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Embedded Performance Measures Within the Delis-Kaplan Executive Function System

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Embedded Performance Measures Within the Delis-Kaplan Executive Function System

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Embedded Performance Measures Within the
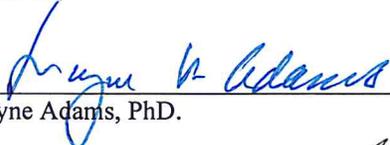
Delis-Kaplan Executive Function System

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Abstract

It has become increasingly clear many patients do not manifest sufficient effort over the course of a neuropsychological evaluation (Horner, VanKirk, Dismuke, Turner, & Muzzy, 2014). While tests of memory and learning are considered to be the *gold-standard* in effort measurement, they are vulnerable to coaching (Bianchini, Greve, & Love, 2003). Fortunately, interest in assessing effort through other cognitive domains has grown over the last few years. In the current study, participants were divided into two groups, simulators and controls. All participants completed the Medical Symptom Validity Test (MSVT, Green, 2004), the Trail Making Test (TMT), the Verbal Fluency Test (VFT), and Sorting Test (ST) of the Delis-Kaplan Executive Function System (Delis, Kaplan & Kramer, 2001). It was hypothesized simulators would demonstrate significantly lower performance on all subtests of the D-KEFS and the MSVT. MANOVA revealed statistically significant differences on MSVT and TMT. Scaled scores from the 5 TMT conditions demonstrated the largest between group differences. VFT and ST variables did not demonstrate sensitivity to low effort. A new aggregate index based on participant performance on TMT conditions, demonstrated excellent ROC results with sensitivity of 71% and specificity of 100% based on the cutoff selected. Further research remains necessary

to use the Trail Making Test Validity Index (TMTVI) to delineate low effort groups from clinical

populations and controls.

Keywords: performance validity, effort, malingering, Delis-Kaplan Executive Function

System, Trail Making Test, Verbal Fluency, Sorting Test, Medical Symptom Validity Test

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Chapter 1

Introduction

Examinee Performance Validity

Until recently, neuropsychological assessment interpretation has been based on the presupposition the examinee invests his or her full effort throughout the length of the assessment battery and respond in an unbiased fashion (Kirkwood, 2012; Kirkwood, Kirk, Blaha, & Wilson, 2010). However, it has become increasingly clear many patients do not manifest sufficient effort over the course of a neuropsychological evaluation (Horner, VanKirk, Dismuke, Turner, & Muzzy, 2014). Carone, Iverson, and Bush (2010) and Iverson (2006) hypothesized multiple explanations as to why a patient may not demonstrate sufficient effort. They suggested the attitude of the patient may be apathetic toward the process and the results, and the participant may be afraid of what the assessment may reveal. Additionally, they hypothesized the participant may be suspicious of the process, or intentionally attempting to appear impaired. As a result of this awareness, a growing body of literature has begun to examine the deleterious impact variable effort has on the results of an assessment (Green & Flaro, 2003). Review of this literature confirms when an examinee's effort is compromised either intentionally or unintentionally – the results misrepresent the individual's capabilities and invalidate the testing data (Kirkwood et al., 2010). Invalid neuropsychological test results create a range of economic, professional, and social problems (Millis, Putnam, Adams, & Ricker, 1995) including invalid testing data, misguided diagnostic impressions and recommendations, misunderstandings of brain-behavior relationships, and poor use of economic healthcare resources (Kirkwood et al.,

2010). Horner et al. (2014) followed patients for one year after they participated in a neuropsychological evaluation including stand-alone effort measures. After controlling for demographic, medical, and psychiatric variables, they found the participants who demonstrated inadequate effort had more visits to the emergency department, more inpatient hospitalizations, and longer stays at inpatient facilities.

The vast and expensive impact of invalid results is concerning considering the base rates for individuals demonstrating inadequate effort, compiled from multiple studies where individuals were believed to be putting forth adequate effort (Chafetz, Abrahams, & Kohlmaier, 2007; Greve, Etherton, Ord, Bianchini, & Curtis, 2009; Larrabee G., 2003; Mittenberg, Patton, Canyock, & Condit, 2002). The compiled base rate of assessed adults who demonstrate inadequate effort ranges from less than 10% in general medical settings to 40% in mild traumatic brain injury (TBI) forensic settings, and even higher in other contexts where secondary gain is a consideration. Considering a sizeable number of neuropsychology referrals stem from systems where the patients may be awarded a substantial financial settlement if they demonstrate legitimate or feigned cognitive impairment, this issue becomes all the more important (Slick, Sherman, & Iverson, 1999). Additionally, the importance of objective effort assessment has become increasingly well documented, as it has been discovered a clinician's subjective assessment of effort is rarely accurate (Faust, Hart, & Guilmette, 1988; Faust, Hart, Guilmette, & Arkes, 1988; Oldershaw & Bagby, 1997). Green, Rohling, Lees-Haley, and Allen (2001) suggest inadequate effort can influence test results more than severe brain injury. Others have suggested poor performance on even one Performance Validity Test (PVT) is correlated with a negative impact across multiple neuropsychological domains (Lange, Iverson, Brooks, & Rennison, 2010).

In the last 20 years, there has been a nearly 20% increase in the proportion of articles published in *The Clinical Neuropsychologist* and *Archives of Clinical Neuropsychology* on the topics of validity testing, effort, and malingering (Martin, P., Schroeder, R., & Odland, A., 2015). As a result of the increased awareness surrounding the impact of effort on assessment, there has been mounting interest in the development of measures that can detect variable effort or fabricated cognitive impairment (Millis et al., 1995). Over the past two decades, the focus on identifying non-credible effort has contributed to a proliferation of well-validated measures for the assessment of effort among the adult population (Boone, 2007; Larrabee, 2007). These instruments are typically referred to as PVTs or Symptom Validity Tests (SVTs). The concerns over PVTs highlighted in the current literature have led examiners to include effort indices as a routine part of adult assessment (Green & Flaro, 2003). Sharland and Gfeller (2007) received surveys from 188 members and fellows of the National Academy of Neuropsychology, and found 84.2% of respondents stated they sometimes, often, or always include a measure of effort. Additional results from this survey suggested approximately 11.1% of respondents rarely administer an effort measure and 4.8% of respondents never administer a measure of effort during a neuropsychological evaluation.

Concerns over invalid assessment results have not gone unnoticed. Many professional agencies including the National Academy of Neuropsychology and the American Academy of Clinical Neuropsychology released position statements suggesting a participant's effort must be taken into consideration with the administration of a neuropsychological battery (Bush et al., 2005; Heilbronner, Sweet, Morgan, Larrabee, & Mills, 2009).

Methods of Evaluation

PVTs have traditionally been grouped into two categories: stand-alone measures and

embedded measures. Stand-alone measures include instruments such as the Test of Memory

Malingering (TOMM; Tombaugh, 1996), Green's Word Memory Test (WMT; Green, 2005), and

the Medical Symptom Validity Test (MSVT; Green, 2004). While stand-alone measures

typically report the strongest sensitivity and specificity, using only stand-alone effort measures

throughout the battery bring along with them the associated problems of the increased time it

takes to administer additional instruments and the added cost. However, these concerns can be

ameliorated through the use of embedded measures of effort. Embedded measures are indices of

effort derived from preexisting tests (Larrabee, 2012). Embedded measures increase the

efficiency of the assessment by providing an index of effort without adding to the length or cost

of the evaluation. They also provide indices of effort over the course of the evaluation, thus

serving to cross-validate other findings (Arnett, Hammeke, & Schwartz, 1995; Meyers &

Volbrecht, 2003; Sherman, Boone, Lu, & Razani, 2002). Additionally, having an understanding

of typical malingering profiles on common neuropsychological tests is important, as a

neuropsychologist may not always have access to stand-alone PVT data, such as when reviewing

the work of a colleague (Suhr & Barrash, 2007). Unfortunately, the use of individual

performance measures largely persists despite the call from many researchers to begin

incorporating multiple measures of effort into every standard battery (Greve, Binder, &

Bianchini, 2009; Larrabee, 2008; Nelson et al., 2003).

Research has primarily focused on the use of tests of memory and learning as embedded

effort measures (Larrabee, 2007). While these tests are considered to be the *gold-standard* in

effort measurement, they are vulnerable to coaching and some participants figure out their

purpose (Bianchini, Greve, & Love, 2003. Essig, Mittenberg, Peterson, Stranman, and Cooper

(2001) conducted a survey of 473 attorneys and found approximately 65% of them spend

between 15 minutes and 2 hours with their clients preparing them for a neuropsychological

evaluation and approximately 19% explicitly discussed malingering detection. This requires

neuropsychologists to have advanced measures available to assess effort, ones that may not be as

obvious or easy to fool as others. Fortunately, interest in assessing effort through other cognitive

domains has grown over the last years. A review of the literature suggests the scope of research

has broadened to include tasks of attention (Henry, 2005; Ord, Boettcher, Greve, & Bianchini,

2010), verbal and visual fluency tasks (Demakis, 1999; van Gorp et al., 1999; Vickery et al.,

2004), planning and organization tasks (Bernard, McGrath, & Houston, 1996), inhibition tasks

(Lu, Boone, Jimenez, & Razani, 2004; van Gorp et al., 1999), visual spatial tasks (Whiteside,

Wald, & Busse, 2011), and psychomotor speed tasks (Suhr & Barrash, 2007) as additional useful

embedded measures of effort.

Trail Making Test

The Trail Making Test (TMT; Reitan & Wolfson, 1985) is one measure researched for its

capacity to assess effort. Early surveys of clinicians indicated the TMT was one of the most

commonly administered neuropsychological tests, making it an obvious instrument to assess for

effort (Guilmette, Faust, Hart, & Arkes, 1990). The obvious place to start was the principle that

examinee performance on simple tasks requiring less cognitive load should not appear more/or

as impaired than more complex tasks. For instance, a participant should not perform worse on

the TMT A than on the TMT B; since the TMT B is more complex and shown to be sensitive to

brain dysfunction (Egeland & Langfjaeran, 2007; Reitan & Wolfson, 1985).

Researchers began by comparing scores from patients suspected of malingering to those from patients believed to be putting forth good effort (Powell, Locke, Smigielski, & McCrea, 2011). This research yielded strong evidence that patients believed to be putting forth good effort consistently completed the TMT A and B in faster times than those patients who were believed to be malingering (Goebel, 1983; Iverson, Lange, Green, & Franzen, 2002; O'Bryant, Hilsabeck, Fisher, & McCaffrey, 2003; Ruffolo, Guilmette, & Willis, 2000; Trueblood & Schmidt, 1993). Iverson and colleagues (2002) found when using a cutoff score of > 64 seconds on TMT A 15% of malingerers could be identified with > 90% specificity. Additionally, using a cutoff score of > 201 seconds on TMT B, 12% of malingerers could be identified with > 90% specificity.

Additional research has investigated the relationship between malingering and error rates and TMT A/B ratio scores; however, these studies have produced mixed results (Goebel, 1983; Iverson et al., 2002; O'Bryant et al., 2003; Ruffolo et al., 2000). When compared to patients with genuine brain damage, Goebel's (1983) study was the first to find a relationship between lower TMT ratio scores and participants directed to manifest low effort. Corroborating results were produced by Ruffolo et al., (2000) and O'Bryant et al., (2003) also found differences using a sample of real-life litigants. However, two similar studies failed to produce similar results (Iverson et al., 2002; Martin, Hoffman, & Donders, 2003), making it unclear whether the TMT ratio is a reliable effort measure. Additionally, O'Bryant et al. (2003) concluded TMT error scores did not reliably differentiate individuals with low effort from those demonstrating good effort.

Wisconsin Card Sorting Test

The Wisconsin Card Sorting Test (WCST; Bernard et al., 1996) is another measure previously investigated for use as an index of effort. However, the literature on this measure is sparse. Bernard et al. (1996) attempted to use the WCST to differentiate simulating malingerers from controls, a group of head-injured patients, and a group of patients with mixed etiologies. They hypothesized malingerers would complete fewer categories and would have higher perseverative responses/errors. Results showed the number of categories completed was the only reliable indicator of low effort with 100% sensitivity and 92% specificity.

Verbal and Visual Fluency

The Controlled Oral Word Association Test, or COWAT (Benton, Hamsher, & Sivan, 1994), and the animal fluency test are two of the most popular phonemic and semantic measures of verbal fluency (Iverson, Franzen, & Lovell, 1999; Rabin, Barr, & Burton, 2005). Additionally, their sensitivity to brain dysfunction and brief administration time make them valuable tests if a relationship to effort assessment can be established (Lezak, Howieson, & Loring, 2004). A study conducted by Demakis (1999), used the COWAT and Ruff Figural Fluency Test to distinguish between simulating malingerers and healthy controls. While simulators demonstrated poorer performances than their healthy peers, their improvement rate was similar, making it difficult to differentiate between the two patterns. van Gorp et al. (1999) attempted to use tasks of verbal fluency to detect malingerers, however, was unable to find statistically significant differences between groups. Vickery et al. (2004) also conducted performance testing using a battery including the COWAT, however results based on the COWAT alone were not provided. Boone (2007) concluded there was not enough evidence to use verbal or visual fluency measures to distinguish malingerers from individuals demonstrating good effort.

Delis-Kaplan Executive Function System

Many of the aforementioned tests appear in similar form in the Delis-Kaplan Executive

Function System, or the D-KEFS (Delis, Kaplan, & Kramer, 2001). However, within the D-

KEFS, some of these measures have been expanded or changed to control for process variables

that may contaminate results when trying to look for effort. For example, the Trails subtest on

the D-KEFS is now divided into five components, accounting for such processes as visual

scanning, motor speed, and set switching. Additionally, the verbal fluency subtest allows for

greater accuracy in testing because the respondents' answers are tracked in quadrants of time.

This allows for the administrator to assess whether the participant responded in a similar pattern

to peers.

To date, literature review revealed a lack of research using the D-KEFS to assess effort. It

seemed like the next logical step to use subtests from the D-KEFS in an attempt to distinguish

the performance of simulated malingerers from participants instructed to put forth good effort.

For the current study the focus is on evaluating current subtests within the D-KEFS battery as

viable embedded measures that allow a measure of effort along the continuum of the battery. D-

KEFS provides several subtests similar to tests that are established as at least possible embedded

measures.

This study sought to discover response bias on the D-KEFS among two major groups: a

group of coached university student simulators and a group of non-coached/non-clinical

university students, making the independent variable instruction type. Dependent variables

included scores obtained from administered D-KEFS subtests and performance on the MSVT.

The subtests from the D-KEFS battery administered include the five Trail Making Test (TMT)

conditions, the three Verbal Fluency Test (VFT) conditions, and the two primary-measure

Sorting Test (ST) conditions.

We consistently find in the literature, simulators demonstrate greater impairment in most

cases than even severe traumatic brain injury patients (Boone, 2007). Given this theory, we

expected MANOVA to demonstrate one main effect: mean scores from the simulator group

would be significantly lower on TMT, VFT, ST, and MSVT variables.

Chapter 2

Method

Participants

The sample for this study was recruited from George Fox University and consisted of 49 adults. Participants were randomly divided into two groups, simulators and controls. Demographic data for the sample is summarized in Table 1.

Table 1

Demographic Data Summarized by Group

		Age		Education		Gender		Ethnicity					
Group	*n*	Mean	*SD*	Mean	*SD*	M	F	EH	A/PI	MR	ME	F	H
Controls	23	22.45	4.97	15.90	1.70	11	12	17	2	1	0	1	2
Simulators	26	20.75	3.31	14.50	1.79	7	19	19	2	3	1	0	1

Note. Age reported in years. M = Male. F = Female. EH = European heritage. A/PI = Asian/ Pacific Islander.
MR = Mixed Race. ME = Middle Eastern. F = Filipino, H = Hispanic

Materials

Demographic Questionnaire. Each participant was asked to complete a questionnaire providing demographic information relevant to this study. The questionnaire screened for various medical and psychiatric disorders (See Appendix A for a copy of the questionnaire).

Informed Consent. Participants in each group received informed consent. Participants in the standard effort group were told they will receive a $10 gift card for putting forth full effort.

Participants in the coached effort group were told they will receive a $10 gift card for adequately

faking cognitive impairment (See Appendices B and C for Informed Consent).

TBI Facts Sheet. Each participant in the coached group received a TBI Fact Sheet prior

to administration. This sheet was composed of information about traumatic brain injury such as

definition, classification, and effects of traumatic brain injury (See Appendix D).

TBI Case Vignette. In addition to the TBI Facts Sheet, participants in the simulator

group received a case vignette detailing the experience of an individual who incurred a traumatic

brain injury (See Appendix E for vignette).

Simulator Instructions. Simulators were given a set of instructions asking them to use

the fact sheet and vignette to guide how they responded to the tests. Instructions asked the

simulators to pretend they experienced a TBI as a result of a skiing accident. They were

instructed to answer the items as they believe a person struggling from the effects of a brain

injury would respond using the information provided to them as a guide. They were encouraged

to respond in what they believe would be the best effort for a person with the TBI. (See

Appendix F for instructions).

Standard Reading Material. Participants in the standard effort group were given

unrelated reading material to balance time compared to simulators. Reading material was

composed of motivational content encouraging everyone to do their best at whatever they do

(See Appendix G).

Participant Post Assessment Survey. All participants were asked to complete a post

assessment survey. This survey assessed the level of effort the participant put forth on all items.

For individuals in the simulator group, it also asked how well they believe they adhered to the

profile consistent with traumatic brain injury. Each post assessment survey also contained a

question asking the administrator to estimate the level of effort they believed the participant put

forth (Copies of these documents can be found in Appendices H and I).

Administrator Post Assessment Survey. Administrators completed a survey assessing

their perception of the level of effort demonstrated by the participant (See Appendix I).

Delis-Kaplan Executive Function System (D-KEFS). The D-KEFS is a battery of tests

that provide a comprehensive review of adult and pediatric higher-order thinking, also called

executive functioning. The D-KEFS boasts a standardized sample of over 1,700 nationally

demographically matched adults and children from ages 8 to 89 years old (Delis, Kaplan, &

Kramer, 2001). The D-KEFS battery constructs of nine subtests, each assessing different

components of executive functioning. During the development of this battery Delis et al., (2001)

utilized a process approach to provide information on the individual cognitive processes that are

part of the larger executive functioning constructs being measured. The test may be administered

in its entirety as a battery, or the administrator may select specific subtests according to the

referral question and logistical constraints of the assessment case.

For the purposes of this study, participants were administered the following D-KEFS

subtests: the five conditions of the Trail Making Test (TMT), the three conditions of the Verbal

Fluency Test (VFT), and the two conditions of the Sorting Test (ST). The TMT is composed of

five conditions including a cancellation task and four connect-the-circle tasks. The fourth

condition is a task measuring cognitive flexibility through a symbol switching task. The other

four conditions provide the examiner with additional information to estimate abilities in related

processes such as visual scanning speed and motor speed. Age appropriate test-retest data for the

TMT report reliability coefficients of .36 to .73. Age appropriate validity data, as reported in the

Technical Manual, include intercorrelations ranging from -0.62 to 0.83. No TBI specific

reliability/validity were available in the manual for this subtest.

The VFT is composed of three conditions including a letter fluency task, a category

fluency task, and a category-switching task. For the first two conditions the examinee is asked to

generate a list of words beginning with a specific letter or belonging to a specific semantic

category under timed conditions. On the third condition the examinee is asked to produce a list

of words under timed conditions but is asked to alternate between two semantic categories.

Asking examinees to alternate between categories tests their ability to fluidly switch between

two concepts. Age appropriate test-retest data for the VFT report reliability coefficients of .24

to .81. Age appropriate validity data as reported in the Technical Manual include

intercorrelations ranging from -0.95 to 0.79. No TBI specific reliability/validity were available in

the manual for this subtest.

The ST is composed of two conditions including a free sort condition and a sort

recognition condition. During the free sort condition, the examinee is asked to sort six cards into

two groups of three sharing a similar characteristic. The sorting process is repeated, giving the

examinee the opportunity to demonstrate multiple sorting rules. During the sort recognition task,

the examiner sorts the cards into two sets of three and asks the examinee to explain the

commonalities within the groups and how they are different from the other group. This test

targets examinees' ability to initiate problem solving abilities, create concepts, and engage

abstract reasoning abilities to sort and explain their rationale. Age appropriate test-retest data for

the ST report reliability coefficients of .46 to .55. Age appropriate validity data as reported in the

Technical Manual include intercorrelations ranging from -0.77 to 0.96. No TBI specific

reliability/validity were available in the manual for this subtest.

   Medical Symptom Validity Test (MSVT). The MSVT is a psychometrically sound

instrument designed to evaluate effort and memory in both adults and children Green, (2004).

Meta-analysis conducted by Sollman & Berry (2011) report Sensitivity = 70.0% (95% CI: 13.1 –

1.00), Specificity 91.3 (95% CI: 64.1 – 1.00), and hit rate 80.7 (95% CI: 52.1 – 1.00). The

MSVT takes approximately 5 minutes to complete, not including the 10-minute delay between

subtests. This makes the MSVT significantly faster to administer while retaining similar

sensitivity, and boasting higher specificity than the Word Memory Test (Green, 2004). The

MSVT is a forced-choice computerized assessment. It consists of two effort subtests and two

memory subtests including Immediate Memory Recognition, Delayed Recognition, Paired

Associates, and Free Recall. These subtests produce the primary effort indices including the

Immediate Recognition (IR), Delayed Recognition (DR), and the Consistency (CNS).

   During administration, 10 semantically related word pairs are displayed twice on a

computer screen. The examinee is asked to differentiate the correct word from a distractor on

both the Immediate Recognition and Delayed Recognition subtests. During these subtests, the

examinee receives auditory stimuli providing corrective feedback on each of their responses.

During the Paired Associate and Free Recall subtests, the participant is asked to spontaneously

recall all of the words they can remember. Participants in this study were administered the

MSVT in a standardized fashion.

Procedure

Approval for this study was obtained from the Institutional Review Board (IRB) of George Fox University.

This study utilized a two group, blind administrator design, employing educated simulators to feign cognitive impairment. Participants were recruited from an undergraduate, primarily traditional, student body through courses such as general psychology and research design. Students were invited to participate by the principle investigator at the beginning of their classes. Literature by DeRight and Jorgensen (2015) suggests undergraduate volunteers motivated only by research credit do not always put forth their full effort during participation. In an attempt to mitigate this potential area of limitation, deception was utilized. Participants were led to believe they would receive a gift card only if they were able to successfully put forth their full effort or "trick" the test into thinking they were impaired but not simulating.

Interested individuals signed up to receive additional information on the study. These individuals were contacted by the PI and an appointment for the assessment was arranged. An a priori random assignment protocol was developed so as participants signed up they were randomly placed into coached and non-coached groups and randomly assigned to an administrator.

Seven administrators were selected from a group of graduate student volunteers. All administrators were enrolled in doctoral training in clinical psychology and had successfully completed training in cognitive assessment theory and procedures. These administrators were trained by the PI to administer the D-KEFS subtests, MSVT, and complete the post-assessment debriefing.

Participants arrived at a quiet testing location, at the graduate department of clinical psychology academic complex. Administrations were conducted on weekend days when the academic building was quiet and free from distraction. This location provided a discrete environment for all participants and was properly furnished to carry out the administrations.

The PI presented all participants with the informed consent document and allowed time for the participant to read it (See Appendices B and C). At this time, the PI fielded any questions asked by the participant. During the informed consent process, participants were notified of the chance to receive a gift card as remuneration for their participation. Individuals in the simulator group were told they would receive the gift card if they were successfully able to demonstrate cognitive impairment without appearing to put forth insufficient effort. Individuals in the control group were told they would receive the gift card if the results from the assessment demonstrated they put forth their best effort.

After completing the informed consent process, students were given time and asked to provide demographic information by completing the demographic questionnaire. At the top of the demographic questionnaire, students were asked to create their own five-digit numerical code to replace their name in order to protect their identity. This code replaced the participant's name on each protocol. A master list containing the names and codes of each participant was kept by the principle investigator in a secured locked location.

Upon completing the demographics questionnaire, participants in the simulator group were given the Simulator Instructions, the TBI fact sheet, and the TBI case vignette for review. Simulators were allowed sufficient time to review the materials before assessment begins. In order to control for contamination due to post-assessment participant discussion among peers,

participants in the control group were provided with innocuous reading material on the importance of trying their best. Following this process, the PI asked the participant not to divulge the contents of the study to their peers and not to tell the administrator which group they are in. They were then led to the room where the administrator was waiting.

Administration was to be completed following standardized protocol as outlined in the D-KEFS examiner manual. All administrators gave the first condition of the MSVT then administered the TMT conditions. This generally provided the appropriate delay before the second condition of the MSVT was administered. The VFT conditions were then administered and finally the ST conditions. The MSVT took approximately 5 minutes to complete, the TMT took approximately 10 minutes to complete, the VFT took approximately 10 minutes to complete, the ST took approximately 15 minutes to complete.

Following the administration of all MSVT and D-KEFS conditions, students were asked to fill out the post assessment survey. Participants were thanked for their participation and reminded not to disclose the specifics of the study. At this point they were also provided with the gift card. After the participant left, administrators completed their portion of the post assessment survey. Total time to train, administer tests, and complete associated paperwork was approximately 60 minutes.

Debriefing of participants occurred through e-mail addresses provided by the participants by their own free will and a master list delineating simulator and control participants was kept in a secure, locked location in the PsyD lab.

Chapter 3

Results

Participants in both the simulator ($n = 26$) and control groups ($n = 23$), rated their

understanding of the instructions and recall of the instructions high during a post-assessment

screening. Independent *t*-tests and Goodness of Fit Chi-Square analyses were computed to

compare the two groups on demographic variables. Results indicated no statistically significant

differences across age ($t(47) = -1.42, p = 0.16$), education ($t(47) = -1.17, p = 0.25$), gender ($\chi^2 (1)$

$= 2.94, p = 0.15$) and ethnicity ($\chi^2 (5) = 3.27, p = 0.66$). Table 1 summarizes the demographic

data for the two groups.

To control for possible confounding effects of head injury, eight participants (three

controls, five simulators) reporting history of concussion and loss of consciousness were omitted

from further analysis. The small number of participants in this group was not enough to act as a

clinical sample. Furthermore, to divide these participants into simulator and control groups, there

would have had to be more participants than the eight eliminated. Administrator error in

recording scores on the Sorting Test subtest precluded complete scoring. Trail Making Test

(TMT) times were not recorded in three administrations and verbatim responses for the free-

sorting portion of Sorting subtest were not always recorded. These errors account for the

discrepancy in participant numbers across subtests.

In order to control experiment-wise Type I error rate, three multivariate analyses of

variance (MANOVA) procedures were conducted across the normally distributed variables from

the three subtests. Descriptive statistics for these variables can be found in Table 2. Significant

multivariate effects were produced from the TMT scores (*Pillai's Trace* = 0.62, F(7,30) = 6.95,

p < 0.01) indicating support to reject the null hypothesis that the two groups are the same.

Insufficient evidence was found to reject the null hypotheses on Verbal Fluency subtest (*Pillai's*

Trace = 0.31, F(10,25) = 1.13, *p* = 0.38) variables and Sorting subtest variables (*Pillai's Trace* =

0.25, F(8,28) = 1.19, *p* = 0.34). Simulators performed significantly below controls on six out of

the eleven TMT variables (Visual Scanning, Number Sequencing, Letter Sequencing, Number-

Letter Sequencing, Motor Speed, and Combined Number + Letter Sequencing). Group

differences for TMT variables are found in Table 3.

      Receiver operating characteristic (ROC) statistics were conducted on the six significant

variables from the TMT subtest to determine utility for predicting group assignment and

sensitivity and specificity. All variables produced significant results (See Table 4). Sensitivity

and Specificity cutoff scores of the single variables did not possess enough variability to be

clinically useful. Therefore, a new index variable with greater variability between simulators and

controls was required.

      The five conditions of the TMT subtest were the most consistent discriminators of

simulators from controls across all scores. Because of this, a new variable was calculated using

TMT variables. Subtracting the standard score mean from the participant's score on all five TMT

conditions and then adding the differences together, produced an index, called the Trail Making

Test Validity Index (TMTVI). The TMTVI indicates the distance from the mean the participant

scored across all five conditions. Participants' scores on the TMTVI ranged from -48 to 20. ROC

analysis was conducted on TMTVI. The area under the curve (AUC) was 0.91(non-parametric

SE = 0.05, Asymptotic Significance <0.01, CI = 0.81 − 1.00), indicating excellent accuracy in classification. Using a cutoff score of -12, the TMTVI produced sensitivity of 71% and specificity of 100%. See Table 5 for analysis of the ROC curve.

MANOVA was conducted to investigate group differences on MSVT output variables. See Table 6 for descriptive statistics. As expected, a significant difference was found between the groups on all subtests (*Pillai's Trace* = 0.55, F(5, 27) = 6.71, $p < 0.01$; See Table 7). The MSVT correctly classified 37 of the 41 participants, incorrectly identifying four simulators as controls. The TMTVI correctly classified 32 of the 38 participants for which there were TMT scores. Additionally, it correctly classified two participants as simulators which the MSVT results indicated passed the effort measures. In order to support the utility of the TMTVI, analysis of concurrent validity was necessary. Pearson product moment correlations were conducted using the five MSVT indices and TMTVI. Large effects were found between the TMTVI and Immediate Recall, Delayed Recall, Consistency, and Paired Associates indices. A medium effect was found between the TMTVI and Free Recall Index (See Table 8).

Table 2

Descriptive Statistics for Standard Scores of Simulators and Controls

D-KEFS Scores	Simulators			Controls		
	n	Mean	*SD*	*n*	Mean	*SD*
Trail Making Test						
Visual Scanning	21	4.71	3.33	17	11.00	1.87
Number Sequencing	21	5.81	4.58	17	11.24	2.31
Letter Sequencing	21	5.62	4.17	17	11.47	1.81
Number-Letter Sequencing	21	4.86	4.07	17	10.71	1.49
Motor Speed	21	6.76	4.61	17	12.06	0.75
Combined Number+Letter Sequencing	21	5.81	4.49	17	11.94	2.08
Switching vs. Visual Scanning	21	10.24	1.84	17	9.76	1.25
Switching vs. Number Sequencing	21	9.05	1.91	17	9.47	2.07
Switching vs. Letter Sequencing	21	9.24	2.34	17	9.24	1.75
Switching vs. Combined Number + Letter Sequencing	21	9.05	1.80	17	8.76	1.72
Switching vs. Motor Speed	21	8.10	3.95	17	8.65	1.12
Verbal Fluency Test						
Letter Fluency Total Correct	21	9.10	2.76	19	10.74	3.14
Category Fluency Total Correct	21	9.19	4.12	19	11.84	3.34
Category Switching Total Correct	20	8.85	3.13	19	10.79	3.33
Category Switching: Total Switching	21	10.14	2.85	19	11.47	2.55
Letter Fluency vs. Category Fluency	21	9.90	2.68	19	9.05	3.69
Sorting Test						
Category Switching vs. Category Fluency	21	9.76	2.61	19	8.95	3.46
First Interval: Total Correct	21	8.81	3.60	19	12.26	3.19
Second Interval: Total Correct	21	9.29	2.61	19	10.53	3.20
Third Interval: Total Correct	21	9.19	2.93	19	10.63	2.59
Fourth Interval: Total Correct	20	9.10	3.40	19	10.16	2.09
Category Switching: Percent Switching Accuracy	20	11.76	1.09	19	12.00	0.00

Table 2 cont.

	n	Mean	SD	n	Mean	SD
Confirmed Correct Sorts	21	10.57	2.09	19	12.05	2.15
Sort Recognition Description Score	21	9.76	2.43	19	11.47	2.59
Confirmed Correct Sorts: Card Set 1	21	10.76	2.05	19	12.00	2.11
Confirmed Correct Sorts: Card Set 2	21	11.24	2.23	19	12.42	2.46

	Simulators			Controls		
D-KEFS Scores	*n*	Mean	*SD*	*n*	Mean	*SD*
Confirmed Correct Verbal Sorts	20	10.75	3.37	19	11.53	3.04
Confirmed Correct Perceptual Sorts	21	11.00	2.17	19	12.37	1.98
Sort Recognition Description Score: Card Set 1	21	10.19	2.50	19	11.21	2.25
Sort Recognition Description Score: Card Set 2	21	9.57	2.40	19	11.58	2.91

Note. SD = Standard Deviation

Table 3

Analysis of Variance for Trail Making Test Simulators and Controls Standard Scores

D-KEFS Scores	MANOVA			
	F	*df*	*p*	η^2
Visual Scanning	48.02	1, 36	<.01	0.13
Number Sequencing	19.74	1, 36	<.01	0.08
Letter Sequencing	29.01	1, 36	<.01	0.10
Number-Letter Sequencing	31.60	1, 36	<.01	0.11
Motor Speed	21.83	1, 36	<.01	0.07
Combined Number+Letter Sequencing	26.93	1, 36	<.01	0.10
Switching vs. Visual Scanning	0.83	1, 36	0.37	0.00
Switching vs. Number Sequencing	0.43	1, 36	0.52	0.00
Switching vs. Letter Sequencing	0.00	1, 36	1.00	0.00
Switching vs. Combined Number + Letter Sequencing	0.24	1, 36	0.63	0.00
Switching vs. Motor Speed	0.31	1, 36	0.58	0.00

Table 4

Receiver Operating Characteristics for Significant TMT Variables

	Results of Receiver Operating Characteristic (ROC)			
Significant DKEFS Variables	Area	SE	AS	95 % CI
Visual Scanning	0.95	0.03	< .01	0.89 - 1.00
Number Sequencing	0.85	0.07	< .01	0.72 - 0.98
Letter Sequencing	0.90	0.05	< .01	0.80 - 1.00
Number-Letter Sequencing	0.90	0.05	<.01	0.79 - 1.00
Motor Speed	0.86	0.07	< .01	0.73 - 0.99
Combined Number+Letter Sequencing	0.89	0.06	< .01	0.77 - 1.00

Note. SE = Standard Error, AS = Asymptotic Significance, CI = Confidence Interval

Table 5

Coordinates of the ROC Curve

Positive if ≤	Sensitivity	Specificity
-46.00	0.00	1.00
-43.00	0.10	1.00
-40.50	0.19	1.00
-39.50	0.29	1.00
-37.00	0.33	1.00
-33.50	0.38	1.00
-29.50	0.43	1.00
-25.00	0.48	1.00
-21.50	0.52	1.00
-19.50	0.57	1.00
-18.50	0.62	1.00
-17.50	0.67	1.00
-12.00	0.71	1.00
-5.50	0.71	0.94
-3.50	0.76	0.94
-2.50	0.76	0.88
-1.50	0.81	0.88
0.00	0.86	0.82
1.50	0.91	0.82
2.50	0.91	0.77
3.50	0.91	0.71
4.50	0.91	0.65
5.50	0.91	0.59
7.00	0.91	0.53
8.50	0.95	0.41
10.00	0.95	0.24
12.00	0.95	0.18
14.00	1.00	0.12
17.00	1.00	0.06
20.00	1.00	0.00

Table 6

MSVT Scaled Scores by Group

MSVT Variables	Simulators			Controls		
	n	Mean	*SD*	*n*	Mean	*SD*
IR	16	81.88	16.62	17	99.41	1.66
DR	16	76.56	19.21	17	99.12	1.97
CNS	16	72.81	17.89	17	98.53	2.94
PA	16	71.25	24.46	17	98.82	3.32
FR	16	67.50	18.26	17	83.53	9.15

Table 7

Analysis of Variance Results MSVT

MSVT	MANOVA			
	F	*df*	*p*	η^2
IR	18.76	1, 31	<.01	0.01
DR	23.22	1, 31	<.01	0.02
CNS	34.23	1, 31	<.01	0.02
PA	21.23	1, 31	<.01	0.02
FR	10.36	1, 31	<.01	0.01

Note. IR = Immediate Recall. DR = Delayed Recall.
CNS = Consistency. PA = Paired Associates. FR = Free
Recall

Table 8

Correlation Matrix for MSVT and TMT Index Variable

Indicator	IR	DR	CNS	PA	FR	TMTV Index Variable
IR	1.00	0.87**	0.89**	0.87**	0.78**	0.73**
DR	----	1.00	0.89**	0.86**	0.69**	0.73**
CNS	----	----	1.00	0.85**	0.79**	0.76**
PA	----	----	----	1.00	0.74**	0.62**
FR	----	----	----	----	1.00	0.45**
Index Variable	----	----	----	----	----	1.00

Note. IR = Immediate Recall. DR = Delayed Recall. CNS = Consistency. PA =Paired Associates.
FR = Free Recall

**$p < .01$, two tails.

Chapter 4

Discussion

Comprehensive neuropsychological evaluations, however informative, are also costly. As of the most recent survey, neuropsychologists reported reimbursement rates between 65.09% and 95.61% (Kanauss, Schatz, & Puente, 2005). Not only are the evaluations costly to the neuropsychologist in terms of materials and professional time, they are also costly and taxing to the patient. Lengthy evaluations can be intellectually and emotionally fatiguing to the patient, a byproduct of which may include less-than optimal performance. Efficient, yet valid and reliable evaluations are only becoming more important in today's healthcare system.

Embedded PVTs are one way of cross validating results with stand-alone effort measures without adding to the time required for costly battery administration (Arnett et al., 1995; Meyers & Volbrecht, 2003; Sherman et al., 2002). This study was designed to investigate potential embedded indices of performance validity within three subtests of the D-KEFS. Boone (2007) recommends the development of PVTs should begin with simulator studies, designs allowing for baseline sensitivity and specificity to be determined. If significance is found in these studies, it paves the way for further investigation. Additionally, it is recommended these studies employ multiple effort tests so relative sensitivity can be calculated. By employing a two group design and using a well-founded, stand-alone, PVT, this study accomplished both of these goals.

During this research, the MSVT proved to be a useful tool for discriminating simulators from controls. Accuracy of the MSVT was consistent with literature findings. The 90.2% hit rate

in this study is above the 80.7% reported in the meta-analysis conducted by Sollman & Berry, (2011), and well within the 95% confidence interval of 52% - 100%. In this study we expected to observe a high hit rate, given participants were drawn from a high-functioning university population, were screened out for cognitive impairment, and were motivated to either put forth complete effort or simulate cognitive impairment.

Anecdotal report by simulators who were successful in passing one or more of the MSVT components indicated they focused on somatic symptoms during the assessment. They reported higher rates of rubbing their heads and eyes and reporting headaches and fatigue rather than focusing solely on cognitive deficits. The training materials provided to the simulators were constructed from resources available to the general public. Real world individuals attempting to simulate cognitive impairment could easily access this information and construct a feigning strategy similar to the ones created by participants of this study, including the behavioral components. The issue of monitoring behavioral observations for performance validity has been addressed in the literature before, however, this remains an area primed for additional investigation (Vanderploeg & Curtiss, 2001).

It was expected atypical patterns of performance would be found on TMT contrast variables. However, this was not the case. Contrast variables proved to be ineffective at distinguishing simulators from controls. Contrast variables are effective at identifying individuals with brain injuries resulting in specific deficits; however, they are ineffective in reliably identifying simulators who feign global decline. Impaired performance across all variables produces contrast measures that are within the average range. This approach to appear severely impaired on all measures is consistent with the literature that suggests simulators

routinely overestimate the level of cognitive impairment seen in clinical populations (Green et al., 2001).

Results confirmed the expectation that simulators would perform significantly below controls on the five TMT conditions. However, when entered into ROC analysis, individual condition standard scores demonstrated limited variability. We believed lack of task variability made it difficult for to delineate between simulators and a clinical sample in future research. It was believed by aggregating the participant's performance below the mean, we would identify individuals demonstrating global cognitive impairment, as is often seen in simulator performance (Green et al., 2001). Refinement of group differences on five TMT condition variables led to the discovery of the TMTVI. Considering the study's relatively small sample size, the excellent AUC characteristic and statistical significance of this measure is encouraging. The TMTVI cutoff score of -12 produced sensitivity of 71% and specificity of 100%. In this investigation, minimizing the number of controls incorrectly identified as simulators was a priority, thereby sacrificing sensitivity. Others who are willing to increase type 2 error may prefer to increase the cutoff score. As can be observed from Table 5, there is a gap in AUC coordinates between -12.00 and -5.50. Additional investigation of this aggregate index would help to fill the gap between these coordinates and provide additional cutoff scores that can be evaluated for clinical utility.

The use of the TMTVI will provide administrators additional information for identifying examinees who display global impairment across all domains, overestimating impairment of clinical populations. These individuals are not likely to be aware that even severely impaired individuals demonstrate differing patterns of performance across measures demanding varying levels of cognitive load. Individuals motivated by secondary gain and are more sophisticated in

ways to feign impairment may be missed by the TMTVI, thus utilization of multiple measures of effort during a neuropsychological assessment continues to be a high standard of practice.

Lack of statistical significance between simulators and controls on verbal fluency variables is inconsistent with Demakis (1999) and Vickery et al. (2004). However, these results are consistent with the findings of van Gorp et al. (1999) and the summary conclusions presented in Boone (2007). It is possible simulators were unaware even healthy individuals typically slow down over the course of the task and instead maintained an average pace of reporting words across the four, 15-second periods of time available in the fluency tasks. This would have led to similar raw scores and thereby similar standard scores amongst simulators and controls. While simulators may have attempted to appear impaired on this measure, results suggest their strategy was inadequate to prove convincing as a group.

Similarly, performance on Sorting test variables lacked clinical utility in discriminating simulators from controls. Inaccurate recording of responses by administrators led to invalid variables, precluding formal statistical analysis. While we would have expected to see variables suggestive of global impairment in simulator performance, we also would have expected to see significantly lower performance on tasks typically requiring less cognitive load, such as recognition and the number of perceptual sorts during the free sorting condition.

Limitations

The sample of participants in this study presents some limitation to generalizing the results to other demographics. While statistical significance was found with this sample, the effect size was small and having a larger sample may have aided in producing additional points along the ROC curve. Barriers to an enlarged sample size during this study include limited volunteer signup, limited administrator availability, and coordination of schedules to arrange a

time that worked for the principal investigator, the administrator, and the participant. Having

additional time to complete the research may have provided additional access to students in other

courses, making the sample larger. Another characteristic of the sample that reduces the

generalizability of these results is the overall demographic homogeneity of the sample. As noted

above, some literature suggests undergraduate students tend to demonstrate suboptimal effort

when participating in research (DeRight & Jorgensen, 2015) and this must be acknowledged as a

potential limitation. However, even with coaching and additional monetary incentive to follow

directions, most of these high functioning individuals were unable to successfully avoid

detection.

Another limitation to this study involves the loss of data that may have provided

additional variables for analysis. The loss of ST variables significantly reduced the sensitivity

and clinical utility of that subtest to detect simulators. Additionally, it raises the question of other

potential areas of administrator error. Protocol review and procedural debriefing of standardized

procedures with administrators indicated there did not appear to be any additional violations of

standardized administration.

Areas for Future Research

Now that significant differences have been established between controls and simulators

on the TMTVI, future research should continue investigating the index's clinical utility.

Additional research should ideally include a clinical sample and a group where there is potential

motivation for secondary gain, such as disability claimants or individuals in a forensic setting. If

such a sample is not available, including a group of simulators may still serve to improve the

ecological utility of the measure.

There are also parts of this project that would benefit from replication. Additional investigation into the ST of the D-KEFS would evaluate this task's utility to detect sub-optimal effort. It may also be useful to increase the sample size to fill out the ROC curve and broaden the sample demographics to increase the generalizability of the results.

Conclusion

In addition to the proliferation of research on stand-alone PVTs, sensitive embedded effort indices are a burgeoning area of interest in the field of neuropsychology. This research supports the utility of D-KEFS TMT conditions as potentially useful embedded measures of effort. In particular, the aggregate TMTVI is likely to identify individuals who simulate global cognitive impairment. However, additional research is needed to better delineate the utility of the index for this purpose.

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Appendix A

Demographics Survey

Participant Number (create a five-digit code): _____

Please complete the following information about yourself:

1. Date of birth: _____ (mm/dd/yy)

2. Age: _____ years, _____ months

3. Ethnicity: _____

4. Gender: _____

5. Current year of education: _____

6. Major: _____

7. Have you ever been diagnosed with a concussion?

    Yes   No

    a. If yes, how long ago did it occur? _____ years, _____ months

    b. If yes, how long did you have difficulty thinking and concentrating?

        _____ days, _____ hours, _____ Minutes.

    Have you ever experienced loss of consciousness (not due to substances)?

    Yes   No

    c. If yes, how many times have you experienced loss of consciousness as a result of head injury? _____ times.

    d. If yes, how long ago did the first experience occur? _____ years, _____ months

    e. If yes, what was the longest period of time you lost consciousness? _____ hours, _____ minutes

8. Are you currently experiencing feelings of sadness?

    Yes   No

9. Are you currently experiencing low motivation?

    Yes   No.

10. Have you recently experienced feelings of intense fear with shortness of breath and racing heartbeat?

    Yes   No

    Please rate the following experiences using a 1-4 scale to indicate frequency:
    1 = Never, 2 = Rarely, 3 = Occasionally, 4 = Consistently.

Issue:	Rating:	Issue:	Rating
Seizures		Diabetes	
Trouble with memory		Thyroid problems	
Hyperactivity		Prolonged fatigue	
Trouble with concentration		Difficulty with balance	
Impulsivity		Finding the right word	
Poor decision making		Heart problems	
Suspended from elementary school		Quick temper	
Expelled from school		Headaches	
Repeated a grade in elementary school		Difficulty getting enough sleep	
Struggle to make friends		Difficulty falling asleep	
Encephalitis			

If you are interested in receiving information about the outcome of this study please provide your email address:

E-mail address:_____

Appendix B

Informed Consent

Embedded Performance Measures Within the
Delis-Kaplan Executive Function System

I agree to participate in a study that requires me to complete a series of tests that will evaluate different ways of thinking such as memory, verbal performance, visual sorting, and decision making. I will be administered three subtests from the Delis-Kaplan Executive Functioning System (D-KEF) and the Medical Symptom Test. I understand that this testing will take approximately one hour and may require up to two sessions.

I understand that all information gathered and test results are for research purposes only, and the doctoral student administering the tests will protect my identity and privacy in any and all learning experiences in which this information is used. I understand that there are some circumstances that can limit this confidentiality, which include, but are not limited to: (a) a statement of intent to harm myself or others, (b) statements indicating harm or abuse of children or vulnerable adults, and (c) a subpoena from a court of law.

I understand that I will have the opportunity to take part in a discussion with the doctoral student administering the test regarding the procedures involved. I understand that there is no cost associated with participating in this study. This study has been assessed for risk and approved by the George Fox University Institutional Review Board.

I understand that I am expected to put forth my best effort while participating in these activities. I understand that these can measure how hard I am trying, and if the tests show that I put forth my best effort I will be awarded a $20 gift card. I understand that by participating I may experience feelings of frustration and stress, and may feel tired. I understand that I may take breaks at any time, and I may also withdraw my involvement at any point with no explanation necessary and without consequence.

If I have any questions or concerns at any point during the process, I may contact the principle investigator, Daniel Olsen, (717) 917-6491, or the research supervisor, Dr. Glena Andrews, (503) 554-2386 or gandrews@georgefox.edu.

If you are willing to participate, please sign below to indicate your consent to participate in this study. Thank you for supporting this important research.

Sincerely,

Daniel H. Olsen, M.A., Principle Investigator
Graduate Department of Clinical Psychology
George Fox University

By signing indicate that I understand and accept the conditions outlined above, and agree to be a participant in the study entitled *Embedded Performance Measures Within the Delis-Kaplan Executive Function System*

_____   _____
Printed Name   Signature

_____
Date

_____   _____
Printed name (Witness)   Witness' Signature

_____
Date

Appendix C

Informed Consent

Embedded Performance Measures Within the
Delis-Kaplan Executive Function System

I agree to participate in a study that requires me to complete a series of tests that will assess many different ways of thinking such as memory, speed tests, and decision making. I understand that this testing will take approximately one hour and may require up to two sessions. I also agree to participate in completing a brief clinical interview.

I understand that all information gathered and test results are for research purposes only, and the person administering the tests conducting the interview will protect my identity and privacy in any and all learning experiences in which this information is used. I understand that there are some special circumstances that can limit this confidentiality, which include, but are not limited to: (a) a statement of intent to harm myself or others, (b) statements indicating harm or abuse of children or vulnerable adults, and (c) a subpoena from a court of law.

I understand that I will have the opportunity to take part in a discussion with the person administering the test regarding the procedures involved. I understand that there is no cost associated with participating in this study. I understand that this study has been assessed for risk and approved by the George Fox Institutional Review Board. I understand that by participating I may experience feelings of frustration and stress, and may become fatigued.

I understand that I am expected to pretend to have a cognitive disability. I understand that the activities I will be participating in are sensitive to how hard I am working, and I am to attempt to fool the tests into thinking I am impaired but still trying hard. I understand that if I am able to trick the tests and perform as though I have a cognitive impairment while putting forth good effort I will receive a $20 gift card. I understand that I may take breaks at any time and I may also withdraw my involvement at any point with no explanation necessary and without consequence.

If I have any questions or concerns at any point during the process, I may contact the principle investigator, Daniel Olsen, (717) 917-6491, or the research supervisor, Dr. Glena Andrews, (503) 554-2386 or gandrews@georgefox.edu.

If you are willing to participate, please sign below to indicate your consent to participate in this study. Thank you for supporting this important research.

Sincerely,

Daniel H. Olsen, M.A., Principle Investigator
Graduate Department of Clinical Psychology
George Fox University

By signing indicate that I understand and accept the conditions outlined above, and agree to be a participant in the study entitled *Embedded Performance Measures Within the Delis-Kaplan Executive Function System*

_____   _____
Printed Name   Signature

_____
Date

_____   _____
Printed name (Witness)   Witness' Signature

_____
Date

Appendix D

Traumatic Brain Injury Fact Sheet

Adapted from http://www.mayoclinic.org/diseases-conditions/traumatic-brain-injury, and

http://www.traumaticbraininjury.com/

What is it?

Traumatic brain injury, often referred to as TBI, occurs when an outside mechanical force

causes brain dysfunction such as a violent blow or jolt to the head or body. An object penetrating

the skull, such as a bullet or shattered piece of skull, also can cause traumatic brain injury. As

with other injuries, the individual is typically functioning well before the injuring event.

However, after the injury there is an abrupt change in the individual's abilities.

Since our brain defines who we are, the consequences of a brain injury can affect all

aspects of our lives, including our personality. Symptoms may appear right away or may not be

present for days or weeks after the injury. One of the consequences of brain injury is that the

person often does not realize that a brain injury has occurred.

Brain injuries do not heal like other injuries. Recovery is a "functional" recovery, based

on mechanisms that remain uncertain. No two brain injuries are alike and the consequence of two

similar injuries may be very different.

Mild traumatic brain injury may cause temporary dysfunction of brain cells. More serious

traumatic brain injury can result in bruising, torn tissues, bleeding and other physical damage to

the brain that can result in long-term complications or death.

Effects

Most people are unaware of the scope of TBI or its overwhelming nature. TBI is a common injury and may be missed initially when the medical team is focused on saving the individual's life. Before medical knowledge and technology advanced to control breathing with respirators and decrease intracranial pressure, the pressure in the fluid surrounding the brain, the death rate from traumatic brain injuries was very high. Although the medical technology has greatly advanced, the effects of TBI are significant.

TBI is classified into two categories: mild and severe. A brain injury can be classified as mild if loss of consciousness and/or confusion and disorientation is shorter than 30 minutes. While brain scans are often normal, the individual can experience cognitive problems such as difficulty thinking, memory problems, attention deficits, mood swings and frustration. These injuries are commonly overlooked. Even though this type of TBI is called "mild", the effect on the family and the injured person can be devastating.

Severe brain injury is associated with loss of consciousness for more than 30 minutes and memory loss after the injury or penetrating skull injury longer than 24 hours. The deficits range from impairment of higher level cognitive functions to comatose states. Survivors may have limited function of arms or legs, abnormal speech or language, loss of thinking ability or emotional problems. The range of injuries and degree of recovery is varies widely and is individualistic.

The effects of TBI can be profound. Individuals with severe injuries can be left in long-term unresponsive states. For many people with severe TBI, long-term rehabilitation is often necessary to maximize function and independence. Even with mild TBI, the consequences to a person's life can be dramatic. Change in brain function can have a dramatic impact on family,

job, social and community interaction. Some signs or symptoms may appear immediately after

the traumatic event, while others may appear days or weeks later.

Mild traumatic brain injury

The signs and symptoms of mild traumatic brain injury may include:

Physical symptoms

- Loss of consciousness for a few seconds to a few minutes

- No loss of consciousness, but a state of being dazed, confused or disoriented

- Headache

- Nausea or vomiting

- Fatigue or drowsiness

- Difficulty sleeping

- Sleeping more than usual

- Dizziness or loss of balance

Sensory symptoms

- Sensory problems, such as blurred vision, ringing in the ears, a bad taste in the mouth or

  changes in the ability to smell

- Sensitivity to light or sound

Cognitive or mental symptoms

- Memory or concentration problems

- Mood changes or mood swings

- Feeling depressed or anxious

Moderate to severe traumatic brain injuries

Moderate to severe traumatic brain injuries can include any of the signs and symptoms of

mild injury, as well as the following symptoms that may appear within the first hours to days

after a head injury:

Physical symptoms

- Loss of consciousness from several minutes to hours

- Persistent headache or headache that worsens

- Repeated vomiting or nausea

- Convulsions or seizures

- Dilation of one or both pupils of the eyes

- Clear fluids draining from the nose or ears

- Inability to awaken from sleep

- Weakness or numbness in fingers and toes

- Loss of coordination

Cognitive or mental symptoms

- Profound confusion

- Agitation, combativeness or other unusual behavior

- Slurred speech

- Coma and other disorders of consciousness

Appendix E

Traumatic Brain Injury Vignette

Adapted from Ogden (2005)

Rachel was a tall, attractive, 14-year-old female adolescent who acted more mature than her age. Rachel was referred because of difficulties she had been experiencing following a mild closed traumatic brain injury (TBI) two months earlier. Rachel's doctor and mother were concerned because her problems were emotional as well as cognitive and had been "dragging on" for many weeks. As Rachel commented, "No one really believes my problems are because of my head injury anymore because I seem so normal and healthy on the outside. Sometimes even I think the head injury never happened, and I am going crazy." The skepticism of friends, family, and even the medical profession about an organic cause for Rachel's problems typifies the attitude of many sufferers and rehabilitation specialists call it "the unseen injury."

Before her accident, Rachel was the top student in her class at school; she enjoyed music, art, swimming, aerobics, and skiing. Rachel planned to graduate from high school early, and attend the university to study fine art. Her mother, younger sister, and friends perceived her to be an extrovert. As her best friend, Louise, commented, "Rachel was always involved in something exciting." She was popular at school and she and her Mom were close. Her younger sister, Jody, was also considered exceptionally talented, and at the age of 12 she was already an accomplished violinist. The girls' parents were divorced and their father lived in New Zealand.

Rachel was vacationing with Louise and Louise's parents. On the last day of the the vacation, Rachel hit a stone while snow skiing and fell, hitting her head hard on the bottom of a pylon supporting a chair lift. When Louise reached her a minute later, Rachel seemed dazed and

a little confused, but after resting for 10 minutes she was able to stand up and ski the short distance to the base facilities. She was checked by the ski patrol staff who said she may have had a brief concussion and should rest and not ski again for a few days. Louise and her parents reported that Rachel seemed confused and was unable to remember much for about 4 hours after the accident. After a night's sleep, Rachel felt somewhat better and was no longer confused, although she did complain of a continuous headache. After a checkup by her family doctor, Rachel rested for the week of school vacation left before returning to school at the beginning of the final term of the year.

Three days after starting school, she returned home in the early afternoon, distressed because she could not concentrate and could not get rid of her headache. From this time on her school performance deteriorated, and art was the only subject with which she could cope. The art room was quiet, and the students worked at their own pace. On her doctor's suggestion, she reduced her school hours to three per day and slept in the afternoon. She still could not keep up with math and soon dropped the class, At home she was irritable, sad, lacked energy, and spent her evenings in her room listening to music. Her mother and friends tried to encourage her to socialize but with little success.

Two months after her head injury Rachel was still demonstrating problems with attention, memory, and drawing tasks, which was surprising given her love for artistically oriented activities. She withdrew from school for the few remaining weeks of the year. After taking some time off, Rachel returned to school the following semester and her performance had significantly improved.

Appendix F

Simulator Instructions

(Adapted from Shaver, 2004)

In this study you will be asked to complete a set of tasks that are often used to measure changes that occur in people who suffer head injuries. As you perform each task, we would like you to assume the role of someone who has experienced a mild brain injury resulting from a skiing accident.

Pretend that you were involved in this accident when another skiier cut you off, forcing you into the woods and causing you to hit your head on a tree and briefly lose consciousness. You were hospitalized for observation and then released. You initially suffered from headaches and experienced difficulty concentrating and remembering information. Gradually, over the past few months, you started to feel normal in some ways. You find that you still struggle with your energy level. You have to make sure that you record your classes because you cannot remember the information from lectures as well as you could before the accident. Your headaches have become less frequent but if you have had a "tough" day with exams and class you will have a headache in the evening. You find that you have to re-read material before you can fully understand it. You are not flunking classes, but your grades have fallen by one-half to a full grade (from A to A- or B).

As you portray the above person, try to approach each task in the research as you imagine this person would respond. Try to respond to the tests in a way that will convince the examiner that you are suffering from your brain injury. You want to perform as well as you can on the tests given you are suffering from the lasting effects of your TBI. Remember, for the purposes of this

study, if you are able to successfully produce the effects of a head injury you will receive a $20

gift card.

Appendix G

Post Questionnaire – Coached

1. While you were participating in the tests how well did you remember the instructions and vignette?

    1 (*not at all*)   2(*some*)   3(*most of it*)   4(*very well*)

2. On a scale of 1-10, how well did you understand the instructions? (1=*I didn't understand them*, 10=*I completely understood them*) _____

3. On a scale of 1-10, for how much of the assessment did you try to pretend cognitive impairment? (1=*none of it*, 10=*all of it*) _____

4. On a scale of 1-10, how confident are you that you fooled the test? (1=*not confident at all,* 10=*completely confident*) _____

5. What was your strategy for fooling the test?

6. Do you have any questions about the study?

Thank you for participating in this study. **Please do not discuss the contents of this study or the activities you participated in with other students who may have also volunteered.**

Appendix H

Participant Post Questionnaire

1. On a scale of 1-10, how hard did you try on all of these activities? (1=*not at all*, 10=*I tried my best all of the time*) _____

2. On a scale of 1-10, how well did you understand the instructions? (1=*I didn't understand them*, 10=*I completely understood them*) _____

3. Do you have any questions about the study?

Thank you for participating in this study. **Please do not discuss the contents of this study or the activities you participated in with students who may also have volunteered.**

Appendix I

Administrator Post Assessment Survey

To be answered by the examiner after administration.

On a scale of 1-10 how much effort do you think the participant put forth on all activities? (1=*no effort*, 10=*full effort*) _____

<div align="center">

Appendix J

Curriculum Vitae

DANIEL H OLSEN

</div>

Formal Educational Background

George Fox University   **09/2012 – Present**
Graduate Department of Clinical Psychology
APA Accredited
Newberg, Oregon
- Graduate Department of Clinical Psychology: APA Accredited
  - Master of Arts in Clinical Psychology awarded 04/2014
  - Doctoral Degree, anticipated graduation: 06/2017
  - Emphasis in Assessment
  - Advisor: Glena Andrews, Ph.D., MSCP
- Dissertation
  - Embedded performance validity measures within the Delis-Kaplan Executive Function System
    - Status: Defended

Lancaster Bible College   **2008 - 2010**
Lancaster, Pennsylvania
- Bachelor of Arts: Mental Health Counseling
  - Graduate with High Honors

Liberty University   **2006 - 2007**
Lynchburg, Virginia
- Accounting

Clinical Experience

Samaritan Health Services: Internship   **06/2016 – Present**
Albany, OR
Ages 8-98
Total Hours: 1,060
  Intervention : 135
  Assessment: 163
  Supervision: 146.5
- **Neuropsychology Rotation**
  - Conduct chart reviews and structured intake assessments and gather collateral information relevant to patient's status.
  - Provide tiered supervision of practicum students.

- Administer batteries of neuropsychological and psychodiagnostic assessments.
- Conceptualize results and history into diagnostic impressions and compile brief reports.
- Coordinate with physicians and medical staff to provide consultations and facilitate warm hand-offs introducing neuropsychological services.
- Provide feedback of test results and treatment/management strategies to patients and caregivers
- Participate in weekly neuropsychological journal club and present articles according to assigned rotations.
- Participate in weekly neuropsychological group supervision, including case presentations, fact finding exercises, assessment psychometric presentations, presentations on controversial issues in neuropsychology.

- **Primary Care Rotation**
  - Deliver interventions from a cognitive behavioral therapy frame targeting medical diagnoses, treatment adherence, and psychosocial/mental health referrals.
  - Work within a biopsychosocial structure as an active member of the larger interdisciplinary team, directly addressing bidirectional relationship between patient's physical and emotional health.
  - Identify and work with patients and medical teams on aspects of diversity salient to comprehensive patient care. Individuals seen have included diversity in ages (ages 4-95), ethnicity, cultural background, sexual orientation, religious affiliation, cognitive/physical ability, rural/urban populations, and partnership/familial status.
  - Coordination of care within multidisciplinary systems including physicians, surgeons, registered nurses, case management, medical assistances, clinic management, and support staff.
  - Facilitate warm hand-offs, conduct curbside and formal consultations, and provide feedback to providers regarding patient care.

- **General Internship Training**
  - Provide traditional mental health therapy to long-term patients and receive supervision on a weekly basis.
  - Serve as Chief Intern to act as liaison between training committee and intern cohort.
  - Participate in weekly training including group didactics, group supervision, journal club, and dedicated research time for cohort research.
  - Present assessment and therapy cases to panel of licensed providers and field questions.

Providence Medical Group: Practicum   **05/2014 – 06/2016**
Newberg, Oregon
Ages 4-95

- **Primary Care Rotation**
  - Provide integrated behavioral health intervention services from a cognitive behavioral therapy frame.
  - Deliver interventions for a wide variety of treatment referrals, including medical diagnoses, treatment adherence, and psychosocial/mental health referrals.

- o Work within a biopsychosocial frame as an active member of the larger interdisciplinary team, directly addressing bidirectional relationship between patient's physical and emotional health.
- o Identify and work with patients and medical teams on aspects of diversity salient to comprehensive patient care. Individuals seen have included diversity in ethnicity, cultural background, sexual orientation, religious affiliation, cognitive/physical ability, rural/urban populations, and partnership/familial status.
- o Coordination of care within multidisciplinary systems including physicians, surgeons, registered nurses, case management, medical assistances, clinic management, and support staff.
- o Conduct both curbside and formal consultation and feedback to providers regarding patient care.
- o Provide warm hand-offs with providers to streamline workflow and increase patient follow-up with referrals.
- o Implement crisis intervention including risk assessments and safety planning.
- o Complete appropriate documentation within the clinic's electronic medical record.
- **Neuropsychological Rotation**
  - o Develop referral and work-flow systems with Neurology and Psychiatry departments to establish a primary care based neuropsychological rotation.
  - o Identify presenting problem and appropriate assessment protocols based on referral question and fixed flexible battery approach.
  - o Conduct efficient intake interviews, administer both brief and comprehensive neuropsychological batteries, write reports, and provide recommendations relative to patient care.
  - o Provide consultation and feedback to neurology, psychiatry, and primary care providers, as well as case management regarding patients' neurocognitive functioning and its impact on patient care, treatment planning, and possible need for higher levels of support within the community.
  - o Initiate and develop cognitive rehabilitation support group and lead 12-week group.
  - o Present neuropsychological correlates of Parkinson's Disease at local PD support group.

Behavioral Health Crisis Consultation Team   **01/2014 – 4/2016**
In collaboration with Yamhill County Mental Health
Providence Newberg Medical Center, Newberg, Oregon
Willamette Valley Medical Center, McMinnville, Oregon
Title: Behavioral Health Crisis Consultant
- Function as a designated Qualified Mental Health Professional (QMHP).
- Independently conduct risk evaluations and crisis management in hospital Emergency Departments, Intensive Care Units, and Medical/ Surgical Departments.
- Provide evidence based assessment of individuals who are at risk of harm to self or others, demonstrate an inability to care for self, and/ or present with psychoses.
- Use evidence based risk assessment tools to aid in determining level of risk.

- Consult and liaise with ED physicians, hospitalists, Physicians Assistants, and nursing staff.
- Provide coordination of care and patient placement as indicated based on risk level, including psychiatric hospitalizations, respite, residential treatment, detox, homeless shelters, and community mental health.
- Coordinate care with county providers; provide summarization of cases and needs in regards to patient care at change of shift.
- Conduct and actively engage in weekly modified Grand Rounds presentations, including formal presentation of patient cases and facilitating group discussion on diagnostics, consideration of risk and protective factors, as well as determinations in regards to patient care.
- Provide coverage for 16-hour weekly on-call shifts and holidays.
- Supervisors: Mary Peterson, Ph.D., ABPP; Joel Gregor, Psy.D.; William Buhrow, Psy.D.

Rural School District Consortium   09/2013 – 05/2014
Yamhill, Oregon
Title: School Based Behavioral Health Specialist
- Develop competency working within systems with multidisciplinary staff, including education staff, autism specialists, and allied professionals.
- Provide therapeutic services to youth, ages 10-17, of European, Latino, and Asian heritage, incorporating CBT, ACT, and Play Therapy based interventions.
- Conduct intake interviews and develop treatment plans to implement empirically supported intervention strategies.
- Implement crisis intervention including risk assessments and safety planning.
- Provide comprehensive psychoeducational assessments in conjunction with IDEA and IDEIA standards. Integrating cognitive, achievement, neuropsychological, personality, and behavioral measures; ages 5-17, European, Latino, and Asian heritage.
- Provide feedback of assessment results to students, families, and professional colleagues.
- Psychoeducation with interdisciplinary staff and families.
- Supervisors*:* Elizabeth Hamilton, Ph.D.; James Gesicki, M.A.

Pre-Practicum Student   08/2012 – 05/2013
Graduate Department of Clinical Psychology
- Provide weekly therapy with undergraduate students.
- Conduct intake interviews, develop treatment plans, write formal intake reports, and complete termination summaries.
- Participate in video review of sessions with supervisor.
- Supervisor: Carlos Taloyo, Ph.D.

Additional Clinical Experience

Parkinson's Resources of Oregon   2015
Lake Oswego, Oregon

- Establish relationship and act as liaison/program developer between neuropsychological student interest group and organization.
- Develop cognitive compensatory strategies based on neuropsychological symptoms associated with Parkinson's Disease using empirically supported interventions.
- Coordinate with local support group leaders to plan delivery of services.
- Deliver psychoeducation services and practical compensatory strategies to support groups in western Oregon.
- Supervisor: Jeri Turgesen, Psy.D.

Northwest Neurohealth   **2013**
Newberg, Oregon
- Conduct neuropsychology intake sessions.
- Provide comprehensive neuropsychological evaluations.
- Conceptualize evaluation data and summarize results into reports to customize patient care programs.
- Provide feedback of assessment results to patients and significant others.
- Supervisor: Robert Weniger, Psy.D., ABPP-CN

Providence Behavioral Health   **2010 – 2011**
Lancaster, Pennsylvania
- Conduct psychotherapy and neuropsychology intake sessions, ages 12-90.
- Administer neuropsychological evaluations, ages 12-90.
- Participate and present in fact-finding/case presentation oral exams.
- Conceptualize evaluation data and summarize results into reports to customize patient care programs.
- Present feedback of assessment results to client and field relevant questions.
- Deploy patient manager software program to consolidate records and maintain client information electronically.
- Supervisor: Freeman Chakara, Psy.D., ABPP-CN

Supervision Experience

Samaritan Health Services, Albany, Oregon   **2016**
- Provide tiered supervision of practicum students in neuropsychology clinic
- Support development of clinical and assessment skills.
- Conduct direct observation of clinical skills.
- Provide feedback of intake and assessment skills
- Supervisor: Robert Fallows, PsyD, ABBP-CN

George Fox University, Newberg, Oregon   **2015-2016**
- Oversee second year Psy.D. students.
- Support development of clinical and assessment skills.

- Conduct direct observation of clinical skills.
- Aid in development of theoretical orientation and personal style of therapy.
- Evaluate student's development of clinical and professional skills.
- Provide feedback on clinical work.
- Supervisor: Carlos Taloyo, Ph.D.

Professional Presentations and Publications

Olsen, D., Andrews, G. (November 2015) *Ability of administrators to detect suboptimal effort during neuropsychological assessment.* Poster presentation to Western Psychological Association annual convention.

Oliver, H., Smith, C., Olsen, D., Lowen, J., Hartman, T., & Song, C. *A training evaluation of county mental health workers participating in a CAMS training.* Poster presented at the 122nd annual convention of the *American Psychological Association,* Division 27 (Community Psychology) Toronto, ON.

Smith, C., Oliver, H., Olsen, D., Lowen, J., & Hartman, T. *A comparison of community crisis workers determining suicide risk using case vignettes*. Poster presented at the 122nd annual convention of the *American Psychological Association,* Division 27 (Community Psychology) Toronto, ON.

Olsen, D., Lowen, J., Davis, S., Maloney, C. & Jasper, L. (May, 2012). *Students against bullying*. Poster presented at Providence Kid's Day Health Fair, Portland, OR.

Research Experience

Research Team Member   **Present**
Samaritan Health Services
Cost Benefit of the Triple Aim
- Review literature
- Organize archival data.
- Conduct statistical analysis using SPSS.

Research Team Member   **2014-2016**
George Fox University
Longitudinal Behavior Changes Among Children with
Agenesis of the Corpus Callosum
- Review literature.
- Organize archival data.
- Conduct statistical analysis using SPSS.

Research Vertical Team Member   **2013 – Present**
George Fox University
- Assist team members in design of various research projects.
- Conduct formal presentations of research projects and results.

- Participate in data collection, entry, and analysis.

Research Assistant   **2014**
Newberg, Oregon
- Administer and score the WRAML-2 to adult volunteers as part of data collection for a dissertation assessing the memory implications from mild to moderate hearing loss.
- Supervisor: Heather Demming, M.A.

Research Assistant   **2014**
Newberg, Oregon
- Administer verbal and non-verbal Stroop measures to sample of pediatric athletes.
- Supervisor: Christopher Koch, Ph.D.

Grants

Richter Scholar Grant   **2014**
- Project: Embedded Effort Measures Within the Delis-Kaplan Executive Function System
- Grant Award: $2,080.00

Richter Scholar Grant   **2013**
- Project: Embedded Effort Measures Within the Wide Range Assessment of Memory and Learning, Second Edition
- Grant Award: $3,268.00

Teaching Experience

George Fox University
Newberg, Oregon
Graduate Department of Clinical Psychology
Title: Graduate Teaching Assistant
- **PSYD 510: Neuropsychological Assessment**   **2015-2016**
  - Course provides students with understanding of neuropsychological assessment and utilization of a brain-based behavior assessment perspective to conceptualize, evaluate, and respond to common referral questions.
  - Guest lecture, conduct assessment labs, supervise student demonstration of competency, grade assignments, and provide feedback to students.
  - Supervisor: Glena Andrews, Ph.D., MSCP
- **PSYD 512: Statistics**   **2016**
  - Course provides students with understanding of statistical analysis as applied to research.
  - Grade assignments, guest lecture, and assist in SPSS instruction
  - Supervisor: Kathleen Gathercoal, Ph.D.
- **PSYD 522: Cognitive Assessment**   **2014**

- Course provides students understanding of cognitive and achievement assessment principles and report writing.
- Guest lecture, conduct assessment labs, supervise student demonstration of competency, grade assignments, and provide feedback to students.
- Supervisor: Celeste Flachsbart, Psy.D., ABPP

George Fox University
Masters in Counseling Program, Graduate Department
CACREP Accredited
Portland, Oregon
Title: Adjunct Professor
- **GCEP 571: Tests and Assessments**   **2015**
    - Two-credit course introduces Masters level students to broad assessment and psychometric principles.
Focus on ethical assessment administration and basic score interpretation.

Leadership and Involvement

National Academy of Neuropsychology   **11/2016-Present**
DistanCE E-Learning Committee
- Student Committee Member

Association for Neuropsychology Students in Training   **2015-2016**
- Student Representative

Neuropsychology Student Interest Group   **2015-2016**
George Fox University
- Founding Member
    - Conceptualized mission and goals, presented to faculty for approval.
    - Applied for Division 40 recognition and received approval.
    - Liaised with neuropsychologists in the field to present as guest speakers.
    - Integrated relationship with Parkinson's Resources of Oregon and trained other members to provide services to support groups.
    - Organized research to be conducted by interest group.
    - Organized and led monthly meetings.
    - Developed website including domain purchasing, securing a hosting provider, and creating website.

Community Service   **2015**
- Psychological correlates of Parkinson's Disease and caregiver fatigue
- Presentation at Friendsview Retirement Community, Newberg, OR

Gender and Sexual Identity Student Interest Group   **2013-2016**

George Fox Graduate Department of Clinical Psychology   **2012-2016**
- Admissions interviewer

George Fox Community Serve Day   **2012-2016**

Professional Affiliations and Memberships

National Academy of Neuropsychology   **2015-Present**
- Student Member

American Psychological Association   **2012-Present**
- **Division 40: The Society for Clinical Neuropsychology**
  - Student Affiliate

American Board of Professional Psychology   **Present**
- Early Entry Applicant

Association for Doctoral Education in Clinical Neuropsychology   **Present**
- Member

References

Robert Fallows, Psy.D. ABPP-CN
- Internship Supervisor
- Associate Director of Clinical Training

Michael Herman, Psy.D.
- Internship Supervisor
- Director of Clinical Training

Glena Andrews, Ph.D., MSCP
- Advisor and Dissertation Chair
- Director of Clinical Training