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The Efficacy and Feasibility of Neuropsychological Services in a Primary Care Setting

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THE EFFICACY AND FEASIBILITY OF NEUROPSYCHOLOGICAL SERVICES IN A PRIMARY CARE SETTING

by

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ABSTRACT

Integrated primary care assimilates psychologists into the primary care setting, thus improving health outcomes and physician satisfaction. Neuropsychology has also begun to assimilate into primary care, as neurocognitive impairment is a correlate of many medical disorders. Subjective cognitive decline (SCD), a common complaint among older adults, is an increasingly recognized warning sign of non-normative cognitive aging. These patients typically present first to their primary care providers who may play a critical role in the early detection of cognitive impairment. Given the growing awareness about cognitive health and disability, the importance of neuropsychological assessment as a standard component of integrated care has been recognized by providers. Thus, the purpose of this study is to examine the efficacy and feasibility of neuropsychological services, for memory concerns, in a community primary care setting. The study also explored the relationship between SCD and performance on neurocognitive measures and satisfaction levels for both patient participants and medical providers. A total of 16 patient participants completed the study. On average, patients were in their late-60's and mostly female and Caucasian. Participants completed a brief interview, neurocognitive evaluation, self-report measures of SCD and mood, and satisfaction survey. Results did not reveal significant correlations between SCD and neurocognitive performance. Significantly more referrals were made to the onsite neurocognitive clinic, than were made for outside services in a nine-month period preceding the described program. Patients referred to the onsite clinic were also significantly more likely to have an accessible report located in their EMR than those referred offsite. Both participants and medical providers were reportedly satisfied with

clinic services. Results suggest that a clinic of this nature has promising benefits and is well-liked by both patients and providers, though barriers related to full utilization of services remain a challenge. Further research with a larger, more diverse sample is recommended.

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CHAPTER 1: INTRODUCTION

Integrated Primary Care (IPC) assimilates psychologists into the primary care setting to collaborate and work alongside primary care providers (James, 2006). Traditionally, primary care refers to the provision of integrated and accessible health care services by providers who address a large majority of personal health care needs, develop a sustained partnership with patients, and practice in the context of family and community. Behavioral health typically refers to the broad area of mental health and substance abuse conditions as well as health behaviors (including their influence to chronic medical illnesses), life stressors, and physical symptoms related to stress. Therefore, primary care and behavioral health integration is defined as "the care that results from a practice team of primary care and behavioral health clinicians, working together with patients and families, using a systematic and cost-effective approach to provide patient-centered care for a defined population," (Peek, 2013; Vogel, Kanzler, Aikens, & Goodie, 2017). While IPC is a relatively new field of practice, it is constantly evolving to adapt to the needs of the patient-centered medical home. Given its early stages, research in IPC remains limited; however, current research has explored common referral questions related to depression, anxiety, and Attention-Deficit/Hyperactivity Disorder (Craig, 2015), and more recently, the role of neuropsychological assessment in primary care (Kubu, Ready, Festa, Roper, & Pliskin, 2016; Michels, Tiu, & Graver, 2010).

Changes in an individual's cognitive abilities can be seen across the lifespan. Broadly, cognitive abilities decline between one and two standard deviations between twenty and seventy years of age (Anstey & Low, 2004; Salthouse, 2009, 2012). The extent of age-associated

cognitive decline differs among individuals and can generally be delineated into normative, or non-pathological cognitive aging, and pathological cognitive aging (Deary & Der, 2005; Park, Polk, Mikels, Taylor, & Marshuetz, 2001; Raz et al., 2005). However, individual trajectories of cognitive aging can vary widely and are affected by numerous lifestyle and idiographic factors including components such as diet, neurobiological changes, genetics, overall general health, cerebrovascular factors such as atherosclerotic disease, and biological processes such as inflammation, and other medical factors (Deary et al., 2009). Clinical neuropsychology has emerged as one strategy to characterize the broad heterogeneity in the presentation, etiology, and prognosis of cognitive impairment in clinical populations of older adults.

Clinical Neuropsychology

Clinical neuropsychology is an "applied science concerned with the behavioral expression of brain dysfunction" (Lezak, 2004, p. 7). In addition, the National Academy of Neuropsychology's (NAN) definition of a clinical neuropsychologist, stipulates that a clinical neuropsychologist possesses expertise in brain–behavior relationships (Barth et al., 2003). Clinical neuropsychologists use this knowledge in the assessment, diagnosis, treatment, and rehabilitation of individuals with neurological, medical, or neurodevelopmental conditions, as well as other cognitive and learning disorders (Barth et al., 2003; Lezak, 2004). In order to evaluate an individual's neurocognitive strengths and weaknesses, as well as components of emotional and behavioral functioning, neuropsychological assessment utilizes a combination of psychological, neurological, cognitive, behavioral, and physiological tests. An individual's performance is then compared to others of similar age, gender, and education level to better

understand the relationship to normal and abnormal cognitive and/or central nervous system functioning (Barth et al., 2003; Lezak, 2004).

The goals and benefits associated with neuropsychological assessment may differ as a result of the referral question. For example, the goal of establishing probable localization, lateralization, and etiology of a brain lesion may be best suited to aid with surgical interventions for epilepsy surgery or deep brain stimulation, whereas identifying an individual's neuropsychological and neurobehavioral profile may most aid in distinguishing between normal cognitive aging and atypical cognitive aging or between varieties of dementia (Lezak, 2004; Michels et al., 2010). Broadly speaking, though, neuropsychologists assess brain function and impairment by drawing inferences from performance on objective test measures. Tests that examine neuropsychological functioning are often able to identify subtle cognitive deficits that may not be detected by electro-physiological or imaging methods. Performance on these assessment measures are subsequently used to inform clinical decision making, planning, and monitoring the outcomes and effects of treatment (Lezak, 2004; Michels et al., 2010). Additionally, the assessment of an individual's cognitive capacities and potential deficits aids in elucidating real-world resources and limitations. Neuropsychological services may also function to improve an individual's overall quality of life through cognitive rehabilitation (cognitive skills, judgment, and decision making). A review of the literature has demonstrated benefit in treating these deficits among stoke and traumatic brain injury (TBI) (Cicerone et al., 2005; Stephens, Williamson, & Berryhill, 2015)

Integrated Primary Care

As noted above, IPC works to assimilate psychologists into the primary care setting, so that they are better able to collaborate and work alongside primary care providers (James, 2006). Integrated primary care and its subsequent benefits have been illustrated with a five-component model that includes components of collaboration, access to care, satisfaction, quality treatment, and reduced costs (James & O'Donohue, 2009).

Collaboration. Integrated primary care aims to create an environment that is conducive to collaboration of providers. This collaboration is fostered by co-locating primary care and mental health in the same facility, as well as encouraging an integrated treatment approach (James, 2006; James & O'Donohue, 2009). The aim of IPC treatment is to develop one comprehensive treatment plan in which providers contribute their area of expertise (A. Blount, 2003). The emphasis on collaboration in IPC is in accordance with the movement towards a patient-centered medical home (PCMH) as supported by The Agency for Healthcare Research and Quality. Both IPC, as well as a PCMH intends to provide comprehensive, coordinated, and quality patient-centered care. IPC also minimizes lack of communication between medical and mental health providers as they utilize the same location and medical record systems (Peikes, Zutshi, Genevro, Parchman, & Meyers, 2012).

Access to care. Approximately 25% of adults visiting their PCP have a psychiatric disorder, and yet close to half of these cases go undetected (Roy-Byrne & Wagner, 2004). Onsite behavioral health providers can aid in improving detection rates and implementing prevention and early intervention. Integrating mental health services into the medical home, may reduce the stigma associated with mental health and thus, patients may be more receptive to services (Craig,

2015). IPC can also help identify and treat populations experiencing mental health problems that may not otherwise seek or receive treatment. In traditional primary care settings, about 40% of patients are referred to specialty mental health, with only 10% of those individuals attending their first appointment (LaBrie et al., 2007). Whereas, an integrated primary care psychologist can increase access and follow-through rate, such that, of the roughly 70% of patients referred to attend behavioral health treatment, about 54% attend their first appointment (Miller-Matero et al., 2015).

Satisfaction. Several studies have demonstrated increased satisfaction ratings among both patients and providers within an integrated primary care setting (Chen et al., 2006; Farrar, Kates, Crustolo, & Nikolaou, 2001). Past research has indicated that while physicians recognized the need for addressing the emotional well-being of patients, they also reported encountering difficulties with the referral process, as a result of the stigma often associated with psychiatry as well as lack of follow-through by patients (James, 2006; Morgan & Killoughery, 2003). A recent survey of family physicians found that those who had access to mental health services onsite reported a higher level of satisfaction and also identified increased communication, collaboration, and access to treatment as benefits of having mental health providers onsite (Kates, Fugere, & Farrar, 2004). Further, it has also been documented that providers feel an increased sense of comfort and confidence when assessing patient's needs with regard to mental health, substance use, and suicide risk when having onsite behavioral health specialists with whom they may consult and collaborate (F. A. Blount & Miller, 2009).

Quality of Treatment. Quality of delivery of healthcare is improved in IPC by also addressing mental health problems, which have been established to be risk factors for many physical health

problems (Prince et al., 2007). With regard to attending to mental health concerns, quality of patient care may be diminished as the process of referring and coordination between medical and mental health professionals can often be lengthy, causing aspects of professional and patient communication, as well as the referral itself, to be left incomplete. Behavioral health specialists can enhance patient care by assisting patients in implementing lifestyle and behavioral changes, including those recommended by their medical providers, to promote better management of chronic conditions and overall health (Miller, Mendenhall, & Malik, 2009). Further, consultation and collaboration among treatment providers under one treatment plan, as opposed to segregated care plans, aids in improving quality of care. Research demonstrates improved treatment outcomes, including decreased symptomatology, in integrated care systems as compared to traditional primary care systems (Hedrick et al., 2003; Zeiss & Karlin, 2008).

Reduced costs. Collectively, depression and other mental illnesses rank as the third highest economic burden resulting from healthcare needs, after hypertension and heart disease (Goetzel et al., 2004). Estimates suggest that the total economic burden of depression is approximately $83.1 billion, 62 percent of which are related to workplace costs (Greenberg et al., 2003). Thus, IPC can aid in facilitating overall reduction in healthcare costs and loss of workplace productivity by addressing mental health needs. Onsite behavioral health specialists can serve to increase medical clinic revenues by billing for patient care as well as alleviating medical providers from spending time on mental health issues, allowing them to see more patients (Miller et al., 2009). Mental health treatment offered through primary care tends to be less expensive for patients compared to specialty mental health services, which are often not covered under insurance (A. Blount, 2003).

Neuropsychology in Integrated Primary Care

Although IPC is a relatively new field of practice, it is continually evolving to adapt to the patient-centered medical home. Given its infancy, research in IPC remains limited; however, more recent research has explored the role of neuropsychology in primary care (Kubu et al., 2016; Michels et al., 2010). Neurocognitive impairment is a correlate of medical disorders, including liver disease, kidney disease, cardiac disease, and even more common diagnoses such as diabetes. Additionally, cognitive impairment has been identified as a barrier to successful treatment, because it adversely impacts a patient's capacity to execute complex medical orders, maintain medication compliance, and provide appropriate information to medical staff. Given this growing awareness about cognitive health and disability has spurred a greater recognition of the value and import of neuropsychological assessment as a standard component of integrated medical care (Block, Johnson-Greene, Pliskin, & Boake, 2017).

While the goals of neuropsychological assessment typically relate to the referral question, generally, neuropsychology can promote functional independence of patients, facilitate diagnosis, and help with patient care and treatment planning (Lezak, 2004). With regard to cognitive screening in primary care, practicing physicians have acknowledged the importance of recognizing and identifying cognitive impairment among their patient population, however, important barriers, such as added visit time, as well as uncertainty in administering diagnostic measures, still exist (Borson et al., 2007; Harvan & Cotter, 2006). Although there is not a singular instrument that has been denoted as the gold standard for cognitive screening, clinician surveys indicate that the Mini-Mental State Examination (MMSE) is the most widely used and recognized instrument in practice. Despite its extensive use, the MMSE has notable limitations

regarding its sensitivity and vulnerability related to education, culture, and language of administration (Cullen, O'Neill, Evans, Coen, & Lawlor, 2007; Shulman et al., 2006). An additional issue related to the MMSE is its ceiling effect, which equates to a limited dynamic performance range for normal individuals. This increases the probability that individuals in pre-dementia stages score within the normal range. The MMSE has been cited for having poor sensitivity for distinguishing mild cognitive impairment (MCI), likely attributed to a lack of complexity as well as the absence of executive function items (Trzepacz, Hochstetler, Wang, Walker, & Saykin, 2015).

The Montreal Cognitive Assessment (MoCA) is another commonly used clinical instrument utilized in the screening of cognitive functioning. Past literature has found the MoCA to have superior sensitivity over the MMSE in detecting MCI. Reasons for this likely include more stringent cognitive assessment criteria such as more words in the memory testing, fewer learning trials, and a longer delay before recall than the MMSE. Additionally, the MoCA utilizes higher-level language abilities and complex visuospatial processing. Overall, the literature indicates that the MoCA's increased sensitivity can be attributed to more numerous and demanding tasks than the MMSE. Nevertheless, it has been noted that the MoCA should only be utilized as a screening tool. The information gained from administering the MoCA should be used to provide quick guidance for referral and further, more comprehensive, investigation of potential cognitive impairment (Larner, 2012; Nasreddine et al., 2005).

While the use of validated cognitive screening tools certainly informs and improves clinical practice for healthcare providers, screening measures were never intended to be used in lieu of neuropsychological evaluation (Kubu et al., 2016; Larner, 2012; Nasreddine et al., 2005;

Temple, Carvalho, & Tremont, 2006). Noted elsewhere, there exist tangible barriers to neuropsychological evaluation, not the least of which is the lengthy waitlist time that is common in urban healthcare centers nationwide and reliance on the process of patient referral and post-evaluation record transmission, particularly with patients who may have cognitive impairment (Borson, Scanlan, Watanabe, Tu, & Lessig, 2006; Kubu et al., 2016; Temple et al., 2006). Ultimately, having access to onsite neuropsychological services may aid in alleviating some of these barriers.

Subjective Cognitive Decline

Identification of candidates for neuropsychological evaluation can result from numerous events – reported concern of a patient's family member, clinical decision making by medical staff, and subjective report of cognitive change, among others. Subjective cognitive decline (SCD) in older adults is increasingly recognized as a possible sign of non-normative cognitive aging, which could eventually progress to a diagnosis of dementia (Rabin et al., 2015; Snitz, Morrow, Rodriguez, Huber, & Saxton, 2008). Recent research has shown an association between SCD and biomarkers as well as neuroimaging markers of Alzheimer's disease (AD), in the absence of objective cognitive dysfunction or depression. Given research supporting SCD as a risk factor for AD in some individuals, the National Institute on Aging–Alzheimer's Association preclinical AD working group has included SCD as a facet, emphasizing its importance in disease detection and prevention (Rabin et al., 2015). Further, the presence of subjective cognitive concerns has been considered to be one of the first symptoms of cognitive impairment,

and as one of the general core and cognitive criteria for the early diagnosis of mild cognitive impairment (Juncos‐Rabadán et al., 2014).

Subjective cognitive complaints are common in older adult patients, who typically present to their primary care providers. Thus, providers located in a primary care setting could play a critical role in the early detection of cognitive impairment. Further, the Alzheimer's Association has recommended cognitive assessment in primary care settings, as a way to aid in reducing the prevalence of missed or delayed dementia diagnoses (Rabin et al., 2015). In a sample of older adult primary care patients (mean age 73.2) Snitz and colleagues (2008) found that self-reports of current memory ability were associated with objective memory performance. Further, in a study of older adult, community-dwelling volunteers, results indicated that 80% of individuals with MCI endorsed subjective memory complaints (De Jager & Budge, 2005).

Subjective cognitive decline is assessed by self-report of cognition. This assessment approach is associated with advantages such as brevity, ease of administration, and low cost. However, past research has documented the disadvantage that, currently, the field lacks a single accepted approach in assessing SCD. These studies have cited the need for additional research to clarify the nature of the questions assessing functioning (present status versus decline), as well as cognitive domains of greatest interest, and optimal items for each domain (Rabin et al., 2015; Snitz et al., 2008).

Proposed Research

The overall purpose of this study was to examine the effectiveness and feasibility of a brief neuropsychological battery, for memory concerns, in a community primary care setting. Specifically, we hypothesized that:

Hypothesis 1: The number of neuropsychological referrals for the onsite clinic would be greater than those made previously for outside referrals (compared on a consistent nine-month timeframe), on account of access to readily available onsite services.

Hypothesis 2: Accessibility of results of neuropsychological evaluations would increase as a result of onsite services. Accessibility was assessed by comparing presence of neuropsychology reports in the UCF Health EMR for those patients who received outside referrals, to the number of such reports for patients referred for integrated neurocognitive assessment.

Hypothesis 3: Scores on the measure of subjective cognitive decline would be significantly correlated with performance on measures of neurocognitive functioning. Specifically, it was hypothesized that SCD scores would correlate with an individual's (Hypothesis 3A) RBANS Total Scale Score, (Hypothesis 3B) RBANS Delayed Memory subscale score, and (Hypothesis 3C) Trails B performance score.

Hypothesis 4: Provider satisfaction with available neuropsychological services would increase as a result of having access to onsite neuropsychological services as measured by scores on the provider survey. Baseline satisfaction levels were measured prior to beginning onsite neuropsychological services and then compared to respondent scores following the completion of the trial period for this onsite clinic.

CHAPTER 2: METHODS

Study Participants

The present study utilized data from both patient participants and medical providers from an outpatient academic medical center.

i. Patient Participants

Participants were recruited from the patient population of an outpatient academic medical center providing both primary and specialty healthcare. Medical providers practicing at this medical center during the course of the study helped to identify patients who may have been experiencing cognitive difficulties (e.g., memory problems). Providers verbally informed patients of the research study and if the patient was interested, entered a referral into the EMR system, which was routed to the study coordinators. Patients could also refer themselves to the study. Once the study coordinator received the patient's information, the patient was then contacted to assess for appropriateness of study inclusion. Inclusion criteria included being 18-years of age or older and demonstrated fluency in English. Prospective participants who had an existing diagnosis of dementia and/or Major Neurocognitive Disorder, Moderate or Severe, were excluded, unless accompanied by their healthcare proxy, who legally held medical power of attorney for the diagnosed individual and agreed to provide consent, while assent was attained from the patient. Additional exclusion criteria included individuals who were actively pursuing litigation related to their neurocognitive functioning and/or previously referred-for neuropsychological services. Patients who consented to participate in the study were then enrolled as participants. Individual assessment services and/or community referrals were

available to patients who did not meet study criteria or who elected not to participate in the study.

Patients that met study criteria were then scheduled for an individual interview and neurocognitive evaluation. During this appointment, they were also given study information, provided informed consent, were interviewed about their cognitive functioning, and completed study questionnaires. After completing the testing session, participants were scheduled for a follow-up session, during which results and recommendations from their evaluation were reviewed. A total of 23 patients were referred for the study. Of those, 4 were unable to be reached and 3 declined services after further information was provided. A total of 16 participants enrolled in and completed the study. All study-related activity took place in the outpatient healthcare clinic and was approved by the University Institutional Review Board and clinic administration.

ii. Medical Providers

Medical providers who were practicing at UCF Health during the study were asked to participate in a provider survey assessing facets of satisfaction related to the availability of neuropsychological services. Both primary care and specialty care providers were invited to participate, including those who practice in cardiology, endocrinology, family medicine, gastroenterology, geriatric medicine, nephrology, neurology, pulmonology, and rheumatology, among others.

iii. Previously referred patients

Participants from UCF Health, who were previously referred for outside neuropsychological services from UCF Health, were also included in the study in order to ascertain the number of referrals made as well as to evaluate the absence or presence of a neuropsychological report contained within their medical record. No other information from their electronic medical record was accessed. Included participants in this subsample consisted of those who received a referral for neuropsychological assessment in the community between February 1, 2017 and October 31, 2017.

iv. Proposed sample size – enrolled participants

A thorough review of the literature suggests that, the practice of clinical neuropsychology is expanding in that there is no longer only limited interaction with other healthcare providers. Previous research has found that the role and value of clinical neuropsychology on integrated care teams is not confined to clinical assessments and has evolved to include a wide range of services provided to a diverse spectrum of healthcare teams (Kubu et al., 2016; Michels et al., 2010). Studies have shown that primary care physicians found neuropsychological services to be useful; integrating information from the neuropsychological evaluation into their patient recommendations as well as physician discharge summaries (Temple et al., 2006). However, despite the well-documented utility of neuropsychological services within an integrated healthcare team, research on the feasibility of these services is lacking. Further, of the available research in this area, most studies do not separate the neuropsychological components (i.e., assessment and treatment) from the complete integrated, multidisciplinary intervention. A study

by Heinemann and colleagues (1995) found that, compared with physical, occupational, and speech therapy, neuropsychological services focused on remediating cognitive deficits resulted in significantly better functional outcomes for patients who had suffered either a traumatic brain injury or spin cord injury. Other studies have supported the fiscal-effectiveness of integrated neuropsychological services on healthcare teams (Aronow, 1987; Wolfs, Dirksen, Kessels, Severens, & Verhey, 2009). Thus, while there are some promising studies examining aspects of integrated neuropsychological services, additional studies are needed to elucidate the feasibility and efficacy of these services within an integrated healthcare team in a community primary care setting.

The number of participants in the sample of clinical service providers was inherently limited by the number of respondents among the UCF medical staff. Other studies that have investigated aspects involving integrated neuropsychological services have had sample sizes ranging from 18 to 55 participants, in populations of individuals with traumatic brain injury (Conneeley, 2012) and HIV-associated neurocognitive disorder (Kamminga et al., 2017), respectively.

Method

v. Feasibility, efficacy, and accessibility

Data investigating the feasibility, efficacy, and accessibility related to the onsite clinic was assessed with various approaches. More specifically, this included an analysis of the number of referrals made for outside neuropsychological services over a nine month period as well as the absence or presence of a neuropsychological report contained within the medical record (no

other information from the medical record was accessed, outside of if a referral was made and investigating whether or not a neuropsychological report had been scanned in and/or attached to their EMR). This data was provided via an honest broker (an individual from the UCF Health IT Team), to maximize the protection of patient PHI.

vi.Patient Participants

Participants who consented to enroll in the study were scheduled for an evaluation and brief interview. The evaluation included testing measures that examined the participant's neurocognitive functioning across domains of attention, language, visuospatial/constructional abilities, immediate and delayed memory, premorbid reading level, confrontation naming, and executive function. Components of current emotional status and perception of cognition were also examined via self-report measures completed by the participant. Once testing was completed, all materials were scored, and a brief report, describing their results and how these results compare to others of similar age, gender, and education level was composed. The primary goal of the report was to allow the participant and/or provider to gain a better understanding of the relationship of the participant's scores to normal and abnormal cognitive performance. All reports were reviewed and signed by a licensed psychologist, prior to being placed in the participant's medical record. Following this, a feedback session with the participant was scheduled, during which results and subsequent recommendations were reviewed, and the participant was given ample time to ask questions for clarification.

Patient satisfaction with onsite clinic services was also measured, This was done with an anonymous survey, to ensure patient confidentiality. The survey assessed components related to

ease of access regarding the onsite clinic, utility of services, adequate acknowledgement of presenting concerns, and helpfulness of feedback and subsequent recommendations. The survey was administered following the feedback session.

vii.Medical Providers

Data assessing provider satisfaction with available neuropsychological services was collected via an electronically distributed anonymous Qualtrics survey. They survey assessed facets of satisfaction related to the availability, utility, and usefulness of services. The survey was administered prior to the beginning of the proposed onsite clinic and again at the end of the trial period for this clinic, in order to better understand satisfaction related to neuropsychological services both before and after onsite services were implemented.

Measures

Demographic Variables. Participants provided information on the following demographic information.

Age. Participants provided their date of birth.

Sex. Participants identified their sex by indicating either male, female, or other.

Ethnicity. Participants identified their ethnicity by indicating one of the following choices: African-American/Black; American Indian/Native Alaskan; Asian/Southeast Asian/Asian-American; Caucasian/European/White; Native Hawaiian/Other Pacific Islander; or Latino(a)/Hispanic.

Level of Education. Participants identified their highest level of education completed.

Existing diagnoses. Participants verified the accuracy of existing diagnoses within their medical records.

Medications List. Participants verified the accuracy of current medications listed within their medical records via verbal confirmation of the listed information.

Assessment Measures.

Repeatable Battery for Neuropsychological Status (RBANS). The RBANS is a brief, individually administered test, which measures attention, language, visuospatial/constructional abilities, and immediate and delayed memory. The RBANS is comprised of 12 subtests, which generate five Index scores as well as a Total Scale score (Duff, Hobson, Beglinger, & O'Bryant, 2010). Research has found the RBANS to be valid and reliable across age ranges and various populations, including neurological populations such as those who have suffered traumatic brain injury (TBI), stroke, and concussion, among others. The RBANS has demonstrated high internal consistency (0.88) and test-retest reliability (Randolph, 1998).

National Adult Reading Test (NART). The NART is a measure of premorbid functioning. It is a reading test comprised of 50 single word items of graded difficulty. The words are irregular, as they contradict typical grapheme-phoneme correspondence rules. The NART has demonstrated high internal consistency, test-retest reliability, and inter-rater reliability (0.90, 0.98, and 0.88, respectively) (Uttl, 2002).

Boston Naming Test-II (BNT-II). The BNT-II is a confrontation naming task, which assesses an individual's ability to retrieve different types of words. Confrontation naming can include pictures of objects, which tests noun retrieval or pictures of actions, which tests verb retrieval. Confrontation naming tasks often are included in clinical testing to detect impairments

in word-finding abilities in individuals with various types of neurologic impairments (Spreen & Risser, 2003). The BNT-II is the most common test of confrontation naming (Kaplan, Goodglass, & Weintraub, 2001). This test requires an individual to identify line drawings of common man-made, as well as naturally occurring, objects. The BNT-II has demonstrated a high test-retest reliability (r = 0.91; (Morris et al., 1989; Welsh-Bohmer & Mohs, 1997).

Reitan Trail Making Test, A and B. The trail making test is administered in two parts; A and B. For Part A, the subject is asked to draw lines connecting consecutively numbered circles on a worksheet. Part B asks that the subject connect consecutively numbered and lettered circles by alternating between the numbers and letters. The test-retest reliability is moderate to high for Part A (r=.36 to .79) and Part B (r=.44 to .89). In addition, inter-rater reliability has been found to be high for both Part A r=(.94) and Part B (r=.90) and content validity has been shown to correlate moderately between Part A and B (Reitan, 1958).

Generalized Anxiety Disorder-7 (GAD-7): The GAD-7 is a self-report measure that assesses severity of symptoms associated with anxiety. The GAD-7 has been found to be a reliable and valid measure across several populations. It produces an overall score with cutoffs to identify points for mild, moderate, and severe symptoms associated with anxiety. The GAD-7 has demonstrated good internal consistency (0.92), test-retest reliability (0.83), procedural validity, and construct validity (Mills et al., 2014).

The Geriatric Depression Scale (GDS). The GDS is a self-report measure of depression in older adults, in which individuals respond in a “Yes/No” format. The GDS was originally developed as a 30-item instrument, however, since its initial version, a 15-item version was developed. The shortened form is comprised of 15 items chosen from the Geriatric Depression

Scale-Long Form (GDS-L). The GDS-15 has been found to have good sensitivity and specificity for detecting depression (88% and 64% respectively), as well as high internal consistency (0.94; (Agrell & Dehlin, 1989; Sheikh & Yesavage, 1986)). Additionally, the GDS has been found to be a useful tool in medical settings, with medically complex patients given that there may be a high level of decreased activity, as well as those with comorbid cognitive impairment (Kieffer & Reese, 2002; Weintraub, Saboe, & Stern, 2007).

Everyday Cognition, Self-Report Form (ECog). The ECog is a multidimensional, psychometrically sound measure of everyday function in older adults. The ECog measures everyday function in multiple domains (memory, language, visual-spatial and perceptual abilities, executive functioning (planning, organization, and divided attention)). The ECog has been found to be a reliable and valid measure across groups of normal aging, those with mild cognitive impairment, and those with a diagnosis of dementia ($\alpha = .96$, test-retest reliability, $r = .82$, $p < .0001$; (Farias et al., 2008)).

Provider Satisfaction Survey. Providers were asked to complete a provider experience survey to evaluate components of satisfaction related to having access to onsite integrated neuropsychological services at UCF Health. The survey was created for purposes of the current study, however, existing surveys were referenced when creating the current provider satisfaction survey (Hine et al., 2017). The survey consists of 9 statements assessing varying domains of satisfaction related to neuropsychological services (e.g., “Neuropsychological services that are available to my patients have been very useful in determining diagnoses”; “When referred, my patients have been able to schedule neuropsychological evaluations in a timely manner”; “The available neuropsychological services provide timely reports after my patients have been seen”;

and “Results of neuropsychological evaluations have helped to inform my practice and patient care.”). Providers rate their agreement with these 9 statements on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The survey also includes one question, asking providers to rate their overall satisfaction with neuropsychological services (0 = Not at all satisfied, 10 = Completely satisfied). Lastly, the survey asks two open-ended questions allowing providers to identify the most and least helpful aspects related to neuropsychological services.

Patient Satisfaction Survey. Participants were asked to complete a patient experience survey to evaluate components of satisfaction related to receiving integrated neuropsychological services at UCF Health. The survey was created for the current study purposes, however, survey items were adapted from existing patient satisfaction measures (Ede et al., 2015). The survey consists of 11 statements assessing varying domains of the onsite clinic (e.g., “Any concerns I may have had regarding my cognitive status were addressed quickly”; “Testing and results were provided to me in a language or way I could easily understand”; “I feel I was provided with helpful recommendations to address my cognitive concerns”; and “I feel that feedback supplied by my cognitive health specialist, to my medical provider, was helpful in coordinating my care.”). Participants rate their agreement with these 11 statements on a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The survey also includes one question, asking participants to rate their overall satisfaction with the onsite clinic (0 = Not at all satisfied, 10 = Completely satisfied). Lastly, the survey asks two open-ended questions allowing participants to identify the most and least helpful aspects of the onsite service.

Statistical Methods

Descriptive statistics were employed to characterize sub-samples of participants as well as medical providers. Comparisons examining the number of neuropsychological referrals were done using Chi-square statistics for categorical variables (hypothesis 1). Comparisons examining the accessibility of neuropsychological reports were made using Chi-square statistics for categorical variables (hypothesis 2). Associations between measures of objective cognitive performance and subjective cognitive decline scores were tested using bivariate Pearson correlations (hypothesis 3). Analyses examining the relationship between subjective and objective cognitive performance were performed both with and without inclusion of the GDS-15 depression score and years of education as control variables. An additional analysis examining participants' satisfaction with the onsite clinic was addressed using descriptive statistics. Comparisons between pre- and post- levels of provider satisfaction were made using an independent samples *t*-test (hypothesis 4). All data were analyzed using *IBM SPSS Statistics 23*.

CHAPTER 3: RESULTS

Feasibility, efficacy, and accessibility

The number of neuropsychological referrals made during the time of the onsite clinic was compared to that of the same length, prior to the start of the onsite clinic. To ascertain whether a difference was present in the number of referrals made during the time of the onsite neurocognitive clinic (September 2018 – May 2019) and those made in a nine-month period prior to the start of onsite services (February 2017 and October 2017), a Pearson chi-square was conducted. More specifically, in total, 23 referrals were made to the onsite clinic, with 16 patients enrolling as study participants. The number of enrolled study participants (16) was significantly more than the 10 referrals that had been made in the nine-month period for outside neuropsychological services, prior to the start of this study ($\chi^2(1) = 26.00$, $p < .001$, $V = 1.00$). Regarding accessibility of neuropsychological reports, an additional chi-square was conducted to compare the accessibility of reports during the onsite clinic as compared to those that had been referred for outside neuropsychological services, prior to the commencement of the onsite clinic. For those who had received services at the onsite neurocognitive clinic, the number of reports located within the patient's EMR was significantly greater than those who had received outside services ($\chi^2(1) = 22.02$, $p < .001$, $V = .92$).

Patient Participants

A total of 16 participants enrolled in and completed the study. As displayed in *Table 1*, participants were on average 67.75-years-old, predominantly female (56.3%), Caucasian

(93.8%), partnered (75.0%), and cohabitated with another individual (75.0%). Participants had an average of 17.25 years of education and 2.38 medical diagnoses.

A reliability analysis was conducted for each domain of the subjective cognitive decline measure. These analyses revealed high internal consistency across all domains, including memory, which consisted of 8 items (α = .94); language, which was comprised of 9 items (α = .96); visuospatial, which included 7 items (α = .97); and executive function, which contained 15 items (α = .98). Following this, associations between subjective cognitive decline and scores on measures of neurocognitive function were tested using bivariate Pearson correlations (see *Table 2*). Assumptions of bivariate normality were assessed visually utilizing a scatterplot of the data points. Results revealed that subjective cognitive decline scores as well as scores on objective measures of cognitive performance, including the RBANS Total Scale Score, RBANS Delayed Memory Index Score, and Trails B violated the assumptions of bivariate normality. Thus, square root transformations were performed on the data, in an effort to normalize the data (Tabachnick & Fidell, 2013). This transformation eliminated the violation of bivariate normality for subjective cognitive decline and objective cognitive performance scores. Results did not indicate a significant correlation between subjective cognitive decline scores and RBANS Total Scale Scores ($r(14) = .20$, $p = .46$); subjective cognitive decline and RBANS Delayed Memory Index Score ($r(14) = .06$, $p = .84$); or subjective cognitive decline and Trails B performance ($r(14) = -.02$, $p = .94$). Additional analysis with the inclusion of GDS-15 depression scores and years of education as control variables were also performed (see *Table 3*). Results from these analyses did not indicate a significant correlation between subjective cognitive decline scores and RBANS Total Scale Scores ($r(12) = .04$, $p = .89$); subjective cognitive decline and RBANS Delayed

Memory Index Score ($r(12) = .01$, $p = .99$); or subjective cognitive decline and Trails B performance ($r(12) = -.32$, $p = .27$). A post-hoc analysis was conducted with the inclusion of GAD-7 scores and years of education as control variables. Results from these analyses also did not indicate a significant correlation between subjective cognitive decline scores and RBANS Total Scale Scores ($r(12) = .06$, $p = .83$); subjective cognitive decline and RBANS Delayed Memory Index Score ($r(12) = -.03$, $p = .93$); or subjective cognitive decline and Trails B performance ($r(12) = -.42$, $p = .14$).

In order to better understand the relationship between subjective cognitive decline and neurocognitive function among participants, auxiliary analyses, examining the relationship between specific domains of subjective cognitive decline (e.g., executive function), as measured by the Ecog, and corresponding measures of neurocognitive functioning (i.e., Trails B) were also performed. Results did not indicate a significant correlation between subjective cognitive decline of language and BNT Scores ($r(14) = .09$, $p = .75$); COWAT scores ($r(14) = -.15$, $p = .58$); or RBANS Semantic Fluency ($r(14) = .28$, $p = .30$); nor between subjective cognitive decline of visuospatial skills and RBANS Figure Copy ($r(14) = .06$, $p = .82$), or RBANS Visuospatial Index Score ($r(14) = .04$, $p = .88$). Results also did not indicate a significant correlation between subjective cognitive decline of memory and RBANS Delayed Memory Index Score ($r(14) = .15$, $p = .59$) nor between subjective cognitive decline of executive function and RBANS Coding ($r(14) = .29$, $p = .26$) or Trails B ($r(14) = -.01$, $p = .96$; see *Table 4*).

Participant satisfaction was measured from 15 participants (the final participant has not yet returned for their feedback session). Survey results revealed that, overall, participants were in agreement with the following statements about the onsite neurocognitive clinic: (1) I am satisfied

with the amount of time the cognitive health specialist spent with me during my visit (*M* = 4.87, *SD* = 0.35); (2) My beliefs about my health and well-being were considered as part of the services that I received (*M* = 4.73, *SD* = 0.59); (3) I would follow through if I were referred outside this clinic for neuropsychological testing services (*M* = 4.67, *SD* = 0.62); (4) Any concerns I may have had regarding my cognitive status were addressed quickly (*M* = 4.60, *SD* = 0.63); (5) Testing and results were provided to me in a language or way I could easily understand (*M* = 4.93, *SD* = 0.26); (6) I am comfortable receiving cognitive health services here at this clinic (*M* = 4.60, *SD* = 1.06); (7) I am treated the same as other people who get care at the clinic (*M* = 4.73, *SD* = 0.70); (8) I prefer to receive my cognitive health services at the location where I receive my medical care (*M* = 4.80, *SD* = 0.56); (9) I feel I was provided with helpful recommendations to address my cognitive concerns (*M* = 4.93, *SD* = 0.26); (10) I feel that consultation between my medical provider and cognitive health specialist was helpful to me (*M* = 4.80, *SD* = 0.56); and (11) I feel that feedback supplied by my cognitive health specialist, to my medical provider, was helpful in coordinating my care (*M* = 4.53, *SD* = 0.83). Participants reported overall satisfaction with the services of the onsite clinic (*M* = 9.80, *SD* = 0.56). Please refer to *Figure 2* for depiction of results.

Medical Providers

In total, nine satisfaction surveys were returned; with six having been completed at the pre-survey and three at the post-survey. It should be noted that, as the survey was submitted anonymously, it is not possible to confirm that the same providers submitted responses for the pre- and post-surveys. Therefore, an independent samples t-test was run to determine if there

was a statistically significant difference in the mean of the pre-survey overall satisfaction level and post-survey overall satisfaction level among medical providers. Homogeneity of variance was assessed using Levene's test for equality of variances and this assumption was met for the analysis ($p > .05$). Results revealed a significantly higher level of overall satisfaction with neuropsychological services following the onsite clinic (post-survey; $M = 8.67$, $SD = 1.16$) than indicated prior to the start of onsite services (pre-survey; $M = 5.83$, $SD = 1.84$; $t(7) = -2.40$, $p = .04$). Despite this, an aspect that must be acknowledged is the marginal statistical power associated with these analyses, due to the limited sample size, and results should not be overinterpreted. Nevertheless, medical providers endorsed significantly higher levels of satisfaction at post-survey related to the following components: (1) timely scheduling of referred patients for neuropsychological services ($t(7) = -12.98$, $p < .001$); (2) timely completion of reports following patient appointment ($t(7) = -2.59$, $p = .04$); (3) ease of accessibility of neuropsychological reports ($t(7) = -2.59$, $p = .04$); (4) interaction with neuropsychological providers ($t(7) = -3.36$, $p = .01$); and (5) availability of neuropsychological services ($t(7) = -3.46$, $p = .01$). Please refer to *Figure 3* for depiction of results.

CHAPTER 4: DISCUSSION

The primary purpose of this study was to evaluate efficacy and feasibility related to the implementation of an onsite neurocognitive clinic within an outpatient academic healthcare setting. Overall, results supported hypothesis 1, with an increased number of neuropsychological referrals for the onsite clinic in comparison to those made for outside neuropsychological services during a nine-month period. Hypothesis 2 was also supported, as accessibility of neuropsychological evaluations located in the EMR increased for those who received onsite services, when compared to those who had received outside referrals. No significant correlations were found between subjective cognitive decline scores and measures of neurocognitive functioning, including RBANS Total Scale Score, RBANS Delayed Memory Index score, and Trails B performance. Results were also insignificant when controlling for years of education and GDS-15 scores as well as for a post-hoc analysis which included GAD-7 scores and years of education as control variables. Satisfaction survey results revealed that, overall, participants were satisfied with and found onsite services to helpful. Medical provider satisfaction was significantly higher following implementation of the onsite clinic than indicated at baseline levels, which were measured prior to the start of onsite services. Medical providers identified increased overall satisfaction, as well as satisfaction related to timely scheduling of referred patients, timely completion of and access to neurocognitive reports, as well as interaction with neuropsychological providers. However, the limited sample size and marginal statistical power associated with analyses surrounding provider satisfaction are important caveats to interpretation of these results.

Analyses did not find a significant correlation between measures of subjective cognitive decline and performance on objective measures of neurocognitive performance. Additional auxiliary analyses of SCD and objective test performance via specific domains (e.g., executive function and Trails B), were also non-significant. One possible reason for non-significant results may be due to the small sample size of the current study. Overall, the literature on the relationship between subjective cognitive decline and objective test performance presents highly varied findings, characterizing a complex relationship between SCD and objective cognitive performance. Snitz and colleagues (2008) found that self-reports of current memory ability were associated with objective memory performance in a sample of older adult patients in a primary care setting. Similarly, Rattanabannakit et al. (2016) found that participant and informant ratings of cognitive impairment were associated with objective scores on cognitive measures, even after adjusting for demographic variables and depressive symptoms. Conversely, Zlatar and colleagues (2017) did not find a significant association between SCD and objective cognition, after adjusting for both demographics and depression, in a sample of older adults referred for memory concerns. Additional studies have revealed similar findings to that of Zlatar et al. (2017), in that SCD was not significantly associated with objective cognitive measures, particularly after controlling for mood and demographic variables , and suggest that subjective cognitive complaints are less likely to be related to co-occurring cognitive impairment, and more likely related to depressive symptoms (Alegret et al., 2015; Balash et al., 2013; Zlatar, Moore, Palmer, Thompson, & Jeste, 2014). Further, Burmester, Leathem, and Merrick (2016) conducted a meta-analysis investigating how subjective cognitive complaints might reliably indicate impairments in objective cognitive function. Their results indicated a small but significant

association between subjective cognitive complaints and objective cognitive function, with stronger links between subjective complaints and depressive symptoms. It is possible that the results of the current study may serve as additional evidence in this complex relationship, though limitations related to samples size and subsequent statistical power should be acknowledged.

An additional possibility for the non-significant findings between SCD and objective neurocognitive data may also be related to the particular group of patient participants. More specifically, it is possible that our patient participants represent a group more consistent with those who have been previously referred to as the "worried well," which describes patients who are hypersensitive to and anxious about memory changes, but do not show objective findings on neuropsychological testing (Kinzer & Suhr, 2016; Thompson, Henry, Rendell, Withall, & Brodaty, 2015). These "worried well" patients are likely to interpret everyday cognitive lapses as an indication of decline or impairment in memory (Kinzer & Suhr, 2016). It is also possible that individuals presenting with the primary concern of memory impairment or potential dementia, may not provide an altogether accurate report of their current neurocognitive functioning (Kinzer & Suhr, 2016). These positions highlight the findings of previous studies that have indicated the likelihood of individuals presenting with SCD representing the "worried well," rather than those with true impairment (Amariglio et al., 2012).Although results of a post-hoc analysis did not find a significant correlation between SCD and objective test scores when controlling for GAD-7 scores and years of education, considerations surrounding limited sample size should be taken into consideration. In addition, the GAD-7 was designed as a screening tool to assess symptom severity. While the brevity of the GAD-7 facilitates an efficient approach to tracking symptoms and response to treatment, it is possible that it was not specific enough to detect worry related to

cognitive symptoms or difficulty with cognitive functioning. Future research may aim to further assess anxiety related to perception of current cognitive difficulties during the interview with the patient to gain a better understanding of the impact this may have on subsequent results. Further, as past studies have also shown an association between negative stereotypes about age-related cognitive decline and subsequent decreased performance on neurocognitive measures (Arnett, 2013; Barber & Mather, 2014; Suhr & Kinkela, 2007), future research may also aim to account for the possibility of this stereotype threat, which may influence the relationship between SCD and objective test performance.

A strength of the current study includes the increased satisfaction levels among medical providers related to onsite neurocognitive clinic services. Moreover, satisfaction levels for the clinic were high among both medical providers and patient participants. Despite this, the referral rate for clinic services was generally slow throughout the study. While the clinic was rated as providing useful, beneficial services, and was largely well-liked by both patients and providers, the overall low referral rate reflects an underutilization of clinic services in this particular application. Extant literature suggests that, as a whole, neuropsychology's integration into primary care settings, and onto integrated care teams, has not happened quickly (Festa, 2018; Ruchinskas & Cullum, 2018). In a community based academic hospital system, the integration of neuropsychology into primary care clinics required a six-month timespan to resolve logistic hurdles alone (e.g., available space, referral flow); as well as an additional six-month time period following implementation, during which guidelines were established to inform appropriateness of referrals and the subsequent referral stream was better developed and refined (Lanca, 2018). Although this can be a prolonged process, the integration of neuropsychology into primary care

is generally quite well received, with high levels of satisfaction with neuropsychology indicated by other team members (Kubu et al., 2016; Lanca, 2018; Ruchinskas & Cullum, 2018). With ample time, it appears that similar clinics offering neuropsychological services, and operating within primary care settings, have overcome difficulties with low referral rates and are largely well utilized, employing waitlists that span several weeks to several months out (Lanca, 2018; Lanca & Meisinger, 2019; Ruchinskas & Cullum, 2018).

The results of the current study suggest multiple ways in which integrated neuropsychological assessment improves access to and quality of delivered health care. The Alzheimer's Association has recommended cognitive assessment in primary care settings, as a way to aid in reducing the prevalence of missed or delayed dementia diagnoses. Research indicates that providers located in a primary care setting play a critical role in the early detection of cognitive impairment, as older adults with subjective cognitive complaints typically present first to their primary care providers (Rabin et al., 2015). Additionally, early cognitive decline is associated with greater use of primary care services (Fowler et al., 2012; Ganguli et al., 2004). Thus, there is a clear need for cognitive assessments that are both accessible and efficient within a primary care setting to meet the needs of this growing patient population. Integrating neuropsychological testing into primary care improves access for patients and allows primary care teams to incorporate neuropsychological results into subsequent case conceptualization, diagnosis, and patient care (Lanca, 2018; Lanca & Meisinger, 2019; Ruchinskas & Cullum, 2018). As the current study documented directly in the EMR, neurocognitive reports were easily accessible to the referring provider, which facilitated cohesive coordination of care for the

patient. Onsite clinic services allowed for greater access to cognitive assessments, as well as improved awareness and management of cognitive symptoms for both patients and providers.

Despite the general findings related to increased referrals, accessibility of neurocognitive reports, and satisfaction with services, several barriers to the feasibility of a clinic of this nature were present. Although onsite clinic services were co-located in the primary care setting, it is possible these services were not viewed as being fully part of the integrated services available to patients and providers, This may have been due to the lack of availability of daily services (e.g., neurocognitive evaluations only scheduled two days per week) as well as services being delivered by a Master's level trainee. While these components are consistent with the nature of a research study, it is possible that these factors limited the extent to which clinic services and providers were viewed as a part of the integrated care team. In addition, numerous structural changes occurred throughout the course of this study, including migration to a new EMR system. During the transition to the new EMR system, several internal processes were disrupted including the process by which referrals are initiated and processed in the EMR system. Due to the period of time this functionality was inaccessible, it likely affected referral rate during that timeframe. Future studies may aim to incorporate supplemental methods for referrals during an EMR transition when the referral system is compromised. This could include frequent check-in with providers or in-session consultation with patients during their medical appointment. It is possible that this approach, akin to a "warm handoff," would moderate the decrease in referrals and subsequent productivity of such a clinic. Additionally, several personnel changes transpired while the study was ongoing, including the loss of medical providers along with the addition of new providers. It is likely that these changes influenced referral rate, as it is possible that new

providers were unaware of onsite services, despite study coordinator's best efforts to consistently remind providers of the onsite clinic. Research has indicated the importance of continually providing education to medical providers about the benefits and usefulness of neuropsychology as well as the ways that neuropsychologists can participate in patient care. Efficient assessments and feasible recommendations for patients can provide helpful information for medical providers and improve overall patient care (Festa, 2018; Lanca, 2018; Mercury, Kehoe, & Tschan, 2007). As staffing changes in health centers are common, future research should consider utilizing regular education sessions for medical providers, perhaps during monthly provider meetings or grand rounds. This could serve to not only remind current providers about the presence and utility of onsite services, but would also ensure that new providers were aware of such services, while also mitigating the potential loss of referrals. Perhaps the most significant change that occurred during the study timeframe included the dissolution of the behavioral health team. The Director of the behavioral health team made repeated efforts to increase awareness of clinic services, as well as the benefit to both patients and providers. It is expected that the conclusion of behavioral health services greatly impacted potential referrals. Overall, the multitude of structural changes that took place during the course of the study created an inherent threat to the rate of referrals.

There are several limitations associated with the current study. One such limitation includes the small sizes of the participant and medical provider samples. There are currently 14 medical providers at the location where the study was conducted, whose areas of practice span internal medicine, family medicine, cardiology, rheumatology, orthopedics, endocrinology, pulmonology, general surgery, gastroenterology, and psychiatry. Due to the small sample sizes,

there was limited power to detect significant statistically significant results. Unfortunately, small sample size remains a direct challenge to current standards of design and analytic approaches (Etz & Arroyo, 2015). With regard to garnishing additional participation from medical providers, future research should aim to incorporate several ways in which providers may participate in measures that will add value to the study. For example, it is possible that certain providers prefer to fill out a paper and pencil survey, rather than utilizing an online modality, which could be circulated at a monthly provider meeting, in order to increase response rate. As noted previously, an additional limitation of this study pertains to the difficulties that were present in recruitment throughout the study. As previous research has indicated the substantial amount of time that has been required to successfully integrate neuropsychological services into a primary care setting, it is possible that, with additional time and resources, the slow rate of referrals of the current study may have resolved. Therefore, future research should aim to have sufficient time in which aspects related to logistics, referrals, and charting can be fully developed and appropriately flushed out. Future studies may also include a predetermined method in which new medical providers are automatically notified of clinic services and the way in which they may refer a patient through the EMR system. Lastly, the current study is also limited by the lack of diversity among the patient participants. This inherently limits the extent to which results, particularly those concerning subjective cognitive decline and objective neurocognitive performance, can be generalized to other populations. Future research should aim to include a more representative sample, whose results may generalize more broadly and to culturally diverse populations.

As medical treatment continues to work toward a model that aims to improve the quality of patient care, while also reducing costs, integration of neuropsychology is increasing. As a

result, cognitive assessment services have become a part of the growing services that are accessible within primary care settings (A. Blount et al., 2007; Lanca, 2018). Subsequently, this has also facilitated recognition that cognitive health is a critical component to overall health and wellbeing and that detection of cognitive difficulties improves treatment efficacy. The value of neuropsychology on integrated care teams can be seen in a multitude of capacities. Neuropsychologists possess a unique expertise, in which their knowledge encompasses functional neuroanatomy, assessment, and behavior, along with clinical skills that are fundamental in working with patients (Festa, 2018; Kubu, 2018). Neuropsychologists are able to address likely barriers to compliance and evaluate cognitive, emotional, behavioral, and psychosocial facets, all of which contribute to improved patient outcomes (Festa, 2018). The current study provides additional support for the value of neuropsychological integration into a primary care setting. Despite a slow referral stream, onsite neurocognitive services allowed for increased accessibility for both patients and providers and also served as a primary source of education for patients regarding cognitive symptoms, behavioral components, and subsequent recommendations. Extant literature indicates that memory disorder clinics are a growing service, and highlights the importance of neuropsychologists serving in such a role, where they have the opportunity to deliver these essential services to a patient and, oftentimes, their family. The current study offers several insights into the complexities associated with both the efficacy and feasibility of a clinic of this nature.

APPENDIX A: FIGURES

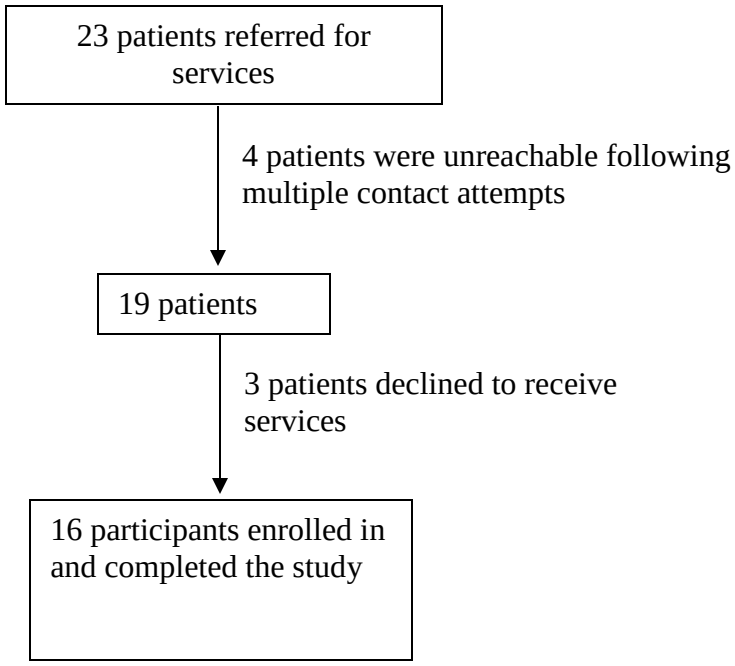


Figure 1: Participant Sample Selection

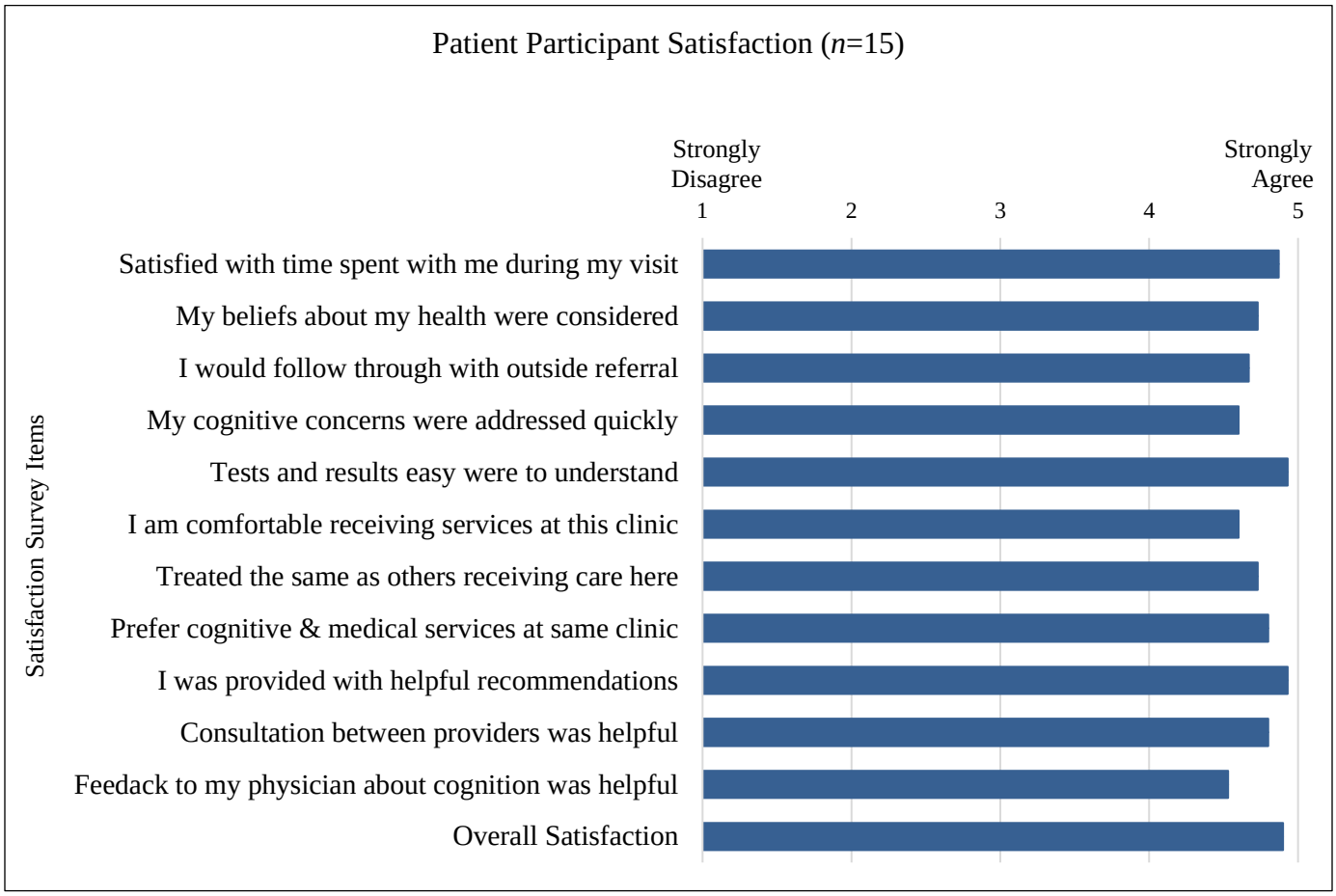


Figure 2: Participant Satisfaction Data

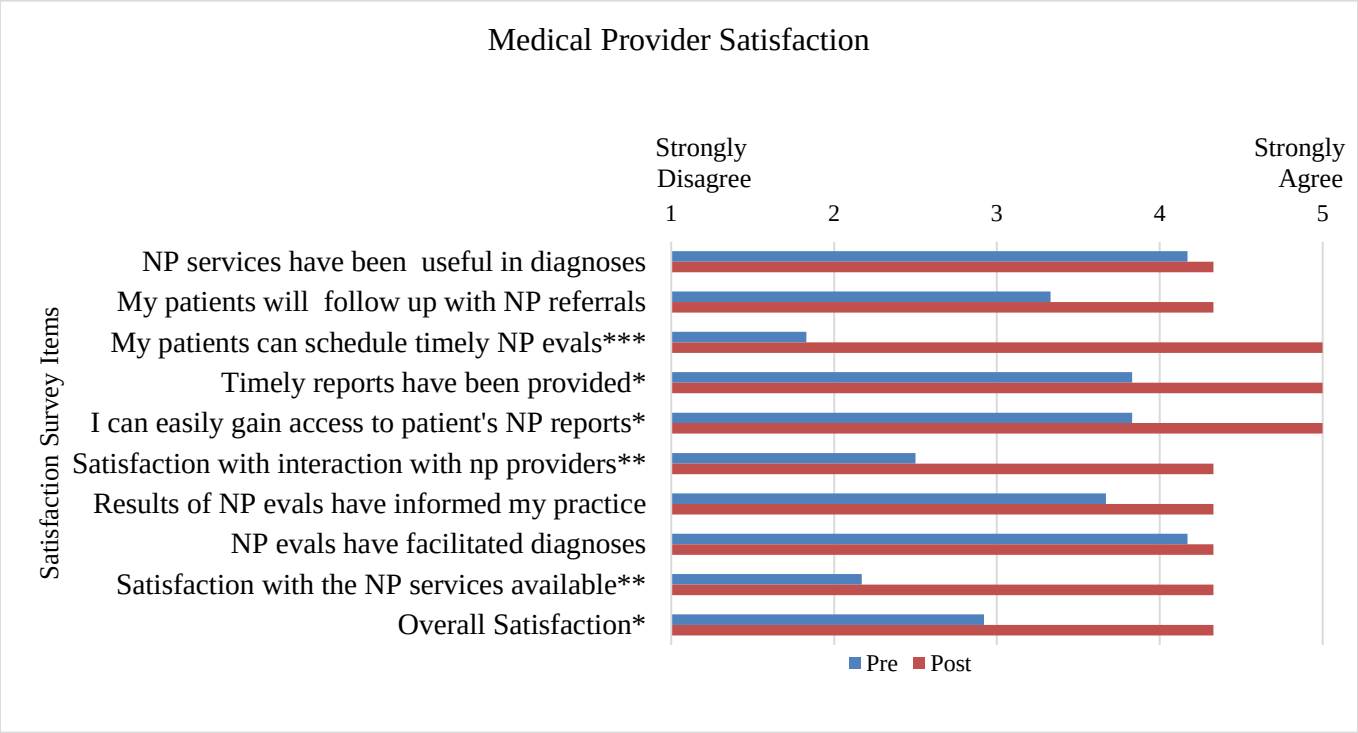


Figure 3: Medical Provider Satisfaction Data

Note: *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$

APPENDIX B: TABLES

Table 1: Participant demographics.

	Patient Participants ***n*** **= 16**
Variable	**M (SD)**
Age	67.75 (10.47)
Education (years)	17.25 (12.69)
Number of Medical Diagnoses	2.38 (1.46)
GAD-7 Total Score	6.00 (4.47)
GDS-15 Total Score	4.44 (2.92)
	Percentage of Sample
Gender	
Male	43.7
Female	56.3
Race	
Caucasian	93.8
Hispanic/Latino	6.2
Partnership Status	
Partnered	75.0
Unpartnered	25.0
Cohabitation Status	
Cohabitates	75.0
Lives Alone	25.0

Table 2: Bivariate Pearson correlations examining the relationship between subjective cognitive decline and neurocognitive domains.

Neurocognitive Measure	Ecog Total Score	*p*
Trails B	0.02	0.94
RBANS Delayed Memory Index	0.06	0.84
RBANS Total Scale Score	0.20	0.46

Note: *n*=16.

Table 3: Partial correlations examining the relationship between subjective cognitive decline and neurocognitive domains, while controlling for education and GDS-15 scores.

Neurocognitive Measure	Ecog Total Score	*p*
Trails B	-0.32	0.27
RBANS Delayed Memory Index	0.01	0.99
RBANS Total Scale Score	0.04	0.89

Note: *n*=16*;* control variables include years of education and GDS-15 score.

Table 4: Auxiliary bivariate Pearson correlations examining the relationship between specific domains of subjective cognitive decline and corresponding neurocognitive performance.

Neurocognitive Domain and Subtest	Ecog Domain Score	*p*
Language		
BNT	0.09	0.75
COWAT	-0.15	0.58
RBANS Semantic Fluency	0.28	0.30
Visuospatial		
RBANS Figure Copy	0.06	0.82
RBANS Visuospatial Index Score	0.04	0.88
Memory		
RBANS Delayed Memory Index Score	0.15	0.59
Executive Function		
Trails B	-0.01	0.96
BRBANS Coding	0.29	0.26

Note: *n*=16

APPENDIX C: PARTICIPANT SCREENING FORM

SCREENING INFORMATION FOR BRIEF NEUROCOGNITIVE EVALUATION

Patient Name:

Date:

1. Were you born in the United States?

2. If you were born outside of the United States, did you attend high school in the U.S.?

3. What language was primarily spoken in the home while you were growing up?

4. Have you ever received a diagnosis related to your cognitive functioning (i.e., dementia, Major Neurocognitive Disorder)? If so, is your healthcare proxy here with you?

5. Are you currently involved in any ongoing litigation related to your neurocognitive functioning, or that involves a previously referred-for neuropsychological assessment?

APPENDIX D: NEUROCOGNITIVE MEASURES

COWAT (FAS)

Name: _____

Date: _____

Letter Fluency Task

F	A	S
1. _____	1. _____	1. _____
2. _____	2. _____	2. _____
3. _____	3. _____	3. _____
4. _____	4. _____	4. _____
5. _____	5. _____	5. _____
6. _____	6. _____	6. _____
7. _____	7. _____	7. _____
8. _____	8. _____	8. _____
9. _____	9. _____	9. _____
10. _____	10. _____	10. _____
11. _____	11. _____	11. _____
12. _____	12. _____	12. _____
13. _____	13. _____	13. _____
14. _____	14. _____	14. _____
15. _____	15. _____	15. _____
16. _____	16. _____	16. _____
17. _____	17. _____	17. _____
18. _____	18. _____	18. _____
19. _____	19. _____	19. _____
20. _____	20. _____	20. _____

NART

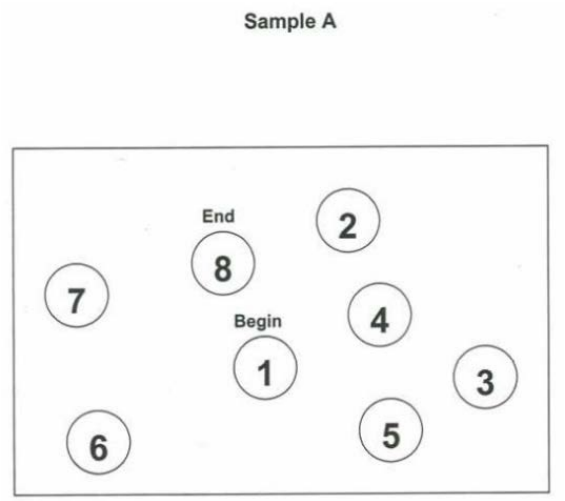
Word	Pronunciation	Score (0/1)
CHORD	kɔːd	
ACHE	eɪk	
DEPOT	ˈdɛpəʊ	
AISLE	aɪl	
BOUQUET	buˈkeɪ	
PSALM	sɑːm	
CAPON	ˈkeɪpɒn, ˈkeɪpən	
DENY	dɪˈnaɪ	
NAUSEA	ˈnɔːziə, ˈnɔːsiə	
DEBT	det	
COURTEOUS	ˈkɜːtiəs	
RAREFY	ˈrɛərɪˌfaɪ	
EQUIVOCAL	ɪˈkwɪvəkᵊl), ɪˈkwɪvəkl	
NAÏVE	naɪˈiːv	
CATACOMB	ˈkætəˌkəʊm, ˈkætəˌkuːm	
GAOLED	dʒeɪld	
THYME	taɪm	
HEIR	ɛə, eə(r)	
RADIX	ˈreɪdɪks	
ASSIGNATE	ˈæsɪgneɪt	
HIATUS	haɪˈeɪtəs	
SUBTLE	ˈsʌtᵊl, ˈsʌtl	
PROCREATE	ˈprəʊkrɪˌeɪt, ˈprəʊkrieɪt	
GIST	dʒɪst	
GOUGE	gaʊdʒ	
SUPERFLUOUS	suːˈpɜːflʊəs, suːˈpɜːfluəs, sjuːˈpɜːfluəs	
SIMILE	ˈsɪmɪlɪ, ˈsɪməli	
BANAL	bəˈnɑːl	
QUADRUPED	ˈkwɒdrʊˌpɛd, ˈkwɒdruped	
CELLIST	ˈtʃelɪst	

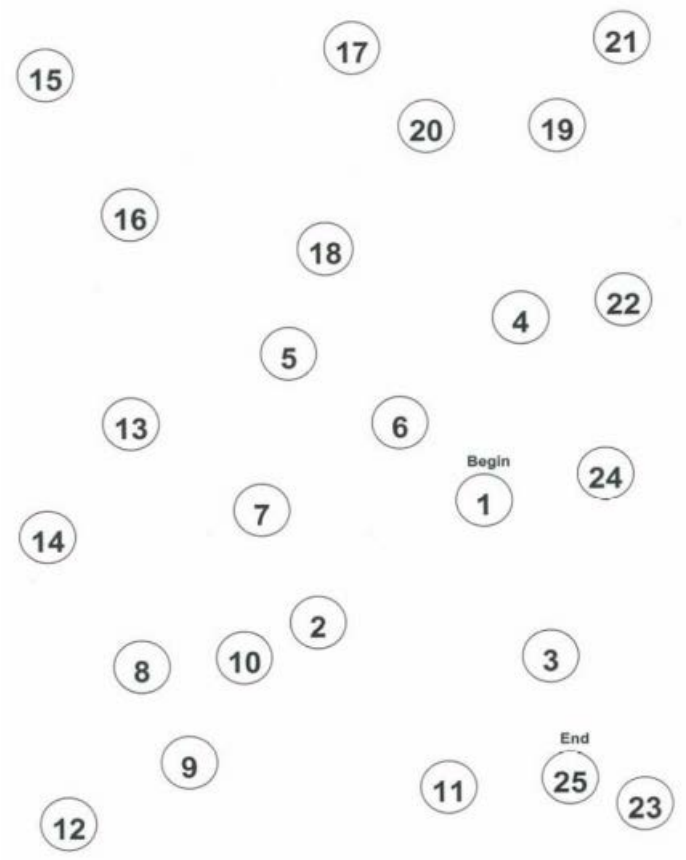
FAÇADE	fəˈsɑːd, fæˈsɑːd	
ZEALOT	ˈzɛlət	
DRACHM	dræm	
AEON	ˈiːən, ˈiːɒn	
PLACEBO	pləˈsiːbəʊ	
ABSTEMIOUS	əbˈstiːmɪəs, əbˈstiːmiəs	
DÉTENTE	deɪˈtɑːnt, *French* detɑ̃t	
IDYLL	ˈɪdɪl	
PUERPERAL	pjuːˈɜːpərəl	
AVER	əˈvɜː, əˈvɜː(r)	
GAUCHE	gəʊʃ	
TOPIARY	ˈtəʊpɪərɪ, ˈtəʊpiəri	
LEVIATHAN	lɪˈvaɪəθən, ləˈvaɪəθən	
BEATIFY	bɪˈætɪˌfaɪ, biˈætɪfaɪ	
PRELATE	ˈprɛlɪt, ˈprelət	
SIDEREAL	saɪˈdɪərɪəl, saɪˈdɪəriəl	
DEMESNE	dɪˈmeɪn, dɪˈmiːn, dəˈmeɪn	
SYNCOPE	ˈsɪŋkəpɪ	
LABILE	ˈleɪbɪl	
CAMPANILE	ˌkæmpəˈniːlɪ, ˌkæmpəˈniːli	

Total Errors: _____

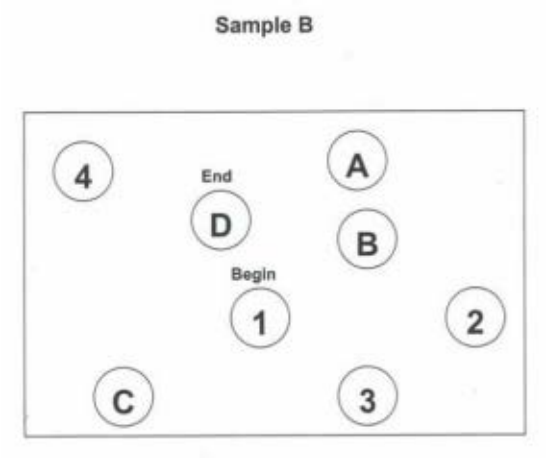
Total Errors	Premorbid VIQ Estimate	Classification Range
0 – 11	120 – 129	Superior
12 – 19	110 – 119	High Average
20 – 36	90 – 109	Average
37 – 45	80 – 89	Low Average
46 – 50	74 – 79	Borderline

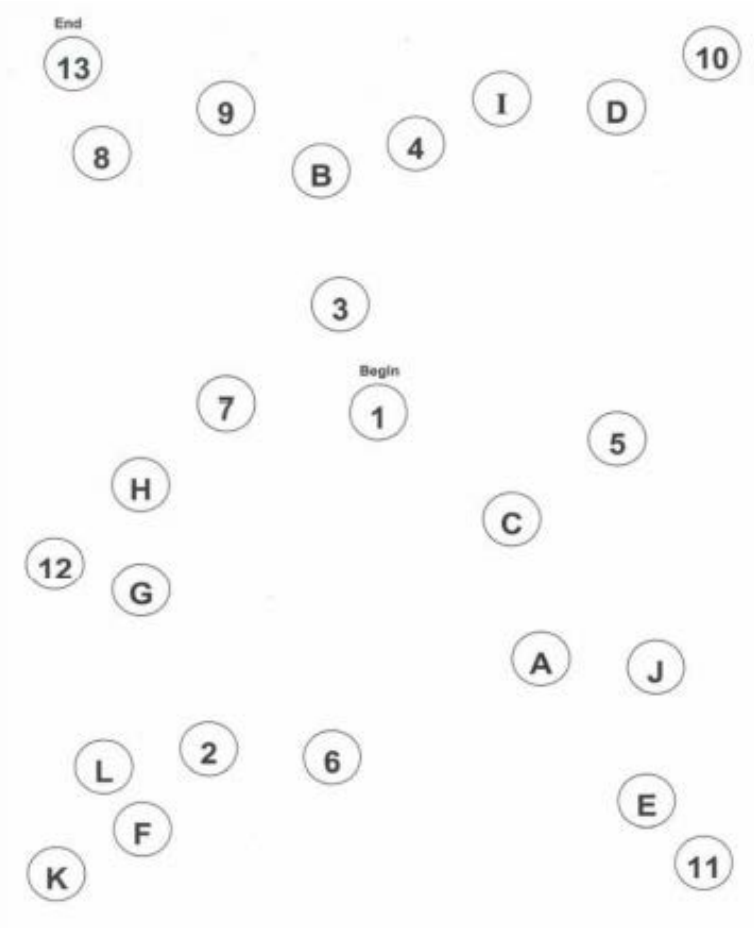
Trails A


Sample A
End
2
8
7
Begin
4
1
3
6
5


17
21
15
20
19
16
18
22
4
5
13
6
Begin
24
1
7
14
2
8
10
3
End
9
11
25
23
12

Trails B


Sample B
4
End
D
A
B
Begin
1
2
C
3


End
13
10
9
I
D
8
4
B
3
Begin
7
1
5
H
C
12
G
A
J
2
6
L
E
F
11
K

Boston Naming Test

Boston Naming Test – 2

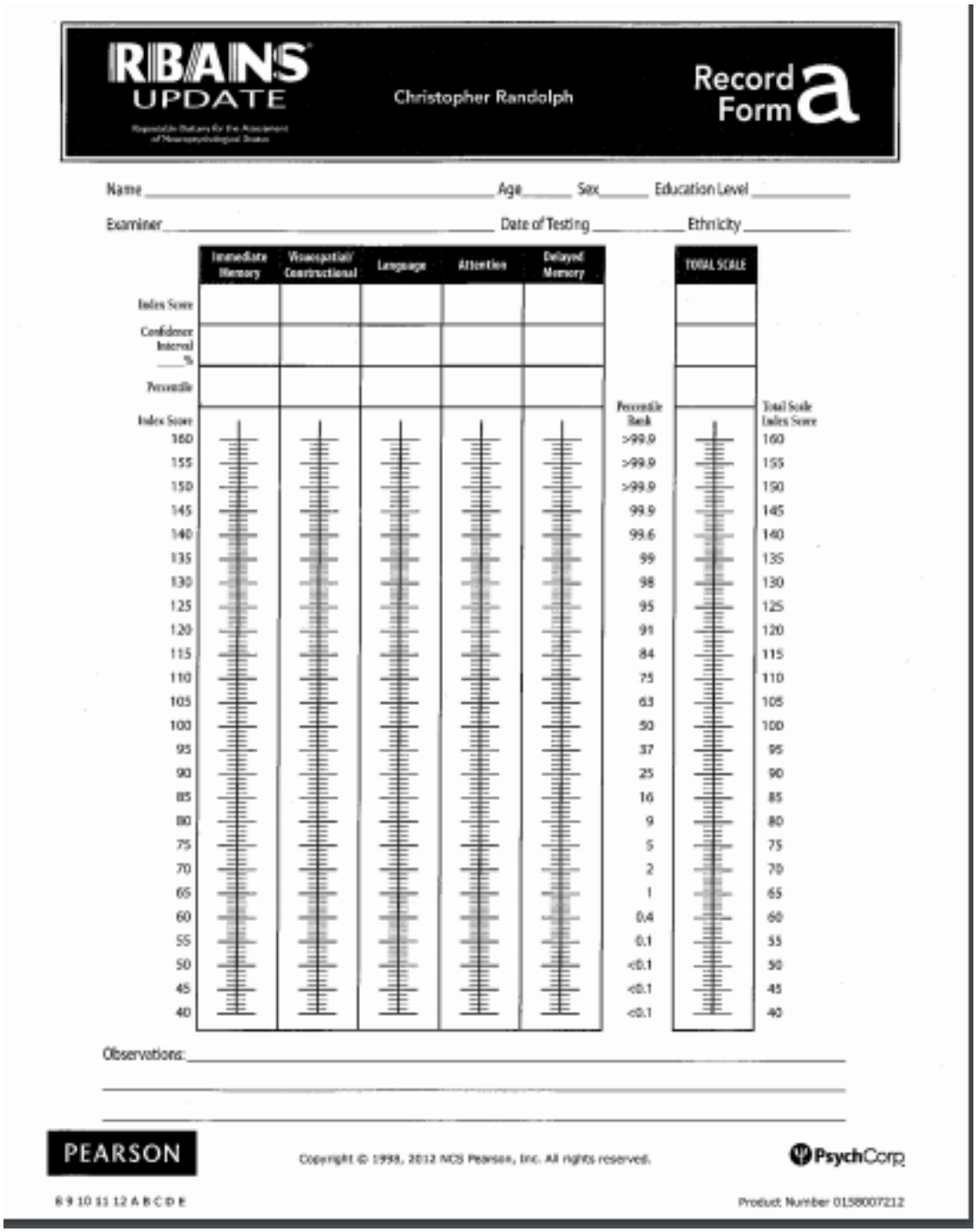
		U	S	P			U	S	P
1.	Bed (a piece of furniture)				31.	Rhinoceros (an animal)			
2.	Tree (something that grows outdoors)				32.	Acorn (it comes from a tree)			
3.	Pencil (used for writing)				33.	Igloo (type of house)			
4.	House (home) (a kind of building)				34.	Stilts (used to make you taller)			
5.	Whistle (used for blowing)				35.	Dominoes (a game)			
6.	Scissors (shears) (used for cutting)				36.	Cactus (something that grows)			
7.	Comb (used for fixing hair)				37.	Escalator (you go up on it)			
8.	Flower (grows in a garden)				38.	Harp (a musical instrument)			
9.	Saw (used by a carpenter)				39.	Hammock (you lie on it)			
10.	Toothbrush (used in the mouth)				40.	Knocker (it's on a door)			
11.	Helicopter (used for air travel)				41.	Pelican (a bird)			
12.	Broom (used for cleaning)				42.	Stethoscope (used by doctors and nurses)			
13.	Octopus (an ocean animal)				43.	Pyramid (found in Egypt)			
14.	Mushroom (toadstool) (something to eat)				44.	Muzzle (used on dogs)			
15.	Hanger (found in a closet)				45.	Unicorn (mythical animal)			
16.	Wheelchair (found in a hospital)				46.	Funnel (used for pouring)			
17.	Camel (dromedary) (an animal)				47.	Accordion (a musical instrument)			
18.	Mask (false face) (part of a costume)				48.	Noose (used for hanging)			
19.	Fennel (something to eat)				49.	Asparagus (something to eat)			
20.	Bench (used for sitting)				50.	Compass (for drawing)			
21.	Racquet (used for sports)				51.	Latch (bolt) (part of door)			
22.	Snail (an animal)				52.	Tripod (photographers or surveyors use it)			
23.	Volcano (a kind of mountain)				53.	Scroll (a document)			
24.	Seahorse (horsefish) (an ocean animal)				54.	Tongs (a utensil)			
25.	Dart (you throw it)				55.	Sphinx (it's found in Egypt)			
26.	Canoe (used in the water)				56.	Yoke (oxbow) (used on farm animals)			
27.	Globe (a kind of map)				57.	Trellis (used in a garden)			
28.	Wreath (a Christmas decoration)				58.	Palette (artists use it)			
29.	Beaver (an animal)				59.	Protractor (measures angles)			
Start 30.	Harmonica (harp; mouth organ) (musical instrument)				60.	Abacus (it's used for counting)			

Total Correct (U+S) _____ Basal/Ceiling: 8 highest correct/incorrect

Unassisted: _____ Phonemic Cuing: ___/___ Z / SS: _____ % tile: _____

Semantic Cuing: ___/___ T: _____

RBANS



RBANS UPDATE

Christopher Randolph

Record Form a

Name _____ Age _____ Sex _____ Education Level _____

Examiner _____ Date of Testing _____ Ethnicity _____

	Immediate Memory	Visuospatial/ Constructional	Language	Attention	Delayed Memory	TOTAL SCALE
Index Score						
Confidence Interval ____%						
Percentile						

Index Score	Percentile Rank	Total Scale Index Score
160	>99.9	160
155	>99.9	155
150	>99.9	150
145	99.9	145
140	99.6	140
135	99	135
130	98	130
125	95	125
120	91	120
115	84	115
110	75	110
105	63	105
100	50	100
95	37	95
90	25	90
85	16	85
80	9	80
75	5	75
70	2	70
65	1	65
60	0.4	60
55	0.1	55
50	<0.1	50
45	<0.1	45
40	<0.1	40

Observations: _____

PEARSON

PsychCorp

8 9 10 11 12 A B C D E

Product Number 0158007212

2 Story Memory

Trial 1

Say ***I am going to read you a short story. I'd like you to listen carefully and, when I finish, repeat back as much of the story as you can remember. Try and use the same wording, if you can. Okay?***

Read the story below, then say ***Now repeat back as much of that story as you can.***

Trial 2

Say ***I am going to read that same story again. When I finish, I want you to again repeat back as much of the story as you can remember. Try to repeat it as exactly as you can.***

Read the story below, then say ***Now repeat back as much of that story as you can.***

Scoring: 1 point for verbatim recall of bold, italic words or alternatives, shown below in color within parentheses. Record intrusions or variations in the Responses column.

Story	Trial 1 Responses	Trial 1 Score (0 or 1)	Trial 2 Responses	Trial 2 Score (0 or 1)	Item Score (0–2)
1. On ***Tuesday,***					
2. ***May***					
3. ***Fourth,***					
4. in ***Cleveland,*** Ohio,					
5. a ***3 alarm***					
6. ***fire*** broke out.					
7. ***Two***					
8. ***hotels***					
9. and a ***restaurant***					
10. were ***destroyed***					
11. before the ***firefighters (firemen)***					
12. were able to ***extinguish it (put it out).***					
				Total Score (Trial 1 + Trial 2) Range=0–24	

3 Figure Copy

Time Limit: 4 minutes

Fold this page back and present the Figure Copy Drawing Page along with the stimulus. Ask the examinee to make an exact copy of the figure. Tell the examinee that he or she is being timed, but that the score is based *only* on the exactness of his or her copy.

Scoring: 1 point for correctness and completeness (drawing), and 1 point for proper placement. See Appendix 1 to Stimulus Booklet A for complete scoring criteria and scoring examples.

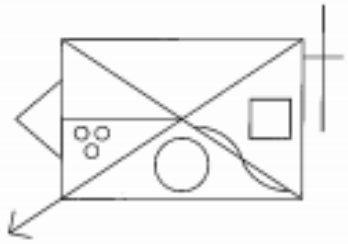


Figure Copy Criteria

(Fold back for use.)

Item	Drawing (0 or 1)	Placement (0 or 1)	Score (0, 1, or 2)	Scoring Criteria
1. rectangle				**Drawing:** lines are unbroken and straight; angles 90 degrees; top/bottom lines 25% longer than sides **Placement:** not rotated more than 15 degrees
2. diagonal cross				**Drawing:** lines are unbroken and straight and should approximately bisect each other **Placement:** ends of lines should meet corners of the rectangle without significant overlap or measurable distance between the ends of the lines and the corners
3. horizontal line				**Drawing:** line is unbroken and straight; should not exceed 1/2 the length of the rectangle **Placement:** should bisect left side of the rectangle at approximately a right angle and intersect the diagonal cross
4. circle				**Drawing:** round, unbroken and closed; diameter should be approximately 1/4–1/3 height of rectangle **Placement:** placed in appropriate segment; not touching any other part of figure
5. 3 small circles				**Drawing:** round, unbroken and closed; equal size; triangular arrangement; not touching each other **Placement:** in appropriate segment; not touching figure; triangle formed not rotated more than 15 degrees
6. square				**Drawing:** must be closed; 90 degree angles; lines straight and unbroken; height is 1/4–1/3 height of rectangle **Placement:** in appropriate segment; not touching any other part of figure; not rotated more than 15 degrees
7. curving line				**Drawing:** 2 curved segments are approximately equal in length and symmetrical; correct direction of curves **Placement:** ends of line touch diagonal; do not touch corner of rectangle or intersection of diagonal lines
8. outside cross				**Drawing:** vertical line of the outside cross is parallel to side of rectangle; >1/2 the height of rectangle; horizontal line crosses vertical at 90 degree angle and is between 20–50% of length of vertical line **Placement:** horizontal line of outside cross touches rectangle higher than 2/3 the height of rectangle, but below top; does not penetrate the rectangle
9. triangle				**Drawing:** angle formed by 2 sides of triangle is between 60–100 degrees; sides are straight, unbroken and meet in a point; distance on vertical side of rectangle subsumed by triangle is approximately 50% of the height of vertical side **Placement:** roughly centered on the left vertical side of the rectangle
10. arrow				**Drawing:** straight and unbroken; lines forming arrow are approximately equal in length and not more than 1/3 length of staff **Placement:** must protrude from appropriate corner of rectangle such that staff appears to be continuation of diagonal cross
	Total Score Range=0–20			

4 Line Orientation

Time Limit: 20 seconds/item

Present the sample item, and say ***These two lines down here*** (indicate) ***match two of the lines on top. Can you tell me the numbers, or point to the lines that they match?*** Correct any errors and make sure the examinee understands the task. Continue with Items 1–10.

Scoring: 1 point for each line correctly identified.

Item	Responses	Correct Responses	Score (0, 1, or 2)
Sample		1, 2	
1.		10, 12	
2.		4, 11	
3.		6, 9	
4.		8, 13	
5.		2, 4	

Item	Responses	Correct Responses	Score (0, 1, or 2)
6.		1, 6	
7.		3, 10	
8.		5, 8	
9.		1, 3	
10.		11, 13	
		Total Score Range=0–20	

5 Picture Naming

Time Limit: 20 seconds/item

Ask the examinee to name each picture. Give the semantic cue only if the picture is obviously misperceived.

Scoring: 1 point for each item that is correctly named spontaneously or following semantic cue.

Item	Semantic Cue	Responses	Score (0 or 1)
1. chair	a piece of furniture		
2. pencil	used for writing		
3. well	you get water from it		
4. giraffe	an animal		
5. sailboat	used on the water (if "boat," query "what kind")		
6. cannon	a weapon, used in war		
7. pliers	a tool		
8. trumpet	a musical instrument ("cornet" okay)		
9. clothespin	used to hold laundry on a line		
10. kite	it's flown in the air		
		Total Score Range=0–10	

6 Semantic Fluency

Time Limit: 60 seconds

Say ***Now I'd like you to tell me the names of all of the different kinds of fruits and vegetables that you can think of. I'll give you one minute to come up with as many as you can. Ready?***

Scoring: 1 point for each correct response.

1. _____	11. _____	21. _____	31. _____
2. _____	12. _____	22. _____	32. _____
3. _____	13. _____	23. _____	33. _____
4. _____	14. _____	24. _____	34. _____
5. _____	15. _____	25. _____	35. _____
6. _____	16. _____	26. _____	36. _____
7. _____	17. _____	27. _____	37. _____
8. _____	18. _____	28. _____	38. _____
9. _____	19. _____	29. _____	39. _____
10. _____	20. _____	30. _____	40. _____

Total Score
Range=0–40 ☐

7 Digit Span

Say ***I am going to say some numbers, and I want you to repeat them after me. Okay?***
Read the numbers at the rate of 1 per second. Only read the second string in each set if the first string was failed. Discontinue after failure of both strings in any set.

Scoring: 2 points for the first string correct, 1 point for the second string correct, and 0 points for both strings failed.

Item	First String	String Score (0 or 2)	Second String	String Score (0 or 1)	Item Score (0–2)
1.	**4—9**		**5—3**		
2.	**8—3—5**		**2—4—1**		
3.	**7—2—4—6**		**1—6—3—8**		
4.	**5—3—9—2—4**		**3—8—4—9—1**		
5.	**6—4—2—9—3—5**		**9—1—5—3—7—6**		
6.	**2—8—5—1—9—3—7**		**5—3—1—7—4—9—2**		
7.	**8—3—7—9—5—2—4—1**		**9—5—1—6—2—7—3—8**		
8.	**1—5—9—2—3—8—7—4—6**		**5—1—9—7—6—2—3—4—5**		

Total Score
Range=0–16 ☐

8 Coding

Time Limit: 90 seconds

Say ***Look at these boxes*** (indicate key). ***For each one of these marks there is a number that goes with it. Down here there are marks, but no numbers. I want you to fill in the number that goes with each mark.***

Demonstrate the first three. Say ***Now I would like you to fill in the rest of these boxes up to the double lines*** (indicate) ***for practice.*** Correct any errors as they are made. Make sure that the examinee understands the task and has correctly completed the sample items before you begin timing.

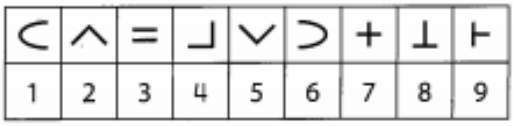
Say ***Now I would like you to continue to fill in the numbers that match the marks. Go as quickly as you can without skipping any. When you reach the end of the line, go on to the next one. Ready? Go ahead.***

Redirect the examinee to the task if he or she becomes distracted. If the examinee is unable to comprehend the task, the subtest score is 0.

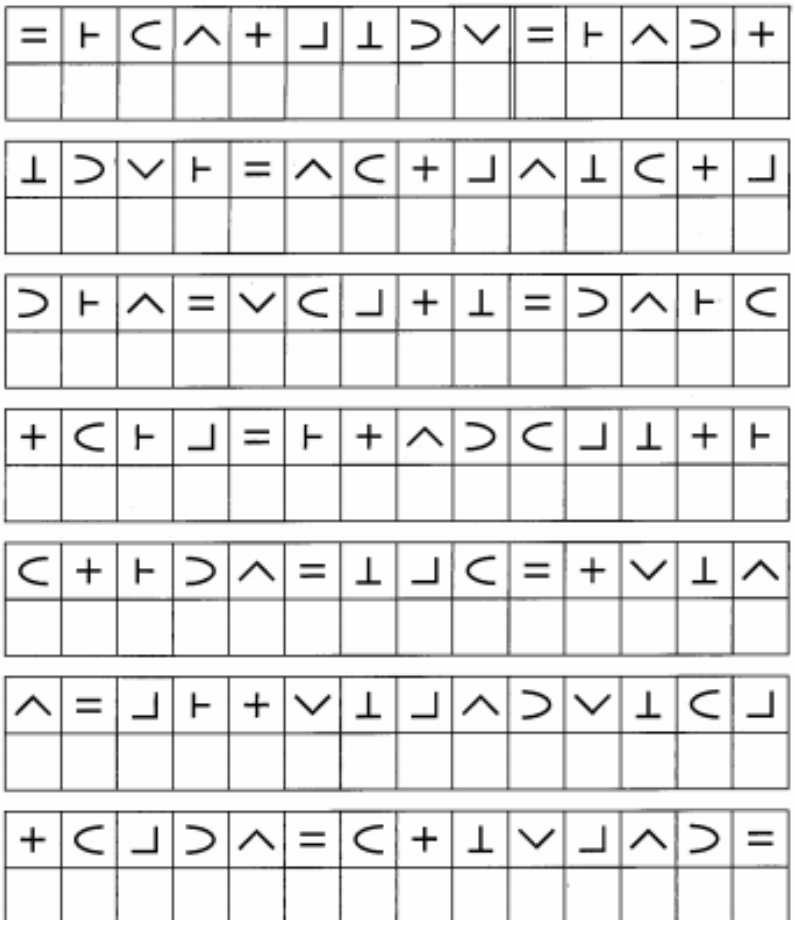
Scoring: 1 point for each item correctly coded within 90 seconds (do not score the sample items).

Note: Familiarize yourself with these instructions before administering this subtest.

Total Score
Range=0–89



SAMPLE_____



9 List Recall

Say ***Do you remember the list of words that I read to you in the beginning? Tell me as many of those words as you can remember now.***

Scoring: 1 point for each word correctly recalled.

List (Do not read.)	Response	Score (0 or 1)
Market		
Package		
Elbow		
Apple		
Story		
Carpet		
Bubble		
Highway		
Saddle		
Powder		
	Total Score Range=0–10	

10 List Recognition

Say ***I'm going to read you some words. Some of these words were on that list, and some of them weren't. I want you to tell me which words were on the list.*** For each word, ask **Was _____ on the list?**

Scoring: 1 point for each word correctly identified. Circle the letter corresponding to examinee's response (y = yes, n = no); bold, capitalized (**Y, N**) letter indicates correct response.

List	Circle One		List	Circle One		List	Circle One		List	Circle One	
1. **Apple**	**Y**	n	6. sailor	y	**N**	11. **Bubble**	**Y**	n	16. **Saddle**	**Y**	n
2. honey	y	**N**	7. velvet	y	**N**	12. prairie	y	**N**	17. **Powder**	**Y**	n
3. **Market**	**Y**	n	8. **Carpet**	**Y**	n	13. **Highway**	**Y**	n	18. angel	y	**N**
4. **Story**	**Y**	n	9. valley	y	**N**	14. oyster	y	**N**	19. **Package**	**Y**	n
5. fabric	y	**N**	10. **Elbow**	**Y**	n	15. student	y	**N**	20. meadow	y	**N**
									Total Score Range=0–20		

11 Story Recall

Say ***Do you remember that story about a fire that I read to you earlier? Tell me as many details from the story as you can remember now.***

Scoring: 1 point for each verbatim recall of bold, italic words or alternatives, shown below in color within parentheses. Record intrusions or variations in the Responses column.

Story (Do not read.)	Responses	Item Score (0 or 1)
1. On ***Tuesday,***		
2. ***May***		
3. ***Fourth,***		
4. in ***Cleveland,*** Ohio,		
5. a ***3 alarm***		
6. ***fire*** broke out.		
7. ***Two***		
8. ***hotels***		
9. and a ***restaurant***		
10. were ***destroyed***		
11. before the ***firefighters*** ***(firemen)***		
12. were able to ***extinguish it*** ***(put it out).***		
	Total Score Range=0–12	

12 Figure Recall

Say ***Do you remember that figure that I had you copy? I want you to draw as much of it as you can remember now. If you remember a part, but you're not sure where it goes, put it anywhere. Try to draw as much of it as you can.***

Now, present the Figure Recall Drawing Page.

Scoring: 1 point for correctness and completeness (drawing), and 1 point for proper placement. See Appendix 1 in Stimulus Booklet A for complete scoring criteria and scoring examples.

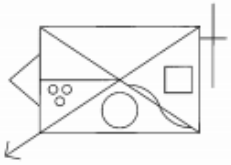


Figure Recall Criteria

(Fold back for use.)

Item	Drawing (0 or 1)	Placement (0 or 1)	Score (0, 1, or 2)	Scoring Criteria
1. rectangle				**Drawing:** lines are unbroken and straight; angles 90 degrees; top/bottom lines 25% longer than sides **Placement:** not rotated more than 15 degrees
2. diagonal cross				**Drawing:** lines are unbroken and straight and should approximately bisect each other **Placement:** ends of lines should meet corners of the rectangle without significant overlap or measurable distance between the ends of the lines and the corners
3. horizontal line				**Drawing:** line is unbroken and straight; should not exceed 1/2 the length of the rectangle **Placement:** should bisect left side of the rectangle at approximately a right angle and intersect the diagonal cross
4. circle				**Drawing:** round, unbroken and closed; diameter should be approximately 1/4–1/3 height of rectangle **Placement:** placed in appropriate segment, not touching any other part of figure
5. 3 small circles				**Drawing:** round, unbroken and closed; equal size, triangular arrangement; not touching each other **Placement:** in appropriate segment; not touching figure; triangle formed not rotated more than 15 degrees
6. square				**Drawing:** must be closed; 90 degree angles; lines straight and unbroken; height is 1/4–1/3 height of rectangle **Placement:** in appropriate segment; not touching any other part of figure; not rotated more than 15 degrees
7. curving line				**Drawing:** 2 curved segments are approximately equal in length and symmetrical; correct direction of curves **Placement:** ends of line touch diagonal; do not touch corner of rectangle or intersection of diagonal lines
8. outside cross				**Drawing:** vertical line of the outside cross is parallel to side of rectangle; >1/2 the height of rectangle; horizontal line crosses vertical at 90 degree angle and is between 20–50% of length of vertical line **Placement:** horizontal line of outside cross touches rectangle higher than 2/3 the height of rectangle, but below top; does not penetrate the rectangle
9. triangle				**Drawing:** angle formed by 2 sides of triangle is between 80–100 degrees; sides are straight, unbroken and meet in a point; distance on vertical side of rectangle subtended by triangle is approximately 50% of the height of vertical side **Placement:** roughly centered on the left vertical side of the rectangle
10. arrow				**Drawing:** straight and unbroken; lines forming arrow are approximately equal in length and not more than 1/3 length of staff **Placement:** must protrude from appropriate corner of rectangle such that staff appears to be continuation of diagonal cross
	Total Score Range=0–20			

APPENDIX E: SELF REPORT MEASURES

GDS-15

Geriatric Depression Scale (short form)

Instructions: Circle the answer that best describes how you felt over the past week.

1.	Are you basically satisfied with your life?	yes	no
2.	Have you dropped many of your activities and interests?	yes	no
3.	Do you feel that your life is empty?	yes	no
4.	Do you often get bored?	yes	no
5.	Are you in good spirits most of the time?	yes	no
6.	Are you afraid that something bad is going to happen to you?	yes	no
7.	Do you feel happy most of the time?	yes	no
8.	Do you often feel helpless?	yes	no
9.	Do you prefer to stay at home, rather than going out and doing things?	yes	no
10.	Do you feel that you have more problems with memory than most?	yes	no
11.	Do you think it is wonderful to be alive now?	yes	no
12.	Do you feel worthless the way you are now?	yes	no
13.	Do you feel full of energy?	yes	no
14.	Do you feel that your situation is hopeless?	yes	no
15.	Do you think that most people are better off than you are?	yes	no

Total Score _____

GAD-7

Generalized Anxiety Disorder 7-item (GAD-7) scale

Over the last 2 weeks, how often have you been bothered by the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3
Add the score for each column	+	+	+	
Total Score *(add your column scores)* =				

If you checked off any problems, how difficult have these made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all _____
Somewhat difficult _____
Very difficult _____
Extremely difficult _____

Source: Spitzer RL, Kroenke K, Williams JBW, Lowe B. A brief measure for assessing generalized anxiety disorder. *Arch Inern Med.* 2006;166:1092-1097.

Ecog

EVERYDAY COGNITION

Participant Self Report Form

DIRECTIONS: Please rate your ability to perform certain everyday tasks **NOW, *as compared to your ability to do these same tasks 10 years ago.*** In other words, try to remember how you were doing 10 years ago and indicate any change in your level of ability. Rate the amount of change on a five-point scale ranging from:

1	There has been no change in my ability or I actually perform better compared to 10 years ago.
2	I occasionally perform the task worse but not all of the time.
3	I consistently perform the task a little worse than 10 years ago.
4	I consistently perform the task much worse than 10 years ago.
9	I don't know.

Circle the number that fits your response.

Before we get started…
Are you concerned that you have a memory or other thinking problem? Yes No

Compared to 10 years ago, has there been any change in…	BETTER OR NO CHANGE	QUESTIONABLE / OCCASIONALLY WORSE	CONSISTENTLY A LITTLE WORSE	CONSISTENTLY MUCH WORSE	I DON'T KNOW
MEMORY					
1. Remembering a few shopping items without a list.	1	2	3	4	9
2. Remembering things that happened recently (such as recent outings, events in the news).	1	2	3	4	9
3. Recalling conversations a few days later.	1	2	3	4	9
4. Remembering where I have placed objects.	1	2	3	4	9
5. Repeating stories and/or questions.	1	2	3	4	9
6. Remembering the current date or day of the week.	1	2	3	4	9
7. Remembering I have already told someone something.	1	2	3	4	9
8. Remembering appointments, meetings, or engagements.	1	2	3	4	9

EVERYDAY COGNITION

Participant Self Report Form

Compared to 10 years ago, has there been any change in…	BETTER OR NO CHANGE	QUESTIONABLE / OCCASIONALLY WORSE	CONSISTENTLY A LITTLE WORSE	CONSISTENTLY MUCH WORSE	I DON'T KNOW
LANGUAGE					
1. Forgetting the names of objects.	1	2	3	4	9
2. Verbally giving instructions to others.	1	2	3	4	9
3. Finding the right words to use in a conversation.	1	2	3	4	9
4. Communicating thoughts in a conversation.	1	2	3	4	9
5. Following a story in a book or on TV.	1	2	3	4	9
6. Understanding the point of what other people are trying to say.	1	2	3	4	9
7. Remembering the meaning of common words.	1	2	3	4	9
8. Describing a program I have watched on TV.	1	2	3	4	9
9. Understanding spoken directions or instructions.	1	2	3	4	9
VISUAL-SPATIAL AND PERCEPTUAL ABILITIES					
1. Following a map to find a new location.	1	2	3	4	9
2. Reading a map and helping with directions when someone else is driving.	1	2	3	4	9
3. Finding my car in a parking lot.	1	2	3	4	9
4. Finding my way back to a meeting spot in the mall or other location.	1	2	3	4	9
5. Finding my way around a familiar neighborhood.	1	2	3	4	9
6. Finding my way around a familiar store.	1	2	3	4	9
7. Finding my way around a house visited many times.	1	2	3	4	9

EVERYDAY COGNITION

Participant Self Report Form

Compared to 10 years ago, has there been any change in...	BETTER OR NO CHANGE	QUESTIONABLE / OCCASIONALLY WORSE	CONSISTENTLY A LITTLE WORSE	CONSISTENTLY MUCH WORSE	I DON'T KNOW
EXECUTIVE FUNCTIONING: PLANNING					
1. Planning a sequence of stops on a shopping trip.	1	2	3	4	9
2. The ability to anticipate weather changes and plan accordingly (i.e., bring a coat or umbrella.	1	2	3	4	9
3. Developing a schedule in advance of anticipated events.	1	2	3	4	9
4. Thinking things through before acting.	1	2	3	4	9
5. Thinking ahead.	1	2	3	4	9
EXECUTIVE FUNCTIONING: ORGANIZATION					
1. Keeping living and work space organized.	1	2	3	4	9
2. Balancing the checkbook without error.	1	2	3	4	9
3. Keeping financial records organized.	1	2	3	4	9
4. Prioritizing tasks by importance.	1	2	3	4	9
5. Keeping mail and papers organized.	1	2	3	4	9
6. Using an organized strategy to manage a medication schedule involving multiple medications.	1	2	3	4	9
EXECUTIVE FUNCTIONING: DIVIDED ATTENTION					
1. The ability to do two things at once.	1	2	3	4	9
2. Returning to a task after being interrupted.	1	2	3	4	9
3. The ability to concentrate on a task without being distracted by external things in the environment.	1	2	3	4	9
4. Cooking or working and talking at the same time.	1	2	3	4	9

APPENDIX F: PATIENT SATISFACTION SURVEY

Patient Experience Questionnaire

	Strongly Disagree		No Opinion		Strongly Agree
I am satisfied with the amount of time the cognitive health specialist spent with me during my visit.	1	2	3	4	5
My beliefs about my health and well-being were considered as part of the services that I received.	1	2	3	4	5
I would follow through if I were referred outside this clinic for neuropsychological testing services.	1	2	3	4	5
Any concerns I may have had regarding my cognitive status were addressed quickly	1	2	3	4	5
Testing and results were provided to me in a language or way I could easily understand.	1	2	3	4	5
I am comfortable receiving cognitive health services here at this clinic.	1	2	3	4	5
I am treated the same as other people who get care at the clinic.	1	2	3	4	5
I prefer to receive my cognitive health services at the location where I receive my medical care.	1	2	3	4	5
I feel I was provided with helpful recommendations to address my cognitive concerns.	1	2	3	4	5
I feel that consultation between my medical provider and cognitive health specialist was helpful to me.	1	2	3	4	5
I feel that feedback supplied by my cognitive health specialist, to my medical provider, was helpful in coordinating my care.	1	2	3	4	5

How would you rate your overall satisfaction of this service? _____

(0 = Not at all satisfied, 10 = Completely satisfied)

Which aspects of the service did you find to be most helpful and why?

_____

_____

_____

_____

Which aspects of the service did you find to be least helpful and why?

_____

_____

_____

_____

APPENDIX G: PROVIDER SATISFACTION SURVEY

Provider Experience Questionnaire

	Strongly Disagree		No Opinion		Strongly Agree
Neuropsychological services that are available to my patients have been very useful in determining diagnoses.	1	2	3	4	5
My patients will usually follow up when referred for neuropsychological evaluations.	1	2	3	4	5
When referred, my patients have been able to schedule neuropsychological evaluations in a timely manner.	1	2	3	4	5
The available neuropsychological services provide timely reports after my patients have been seen.	1	2	3	4	5
Once my patients complete neuropsychological referrals, I can easily gain access to their reports.	1	2	3	4	5
I am satisfied with the level of interaction with neuropsychological providers.	1	2	3	4	5
Results of neuropsychological evaluations have helped to inform my practice and patient care.	1	2	3	4	5
Neuropsychological evaluations have facilitated diagnosis of my patients.	1	2	3	4	5
I am satisfied with the neuropsychological services that have been available to my patients.	1	2	3	4	5

How would you rate your overall satisfaction of this service? _____
(0 = Not at all satisfied, 10 = Completely satisfied)

Which aspects of neuropsychological services do you find to be <u>most</u> helpful and why?

_____

_____

_____

_____

Which aspects of neuropsychological services do you find to be least helpful and why?

_____

_____

_____

_____

Please indicate your current area of practice:
Allergy/Immunology
Cardiology
Dermatology
Endocrinology
Family medicine
Gastroenterology
General surgery
Geriatric medicine
Gynecology
Internal medicine
Nephrology
Ophthalmology
Orthopedics
Psychology
Pulmonology
Rheumatology
Sports Medicine
Other:

APPENDIX H: IRB APPROVAL OF HUMAN RESEARCH

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Daniel Lee Paulson, Cerissa L Blaney, Danielle Herring, Maria Louise Cannarozzi**

Date: **August 07, 2018**

Dear Researcher:

On 08/07/2018 the IRB approved the following modifications / human participant research until 08/06/2019 inclusive:

Type of Review:	Submission Correction for UCF Initial Review Submission Form Expedited Review Category #6 and #7; n=45 adult participants. Vulnerable population: Adults unable to consent
Project Title:	The Efficacy and Feasibility of Neuropsychological Services in a Primary Care Setting.
Investigator:	Daniel Lee Paulson
IRB Number:	SBE-18-13906
Funding Agency:	
Grant Title:	
Research ID:	N/A

The scientific merit of the research was considered during the IRB review. The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

If continuing review approval is not granted before the expiration date of 08/06/2019, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

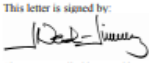
Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a signed and dated copy of the consent form(s). Legal authorized

representatives will sign for adults unable to consent. Participant assent will be seek unless the capability of the subject is so limited that the subject cannot reasonably be consulted.

All data, including signed consent forms if applicable, must be retained and secured per protocol for a minimum of six (HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained and secured per protocol. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

This letter is signed by:



Signature applied by Jennifer Neal-Jimenez on 08/07/2018 09:07:35 AM EDT

Designated Reviewer

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