AGING BRAIN COHORT STUDY @UofSC

Initial Questionnaires
Participant Health History (Sociodemographic data and self-reported health) (age, race, language proficiency, marital status, handedness, education, income, employment status)
BRFSS 2009 Section 11 Tobacco use
BRFSS 2009 Section 15 Alcohol Consumption
NHIS Dietary Screener
Food Security Supplement-CPS-FSS
Lifetime Discrimination Subscale of the Perceived
Pittsburgh Sleep Quality Index (PSQI)
Physical Activity Scale for the Elderly (PASE)
IPAQ Short Form (self-administered)
PROMIS 57 Profile V20
Speech, Spatial, and Qualities of Hearing Scale (SSQ-12)
Adult Reading History Question-Revised
Satisfaction with Life Scale
Pearlin Mastery Scale (Problem coping skills)
Social Relationships
Collective Efficacy Scale (Ability to work together)
PROMIS SF V20 Emotional Support 8a
PROMIS SF V20 Instrumental Support
PROMIS SF V20 Ability to Participate Social Roles and Activities 8a
PROMIS SF V20 Social Isolation 8a
Quality of Life Inventory (QOLI)
Activities-specific Balance Confidence (ABC) Scale (paper form)

Speech/Language/Cognition (including subtests from NIH Cognition Battery)	
Small et al. Sentence Repetition	Sentence repetition ability can be used to identify adults as well as children with developmental language disorder (cf., Poll, Betz, & Miller, 2010). Sentences are scored by initial, medial and clausal phrases and then additionally scored by the following sentence types: active, passive, object-subject, object-object, subject-subject, and subject-object. Small, J. A., Kemper, S., & Lyons, K. (2000). Sentence repetition and processing resources in Alzheimer's disease. *Brain and Language*, *75*(2), 232-258.
Comprehensive Test of Phonological Processing, 2nd Edition (CTOPP 2)-nonword repetition subtest	(Wagner, Torgesen, Rashotte, & Pearson, 2013). Nonword repetition is a proposed clinical marker of both DLD and dyslexia. For this task, participants listen to some made-up words and are instructed to say it exactly as they hear it as clearly as they can. Feedback is stopped after item #9 and then testing is stopped after 3 incorrect responses in a row.

Self-paced reading task	The SOAP syntactic battery is composed of sentences targeting reversible actions with Active, Passive, Subject-Relative, and Object-Relative constructions. Participants are presented with sentences in 4 separate parts advancing to each part of the sentence at their own rate. The participant then answers a yes or no question based on the sentence they just read answering with a keyboard response.
Montreal Cognitive Assessment (MoCA) Version 8.1 English	The MoCA is a screening tool for individuals with mild cognitive dysfunction. The test assesses 8 domains of cognitive functioning: attention and concentration, executive functions, memory, language, visuoconstructional skills, conceptual thinking, calculations, and orientation.
Boston Diagnostic Aphasia Examination- Cookie Theft picture description	The participant will be presented with the "Cookie Theft" picture and will be instructed to, "Tell me everything you see going on in this picture." This task is recorded for later transcription and analysis.
"Cat Rescue" discourse measure from the AphasiaBank Non-Aphasia Control protocol	The participant will be presented with the "Cat Rescue" picture and the clinician will say, "Here is another picture. Look at everything that's happening and then tell me a story about what you see. Tell me a story with a beginning, a middle, and an end." This task is recorded for later transcription and analysis.
Peer Conflict Resolution (PCR) discourse measure	To introduce the task, the clinician will read the following statement aloud to the participant (adapted from Selman et al., 1986, p. 459): "People are always running into problems with others at school, at work, and at home. Everyone has to work out ways to solve these problems. I am going to read you a story that illustrates one of these problems. I would like you to listen carefully and be ready to tell the story back to me, in your own words. Then I will ask you some questions about the story. There are no penalties for incorrect answers. I just want to know what you think about the issues and how they should be handled. This task is recorded for later transcription and analysis."
Vowel Production Task	Participants read monosyllabic American-English words aloud. Six American-English vowels are presented embedded in /hVC/ context (/i ɛ æ ɑ ʌ u/: 'heat, head, hat, hot, hub, and hoot'). Stimuli are presented in written form on a computer screen, with 15 presentations per stimulus type. Participant responses will be recorded and analyzed using Praat software (Boersma, 2001). Vowel formant measures are used to calculate (1) formant centralisation ratio, a measure of individual vowel space, and (2) formant dispersion, a measure of articulatory stability.
NIH Toolbox- Flanker Inhibitory Control and Attention Test 12+	Assesses the allocation of one's limited capacities to deal with an abundance of environmental stimulation.

(attention & executive functioning)	
NIH Toolbox-Picture Sequence Memory Test 8+ *(episodic memory)*	Measures cognitive processes involved in the acquisition, storage and retrieval of new information.
NIH Toolbox-List Sorting Working Memory Test 7+ (working memory)	Measures the ability to store information until the amount of information to be stored exceeds one's capacity to hold that information.
NIH Toolbox- Oral Reading Recognition Test 3+ (language)	Measures reading decoding skill and crystallized abilities. Participant is asked to read and pronounce letters and words as accurately as possible.
NIH Toolbox-Pattern Comparison Processing Speed 7+ (processing speed)	Assesses the amount of information that can be processed within a certain unit of time. Items are simple so as to purely measure processing speed.
Auditory Verbal Learning Test 8+ subdomain (immediate recall)	Measures immediate recall. Unrelated words presented via audio recording and participant recalls as many as possible.
NIH Toolbox- Oral Symbol Digit Test subdomain (processing speed)	Measures speed of processing. Symbols on the screen are associated with a number, then presented with symbols without numbers.
Auditory	
Audiometric thresholds	Audio thresholds (L and R ear) are captured utilizing the Amplivox 170 audiometer using the automatic testing setting. Settings: familiarization is on and set at 2/3 correct responses. Manual testing is completed if a specific frequency is missing. Frequencies measured include: 250hz, 500hz, 1000hz, 2000hz, 3000hz, 4000hz, 6000hz, and 8000hz.
NIH Toolbox Words in Noise 6+	Measures a person's ability to recognize single words amid varying levels of background noise, measuring difficulty a person might have hearing in a noisy environment. A recorded voice tells the participant to listen and repeat words. Background noise gets louder, reducing the signal-to-noise ratio.
University of California- Riverside Brain Game Center UCR-BGC: Spatial Release App	Spatial Release is a novel hearing assessment designed to address symptoms of auditory dysfunction related to hearing in noisy environments; in particular understanding a talker in an environment populated by other talkers. This procedure is based upon a speaker-on-speaker task developed by Gallun et al (Frontiers in Neuroscience, 2013) and can measure auditory thresholds for speech

	alone, speech in the presence of other talkers and the exert to which spatial auditory cues can rescue speech comprehensibility in the presence of other talkers. Studies using this task have shown that it can dissociate effects of age from those of hearing loss. Data captured: Single Talker (Left): Adaptive Single Talker (Right): Adaptive Co-Localized (Progressive) Separated (Progressive)
NIH Motor Battery	
Standing Balance	Measures individual's ability to orient their body in space, maintain an upright posture under both static and dynamic conditions, and move and walk without falling.
Grip Strength	The capacity of a muscle to produce the tension and power necessary for maintaining posture, initiating movement, or controlling movement during conditions of loading the musculoskeletal system.
4-Meter Walk Gait Speed	Measures locomotion. Participants walk a short distance at their usual pace, completing one practice and two-timed trials. Scores are recorded as time in seconds required to walk 4 meters on each of two trials, with the better trial used for scoring.
9-Hole Pegboard Dexterity	Measures hand/finger fine motor skills.
NIH Sensation Battery	
Odor Identification	Assesses the ability to detect odors, recognize and discriminate odor qualities, and identify the sources of odors in our world.
Visual Acuity	Measures distance vision. Participants are seated 3 meters from the screen and letters are displayed one at a time. As the participant successfully identifies letters of a given size, smaller ones appear, until the software ascertains the smallest size the participant can successfully see.
NIH Emotion Battery 18+	

Negative Affect		
	Anger	Attitudes of hostility and cynicism often associated with experiences of frustration impeding goal-directed behavior.
	Fear	Symptoms of anxiety that reflect autonomic arousal and perceptions of threat.
	Sadness	Low levels of positive affect; comprised of symptoms that are primarily affective (poor mood) and cognitive (negative perceptions of self, the world, and the future) indicators of depression.
Psychological Well-Being		
	Positive Affect	Feelings that reflect a level of pleasurable engagement with the environment, such as happiness, joy, excitement, enthusiasm, and contentment.
	General Life Satisfaction	One's cognitive evaluation of life experiences and whether one likes his/her life or not.
	Meaning & Purpose	The extent to which people feel their lives matter or make sense.
Stress & Self-Efficacy		
	Perceived Stress	Individual perceptions about the nature of events and their relationship to the values and coping resources of an individual.
	Self-Efficacy	A person's belief in his/her capacity to manage functioning and have control over meaningful events.
Social Relationships		
	Social Support	The perception that people in one's social network are available to listen to one's problems with empathy, caring, and understanding.
	Companionship	Perceptions that one is alone, lonely, or socially isolated from others and perceptions of the availability of friends or companions with whom to interact or affiliate.
	Social Distress	The extent to which an individual perceives his/her daily social interactions as negative or distressing. This can include aspects of perceived hostility and perceived insensitivity.
Physiological measurements (collected using the Pulse Wave Analysis on Sphygmocor XCEL device)		

Brachial blood pressure	
Aortic blood pressure	
Heart rate	
Augmentation Pressure (AP)	
EEG Testing	
Rest	Participant fixates on a centrally presented cross ('+') for 3 minutes with eyes open, and then rests with eyes closed for an additional 3 minutes.
Visual Evoked Potential	Alternating visual stimuli (checkerboard pattern) are presented on the screen (⅓ centrally presented circular checkerboard, ⅓ left lateralized half-circle checkerboard, ⅓ right lateralized half-circle checkerboard) while the participant is instructed to focus on a centrally presented red fixation dot.
GoGoNogo task	Computerized test used to assess inhibitory control, a cognitive process that enables humans to rapidly cancel motor activity even after its initiation. Participants press a button in response to common go (centrally presented gray circle) and uncommon go (centrally presented yellow circle) stimuli, while withholding responses to uncommon nogo (centrally presented blue circle) stimuli.
Stroop Test	A neuropsychological test extensively used to assess the ability to inhibit cognitive interference that occurs when the processing of a specific stimulus feature impedes the simultaneous processing of a second stimulus attribute, well-known as the Stroop Effect. Participants press one of four buttons (corresponding to red, yellow, green and blue) based on the COLOR of the word that appears. ½ incongruent trials, ½ congruent trials.
Oral Reading/naming	Participants are presented with real words, non-words and pictures. Participants are instructed to read the words aloud and name the nouns/actions represented by the pictures. Responses are recorded and the initiation of response time is also captured.
Passage (English/foreign language)	Participants are instructed to actively listen to a story or series of sentences in English and in a foreign language. The participant then answers 4 multiple-choice questions at the end based only on the English passage or series of sentences.
Blood panel/genetics	

Blood draw and buccal swab are collected for further analysis.

BLOOD:

HbA1c (blood glucose measure), **TSH** [Free thyroxine index; T3 uptake (THBR); thyroid-stimulating hormone (TSH); thyroxine (T4)], **CMP** [Alanine aminotransferase (ALT/SGPT); albumin:globulin (A:G) ratio; albumin, serum; alkaline phosphatase, serum; aspartate aminotransferase (AST/SGOT); bilirubin, total; BUN; BUN:creatinine ratio; calcium, serum; carbon dioxide, total; chloride, serum; creatinine, serum; eGFR calculation; globulin, total; glucose, serum; potassium, serum; protein, total, serum; sodium, serum], **CBC with Differential** [Hematocrit; hemoglobin; mean corpuscular volume (MCV); mean corpuscular hemoglobin (MCH); mean corpuscular hemoglobin concentration (MCHC); red cell distribution width (RDW); percentage and absolute differential counts; platelet count (RBC); red cell count; white blood cell count (WBC)], **B12** (available @ participant 58 only!)

GENETICS:

Akesogen Global Screening Array (*Data from first 96 participants expected to be available Fall, 2020)

MRI

ABC@UofSC MRI SEQUENCE PROTOCOL (

PREPROCESSING:

All data are preprocessed using our custom nii_preprocess pipeline:
https://github.com/neurolabusc/nii_preprocess
This pipeline generates a single .mat file (~35 mb each) for each participant containing data from all modalities.
Relationships between various brain measures (below), and behavioral data (above) can be assessed using our in-house analysis program NiiStat: https://www.nitrc.org/projects/niistat/
Exact details regarding sequence parameters, order of data collection, and data preprocessing available on request from Roger D. Newman-Norlund (rnorlund@mailbox.sc.edu)

STRUCTURAL:

anat_T1 (high-resolution structural image)
anat_T2_FLAIR (high-resolution structural image)
DWI_AP - diffusion weighted image (FA, MD, Connectivity and DKI measurements are extracted. ROI-based connectivity matrices provided for the atlases listed below.)
DWI_PA - (used to unwarp DWI Images)

functional MRI:

fMRI_fam (more/less familiar words and pictures are presented for 8 minutes)
fMRI_pass (participants listen to English (360 sec) and non-English (100 secs) speech, .mat file includes contrasts English>Foriegn)
Rest_fMRI_AP (eyes-closed scan, *identical protocol to POLAR rsfMRI. ROI-based rsConnectivity matrices are provided for the atlases listed below)
Rest_fMRI_PA (used to unwarp rsfMRI images)

OTHER:

anat_SWI - (susceptibility-weighted image suitable for detection of microbleeds)
asl_ep2d_PCASL - Processed with FSL's BASIL to extract regional cerebral blood flow measure

asl_ep2d_PCASL_pa asl_ep2d_PCASL_PA - (used to unwarp ASL images)

Atlases: JHU, FOX, AAL, AAL-CATANI, AICHA