objects in sequential order and then the digits in sequential order. This task requires the ability to hold information in immediate awareness, divide the information into two groups, and shift attentional resources to the two new ordered sequences.

g. *Visual Matching* - intended to measure the Respondent's processing speed. More specifically, it is a measure of perceptual speed. This task measures an aspect of cognitive efficiency—the speed at which an individual can make visual symbol discriminations. The Respondent is asked to locate and circle the two identical numbers in a row of six numbers. This task proceeds in difficulty from single-digit numbers to triple-digit numbers and has a 3-minute time limit.

h. *Incomplete Words* - intended to measure the Respondent's auditory processing abilities. The test measures auditory analysis and auditory closure, aspects of phonemic awareness and phonetic coding. (After hearing, from an audio recording, a word that has one or more phonemes missing, the Respondent is asked to identify the complete word.)

i. *Concept Formation* - intended to measure the Respondent's fluid reasoning. This controlled-learning task involves categorical reasoning based on principles of inductive logic. This task also measures an aspect of executive processing—flexibility in thinking when required to shift one's mental set frequently. Unlike some concept formation tasks that require a Respondent to remember what has happened over a series of items, this test does not include a memory component. The Respondent is presented with a complete stimulus set from which to derive the rule for each item. With the exception of the last items, the Respondent is given immediate feedback regarding the correctness of each response before a new item is presented.

j. *Calculation* - intended to measure the Respondent's math achievement or the ability to perform mathematical computations. The initial items in Calculation require the individual to write single numbers. The remaining items require the person to perform addition, subtraction, multiplication, division, and combinations of these basic operations, as well as some geometric, trigonometric, logarithmic, and calculus operations. The calculations involve negative numbers, percents, decimals, fractions, and whole numbers. Because the calculations are presented in a traditional problem format in the Test Record form, the person is not required to make any decisions about what operations to use or what data to include.

k. *Word Attack* - intended to measure the Respondent's skill in applying phonic and structural analysis skills to the pronunciation of unfamiliar printed words. The initial items require the individual to produce the sounds for single letters. The remaining items require the person to read aloud letter combinations that are phonically consistent, or regular, patterns in English orthography but are non-words or low-frequency

words. The items become more difficult as the complexity of the non-words increases.

4) The *Wechsler Abbreviated Scale* of Intelligence (WASI; Wechsler, 1999)
   a. *Vocabulary* - intended to measure the Respondent's expressive vocabulary, verbal knowledge, and fund of information. It also taps other cognitive abilities, such as memory, learning ability, and concept and language development.
   b. *Block Design* - intended to measure the Respondent's abilities related to spatial visualization, visual-motor coordination, and abstract conceptualization. It is a measure of perceptual organization and general intelligence. The Respondent uses blocks to replicate two-color designs within a specified time limit. The 13 designs progress in difficulty from simple designs requiring two blocks to more complex designs requiring nine blocks.
   c. *Similarities* - intended to measure the Respondent's verbal concept formation, abstract verbal reasoning ability, and general intellectual ability.
   d. *Matrix Reasoning* - intended to measure the Respondent's nonverbal fluid reasoning and general intellectual ability.

II. **Need for Cognition** (NCOG) -- This is considered an individual difference variable, and was defined by Cacioppo and Petty (1982, p.116) as "the tendency for an individual to engage in and enjoy thinking. Studies by Cacioppo and colleagues (e.g., Cacioppo & Petty, 1982; Cacioppo, Petty, Feinstein, & Janis, 1996) have posited that individuals high or low in need for cognition make sense of their world and approach problem solving differently. For example, individuals high in need for cognition think about things, seek, acquire, and reflect on information, whereas those low in need for cognition prefer to obtain information from other sources, including other people, by making social comparisons, or using cognitive heuristics, rather than figuring things out for themselves.

We measured NCOG in this study using the 18-item short form measure validated by Cacioppo, Petty, & Kao (1984). Participants responded to each item using a 5-point Likert-type response scale ranging from Strongly Disagree to Strongly Agree.

III. **Big Five personality traits** - Personality refers to relatively stable characteristics of thought, affect, and behavior. In this study, we conceptualized personality in terms of the Big Five model of personality, which describes five broad personal traits: conscientiousness (being goal-directed, organized, and detail-oriented), agreeableness (having a tendency to get along easily with others), extroversion (enjoys social engagement and interacting with others), openness to experience (willing to try new things), and neuroticism (having a tendency to worry a lot).

These five characteristics were measured via self report with the 44-item *Big Five Inventory* (BFI; John & Srivastava, 1999). Participants indicated the extent to which he/she agreed with a series of statements that describe him/herself using a 5-point Likert-type response scale ranging from Strongly Disagree to Strongly Agree.

IV. **Risk-Taking** was based on 5 questions -- in general, when driving a car, in financial matters, in leisure or sports activities, health risks)

V. In addition to these measures, information was collected regarding occupation and industry and assessments of sensory abilities (vision and hearing) were performed.

Wave 3 Telephone Survey

The Wave 3 telephone survey content primarily replicated the Wave 1 telephone survey, except where it did not make sense to ask the same information a second time and where new content was added to take its place. The average interview length for the Wave 3 telephone interview was 33.52 minutes and included confirmation of the respondent's marital status and residence type and a replication of the cognitive measures administered in Wave 1 (HRS episodic memory and mental status questions, depressive symptoms, numeracy, and a few brief cognitive measures designed to assess fluid reasoning, including a telephone adaptive version of the Woodcock-Johnson III (WJ-III) Number Series test, and WJ-III retrieval fluency). (For more information on the HRS cognition measures, see Ofstedal et al., 2005). Health status was updated and a section examining expectations and subjective probabilities as well as a section examining Medicare decision making were added.

IV. CogUSA Data Files

Although we have just entered the initial stages of new data analysis on this project, we have placed most of the key variables and measures in a public-use dataset at the ICSPR for others to use. We assume that any investigator who is interested in more detailed data or formats will contact the study coPIs. The CogUSA archive at ICPSR consists of two files. The first file (track_20120924_pub) contains basic demographic information about the CogUSA respondents as well as information related to the administration of the interview. The second (allscores_20111207_pub) contains scores calculated for each of the cognitive tests administered to the respondents in each of the three waves. The two data files can be linked using the 'sampid' variable. Information regarding the individual variables can be found in the corresponding codebooks.

Three different types of scores have been calculated, labeled *p*-score, *t*-score and *w*-score. The *p*-score was calculated as the percent of all items answered correctly. The *t*-score was calculated for the WASI tests because a table of T-scores was available. The *w*-score was based on a Rasch model where the item difficulty was considered known and the ability to answer correctly was converted to a log scale (see Woodcock, 1977; Baker, 2002). Of course, it is the user's responsibility to determine which scoring system is most appropriate for any given analysis depending on the purpose of the analysis.

Two separate validity reviews were carried out on these data. In the first review, interviewer notes were thoroughly reviewed to determine whether any issues or problems were encountered during the administration of each test. For example, interviewers noted

whether a respondent had any hearing or visual impairment which affected the administration of the test. Interviewers also noted whether other problems occurred, including technical problems or interruptions which could impact the validity of a score (e.g., an interruption during a speeded test). In the second review, each test was examined for adherence to the rules of administration for that particular test, proper flow through the test, refusal patterns, and basal criterion.

Results of the first review are contained in a series of variables named "x_valid" and "x_validtype." The "x_validtype" variables list the specific reason the test was considered invalid. Results of the second review are contained in a series of variables named "x_flag." As not every condition noted in the second review is deemed significant enough to invalidate the entire test, the variable is considered a "flag". The series of variables "x_use" consolidates the information gathered from the two reviews. All tests determined to be invalid in the first review (x_valid=0) as well as those tests considered to have significant administration problems (x_flag in (1,2,5,7,8)) are coded "0" on the corresponding "x_use" variable, denoting that the test should not be included in primary analyses.

V. CogUSA Data Analysis

As they become available, sample code for specific types of analyses will be made available.

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