ABSTRACT

PATTERSON, TARYN ROSE. Examining Domain-Specific Relationships between Cognitive Functioning in Older Adulthood and Performance on Observed Tasks of Daily Living. (Under the direction of Jason C. Allaire, Ph.D.)

The present study builds on the growing body of research examining the relationship between basic cognitive functioning and instrumental task performance. Specifically, the aim of the study was to determine if specific cognitive abilities were related to overall and domain-specific instrumental functioning (e.g., medication use, financial management, and telephone use.). The sample consisted of 204 older adults (28% African-American, 72% European-American) with a mean age of 73 years (range = 60-91; SD = 6.85). Participants completed an objective measure of everyday competence, the Revised Observed Tasks of Daily Living assessment (OTDL-R; Diehl, Marsiske, Horgas, Rosenberg, Saczynski, & Willis, 2005) as well as a number of basic cognitive ability measures (processing speed, inductive reasoning, working memory, verbal memory, verbal ability). Results from path analyses indicated that processing speed was significantly related to overall OTDL-R performance as well as performance in the financial management domain. Interestingly, better overall OTDL-R performance was related to slower processing speed but better performance in the financial management domain was related to faster processing speed. Discussion will focus on the multi-dimensionality and directionally of the relationships between cognitive functioning and everyday competency.
Examining Domain-Specific Relationships between Cognitive Functioning in Older Adulthood and Performance on Observed Tasks of Daily Living

by
Taryn Rose Patterson

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APPROVED BY:

________________________________ _________________________________
Shevaun D. Neupert, Ph.D. Thomas M. Hess, Ph.D.

________________________________
Jason C. Allaire, Ph.D.
Chair of Advisory Committee
DEDICATION

To Mom, Dad, Nana & Gramps for always believing in me
BIOGRAPHY

“But we lean forward to the next crazy venture beneath the skies”

~Jack Kerouac
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Thank you first and foremost to my mentor, Jason Allaire, for his patience, sense of humor, and willingness to foster creativity. Although I was fully aware that every thesis meeting would end with Jason stealing my pen, I was also certain that the significant gain in statistical and theoretical knowledge would far outweigh the significant loss in writing utensils. I would not have made it without Gilda and Tara; you guys are my “safe chair”. I’d also like to thank my former lab mates, Sarah Kennedy and Alyssa Gamaldo, for their continued guidance and wisdom!
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Introduction

“Successful aging” refers to maintenance of functional capacities, components of which include cognitive, social, and physical activities (Rowe & Kahn, 1997). Consequently, sustained independence, as determined by maintained levels of functioning in adulthood, is a primary concern for many. Functional activities can refer to two different categories: activities of daily living (ADLs, such as feeding and bathing; Katz, Ford, Moskovitz, Jackson, & Jaffe, 1963), and instrumental activities of daily living (IADLs, such as taking medication, handling finances, and cooking; Lawton & Brody, 1969). Most of the previous research on functional activities has focused on determinants of decline and maintenance such as cognitive functioning. However, a main criticism of this research is that functional activities are usually assessed through the use of subjective self-reports which do not assess actual ability or competency, nor do they assess individual ability to perform various tasks within a single domain of functioning (Allaire et al., 2009; Guralnik, Branch, Cummings, & Curb, 1989). In addition, prior research has not clearly identified which cognitive abilities are associated with specific domains of instrumental functioning. Using an objective measure of instrumental functioning, the current study will examine the extent to which a broad array of basic cognitive abilities account for individual differences in overall competency, as well as within the domains of medication use, financial management, and telephone use.

Review of the Literature

Instrumental Functioning in Older Adults

Instrumental functioning can be defined as activities encountered in the environment
that require a certain amount of cognitive competence to perform, such as preparing meals, managing finances, and taking medications (Lawton & Brody, 1969). Such activities go beyond more basic tasks of daily living, such as bathing and dressing, and require a higher level of memory, planning, and execution in order to properly carry out the task. Due to the greater cognitive complexity of IADLs, such activities are not surprisingly more strongly related to cognitive ability than are ADLs (Burton, Strauss, Hultsch, & Hunter, 2006; McCue, Rogers, & Goldstein, 1990). Taken together, ADLs and IADLs reflect the minimum level of capacity required for independent living (Katz et al., 1963).

The inability to perform both categories of everyday functional tasks is associated with greater use of health care services (Wolinsky, Miller, Prendergast, Creel & Chavez, 1983), increased risk of institutionalization (Branch & Jette, 1982), and increased risk of mortality (Manton, 1988; Simonsick, Lafferty, Phillips, Mendes de Leon, Kasl, Seeman et al., 1993). Previous studies have found that maintaining independence in older adulthood is often cited as integral to maintaining well-being and sustaining adequate quality of life (Baltes & Carstensen, 1996). Loss of independence in older adulthood due to chronic illness or disability, therefore, is strongly associated with feelings of helplessness and impaired coping mechanisms (Gignac, Cott, & Badley, 2000).

Assessing Instrumental Functioning in Older Adults

Subjective Assessments

Most research on the relationship between cognition and daily functioning has relied on subjective assessments, such as self or proxy ratings of performance. Relying on self-
report ratings by the participant or a proxy-rating obtained by a caregiver or relative is problematic for at least four reasons. First, subjective ratings are susceptible to potentially inaccurate responses; they rely on subjective evaluation, may be prone to memory inaccuracies, or independently influenced by such things as depression, personality, cognitive status, and social desire to maintain optimal levels of functioning (Kempen, Steverink, Ormel, & Deeg, 1996; Kruger & Dunning, 2009; Horgas, Elliot, & Marsiske, 2009; Owsley, McGwin, Sloane, Stalvey, & Wells, 2001). Second, subjective ratings tend to assess a multidimensional domain, such as taking medications, through the use of a single, narrow question such as “How much trouble do you have taking your medication?” Such a question ignores the multifaceted nature of the task. Problems may arise with regard to remembering to take the medication (either at the right time or at all), taking the correct dosage, refilling the prescription, or managing multiple medications. Third, subjective items are not very sensitive to individual differences in performance. That is, responses to these items usually dichotomize level of functioning into “independent” or “dependent and sometimes a third category of “needs help” (Allaire, Gamaldo, Ayotte, Sims, & Whitfield, 2009). Furthermore, doing so potentially overlooks direct and indirect relationships between the determinants of functional decline and domains of daily functioning. It is therefore important to avoid over-reliance on subjective assessments of functional abilities in order to more fully identify the relationships that exist between domains of cognition and domains within tasks of daily living, specifically those that may incur detriments in the face of cognitive decline. Finally, subjective assessments are often not uniformly related to actual performance. Overall,
moderate to weak correlations have been found between self- or proxy reports of functional status and performance-based assessments (Farias, Harrell, Neumann, & Houtz, 2003; Reuben, Valle, Hays & Siu, 1995).

**Objective Assessments**

As the name implies, objective measures attempt to remove personal biases incurred by subjective responses by either employing direct observation of an individual manipulating an object in the environment, or by presenting an individual with real-world problems which they must solve within a relevant context of daily living (Allaire et al., 2009). The benefit of objective measures over more pervasive subjective assessments is that an individual’s actual real-world performance of the everyday task is assessed and quantified. There are two main ways to tap objective performance of instrumental functioning. The first involves the use of measures of everyday cognition in which individuals are presented with cognitively complex pen-and-paper problems addressing tasks typically encountered in everyday life (Everyday Problems Test; EPT, Willis & Marsiske 1993; Marsiske & Willis 1995; Everyday Cognition Battery; ECB, Allaire & Marsiske, 1999, 2002). Such assessments utilize real-world stimuli, such as a bank statement or a phone bill, which participants must use to answer questions. However, participants are never asked to manipulate real-world objects so an accurate objective assessment of older adults’ functional abilities is never obtained. In addition, such paper-and-pencil measures potentially allow education, literacy, and age biases to negatively affect subsequent performance (Diehl, Marsiske, Horgas, Rosenberg, Saczynski, & Willis, 2005).
The second approach to assessing objective performance is typically used by clinicians and is referred to here as the “clinical approach.” The clinical approach typically utilizes actual real-world stimuli such as a check or a medicine bottle, but simply ask participants to perform one discrete action (Giannovetti, Libon, Buxbaum, & Schwartz, 2002; Griffith, Belue, Sicola, Krzywanski, Zamrini, Harrell, & Marson, 2003; Okonkwo, Wadley, Griffith, Ball, & Marson, 2006), thereby eliminating the inherent multidimensional nature of most everyday tasks. A single question about a domain such as medication adherence ignores the multidimensional nature of the everyday task (e.g. remembering to take the medication, understanding the label, taking the correct dose at the correct time, etc). As the name suggests, findings from the clinical approach are largely based on patient samples of older adults who often have been diagnosed with mild cognitive impairment (MCI) or dementia.

The Revised Observed Tasks of Daily Living (OTDL-R; Diehl et al., 2005) is a unique means of assessing objective instrumental functioning that combines the multidimensionality of everyday cognition and the physical, real-world stimuli used in the clinical approach. The OTDL-R asks participants to perform discrete, cognitively complex, observable actions in response to an experimenter prompt, such as making change with coins and bills, balancing a checkbook, and paying a utility bill with a check and mailing it. The original OTDL (Diehl, Willis, & Schaie, 1995) included a “food preparation” domain, but was replaced with the domain of financial management allowing the OTDL-R to better reflect cognitive IADLs identified by Wolinsky and colleagues (1983) shown to predict bed-disability days, hospital
contact, and mortality. The OTDL, therefore, uses an ecologically valid approach to everyday cognition by observing and evaluating an individual’s ability to manipulate objects in the environment.

Specifically, the OTDL-R consists of nine total multidimensional objective tasks, three in each of the domains of medication use (following medicine label directions, understanding an aspirin pamphlet, and completing a patient record form); telephone use (finding and dialing a number from the yellow pages, finding and dialing a number from a directory of social service resources from the phone book, and using a discount rate chart from a phone book); and financial management (making change with coins and bills, balancing a checkbook, and paying a utility bill with a check and mailing it). Confirmatory factor analysis on the OTDL-R has shown that both a one-factor and a three-factor model of everyday competence provided a good fit to the observed data (Diehl et al., 2005). The single-factor solution (see Figure 1) specifies one overall OTDL factor, composed of three composite scores; medication use, telephone use, and finance. The three-factor model (see Figure 2) specifies a separate factor for each of the domains which are comprised of several individual items assessing each domain respectively. The latter model provides additional support for the multidimensionality of older adults’ everyday problem solving and was consistent with findings reported by Diehl et al. (1995) on the original version of the OTDL. However, the large intercorrelations among the latent factors suggested that a more parsimonious factor structure, such as a single-factor structure, might be psychometrically more appropriate. The proposed study intends to initially identify whether a one- or three-
factor structure best fits the data. Utilizing the OTDL-R, due to the fact that this type of assessment necessitates both understanding cognitively complex actions as well as actually performing them, will allow for a more multidimensional examination of the relationship between cognition and instrumental functioning.

Predictors of Instrumental Functioning in Older Adults

Regardless of assessment type, many studies have found evidence of age differences and age-related decline in instrumental functioning (Diehl et al., 2005; Fleishman, Spector, & Altman, 2002). For instance, Diehl and colleagues (2005) found a significant cross-sectional negative correlation between age and IADL performance ($r = -.24$), as did Willis, Tennstedt, and Marsiske (2006) who observed a longitudinal decline in functioning for both experimental and control groups over a five year period. Given these age differences and the importance of maintaining competency in instrumental domains of functioning for successful aging, many studies have attempted to explain age-related differences, as well as individual differences unrelated to age, by more proximal constructs, particularly cognitive functioning.

Cognition and Instrumental Functioning: Global Relationships

Previous research has found that cognitive functioning is closely tied to older adults instrumental functioning (Burton, Strauss, Hultsch, & Hunter, 2006; Cromwell, Eagar, & Poulos, 2003; McGuire, Ford, & Ajani, 2006; Willis et al., 2006). However, much of this work has relied on broad measures of mental status to predict overall ADL and IADL performance as assessed by subjective evaluations (Black & Rush, 2002; Moritz, 1995; Njegoven et al., 2001; Pfeffer et al., 1982). For instance, McGuire and colleagues (2006)
determined that lower overall cognitive functioning, as determined by the Telephone Interview of Cognitive Status (TICS; Brandt, Spencer, & Folstein, 1988), was predictive of later ADL and IADL disability. In other studies (e.g. Burton et al., 2006; McCue et al., 1990), cognitive status was not predictive of individual ADLs, but was predictive of the IADL tasks. Similarly, Cromwell and colleagues (2003) identified significant relationships between overall cognitive status and impairments within Lawton and Brody’s (1969) IADL domains of telephone use, medication use, and financial management.

These findings suggest that cognition is related to instrumental functioning, and even specific domains of functioning. However, they do not identify the specific cognitive abilities that might be related to overall instrumental functioning or perhaps to specific domains of functioning. An in depth examination of these relationships would lead to a greater understanding of whether or not individual functional capacities are uniquely related to individual domains of cognition, thereby elucidating pathways potentially amenable to intervention (Royall, Lauterbach, Kaufer, Malloy, Coburn, & Black, 2007).

*Specific Cognitive Abilities and Instrumental Functioning*

Though research is limited, previous research has found that specific cognitive abilities are related to instrumental functioning. In particular, a significant relationship between executive abilities and IADL impairment has been found (Carlson, Fried, Xue, Bandeen-Roche, Zeger, & Brandt, 1999; Royall, Chiodo & Polk, 2000). That is, individuals with poor executive function are more likely to have difficulty with instrumental functions when compared to individuals with no cognitive impairment (Johnson, Lui, & Yaffe, 2007).
Royall, Palmer, Chiodo, and Polk (2004) found that decline in a measure of executive function was a more salient predictor of IADL decline than the MMSE for a population of older adults residing in a continuing care community. In addition, intervention research utilizing cognitively normal populations has found that improved reasoning ability (Willis et al., 2006), and speed of processing (Edwards, Wadley, Myers, Roenker, Cissell, & Ball, 2001) are related to less difficulty with IADLs, as assessed by both self-reported and objective ratings of functioning.

Similarly, studies examining everyday cognition have found a relationship between assessments of basic cognitive abilities and everyday cognition (Allaire & Marsiske, 1999; 2002; Willis & Schaie, 1986; 1993). Allaire and Marsiske (1999) utilized a battery of paper-and-pencil measures of everyday problem solving within IADL domains of medication use, financial planning, and food preparation, and found that verbal knowledge, declarative memory, and inductive reasoning significantly predicted community-dwelling older adults’ everyday cognitive performance. In addition, these cognitive abilities mediated all of the age-related variance in instrumental performance. Finucane, Mertz, Slovic, and Schmidt, (2005) reported that working memory and processing speed were significantly related to comprehension and decision-making consistency within everyday cognitive domains. Participants were presented with two simple and two complex problems in each of three domains (health, finance, and nutrition) and were asked to answer both literal and inferential questions within each domain, with the difference being the latter is reliant on a higher degree of reasoning skills. Results indicated that poorer working memory and processing
speed were associated with greater comprehension errors collapsed across the three domains. Similarly, Burton et al. (2006) examined whether measures of specific cognitive abilities (i.e. memory, executive functioning, and speed of processing) were more useful in predicting problem solving abilities than measures of global cognitive functioning. Results indicated that global measures of cognitive functioning, as well specific cognitive abilities, were important predictors of older adults’ ability to solve problems of everyday living on the Everyday Problems Test. Results from research by Diehl and colleagues (1995; 2005) have also shown that overall performance on the OTDL is significantly related to a number of traditional measures of psychometric intelligence (ranging from $r = .33$ with memory to $r = .68$ with fluid intelligence). Performance on the OTDL-R was positively related with older adults’ performance on tests that assessed basic cognitive functioning such as verbal ability, memory, inductive reasoning, and perceptual speed.

Clearly these studies link specific cognitive abilities to instrumental functioning. However, they fall short of identifying which abilities are related to specific subdomains of instrumental functioning. Specifically, greater examination of abilities such as memory, inductive reasoning, and processing speed, may elucidate domain-specific relationships potentially amenable to intervention.

**Cognitive Abilities and Domain-Specific Instrumental Functioning**

There has been some indication that specific cognitive abilities are related to specific domains of everyday functioning. For instance, memory and reasoning are both uniquely related to medication usage (Park, 1994; 1992b), and executive abilities and
reasoning have been linked to performance on a financial ability (Okonkwo et al., 2006). Barberger-Gateau and colleagues (1999) found that processing speed was associated with all four IADL domains (e.g., telephone, transportation, medication, and finance). A number of more specific relationships was also found: visuo-spatial perception/attention and transportation use, conceptual abilities/orientation and telephone use, episodic memory and medication use, conceptual abilities/orientation as well as episodic memory/semantic ability and financial management.

Interestingly, the vast majority of research examining domain-specific relationships between cognitive abilities and specific functional domains falls under the clinical approach. However, most of this research has been conducted comparing group differences in performance between “normal” older adults and those diagnosed with MCI or dementia. Okonkwo and colleagues (2006) investigated the relationship between cognitive correlates and subsequent financial abilities in individuals with MCI as indicated by performance on The Financial Capacity Instrument (FCI), a standardized, psychometric instrument that assesses nine domains of financial abilities, and a composite score based on a neurocognitive battery. Results indicated that executive function and attention were significantly related to impaired financial conceptual knowledge, bank statement management, and bill payment but not cash transaction skills. Similarly, Griffith and colleagues (2003) reported that MCI participants were at a higher risk relative to control participants for impairments in FCI domains of conceptual knowledge, cash transactions, bank statement management, bill payment, and in overall financial capacity. Interestingly, there was heterogeneity in financial
impairment in MCI participants in that not all individuals demonstrated impairment, perhaps due to differential progression of impairment.

Allaire and colleagues (2009) examined not only the prevalence of impaired abilities within the domains of medication use, financial management, and nutrition/food preparation, but the unique contribution of the Everyday Cognitive Battery (ECB) memory test in predicting MCI status. They found significant differences between MCI and non-MCI individuals in frequency of reported IADL difficulty; a greater proportion of participants in the MCI group reported dependency on others for preparing meals and paying bills/handling money. Furthermore, MCI participants performed significantly worse on all three everyday memory domain subscales, with performance on the domains of medication use and financial management serving as unique and significant predictors of MCI group membership.

Farias and colleagues (2003) extended this work to examine the relationships among multiple cognitive domains and a broader array of functional abilities on both performance and informant-based IADL ratings. Result indicated that executive functioning was an important predictor of several functional domains, including the ability to write a check and balance a checkbook as well as reports of the ability to shop independently (as measured by Lawton and Brody’s IADL scale, 1969). Visuospatial and executive abilities were related to writing a check and addressing a letter, and the ability to recall the location of real-world objects was related to both immediate and delayed memory. Furthermore, education was a significant predictor of two IADL domains (using a telephone, doing laundry, and balancing a checkbook). These findings are consistent with previous work with the original OTDL
(Diehl et al., 1995) that found that high scores on the cognitive ability measures were associated with higher performance on the OTDL. Specifically, significant correlations ranged from .31 (perceptual speed and telephone use) to .68 (fluid intelligence and medication use). All three factors of the OTDL (food preparation, telephone use, and medication), had the strongest associations with fluid intelligence.

Although knowledge of both general and domain-specific instrumental functioning is important in fostering independence in older adulthood, the ability to manage one’s medications is arguably a critical and highly modifiable component. There is a breadth of research on the effects of cognitive impairment on medication management and subsequent quality of adherence. Researchers have examined the key role memory plays in medication adherence and comprehension due to the fact that memory can have either direct effects on a medication regimen, or indirect effects where improper comprehension about a medication leads to suboptimal management (Ley, 1986). Such an examination is an ideal way to connect an everyday task that is not only a vital component in the daily lives of older adults, but is necessarily contingent on cognitive behaviors including comprehension, working memory, long-term memory, prospective memory, and reasoning (Park, 1992b). Park and colleagues (1994) focused on the cognitive aspects of medication comprehension, particularly memory and reasoning. They found that both normal and cognitively impaired older adults had more trouble when asked to infer the appropriate course of action as compared to more literal questions regarding information with which they are presented. Cognitively impaired individuals had even greater difficulty as compared to normal older adults.
Similarly, Neupert and McDonald-Miszczak (2004) examined cognitive and metacognitive predictors of cued recall for verbal medication information after a 24-hr delay and found a significant interaction between age and working memory, with medication recall contingent on working memory ability in older adults. More importantly, they found that both younger and older adults are typically overconfident when gauging their ability to recall important medical information, which might have serious implications for community dwelling older adults who are, on average, prescribed more medications as compared to younger adults (Neupert & McDonald-Mizczak, 2004). Research that employs an ecologically valid approach to the study of adherence has found that age may not be a factor in non-adherence. Rather it may be factors such as lower cognitive capacity, specifically working memory and executive functioning, (Neupert & McDonald-Mizczak, 2004; Insel et al., 2006), or self-report busyness (Neupert, Patterson, Davis, & Allaire, 2010) that are equally influential factors.

As outlined, previous research has established that relationships exist between basic cognition and subjective assessments of functioning (Carlson et al., 1999; Royall et al., 2000; Willis et al., 2006), basic cognition and everyday assessments of cognition (Allaire et al., 1999, 2002; Burton et al; 2006; Finucane et al., 2005; Griffith et al., 2003; Okonkwo et al., 2006; Willis et al., 1993), and that both of these assessment approaches have been found to be related to actual objective performance (Diehl et al., 1995; Farias et al., 2003). In sum, there is evidence suggesting that specific domains of functioning, as assessed by the clinical approach, are related to specific functional abilities. However, as mentioned, most of these
studies merely observed if patients were able to perform a discrete, everyday task, but were not asked to solve problems with that domain of functioning, which limits the predictive utility of such assessments.

The current research proposes to examine the relationships between specific cognitive abilities and specific everyday functional domains in an attempt to more fully understand the process that promotes functional maintenance, and subsequent independence, in older adults within specific everyday domains. Little research has examined the predictive utility of domain-specific cognitive performance, such as on everyday assessments of medication and financial management, and subsequent effects on real-world functional outcomes. It would therefore be important to know if OTDL-R performance is uniquely predicted by domain-specific performance on a multidimensional assessment of everyday cognition (assessing domains of food preparation, medication use, and telephone use) above and beyond the predictive utility of basic cognitive abilities.

Demographic Predictors

In addition to cognitive abilities, extant research has attempted to identify demographic predictors potentially related to everyday functioning. Age and education tend to be related to domain-specific aspects of everyday cognition, such as when assessing food preparation, financial management, and telephone usage (Allaire & Marsiske, 1999; Allaire & Whitfield, 2004). Ayotte and colleagues (2008) were able to identify significant domain-specific relationships that exist between age and telephone use and education and finance-related everyday cognition in a population of older adults from the Baltimore Study on Black Aging (BSBA).
These results are consistent with previous findings that also identified a significant relationship between education and telephone use (Farias et al., 2003). Although the latter research did not find a significant relationship between age and telephone use, it should be noted that much domain-specific research has utilized populations of cognitively impaired individuals. This research has, however, highlighted the importance of identifying both direct and indirect relationships between predictors, overall performance, and domain specific performance. Ignoring potential direct relationships may overestimate the actual relationship that exists between a predictor and overall cognitive performance.

**Summary**

It is important to identify cognitive predictors of not only overall functional status, but of individual domains of instrumental functioning. Doing so may lead to more accurate detection of everyday functioning abilities that need immediate attention, thereby potentially informing more specific avenues for intervention. Ideally, such an improvement in assessment may result in increased independence and quality of life in later adulthood, as well as decreased health care expenditures (Spiro & Brady, 2008). It is similarly necessary to understand individual differences and mediators of daily functioning and cognition, such as demographic variables, as they may highlight additional variables and relationships that are driving the outcome. The present study intends to build on the growing body of research that examines practical, and potentially clinical, applications of everyday functional assessments. We will examine the relationship between traditional laboratory-based assessments of
cognitive functioning and performance on an objective instrumental functioning as assessed by the OTDL-R. Specifically, through the use of a multiple indicators multiple causes (MIMIC) modeling approach, the relationship between cognitive functioning and domain-general (overall performance) and domain specific (medication, finance, and telephone use) instrumental functioning will be examined.

Specific Aims

The present study intended to first examine the factor structure of the OTDL-R in order to determine through confirmatory factor analysis if a one, three, or second order factor model best fits the data. Based on previous research, it is hypothesized that both a 3-factor, and single-factor model will provide a good fit to the data, with a single-factor model perhaps offering a more parsimonious fit (Diehl et al., 1995; 2005).

Next, we sought to determine the extent to which demographic variables and basic cognitive abilities explain individual differences in overall OTDL-R performance and whether specific abilities are related to subdomains of the OTDL-R through the use of a multiple indicators multiple causes (MIMIC) modeling approach (see Figure 3). Based on the literature outlined, it can be hypothesized that age would be negatively related to telephone use (Ayotte et al., 2008), education would be positively related to the domains of telephone use and finance (Farias et al., 2003; Ayotte et al., 2008), memory (Ley, 1986; Neupert & McDonald-Miczczak, 2004; Barberger-Gateau et al., 1999), and reasoning (Park et al., 1992, 1994; Okonkwo et al., 2006) would be positively related to the domains of medication and finance.
Lastly, the present study intended to explore the extent to which cognitive abilities mediate the relationship between demographic characteristics (age and education) and performance on the OTDL-R. Based on previous literature, we hypothesized that processing speed may mediate the relationship between age and telephone use, as well as education and telephone/finance (Ayotte et al., 2008; Farias et al., 2003)

Method

Participants

Participants were recruited by the researchers from local community centers, churches, and retirement facilities. Each participant was paid $100 for their participation, as well as an additional $50 for every referral they made to the researchers for potential participants. The sample consisted of 204 community dwelling elders (130 white, 74 non-white) ranging in age from 60 to 91 years ($M = 73$ years old, $SD = 6.85$). Participants’ average yearly income was $32,500 ($SD = $10,000; range = < $5,000 - >$45,000) and the average years of education was 15.36 years (range = 5-24 years, $SD = 3.19$ years). Approximately 64% of the sample was European American, 35% was African American, and 1% reported as being Hispanic. Additionally, 60% of the participants were female.

Design

The current investigation is a secondary analysis of data collected as part of a larger study. The purpose of the larger study was to design a daily measure of everyday cognitive performance, and included numerous additional measures beyond those included in the
present investigation. A daily diary design was used which consisted of a pretest and eight daily sessions. The current investigation utilized the pretest data exclusively.

Procedure

Testing locations included surrounding senior centers, churches, and community organizations. Individuals who expressed interest in participating in the study were contacted via telephone, given more information about the intentions of the study, and briefly screened in order to determine eligibility. If interested and eligible, potential participants were scheduled for a pretest session. Baseline testing was led by either the Primary Investigator or a trained graduate research assistant and occurred in groups of no more than five participants at a time. At this testing session, each participant received a 2-hour psychological test battery that included both paper-and-pencil and computer administered tests. Before each test, instructions were given verbally and administered under timed conditions by imposing fixed test times with a preset timer when appropriate. Measures that were administered by the computer began with ample practice sessions so participants became familiar and comfortable with responding via the computer keyboard. The specific measures included in Phase 2 are provided below.

Measures

Background information inclusive of demographic variables and basic cognitive abilities including inductive reasoning, memory, and processing speed was gathered for each participant.
The Center for Epidemiological Studies-Depression (CES-D) scale. Due to the potential relationship that exists between depression and subsequent performance on cognitive and functional tasks, the CES-D (Radloff, 1977) was used to control for such effects.

The Observed Tasks of Daily Living Assessment- Revised (OTDL-R). The OTDL-Revised (Diehl et al., 2005) is a behavioral measure of everyday competence that requires adults to perform a set of discrete, observable actions in response to a question by an interviewer. Participants were asked to complete three tasks within each everyday domain, such as balancing a checkbook or following directions on a medicine label. The OTDL-R includes a total of nine tasks, three in each of the domains of medication use (following medicine label directions, understanding an aspirin leaflet, and completing a patient record form); telephone use (finding and dialing a number from the yellow pages, finding and dialing a number from a directory of social service resources from the phonebook, and using a rate discount chart from a phonebook); and financial management (making change with coins and bills, balancing a checkbook, and paying a utility bill with a check and mailing it). Each main task in the OTDL-R (e.g., finding and dialing a number from the yellow pages) has a number of subtasks or steps (e.g. first finding the number), yielding a total of 28 items on which scores were assigned.

For each task, participants received real-life materials (e.g., medicine bottles, a push-button phone, a lunch bill, and coins) and a question that the interviewer presented on an index card. Participants were asked to perform the necessary steps to complete the task, and
their actions were scored as correct (1) or incorrect (0) for each step, with total scores ranging from 1 to 4 depending on the task. For the purpose of the present analyses, composite scores were created for each of the domains (medication, telephone, finance) by summing the tasks and subtasks associated with that domain. The composite domains were then utilized as indicators for the single factor model. On average, administration of the OTDL-R takes 20-30 minutes. Alphas for the three domains were .71 for medication use, .66 for telephone use, .71 for financial management, and the internal consistency for the total measure was .82 (Diehl, Marsiske, Horgas, Rosenberg, Saczynski, & Willis, 2005).

Cognitive Ability Measures

Choice Reaction Time (CRT) Task (Hultsch et al., 2002; MacDonald, Hultsch, & Dixon, 2003). This task assessed processing speed by asking participants to identify as quickly as possible the location of an object on the computer screen by pressing the corresponding key on the keyboard. Participants were presented with a stimulus of four plus signs arranged horizontally on the screen. After a delay of 1,000 ms, one of the plus signs change to a box, and the participants must subsequently press the key on the keyboard that corresponds to the location of the box on the computer screen. Scores consisted of average milliseconds to complete each item.

Digit Symbol Substitution Task (DSST; Weschler 1981). This task assessed processing speed by presenting participants with an array of symbols on a computer screen, each of which corresponds to one number, ranging from 1 to 9, on the key board. Participants identified which symbol corresponded to which number as quickly as possible for 1 minute.
Scores consisted of average milliseconds to complete each item.

*Letter Series Test (Thurstone, 1962).* This 48-item measure assessed inductive reasoning, or the ability to extract novel relationships in over-learned material. Participants were asked to correctly identify the letter that comes next in a series of letters presented on the computer screen for a total of four minutes. For example if the letters presented were “a b a b c d c” the participant would press the correct letter that would come next in the series, which would be “d”. The correctly classified items were summed to represent an overall score, with the highest possible score being 30.

*Rey Auditory Verbal Learning Task (AVLT; Rey, 1941).* This task required participants to study a list of 15 semantically unrelated words on a laptop computer for 1 minute and then recall as many of the words from the list as possible. The number of correctly recalled words was used as the total score; there is no penalty for intrusion or preservation errors. The total time allotted to complete the test was 2 min; 1 min to study the list and 1 min for recall.

*Verbal Ability (Verbal Ability Test; Thurstone 1962).* This test, which assesses verbal knowledge, required that respondents identify the correct definition of a word from a list of possible alternatives. Each item and the answer choices were presented one at a time on the computer screen. The participant chose the correct answer from a list of four possible choices by pressing the corresponding key. The sum of the number of correct responses out of 18 total words was used to determine verbal ability. The Verbal Ability Test was self-paced; therefore an estimate of how long it took participants to complete the task is not available.
N-Back (Kirchner, 1958). The n-back task assessed working memory capacity. A list of 52 letters was presented at a rate of 1s with a 500 ms interval between stimuli. The participant’s task was to determine whether the letter presented was the same or different from the letter 1-back or 2-back. Participants were told to press the number ‘1’ key when the letter matches the letter of the instructed amount of letters back (e.g. 1-back or 2-back), and press ‘2’ when the letter was not a match. For example, if the letters presented are K, L, S, L, the responses for the 2-back task to the letter ‘S’ would be ‘2’ for a non-match, whereas the response to the letter ‘L’ would be ‘1’ for a match. Separate scores were calculated for the 1-back and 2-back trials, where a participant's score on each task is the number of correct answers out of the 50 1-back and 50 2-back trials.

Analytic Approach

In order to identify relationships among basic cognitive abilities, specific domains of cognition, and subsequent performance on the OTDL-R, the multiple indicators multiple causes (MIMIC) modeling approach was utilized. The MIMIC model is a subset of structural equation modeling in which there are multiple indicators for each latent variable (analogous to confirmatory factor analysis) and multiple covariates, or predictor variables (Jones & Gallo, 2002; Muthén, 1989). The MIMIC model approach can be inclusive of both categorical and continuous variables while simultaneously examining both direct and indirect effects of the covariates on everyday cognition. Such a model is useful in examining direct and indirect relationships between predictors and outcomes.
Results

Specific Aim 1: Factor Structure of the OTDL-R

In order to identify which of the three potential models (single-factor, three-factor, second-order) best fit the data, confirmatory factor analyses were conducted using AMOS 16.0. A single–factor as well as a three-factor model were estimated followed by a second-order model. Adequate fit was determined by the Maximum Likelihood Estimation, represented as a chi-square statistic, the root mean square error of approximation (RMSEA), and at least one additional relative fit index, such as the comparative fit index (CFI), Bentler-Bonett Normed Fit Index (NFI), or Tucker-Lewis Index (TLI) (Hu & Bentler, 1999). Lastly, each model was compared to one another to determine which best represented the factor structure of the OTDL. Model comparisons were made using Akaike's Information Criterion (AIC; Akaike, 1983) values, with small AIC values indicating more optimal models.  

The single-factor model (see Figure 1) consisted of three indicator variables (telephone, medication, finance) comprising the latent variable “OTDL-R”. The indicator variable medication loaded most highly in the latent OTDL-R factor, with a beta weight of 0.89, followed by the indicator telephone use with a beta weight of .42, and lastly the indicator finance with a beta weight of .04. The model adequately fit the data $\chi^2(1) = 0.04$, $p > .05$, RMSEA < .0001 (90% CI = .000, .150), with relative fit indices indicating a good fit as well (NFI = .99, CFI = 1.00). The resulting AIC value was 10.297.  

For the three-factor model (see Figure 2), the three variables that were indicators in
the single-factor model (telephone, medication, and finance) were now treated as latent factors, each with three indicators. For example, the three indicators of the finance domain were a) participant scores for making change, b) balancing a checkbook, and c) questions regarding a utility bill. The model did not fit the data as well as the single-factor model, but was acceptable $\chi^2(24) = 51.10, p < .001, \text{ RMSEA} = .075 (90\% \text{ CI} = .046, .103)$, with relative fit indices indicating an acceptable fit (NFI = .90, CFI = .94). The resulting AIC value was higher than the AIC value from the single-factor model, at 111.087.

Lastly, a second-order model was tested (see Figure 2). This model was identical to the three-factor model; however a second-order latent variable “OTDL-R” was included with the Telephone, Medication, and Finance factors as indicators. The model did not fit the data well $\chi^2(27) = 95.30, p < .001, \text{ RMSEA} = .110 (90\% \text{ CI} = .088, .137)$, with relative fit indices indicating a poor fit (NFI = .90, CFI = .84). The resulting AIC value was the highest of the three models, at 149.283.

In sum, analyses verified that both a single-factor and three-factor model adequately fit the data. The single-factor structure of the OTDL-R was most parsimonious and had the lowest AIC value, replicating findings from Diehl and colleagues (2005). Therefore, was used as the base model for subsequent demographic and cognitive MIMIC models (see Table 1).

**Specific Aim 2:** Relationships among demographic and cognitive variables on overall and domain-specific OTDL performance: MIMIC model results

As indicated, the single-factor model served as the base for both the demographic
predictor MIMIC model, as well as the cognitive predictor MIMIC model (see Figure 3). For the demographic variable model, hypothesized paths from each demographic predictor (age, gender, and education) to the overall OTDL-R latent factor were first estimated. Significant paths would indicate that specific predictors were related to the overall latent construct of OTDL-R. Paths from each demographic predictor to the indicators of the overall OTDL-R factor were then estimated. Significant paths would indicate that specific demographic variables were related to performance on specific tasks within a domain (i.e. finance) controlling for overall OTDL-R performance.

The demographics model fit the data poorly, $\chi^2(4) = 16.36, p = .003$, CFI = .86, RMSEA = .114, and accounted for 25% of the total variance in the latent OTDL-R factor. The path from age to the OTDL-R factor was negative and significant, with a beta weight of -.47. Significant domain-specific paths included the path from education to the telephone domain ($\beta = 0.25, p<.001$), with higher levels of education related to better telephone use and related activities.

Next, the cognitive predictor model was tested. Hypothesized paths from each cognitive predictor (inductive reasoning, working memory, verbal memory, verbal ability, and a composite “speed” variable consisting of choice reaction time and DSST) to the OTDL-R latent factor were first estimated. Significant paths would indicate that specific cognitive predictors were related to the overall latent construct of OTDL-R. Paths from each predictor to the indicators of the overall OTDL-R factor were then estimated. Significant paths would indicate that specific cognitive variables were related to performance on specific
tasks with in a domain (i.e. finance) controlling for overall performance (OTDL-R).

The cognition model fit the data well, $\chi^2(4) = 3.15, p = .53, \text{CFI} = 1.00, \text{RMSEA} < .0001$, and accounted for 55% of the total variance in the OTDL-R factor. The paths from the composite predictor speed to the latent variable OTDL-R ($\beta = 0.23, p < .05$) as well as from speed to the domain finance ($\beta = -.31, p < .001$) were significant. Interestingly, although these two paths both included the composite predictor speed, resulting relationships were in opposite directions: slower speed of execution was related to better overall latent functioning, whereas faster speed was related to better performance in the finance domain. The path from speed to the indicator finance, while controlling for overall OTDL-R performance, accounted for approximately 9% of the variance in financial ability.

The final model included all the significant paths from both the demographics and cognitive models. This model fit the data relatively well, $\chi^2(17) = 31.33, p = .018, \text{CFI} = .969, \text{RMSEA} = .06$. Paths that remained significant included the paths from age and speed to the OTDL-R factor. Education was significantly and positively related to telephone use ($\beta = .26, p < .001$) while speed was significantly and negatively related to finance ($\beta = -.32, p < .001$) and significantly and positively related to OTDL-R ($\beta = .43, p < .001$). The final model accounted for 33% of the variance in the latent OTDL-R factor. Follow up commonality analyses revealed that with regard to finance, there is no shared variance between speed and the OTDL-R factor, rather speed uniquely accounted for nearly all (.079%) of the variance within this domain which is not surprising given the low loading of the finance variable on the OTDL-R factor.
Specific Aim 3: Mediation

The next step was to examine whether the cognitive variables mediated the relationships between demographic variables and everyday functioning. Since speed and age were both significant predictors of the OTDL-R factor, it was tested whether speed mediated the impact of age on OTDL-R performance. First, the path from age to OTDL-R was estimated ($\beta = -.35, p < .001$). With the addition of the path from speed to OTDL-R, the age-OTDL-R relationship was reduced ($\beta = -.22, p = .003$). Sobel test results (Sobel, 1982) indicated that speed significantly ($t = 3.74, p < .001$) mediated the relationship between age and OTDL. Follow up commonality analysis revealed that 16% of the variance in OTDL-R was shared between age and speed; only 1% was unique to age and 14% was unique to speed.

Based on previous research by Farias and colleagues (2003), the path from education to telephone use was tested next for mediation. After having established that education was significantly related to all cognitive predictor variables, a mediation model was tested in which an initial path from education to telephone use was estimated, controlling for the latent variable OTDL-R, which resulted in a significant path. When cognitive predictors (speed, reasoning, memory, verbal ability) were added to the model as potential mediators, education still remained significant, and loading estimates did not significantly change, as determined by a Sobel test, indicating that the significant relationship between education and telephone use was not mediated by cognitive ability.
Discussion

The primary goal of the current study was to examine the relationships that exist among traditional laboratory-based assessments of cognitive functioning and performance on an objective assessment of instrumental functioning, the OTDL-R, through the use of a multiple indicators multiple causes (MIMIC) modeling approach (i.e. a latent variable approach to data analysis). Such an approach allows for the examination of the relationships between cognitive functioning and domain-general instrumental functioning (overall OTDL-R performance) and domain specific instrumental functioning (medication, finance, and telephone use) while simultaneously controlling for the effects additional variables may exert on subsequent performance. Results suggested that speed was a significant predictor of both overall and domain-specific instrumental functioning within the domain of finance. Interestingly, slower speed was related to better overall OTDL-R functioning, whereas faster speed was related to better performance in the finance domain. Results reveal the importance of examining multidimensional and multidirectional relationships that exist among cognitive variables and instrumental functioning.

The present study replicated several findings in the literature with regard to overall and domain specific relationships among demographics, cognitive abilities, and instrumental functioning. Age was indeed negatively related to the overall OTDL-R factor, and education was positively related to the domain of telephone use, replicating findings from Farias and colleagues (2003). Similar to the findings of Ayotte and colleagues (2008), gender was not related to overall instrumental functioning or any of the specific domains, nor was age found
to be a significant predictor of telephone use. Education, however, was not predictive of performance in the finance domain, contrary to Ayotte’s findings. Such a discrepancy may be due to inherent differences in the examined populations; Ayotte and colleagues utilized data from the Baltimore Study on Black Aging (BSBA) in which education may have played a more significant role for low-income African American older adults.

With regard to cognitive predictors of overall and domain-specific instrumental performance, contrary to previous findings (Barberger-Gateau et al., 1999; Ley, 1986, Neupert & McDonald-Mizczak, 2004), memory was not found to be predictive of performance within the domains of medication and finance. In addition, reasoning was not related to performance within the domain of finance as was previously found by Okonkwo and colleagues (2006). A main distinction should be made between characteristics of previous studies and those of the present study: the present study utilized an objective measure of overall instrumental functioning inclusive of subdomains of functioning (telephone, medication, finance). Each subdomain consisted of several related questions (see Figure 2), each of which may tap different cognitive abilities. For example, within the medication domain, participants are asked to locate a particular medication, calculate days of a pill supply, load a pill reminder box, comprehend a patient medication chart, fill out a patient record, and so forth. Each question or action may differentially rely on a cognitive ability, and it may, therefore, be important to extend the present examination to the individual items that make up a domain in order to more fully understand if specific cognitive abilities are predictive of performance on a unique action encompassed by the
overarching domain. In doing so, we may more fully understand exactly where assistance is needed within a domain of instrumental functioning, and be able to tailor subsequent interventions to more defined aspects of functional activities.

Such an approach has been taken with research examining medication comprehension. Researchers have looked at whether or not a particular item, or required action, within an overall medication domain was reliant on inferential processes, could be interpreted in literal terms, or was disproportionately complex as compared to the other items within the domain (Park, 1994). Similarly, research examining financial capacity often utilizes assessments that can be divided into both understanding and applying financial concepts (i.e. prioritizing, understanding, and preparing bills; Okonkwo et al., 2006). For the purpose of the present study, we examined relationships between predictors and the overall subdomain rather than examining the components of the domain, and this may have limited our ability to discern between different tasks within a single domain.

As noted, the most interesting finding was the differential predictive relationship speed had with overall instrumental functioning and domain-specific functioning within the domain of finance. Slower speed of execution was related to better overall OTDL-R performance, whereas faster speed was related to better performance in the finance domain. This can be explained by additional statistics provided by the MIMIC model. Firstly, the fact that the finance domain did not load highly onto the OTDL-R factor may indicate that performance in the finance domain is independent from performance within the domains of telephone and medication; the finance domain may be more unique or distinct from other
instrumental abilities. This may indicate that IADL composite scores, or factors, that include financial capacity items may not be accurately capturing this ability. Secondly, the low loading of the finance domain may explain why speed differentially predicts performance on overall and domain-specific functioning. The finance domain did not contribute a significant amount of variance to the OTDL-R factor, so when speed is a predictor variable of the OTDL-R factor, it is predicting individual differences in medication and nutrition exclusively. This may explain the finding that slower speed was related to better performance in the medication and telephone domains, yet faster speed of processing was related to better performance in the finance domain. From an intuitive stance, it can be argued that taking one’s time with regard to medication regimens or telephone use may lead to greater accuracy, whereas faster speed of processing may benefit accuracy in domains largely reliant on working memory or numeracy skills.

This finding may also speak to several points raised in the cognitive training literature, specifically regarding speed of processing training and the lack of transfer of training to real-world domains. Previous intervention research has found that gains in speed only relate to tasks of instrumental functioning and driving (Edwards, Wadley, Myers, Roenker, Cissell, & Ball, 2002; Edwards, Wadley, Vance, Wood, Roenker, & Ball, 2005). Given the results of the current study, increasing older adults’ processing speed may actually be deleterious to performance in real-world domains such as finance. It can even be argued that performing some daily activities more slowly, aside from those that rely on quick reaction times such as driving, can be viewed as compensatory when faced with additional
cognitive detriments. The present finding of a multidirectional relationship within the single ability of speed of processing may suggest that it is more beneficial to focus not on speed of execution but rather accuracy when examining performance on some daily activities.

There are a number of caveats that should be considered when interpreting the results of this study. First, only about 32% of the variance in instrumental functioning was accounted for by the demographic and cognitive variables included in this study, suggesting that there are a number of other sources of individual differences that were not included in the study. For instance, it may be beneficial to include assessments of health as both instrumental functioning and cognition can be negatively affected by poor health status. Furthermore, as racial and ethnic minorities come to make up a larger percentage of the total population, finding ways to improve minority health has taken on heightened urgency; theories of aging and subsequent practice can no longer be based on homogenous populations that do not reflect society at large. Including race or ethnicity as a potential predictor may help to identify functional differences, which may indicate deeper systemic inequities that have resulted in domain-specific deficits. Lastly, the laboratory-based nature of the present study prohibits extrapolation to real-world outcomes. Future research should examine the predictive validity of the OTDL-R in the hopes that it would be useful in identifying functional pathways amenable to intervention.

The results of the current study suggest that within overall instrumental functioning, performance on specific subdomains have unique and significant sources of variance. Treating instrumental functioning as a domain-general ability ignores the inherit
multidimensionality, and may overlook meaningful and perhaps clinically important sources of individual differences. In order to more fully understand not only the multidimensional relationships between cognitive variables and subsequent outcomes, but the relative importance of such relationships in functional terms (i.e. how everyday abilities are differentially affected by declines in cognitive domains), the MIMIC modeling approach may prove valuable in uncovering such relationships. The next step would be to bridge this approach to the cognitive training literature, and ultimately to more fully understand how this information can be applied to improve on current means of assessment and intervention to counteract declines in everyday functional abilities.
Figure 1. One-factor solution to the Revised Observed Tasks of Daily Living assessment (Diehl et al., 2005).
Figure 2. The three-factor model of the Revised Observed Tasks of Daily Living (Diehl et al., 2005), and a hypothetical second order factor solution.
Figure 3. MIMIC Model with direct and indirect standardized regression weights among cognitive predictor variables, demographic predictor variables, overall OTDL performance, and domain-specific OTDL performance.

*p < .05
Table 1

*Fit Indices of Individual Measurement Models*

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>RMSEA (90% CI)</th>
<th>NFI</th>
<th>RFI</th>
<th>IFI</th>
<th>CFI</th>
<th>AIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-Factor</td>
<td>0.04</td>
<td>1</td>
<td>.000 (.000, .150)</td>
<td>.99</td>
<td>.97</td>
<td>1.00</td>
<td>1.00</td>
<td>10.297</td>
</tr>
<tr>
<td>Three-Factor</td>
<td>51.10</td>
<td>24</td>
<td>.075 (.046, .103)</td>
<td>.90</td>
<td>.83</td>
<td>.94</td>
<td>.94</td>
<td>111.087</td>
</tr>
<tr>
<td>Second-Order</td>
<td>95.30</td>
<td>27</td>
<td>.110 (.088, .137)</td>
<td>.80</td>
<td>.72</td>
<td>.84</td>
<td>.84</td>
<td>149.283</td>
</tr>
</tbody>
</table>

Note: RMSEA = root mean square error of approximation; CI = confidence interval; NFI = normed fit index; RFI = revealed factor intensity; IFI = incremental fit index; CFI = comparative fit index; AIC = Akaike information criterion.
Table 2

Variance Accounted by Observed Variables and Model Fit for Demographic and Cognitive Predictor MIMIC Models of the Revised Observed tasks of Daily Living Assessment

<table>
<thead>
<tr>
<th></th>
<th>Demographic Model</th>
<th>Cognitive Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R² Observed Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td>0.22</td>
<td>0.30</td>
</tr>
<tr>
<td>Finance</td>
<td>0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Medication</td>
<td>0.40</td>
<td>0.53</td>
</tr>
<tr>
<td><strong>R² Latent Variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OTDL-R</td>
<td>0.25</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Model Fit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>χ²(df)</td>
<td>16.36 (4)</td>
<td>3.15 (4)</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.11</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CFI</td>
<td>0.856</td>
<td>1.00</td>
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<tr>
<td>NFI</td>
<td>0.847</td>
<td>0.991</td>
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<tr>
<td>AIC</td>
<td>62.36</td>
<td>83.149</td>
</tr>
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Table 3

*Standardized and Unstandardized Estimates for Final MIMIC Model*

<table>
<thead>
<tr>
<th>Regression Coefficients</th>
<th>Unstandardized (SE)</th>
<th>Standardized</th>
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</thead>
<tbody>
<tr>
<td>Age → Functioning</td>
<td>-0.06 (0.02)*</td>
<td>-0.24</td>
</tr>
<tr>
<td>Speed → Functioning</td>
<td>0.34 (0.07)**</td>
<td>0.43</td>
</tr>
<tr>
<td>Education → Telephone</td>
<td>0.12 (0.03)**</td>
<td>0.26</td>
</tr>
<tr>
<td>Speed → Finance</td>
<td>-0.12 (0.04)**</td>
<td>-0.32</td>
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</table>

R² Observed Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>R²</th>
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</thead>
<tbody>
<tr>
<td>Finance</td>
<td>0.08</td>
</tr>
<tr>
<td>Medicine</td>
<td>0.63</td>
</tr>
<tr>
<td>Telephone</td>
<td>0.28</td>
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R² Latent Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTDL-R</td>
<td>0.33</td>
</tr>
</tbody>
</table>

Model Fit

χ² (df) | 31.33 (17)
Table 3 Continued

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMSEA</td>
<td>0.06</td>
</tr>
<tr>
<td>CFI</td>
<td>0.969</td>
</tr>
<tr>
<td>NFI</td>
<td>0.940</td>
</tr>
<tr>
<td>AIC</td>
<td>127.333</td>
</tr>
</tbody>
</table>

Note: * indicates $p<.05$, ** indicates $p<.001$
REFERENCES


Ritchie, K., Artero, S., & Touchon, J. (2001). Classification criteria for mild cognitive


