EXAMINING THE FACTOR STRUCTURE OF TWO SUBSCALES OF THE INDEPENDENT LIVING SCALES (ILS) IN A CLINICAL SAMPLE AND A COLLEGE SAMPLE

by

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A thesis submitted to the faculty of
The University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Master of Arts in
Psychology

Charlotte

2015

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ABSTRACT

ASHLEY NICHOLE JOHNSON. Examining the factor structure of two subscales of the Independent Living Scales (ILS) in a clinical sample and a college sample. (Under the direction of DR. GEORGE DEMAKIS)

This study examined the factor structure of the Independent Living Scales in two subscales of the measure, Managing Money (MM) and Health and Safety (HS), that have been recommended as most valid for predicting competency adjudications (Quickel & Demakis, 2012). The study was conducted with a clinical sample and a sample of college undergraduates. The clinical sample consisted of 131 individuals with various neurological or psychiatric diagnoses, or diagnoses of mental retardation, who were evaluated for competency. The undergraduate sample consisted of 71 college students. Both samples were administered the ILS-MM and ILS-HS subscales as well as other measures of cognitive and neurological functioning (Mini Mental Status Examination and Trail Making Test A & B). As predicted, results of analyses of covariance indicated that participants from the clinical sample had significantly lower performance scores on all cognitive and functional measures than the undergraduate sample. More importantly, a series of four confirmatory factor analyses (CFA) indicated that items on the MM and HS subscales were accounted for by the Problem-Solving (PS) and Performance/Information (PR) factors in the undergraduate sample. In the clinical sample, the CFA indicated that the two-factor structure was an “acceptable-fit” for the data from the MM subscale, however, the two-factor model did not fit the data from the HS subscale.

ACKNOWLEDGMENTS

I would like to acknowledge the invaluable efforts of Dr. George Demakis as my advisor and Dr. Laura Armstrong and Dr. Richard McAnulty as members of my thesis committee for their many contributions to the formulation and editing of my thesis. I would also like to thank Dr. Charlie Reeve for his advice and guidance in the completion of multiple statistical analyses. Additionally, I greatly appreciate the support and efforts of Cody Solesbee, Zachary Greth, and Meagan Padro in testing administration, scoring, and data entry. Finally, I thank my family and my companion, Michael Pierce, for the continuous love and support that kept me strengthened and motivated as I accomplished this achievement in my life.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS

AD	Alzheimer's disease
ADLs	activities of daily living
DSM-IV-TR	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
FINRA	Financial Industry Regulatory Authority
HCAI	Hopemont Capacity Assessment Instrument
HS	Health and Safety subscale of ILS
IADLs	instrumental activities of daily living
ILS	Independent Living Scales
MDE	Multidisciplinary Evaluation
MM	Managing Money subscale of ILS
MMSE	Mini-Mental State Examination
PR	Performance/Information factor index of the ILS
PS	Problem Solving factor index of the ILS
TMT-A	Trail Making Test, Part A
TMT-B	Trail Making Test, Part B
WCST	Wisconsin Card Sorting Test
WRAT-4	Wide Range Achievement Test 4
WTAR	Wechsler Test of Adult Reading

CHAPTER I: INTRODUCTION

Independent living skills characterize an important set of adaptive, real-world behaviors that allow individuals to perform everyday living activities. These skills are necessary for an individual to live independently and maintain a healthy lifestyle and psychological well-being. The capacity of an individual to perform instrumental activities of daily living (IADLs) such as managing a home, medication, and finances is necessary for independent self-care. These skills can be distinguished from more basic activities of daily living (ADLs) such as feeding, personal hygiene, and dressing (Everhart, Lehockey, Moran, & Highsmith, 2012). This distinction is important because interpreting the varying degrees in a person's ability to safely perform these activities may influence the level of care and supervision as well as types of resources and support an individual may need. Unfortunately, older adults are at greater risk than younger adults for cognitive and physical health problems that may adversely affect their capacity for instrumental and basic activities of daily living (Moore, Moseley, & Palmer, 2008). Therefore, with an increase in the aging population, the demand for assessment of physical and cognitive functioning and care taking needs will only increase (Bell-McGinty, Podell, Franzen, Baird, & Williams, 2002). As a result, the need for neuropsychologists and other clinicians to evaluate the functional status and competency of older adults with diminished functional abilities will also increase.

When exploring the assessment of independent living skills, an additional population to consider is young adults, particularly those beginning college. Although the assessment of independent living skills of young adults may be very different from an assessment of older adults, there may be similar deficits in managing certain instrumental activities of daily living, particularly finances, across both populations. Typically, young adults beginning college are in an important transition period from depending on their parents to becoming independent. From a developmental perspective, emerging adults may face changes in social roles, living arrangements, employment status, and relationship status (Howard, Galambos, & Krahn, 2010). The manner in which a young adult experiences and manages these life transitions may affect the success of future life outcomes. These transitions can be difficult, especially if the individual is unprepared and without the necessary abilities to live independently. When it comes to the health and wellness of young adults, many studies have also suggested that undergraduate students experience lower levels of wellness than nonstudent young adults (Osborn, 2005; Myers & Mobley, 2004; Gibson & Myers, 2006). Specifically, college students' ability to cope and manage stress resulting from daily hassles, as well as sound knowledge of personal safety precautions ultimately has an affect on their health (Lewis & Myers, 2012). For these reasons, research examining the health and safety knowledge of college students is important. This information could be influential in advising colleges about the well being of their students and inform future safety policies and education.

Additional transitions in IADLs that young adults may struggle with involve financial matters. These include paying bills for the first time, managing their own checking and savings accounts, managing their spending habits and student loans, and maintaining a residence (Serido, Shim, & Tang, 2013). Factors that may impact the difficulty of these transitions include mental health problems, such as depression and anxiety (Howard, Galambos, & Krahn, 2010), physical health issues that may arise as a result of stress (Bell & Lee, 2008), socioeconomic resources of families of origin, and childhood experience of parental conflict or divorce (Cohen, Kasen, Chen, Hartmark, & Gordon, 2003).

A recent study indicated that many young adults (ages 18-25) lack the financial capability to make good financial decisions independently (Serido et al., 2013). Recently, a National Financial Capacity Study (2009), commissioned by the FINRA Investor Education Foundation, found that while many American adults believed they were proficient in dealing with everyday financial matters, they nevertheless engaged in poor financial behaviors. The study suggested that adults exhibited some inability to do basic interest calculations and other math-oriented tasks, and made financial decisions that produced excessive expenses and fees. In addition, few compared the prices of products or shopped around before making financial decisions (FINRA, 2009). Because of limited research on the financial independence of young adults, it is important to examine the performance of college students on measures of IADLs that involve finances and other complex matters of independent living. This research is also important because financial knowledge relates to long-term outcomes for young adults. Serido et al. (2013) suggested that individuals with higher levels of financial capability possess the knowledge, skills, and access to tools that will help them successfully manage their finances and foster long-term financial well-being. For example, there is evidence that suggests financial literacy is positively correlated with “retirement planning, wealth, and financial well-being in retirement” (Schmeiser & Seligman, 2013, pp. 246; Lusardi &

Mitchell, 2007). Jorgensen and Savla (2010) argued that young adults need to have the basic knowledge and skills to make important personal financial decisions. In addition to a lack of basic knowledge regarding personal finance, there are likely other reasons why young adults make poor financial decisions. For example, due to a lack of certain psychosocial factors such as impulse control and emotion regulation, young adults are more likely to make more risky decisions in general (Steinberg, 2004). Additionally, neuropsychological evidence has indicated that the prefrontal cortex of young adults is not fully developed until around the age of 25, therefore affecting executive functioning and decision making (Van Leijenhorst, Moor, Op de Macks, Rombouts, Westenberg, & Crone, 2010).

Financial capabilities are important for older adults to maintain as well, especially when managing household finances, making financial decisions, and because elderly individuals can be vulnerable to exploitation (Marson, Triebel, & Knight, 2012). Sound financial capabilities of older adults have been linked to certain beneficial behaviors like investing in stocks, choosing mutual funds with lower fees, and planning for retirement, resulting in higher wealth accumulation (Lusardi & Mitchell, 2011). Because financial capacity is highly cognitively mediated—requiring memory, attention, language, and computation skills—it is vulnerable to deficits in cognitive functioning that may be experienced by older adults with dementia as well as individuals with a variety of neurological, psychiatric, and medical conditions (Marson et al., 2012). However, clinicians must also consider initial individual differences in financial literacy and recognize that there may have been large variability in these skills to begin with. For these reasons, it is important for clinicians to use assessment tools that accurately measure the financial knowledge and capabilities of individuals.

Financial capacity is often assessed as part of a civil competency evaluation. Civil competency evaluations assess independent living skills, particularly financial knowledge and abilities. These evaluations assess competency, or the individual's capacity to manage activities of daily living and to make decisions regarding themselves and their property (Denny & Wynkoop, 2000). Moberg and Shah (2012) stated, "The overarching definition of competency includes the capacities to work, drive, parent, make medical decisions, provide informed consent in treatment and research settings, care for oneself or one's property, and enter into legal contracts (e.g., designate a will)" (pp. 265).

A civil competency evaluation typically includes a cognitive and functional assessment, documentation of medical diagnoses, assessment of an individual's preferences and values, as well as evaluation of the risk of potential harm and level of supervision needed (Moye, 2007). These types of assessments are necessary because an individual's ability to perform daily living tasks and function in their environment is in question. Competency evaluations are usually performed by a neuropsychologist or other clinician who offers his or her professional opinion about an individual's competency status and provides recommendations for guardianship if needed. With civil competency, the ultimate issue in a legal context is whether an individual is competent to manage their own affairs broadly defined, or if they are in need of a guardian to oversee these matters (Zapf & Pirelli, 2012). In civil competency evaluations, clinicians conduct a clinical interview, record review, interviews with relevant others, as well as administer a variety of cognitive and neuropsychological measures.

There are a variety of methods of assessing activities of daily living. Some methods include direct observation, self-report, caregiver-report, and performance-based measures. While self- and other-reports are important in considering an individual’s life circumstances, self-report of activities in which the individual is impaired may be subjectively biased or miss the severity or impact of serious deficits in ADLs (Moberg & Shah, 2012). Other measures that are performance-based require the individual to actually carry out instrumental tasks of daily living, such as making a phone call or writing a check.

Performance-based measures, also considered functional capacity measures, assess an individual’s capacity to complete key tasks of daily living, like managing finances and maintaining a household. These measures incorporate real-world tasks needed for daily living and are utilized in assessing an individuals’ ability to function in their environment. While performance-based measures are commonly administered in civil competency evaluations, they are typically combined with other instruments when assessing an individuals’ overall competency. This is because high performance scores that indicate better ability to carry out tasks of daily living may not always generalize to the person’s ability in the community. A measure that only considers how well an individual can complete a task is likely to miss the fact that their preparation and planning for a particular task, as well as judgment, may be impaired (Patterson & Mausbach, 2010). For example, an individual may be able to write a check in a structured environment, but may have difficulty doing so in the real world when sound financial judgment is required. The person may have the knowledge about how to write a check, but may be vulnerable to exploitation whether it is from others asking for money, forgetfulness resulting in multiple unintentional donations to charity or duplicate bill paying. Thus, in a competency evaluation, objective performance measures, situational questions, and clinical interviews are all important as they provide scenarios generalizable to the real world (Patterson & Mausbach, 2010).

Although ADLs and IADLs are related constructs and may overlap, they can be considered independent (Everhart et al., 2012). Research on ADLs with patients with Alzheimer's disease (AD) has shown that basic ADLs related to personal care tend to be spared early on in the disease process, whereas IADLs are impacted first. In other words, a decline in IADLs manifests in early stages of neurodegenerative diseases, like AD (Marson & Hebert, 2006). The procedural nature and automatic processing involved in performing ADLs such as dressing, bathing, and feeding, are what accounts for an individual's ability to complete these tasks with relatively few difficulties in the early stages of AD. However, deficits in performing IADLs, such as managing finances, are detectable early on since higher levels of executive processes (e.g., planning), language, memory, and attention are required (Marson & Hebert, 2006). The eventual decline in all ADLs during later stages of neurodegenerative disease or chronic mental illness can result in greater caregiver burden, risk of harm to the individual or others, and often results in higher rates of institutionalization (Goode, Haley, Roth, & Ford, 1998). For these reasons—and others—it is important to research measures that clinicians use when evaluating the capacities of vulnerable individuals. With more accurate measures of IADLs, clinicians are better able to distinguish the level of care an individual may need, resulting in the placement of appropriate supports and in turn, reducing caregiver burden and risk of harm to the individual.

One commonly used measure of instrumental activities of daily living is the Independent Living Scales (ILS; Loeb, 1996). The ILS is a combination of performance-based and situational questions that assess the individual's overall ability to function in their environment. It was initially developed as a scale to assess capacity for independent living in elderly patients with cognitive disabilities such as AD (Loeb, 1996). Data for the ILS standardization were collected from a nonclinical sample and a clinical sample that included 248 adults, 17 years of age and older, who had various clinical diagnoses including mental retardation, traumatic brain injury, chronic psychiatric disturbance, or dementia. The measure includes items involving problem solving, knowledge, and performance tasks. This instrument is comprised of five subscales that each assess a different construct associated with IADLs. The subscales include Memory/Orientation, Managing Money, Managing Home and Transportation, Health and Safety, and Social Adjustment. Summation of the five subscales results in a full-scale score that reflects the individual's ability to function independently. However, in the current study, two subscales of the ILS (MM and HS) were specifically chosen for analysis based on the conclusion of Quickel and Demakis (2012) that suggested when utilizing the ILS as part of a battery of different measures, these subscales were the best at predicting the expert's ruling of an individual's civil competency. Some of the items on these subscales require examinees to write out a check, compute financial balances, demonstrate how to call 911, and determine how they would respond in certain everyday situations. In addition to the five subscales, two factor indices, Problem Solving (PS) and Performance/Information (PR), were derived from some of the items on the subscales based on a factor analysis by Loeb (1996). The PS factor includes items that require knowledge of relevant facts, abstract reasoning, and problem solving. For example, one item included in this factor is "Name one thing you can do to keep from being cheated out of your money." The PR factor includes items that require general knowledge and the ability to perform simple tasks. Example items include, "Show me how you call the police" and "Suppose you bought a dozen eggs for $1.19. If you gave the clerk $5.00, how much change should you receive?"

A factor analysis of the ILS by Loeb (1996) evaluated the underlying structure of the measure. The analysis was performed on a nonclinical sample of 590 adults, 65 years of age or older, who had no known clinical diagnoses. The analysis revealed a pattern of factor loadings that initially conceptualized the ILS as a four-factor model, however, only the first two factors were retained because they provided additional information not reflected by the subscales. As previously mentioned, the two factors were labeled Problem Solving and Performance/Information and about 73% of the items on the test loaded on these two factors. Items included on these two factors had factor loadings of .30 or higher. In addition to the factor analysis, the ILS has adequate psychometric properties including a coefficient alpha of .93. In order to establish convergent and divergent validity, the ILS full-scale score was compared with the Wechsler Adult Intelligence Scale-Revised (WAIS-R). In the ILS manual, "low to moderately high correlation coefficients (.11 to .78) with the WAIS-R indicate that the ILS subscales assess constructs that are related, but not identical to general intelligence as measured by the WAIS-R" (Loeb, 1996, pp. 63).

In the ILS manual, Loeb (1996) suggested that the two established factor structures (ILS-PS and ILS-PR) provide important information about an individual's performance that can be used to interpret their ability to function independently. For example, the manual proposed that the two factors distinguish between an individual's reasoning ability (Problem Solving) and their ability to perform simple tasks (Performance/Information). Loeb (1996) proposed that the majority of items in the Performance/Information factor require actual skills or knowledge used to carry out tasks, whereas items from the Problem Solving factor require the individual to apply this knowledge. It is important to distinguish an individual's deficits in each of these categories to best understand their pattern of strengths and weaknesses and even assist in treatment recommendations and patient management. For example, an individual may know what number to dial in case of an emergency, but may lack the ability or the judgment to comprehend that a doctor should be called if chest pain occurs. This could inform the clinician's recommendations for the type of supervision necessary. In addition to describing various studies of the validity and reliability, the manual also provides cut scores to aid in making decisions regarding the level of supervision an individual requires in the community.

While there is little research other than what is presented in the manual about the factor structure of the ILS, two studies have examined the ILS in various patient populations and provide important information. Additionally, two subsequent studies explicitly used the PS factor scale as a proxy measure of problem solving. One study by Bell-McGinty et al., 2002 used common neuropsychological measures of executive function to predict functional status among a group of older adults, particularly, their ability to perform IADLs as measured by the ILS full scale score. They found that all of the executive function tests accounted for 54% of the variance in participants' ability to perform IADLs as measured by the ILS. Specifically, the Trail Making Test-Part B (TMT-B; Reitan & Wolfson, 1985) and the Wisconsin Card Sorting Test (WCST; Heaton et al., 1993) were the best predictors of these abilities. Though they did not examine the underlying factors, these results provide evidence that the ILS is highly correlated with executive functioning tasks.

The construct validity of the ILS was established with a variety of populations with cognitive impairment as well as a sample of normal adults (Loeb, 1996). Another study by Baird, Solcz, Gale-Ross, and Blake (2009) provided evidence that supports the construct validity of the ILS. When compared to another commonly used capacity-related measure with good construct validity, the Hopemont Capacity Assessment Instrument (HCAI; Edelstein, 1999), the ILS performed just as well as the former measure in a sample of cognitively intact and psychiatrically stable older adults. Results demonstrated a moderate correlation between the HCAI total raw score and the ILS four-subscale total *T* score. Specifically, there were significant correlations between the Medical Decision Making section of the HCAI and the ILS Health and Safety subscale, as well as a significant correlation between the HCAI Financial Decision Making section and the Managing Money subscale of the ILS (Baird et al., 2009).

In addition to the studies above, some studies utilized one of the two factors of the ILS as a measurement of problem-solving abilities in a population of individuals with schizophrenia. Revheim et al. (2006) investigated the relationship between cognitive functioning, clinical symptoms, and daily problem-solving skills in a sample of individuals with persistent mental illness. Specifically, the authors examined these relationships in comparison with daily problem-solving skills as measured by the

Problem Solving factor of the ILS (ILS-PS). They found that both clinical symptoms and neurocognitive measures were significantly correlated with the ILS-PS factor. The authors also found that daily problem solving skills (ILS-PS) (the person's ability to solve cognitively challenging everyday tasks relevant to the domains of meal preparation, housekeeping, transportation, health/medication use, and finances) were significantly different between the inpatient and outpatient samples (Revheim et al., 2006). These findings demonstrated that the ILS-PS could be used as a discriminant measure of the problem-solving skills of in-patient versus outpatient individuals with schizophrenia. Similar results were also found in an earlier study by Revheim and Medalia (2004) that examined how the factor structure of the ILS functioned with a clinical population and showed that the ILS-PS effectively distinguished patients with schizophrenia residing in the community across three gradients of care: maximum supervision, moderate supervision, and minimal supervision (Revheim & Medalia, 2004). The findings demonstrated discriminant validity with significant differences on the ILS-PS scores between all groups. This study also found the ILS-PS to have better discrimination for outpatient residential status than Global Assessment of Functioning (GAF) ratings provided by clinicians.

Though the above research has been helpful in understanding functional abilities assessed by the ILS in a variety of populations, research on the psychometric properties of the ILS is limited. There are no studies that specifically examine the validity of the two factor structures of the ILS, Problem Solving and Performance/Information, in a college sample or in a sample of individuals undergoing competency evaluation. Exploring college students' financial capacity as well as health and safety knowledge can contribute to the understanding of the developmental transition of young adults to independent living. The assessment of college students can also contribute to the validation of current measures, like the ILS, used to evaluate certain capacities. In fact, Moye, Marson, and Edelstein (2013) argued, “more data on the range of normal capacity performance in healthy populations will strengthen the utility of forensic assessment instruments for discriminating clinically impaired performance” (Moye et al., 2013, p. 167). Additionally, the assessment of older adults is important because questions about their ability to care for themselves and their finances often arise from the concern of family members, social workers, and others. This also may be the case with adults with a psychiatric diagnosis, like schizophrenia, or traumatic brain injury.

There is a need to replicate evidence of the factoral validity of performance-based measures, like the ILS, for an accurate assessment of daily living skills with vulnerable individuals, like those involved in civil competency cases. Measures such as the ILS that assess a person’s functional capacity are used in a variety of critical situations. Many important decisions hinge on the accuracy of the evaluation tools that measure individuals’ specific strengths and weaknesses with respect to functional capacity. If the court has judged an individual as incompetent, the type of guardianship they need may be determined from their functional strengths and weaknesses. For example, in cases where an individual may have some specific retained competencies, such as making medical, self-care, and living decisions, but not financial decisions, a partial or limited guardianship can be imposed to handle financial decision-making on that person’s behalf. Treatment recommendations and living situations may also be decided based partly on performance on these measures. Results of an individual’s performance on the ILS can help in estimating requirements for community support services, potential for rehabilitation or remediation, as well as to guide the determination of the most appropriate living arrangements.

1.1 Current Study

The current study was designed to expand on existing literature by examining the proposed factor structure of select subtests of the ILS (Managing Money and Health and Safety) along with analyzing performance on the ILS, the MMSE, and Trail Making Tests A and B, in a sample of college students and in a clinical sample of individuals who have had civil competency evaluations.

First, we examined and compared the demographic characteristics of individuals from both samples, including age, education level and ethnicity, as well as the relevant diagnoses of the clinical sample.

Next, to describe the functional and cognitive abilities of our sample, we analyzed performance on the two ILS subscales Managing Money (MM) and Health and Safety (HS), as well as performance scores on the MMSE, and Trail Making Tests A and B in both samples of participants.

Finally, we assessed performance patterns across groups on the two factor indices of the ILS, Problem Solving (PS) and Performance/Information (PR). By examining participant's scores on these two factor indices on both the ILS-HS and ILS-MM subscales, in both a college and a clinical sample of adults, we determined whether the proposed factors are valid. We sought to establish whether selected items from each ILS subscale loaded on the proposed factors.

1.2 Hypotheses

First, we predicted there would be significant demographic differences between the clinical sample and the undergraduate sample. Specifically, we predicted there would be significant differences found for the age and the education level of the two sample groups. These differences were hypothesized because the clinical sample had a much wider range of ages (e.g., 18 to 98) and many of them were older adults undergoing competency evaluation. Additionally, the differences in education level were predicted because the undergraduate sample had completed about one or two years of college, while most of the clinical sample had completed high school.

Second, we hypothesized that participants from the clinical sample would have significantly lower performance scores on all cognitive and functional measures than the college sample. We predicted this because these individuals have had their competency questioned and because many of these individuals have serious neurological and psychological disorders that affect functioning.

Next, we hypothesized a confirmatory factor analysis would validate that items on ILS-MM and ILS-HS subscales would be accounted for by the two ILS Problem-Solving and Performance/Information factor indices. Specifically, we predicted that items that required the participant to have knowledge of relevant facts and abstract reasoning abilities would load onto the Problem Solving factor of the ILS-MM subscale across both samples. We predicted a similar loading for the knowledge-based items onto the Problem Solving factor of the ILS-HS subscale across both samples.

With the four factor analyses, we also predicted that items that required the participant to perform a task (physically or mentally) using prior knowledge would load onto the Performance/Information factor of the ILS-MM subscale across both samples. We predicted a similar loading for these performance-based items onto the Performance/Information factor of the ILS-HS subscale across both samples. These were hypothesized in order to demonstrate the validity of the two ILS factor structures.

CHAPTER II: MATERIALS AND METHODS

2.1 Participants

2.1a. Clinical Sample

Data collected from the clinical sample were compiled in a database of Multidisciplinary Evaluations (MDE) developed by Quickel and Demakis (2012) and was used in comparison with data collected from the undergraduate sample. The information in the MDE database consisted of 131 individuals (Males = 59, Females = 72) evaluated for civil competency between 2004 and 2014 by Dr. George Demakis. As can be seen in Table 1, the full sample ranged in age from 18 to 98 years (M = 52.08, SD = 24.96), had slightly more females (55%) than male (45%) participants, completed high school on average (M = 11.99, SD = 3.2), and was primarily African American (51.9%) or White (44.3%). The database also included information about the participants' marital status and residence as well as their level of motivation for evaluation and number of current medications.

Participants' diagnoses were assessed by Dr. Demakis based on clinical interviews, review of records, interviews of collaterals, cognitive screening, and a battery of tests to determine a clinical decision of competency. Participants were grouped into the following diagnostic categories: 1. Neurological Disorders (e.g., dementia), 2. Psychiatric Disorders (e.g., schizophrenia), 3. Combined Neurological and Psychiatric Diagnoses, 4. Mental Retardation/Borderline Intellectual Functioning. Diagnoses were determined using diagnostic criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised* (DSM-IV-TR 4th ed., text revision, American Psychiatric Association, 2000) and recent evaluations used criteria from the DSM-5th edition (American Psychiatric Association, 2013). A larger percentage of the sample met criteria for a neurological diagnosis (29.2%), and the remaining sample met criteria for diagnoses of mental retardation/borderline intellectual functioning (25.4%), psychiatric diagnosis (23.5%) or both a neurological and a psychiatric diagnosis (21.2%). One participant in the clinical sample did not meet criteria for any of the diagnostic groups because the evaluation was terminated due to the client's level of impairment or refusal to continue. The MDE database included the Mini Mental Status Examination (MMSE), Trail Making Tests A and B (TMT-A & B), and scores on two subscales of the Independent Living Scales; Managing Money (ILS-MM) and Health and Safety (ILS-HS). Participant data was not included in the analyses if the individual was not testable due to severe cognitive impairment or if they refused to be evaluated, however, their demographic information was included.

Also included in the database were the competency judgments ruled by a hearing officer in the Mecklenburg County Courthouse and the clinician's judgments of the individual as competent or not competent. This information is available to the public and was collected from the Mecklenburg County Courthouse.

2.1b. Undergraduate Sample

Participants included 71 undergraduate students (Males = 33, Females = 38) attending the University of North Carolina at Charlotte who were at least 18 years of age. As can be seen in Table 1, the undergraduate sample ranged in age from 18 to 38 years

(*M* = 20.51, *SD* = 3.65), included slightly more females (53.5%) than males (46.5%), and was primarily White (63.4%). The undergraduate sample, on average, had completed one year of college (*M* = 13.23, *SD* = 1.35), and had self-reported GPAs ranging from 1.13 to 3.97 (*M* = 3.22, *SD* = .53). Participants were recruited through the university's SONA research studies system and received course credit as compensation. Participants who did not complete all measures, were not at least 18 years old, or did not consent to release of their GPA were excluded from the study, however, they still received course credit for participation.

2.2 Measures

Demographic information: Standard demographic data were collected on all participants: age, education level, ethnicity, sex, and self-reported current GPA.

Mini Mental Status Examination (MMSE): The Mini Mental Status Examination (Folstein, Folstein, & McHugh, 1975) was administered to screen participant's current cognitive functioning. The MMSE is a brief measure of memory and orientation that includes knowledge and performance-based questions. For example, participants were asked to answer questions about time, place (e.g., "What is the building name?") and orientation (e.g., "What is the year?") and were asked to write a sentence and mentally subtract numbers. Score ranges are from 0-30, with higher scores demonstrating better cognitive functioning. The MMSE has test-retest reliability coefficients ranging from .83 to .99. Concurrent validity was established by correlating MMSE scores with the Wechsler Adult Intelligence Scale, Verbal (.78) and Performance scores (.66) (Folstein, Folstein, & McHugh, 1975). Normative data from Crum, Anthony, Bassett, and Folstein (1993) were used to convert raw scores to standard scores.

Trail Making Tests (TMT) A and B: The Trail Making Tests (Reitan & Wolfson, 1985) include two trials of numbers and letters that were developed to measure various aspects of executive functioning such as cognitive flexibility, conceptual tracking, set-shifting, sustained attention, visual search, psychomotor speed, and working memory. The TMT was administered in two parts, Trails A and B, each with a separate score. Trail A involves consecutively connecting numbers from 1 to 25, while Trail B requires the subject to connect numbers from 1 to 13 and letters from A to L in alternating order, (e.g., 1-A-2-B-3-C). Scores are based on the time in seconds of the participant's completion of the task (Quickel & Demakis, 2012). Errors on the TMT do not directly contribute to the scoring and are generally not totaled. The effect of errors is considered in the total time to complete the test, as the examiner stops the examinee and returns them to the last correct response (Bowie & Harvey, 2006). The TMT has test-retest reliability coefficients ranging from .69 to .86 (Reitan & Wolfson, 1985). Normative data from Heaton, Miller, Taylor, and Grant (2004) were used to convert raw scored to standard scores.

Independent Living Scales (ILS): Managing Money and Health & Safety: The Independent Living Scales (Loeb, 1996) measure an individual's ability to perform daily living activities and is comprised of five subscales and two factor scales. The subscales include Memory/Orientation, Managing Money, Managing Home and Transportation, Health and Safety, and Social Adjustment. As noted above, the two factor scales are Problem Solving items and Performance/Information-based items pulled from each of these subscales. Completion time for the two selected subscales of ILS is approximately 30 minutes with the scoring time of about 10 minutes. Psychometric properties of the ILS Problem Solving factor (totaled across all five subscales) suggest that this factor is a good representation for the ILS as a whole (alpha coefficient = .86, test-retest reliability = .90, interrater reliability = .98, concurrent validity based on tests of social reasoning [e.g., r = .65 with WAIS-R Comprehension]) (Revheim & Medalia, 2004). The ILS full-scale score has also demonstrated good internal consistency (.88) with subscales ranging from .72 (Social Adjustment) to .87 (Managing Money) and good interrater reliability (.95 to .99). The ILS subscales have good test-retest reliability (.81 to .92), as do the two factors scores (.90 and .94) (Loeb, 1996).

Participant's performance scores on the Managing Money (ILS-MM) (17 items with score ranges from 0-34, with higher scores indicating better financial abilities) and Health and Safety (20 items with score ranges from 0-40, with higher scores indicating better functional ability) subscales of the ILS were used in the current study. The MM subscale of the ILS was administered to assess an individual's ability to manage financial matters such as paying bills and taking precautions with money. Examples of problem-solving items on this subscale include, "Tell me two reasons why it is important to pay your bills?" and "Why is it important to read carefully and fully understand any document before signing it?" An example of a performance item on this subscale includes, "Now I would like you to count out $1.39 from these coins." The HS subscale of the ILS was administered to assess an individual's ability to take safety precautions in daily life, make medical decisions, and handle medical emergencies. Examples of problem-solving items on this subscale include, "If you didn't have a regular doctor and you needed medical help quickly, how could you get it?" and "Tell me two reasons why bathing is important?" An example of a performance item on this subscale includes, "What would you do if you couldn't hear most conversation?"

2.3 Procedure

2.3a. Multidisciplinary Evaluations of Competency

Each Multidisciplinary Evaluation conducted by Dr. Demakis included a review of the client's academic, medical, and occasionally, legal records, if available. The evaluations also included a clinical interview and participants were administered a brief battery of adaptive functioning and neuropsychological tests (Quickel & Demakis, 2012). Some of these batteries were altered somewhat for the client based on their presenting problem and ability level, however, the MMSE, Trail- Making Test, Part A (TMT-A) and TMT-B, as well as the ILS-MM and ILS-HS were administered to most respondents, regardless of their diagnosis (Quickel & Demakis, 2012). Quickel and Demakis (2012) reported that the MMSE and Trail-Making Tests were administered to this clinical sample because these measures are well known and are utilized regularly by psychologists. They also reported that only two of the ILS subscales were specifically chosen to be administered, rather than the entire measure, because they specifically assess an individual's functioning with health and safety matters and money management, constructs that are important and typically assessed in civil competency cases. Also, many of the constructs measured by the remaining subscales of the ILS, such as memory, are already covered in more detail by other measures in the test battery.

2.3b. Undergraduate Study

Participants volunteered for hour and a half-long individual testing session, which included a battery of nine different measures: ILS, MMSE, TMT-A & B, WCST, Animal

Fluency, Digit Span, Financial Literacy Measure, Wechsler Test of Adult Reading (WTAR), Wide Range Achievement Test-4: Math Computation Subtest (WRAT-4). Participant's performance on the ILS, MMSE, and TMT-A & B were examined in the current study.

2.3c. Data Preparation and Analysis

The database included participant's scores on each measure as well as demographic information including age, gender, ethnicity, and education level of both samples. The database also included information about residence, marital status and diagnoses of the clinical sample, and self-reported overall GPA of the undergraduate sample. Scores were converted to *T* scores and *Z* scores to compare test performance across samples. The current study compared data collected from the undergraduate and clinical sample's performances on the MMSE, Trails A and B, and the two ILS subscales: Managing Money and Health and Safety. Statistical analyses were completed using SPSS software version 21 and AMOS Graphics software.

The data were screened for normality and outliers and missing data were addressed. All participants (N = 131) were included in the demographic analyses as there were no missing data for these variables of age and gender, with the exception of education in the clinical sample, in which 10 participants had missing educational data. Because not all clinical participants completed every measure due to impairment, not every test in the battery was administered. For each measure, participants who did not have a total score were eliminated from the analyses. This resulted in the following clinical sample: ILS-MM (n = 98), ILS-HS (n = 99), MMSE (n = 111), TMT-A (n = 85), TMT-B (n = 68). There were no missing data in the undergraduate sample (n = 71).

For each of the four confirmatory factor analyses (CFA), variance screenings were performed to determine which test items had to be eliminated from the model due to lack of variance in sample scores. For the first CFA of the ILS-MM subscale with the undergraduate sample, items MM-1: “How are you supported financially?”, MM-4: “Now I would like you to count out $1.39 from these coins”, MM-7: “Where do you get checks/money orders?”, MM-13: “What is health insurance?”, and MM-17: “What is home insurance?” were excluded from the model because at least 95% of participants answered these items correctly, resulting in significantly limited variance in scores. Item MM-9: “Now make out one check/money order payable to the Gas and Electric Company for this bill”, was eliminated from the model because it had a strong correlation (.96) with item MM-8: “Now make out one check/ money order payable to the Telephone Company for this bill” with scores tending to be the same on both items.

For the second CFA of the ILS-HS subscale with the undergraduate sample, items HS-1: “Show me how you call the police”, HS-2: “If you didn't have a regular doctor and you needed medical help quickly, how would you get it?”, HS-5: “What are two precautions you can take to protect yourself when going out at night?”, HS-6: “Tell me two ways you know that it’s safe to cross a busy street”, HS-10: “Tell me three things that are important to do to take good care of your body”, HS-11: “Tell me two things about the condition of your health in the past five years”, HS-13: “Let's suppose you have to take medication three times a day. How would you remember when to take it?”, and HS-18: “What would you do if you could not read small print, like the print in the phone book or on the labels of medicine bottles?” were excluded from the model because of significantly limited variance in scores on these items in the sample (e.g. at least 95% of participants answered these items correctly).

For the third CFA of the ILS-MM subscale with the clinical sample, item MM-8: "Now make out one check/money order payable to the Telephone Company for this bill" and item MM-9: ""Now make out a check/money order payable to the Gas and Electric Company for this bill" were excluded from the model because the two had a strong correlation with each other (1.00) and both items were strongly correlated (.99) with item MM-10: "Now I want you to deduct the two checks/money orders from the beginning balance and tell me how much money, if any, you will have left over." Scores on ILS-MM item 5: "About how much does a loaf of bread cost at the store?" were not included in any of the factor analyses because it was not originally included in either factor of the original test by Loeb (1996).

Finally, no items were excluded from the fourth CFA of the ILS-HS subscale with the clinical sample because all of the items had variance in scores and no items were strongly correlated with one another.

As mentioned above, four confirmatory factor analyses were completed resulting in four models. Two models were completed with the undergraduate sample scores; one for the ILS-Managing Money subscale items and one for the ILS-Health and Safety subscale items. Two models were completed with the clinical sample scores; one for the ILS-MM items and one for the ILS-HS items. Each model contained two latent variables labeled by Loeb (1996) in the initial CFA as PS (Problem Solving) and PR (Performance/ Information) and each model was oblique (had correlated latent variables). Under each latent variable, observed variables (individual subscale items) were divided accordingly as proposed by the ILS test (see Figures 1 and 2 in Appendix B for original division of test items). Observed variables (test items) were represented as ordinal with a scale from 0 to 2 on each item with 2 indicating a higher score on that item. Each observed variable was assigned an error term to account for unexplained unique error (e.g., variance due to other or unknown influences). All error terms had a regression weight of 1 and the error term “e2” on the first CFA (undergraduate sample, ILS-MM model) had a constraint parameter of 0. Otherwise, all other error terms had no constraints and were free to vary. For each model, a correlation matrix was analyzed (see Tables 6, 7, 8, and 9). The Maximum Likelihood (ML) estimation procedure was used for each model and standardized loading estimates were used for observed variables on latent variables (Jackson, Gillaspy, & Purc-Stephenson, 2009).

CHAPTER III: RESULTS

Analyses were conducted using SPSS.21 for descriptives, individual-sample *t*-tests, analysis of covariance (ANCOVA) and chi-square tests. AMOS Graphics software was used to complete the four confirmatory factor analyses (CFA). As shown in Table 1, the demographic characteristics of the clinical sample and the undergraduate sample were analyzed to assess differences in age, education, gender and ethnicity. Independent samples *t*-tests indicated significant differences in age and education between samples ($p < .0001$). Individuals in the clinical sample were older and had less education, on average, than the undergraduate sample. Chi-square tests resulted in significant differences in ethnicity across samples ($p < .0001$). There were significantly more White participants in the undergraduate sample (63.4%) than in the clinical sample (44.3%) and significantly more Hispanic/Latino participants in the undergraduate sample (11.3%) than in the clinical sample (1.5%). There were significantly more African American participants in the clinical sample (51.9%) than in the undergraduate sample (19.7%). There were no significant differences in gender between samples.

To assess the second hypothesis, a one-way Analysis of Covariance (ANCOVA) was conducted for each measure to determine whether the clinical sample ($n = 131$) differed from the undergraduate sample ($n = 71$) on the neuropsychological and functional measures (i.e., ILS-HS, ILS-MM, MMSE, TMT-A, TMT-B). Age and education level were controlled for because there were significant differences in both variables across samples. As shown in Table 2, the ANCOVA indicated significant differences ($p < .0001$) across samples on all measures. In each case, the undergraduate sample performed significantly better than the clinical sample.

A series of four confirmatory factor analyses (CFA) were conducted on ILS items. CFA was chosen as the appropriate analyses because it “allows the researcher to impose a particular factor model on the data and then see how well that model explains responses to the set of measures” (Bryant & Yarnold, 1995, pp. 109). It was hypothesized that these factor analyses would validate Loeb’s (1996) two-factor structure of the ILS (Problem Solving and Performance/Information) in both samples on the ILS-Managing Money and ILS-Health and Safety subscales. Specifically, we predicted that items requiring knowledge of relevant facts and abstract reasoning would load onto the Problem Solving factor and items requiring performance of a task (physically or cognitively) using prior knowledge would load onto the Performance/Information factor.

In order to evaluate the model that best fits the data, one must decide and indicate the cutoff values for fit measures they intend to use. Jackson, Gillaspy, & Purc-Stephenson (2009) provided a summary of recommendations for reporting CFA results. They recommended reporting, minimally, the use of the following fit indices: the chi-square value and the associated degrees of freedom and probability value, an index to describe incremental fit, and a residuals-based measure. For each CFA in this study, chi-square statistics, chi-square divided by the degrees of freedom (CMIN/*df*), root mean-square error of approximation (RMSEA), and the comparative fit index (CFI) were reported. The Chi-square value traditionally measures the overall model fit and is often referred to as a “lack of fit” measure. This is because a good model fit would provide an insignificant result at a threshold of .05 (Barrett, 2007). However, it is not recommended as a sole indicator of model fit. This test is sensitive to sample size and in cases where small samples are used, the chi-square statistic may not discriminate between good model fit and poor model fit due to a lack of power (Kenny & McCoach, 2003).

Because of this, a second fit statistic, the RMSEA, is used. This index is sensitive to the number of estimated parameters in the model and determines how well the model fits the samples' covariance/correlation matrix (Hooper, Coughlan, & Mullen, 2008). In other words, the RMSEA estimates lack of fit compared to the "just-identified" or saturated model. In a just-identified model there is a direct path from each variable to each other variable. In such a model, the chi-square will always have a value of zero, since the fit will always be perfect. When one or more of the paths are deleted, as done with some ILS items (see below), an overidentified model is obtained. The value of the associated chi-square subsequently rises. For any model, elimination of any path will reduce the fit of model to data, increasing the value of this chi-square statistic, but if the fit is reduced by only a small amount, the model will be a better fit in the sense that it is less complex and explains the covariances almost as well as the more complex model. A good fitting model is one that can reproduce the original variance-covariance matrix (or correlation matrix) from the path coefficients (Hooper, Coughlan, & Mullen, 2008). Researchers recommend a cutoff statistic of about .05 (Hu & Bentler, 1999) to .07 (Steiger, 2007) for the RMSEA, with numbers below this cutoff indicating a good model fit.

Finally, the CFI is an incremental fit index that compares the chi-square value to a baseline model, which assumes all variables are uncorrelated. Unlike the chi-square statistic, the CFI takes into account sample size and works well with a small sample (Hooper, Coughlan, & Mullen, 2008). A cutoff value of at least .90 has been established for this fit index with numbers above this cutoff indicating a good model fit (Bentler, 1990). Overall, reporting a variety of model fit indices is important in order to represent different aspects of the model and only reporting indices that support the model can be misleading.

3.1 Model 1

The first CFA was completed with scores on the ILS-Managing Money subtest from the undergraduate sample (*n* = 71). See Figures 1 and 2 in Appendix B for a complete list of the items in each subscale as proposed by Loeb (1996) and Figure 3 for a visual depiction of the proposed model. After testing an initial model with all of the Money Management items, numbers 1, 4, 5, 7, 9, 13, and 17 were excluded from the model due to significantly limited variance in participants' scores. Results indicated that the two-factor model, which included Problem Solving (PS) and Performance/Information (PR) factors, was a "good fit" for the data. ILS-MM items 3, 6, 8, 10 and 14 loaded onto the PR factor and items 2, 11, 12, 15, and 16 loaded onto the PS factor. The recommended cutoff for adequate factor loadings is typically .30. Items from the ILS-MM had factor loadings ranged from .27 to .74 on the PR factor and .03 to 1.00 on the PS factor. Not all of the factor loadings could be considered "good" loadings. In this model, items MM 6 (.74), 10 (.42), and 14 (.43) had good factor loadings on the PR factor. Items MM 2 (1.00), and 16 (.40) had good factor loadings on the PS factor. The correlation between the two factors was .58.

3.2 Model 2

The second CFA was completed with scores on the ILS-Health and Safety subtest from the undergraduate sample (*n* = 71). See Figure 4 in Appendix B for a visual depiction of the proposed model. After testing an initial model with all of the Health and Safety items, numbers 1, 2, 5, 6, 10, 11, 13, and 18 were excluded from the model due to significantly limited variance in participants' scores. Results indicated that the two-factor model, which included Problem Solving (PS) and Performance/Information (PR) factors, was a "good fit" for the data. ILS-HS items 3, and 17 loaded onto the PR factor and items 4, 7, 8, 9, 12, 14, 15, 16, 19, and 20 loaded onto the PS factor. Items from the ILS-HS had factor loadings that ranged from -.43 to .24 on the PR factor and -.49 to .39 on the PS factor. In this model, item HS 7 (.39) had a good factor loading on the PS factor. The correlation between the two factors was -.34.

3.3 Model 3

The third CFA was completed with scores on the ILS-Managing Money subtest from the clinical sample (*n* = 98). See Figure 5 in Appendix B for a visual depiction of the proposed model. After testing an initial model with all of the Money Management items, numbers 5, 8, and 9 were excluded from the model (e.g. item 5 was excluded from the two-factor structure by the test publisher and scores on items 8 and 9 were very similar and highly correlated with other items on the scale [.99-1.00]). Results indicated that the two-factor model, which included Problem Solving (PS) and Performance/Information (PR) factors, was a "moderate to acceptable fit" for the data. ILS-MM items 3, 4, 6, 10, and 14 loaded onto the PR factor and items 1, 2, 7, 11, 12, 13, 15, 16, and 17 loaded onto the PS factor. Items from the ILS-MM subscale had factor loadings that ranged from .38 to .71 on the PR factor and .33 to .78 on the PS factor. The correlation between the two factors was .69.

3.4 Model 4

The fourth and final CFA was completed with scores on the ILS-Health and Safety subtest from the clinical sample (*n* = 99). See Figure 6 in Appendix B for a visual depiction of the proposed model. No items were excluded from the model because all of the items had variance in scores and no items were strongly correlated with one another. A two-factor model was imposed on the HS items which included Problem Solving (PS) and Performance/Information (PR) factors where ILS-HS items 1, 3, 5, 17, and 18 loaded onto the PR factor and items 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 19 and 20 loaded onto the PS factor. Results indicated that the solution to this model was not permissible, meaning that the model including all of the HS items and two factor indices did not fit the clinical data. This is demonstrated in the model because the correlation between the PS and PR factors was 1.04, which is not a valid correlation. As a result, no chi-square or fit statistics were given by the model or reported.

A summary of the measurement model findings based on the four CFAs can be seen in Table 3. In Tables 4 and 5, a model-fit decision matrix offers a visual of the four CFA models, their statistics, and the cutoff values for the fit indices they met. A model's fit statistics were determined to exhibit "good," "acceptable," "marginal," or "poor/reject" fit based on the comparison of fit indices to their relative cutoff values as recommended by Hu and Bentler (1999) and Sivo, Fan, Witta and Willse (2006).

Overall, as seen in Table 5, the fit statistics of models 1 and 2 were each labeled as a "good fit" for the undergraduate data because they met the strictest cutoff values for the three fit indices. Model 3 had one index (the *p* value of the chi-square statistic) that was labeled as a “marginal fit” for the clinical sample data and two fit indices (CFI and RMSEA) that were labeled as an “acceptable fit.” Once again, the fit statistics for model 4 were not reported because the two-factor model that included all the ILS-HS items was not permissible and did not fit the clinical sample data. Overall, the factor analyses indicated that the two-factor model (PS & PR) for both the ILS subscales fit the undergraduate sample data well. However, this type of model fit the clinical data only marginally to acceptably well on the ILS-MM subscale and did not fit the clinical sample data on the ILS-HS subscale.

CHAPTER IV: DISCUSSION

4.1 Summary

Overall, the first and second hypotheses in this study were supported. The first hypothesis correctly predicted significant demographic differences between the clinical and the undergraduate samples. Significant differences were found in the age, education level, and ethnicity of the two sample groups. These differences were as expected because the clinical sample had a much wider range of ages (e.g., 18 to 98) and many clients undergoing evaluation for competency are older adults with some type of psychological or cognitive impairment. Additionally, the differences in education level were because the majority of the undergraduate sample had completed at least their first or second year of college, while most of the clinical sample completed high school or below. The second hypothesis correctly predicted significant differences in participant's scores on all neurocognitive and functional measures administered (ILS-MM, ILS-HS, MMSE, TMT-A, TMT-B). As expected, the undergraduate sample group performed better than the clinical group on all measures, which is not surprising given that the clinical group typically had a wide variety of neurological and/or psychiatric diagnoses.

The study's major findings stemmed from the conclusions of the four confirmatory factor analyses. These analyses were conducted to examine the two-factor structure of the Independent Living Scales, specifically the Managing Money and Health and Safety subscales, as proposed by Loeb (1996) in a clinical sample and an undergraduate sample. Results of the factor analyses indicated that the two-factor (PS and PR) models of the ILS Managing Money (model 1) and Health and Safety (model 2) subscales fit the undergraduate sample data well with model-fit statistics all falling in the "good fit" range. This indicates that the factor structure of the ILS, with items that measure an individual's problem solving abilities or the performance of a task, was confirmed in a sample of college undergraduates. The support of the two-factor structure of the ILS may be because the undergraduate sample is similar to the normative sample of adults Loeb (1996) assessed to developed the structure of the measure. Loeb's (1996) normative sample included 590 adults, age 65 or older, who had no known clinical diagnoses that would affect cognitive functioning. Like the normative sample, the undergraduate sample in this study also included individuals without neurological or psychological diagnoses that would affect cognitive functioning. These results supported the hypotheses, which predicted that Loeb's two-factor structure would be validated for both ILS subscales administered to the undergraduate sample.

When evaluating the two-factor model of the ILS Managing Money subscale, model 3 had two fit indices that were an "acceptable fit" for the clinical sample data, and one index (*p* value of the chi-square statistic) that was a "marginal fit" for the data. Model 4 of the ILS Health and Safety subscale resulted in statistics that were not permissible and demonstrated that the two-factor model including all HS items was not able to fit the clinical sample data or correlation matrix. The results of model 3 supported the hypotheses, which proposed that the two-factor model would fit the data from the clinical sample, however, the fit statistics indicated that the two-factor structure of models 1 and 2 fit the undergraduate sample data better. This could be a result of the lack of variance in the undergraduate sample scores, which lead to the elimination of multiple items from the models, resulting in a better model fit. However, it could be that the undergraduate sample was similar to the normative sample, as mentioned above, that was used by Loeb (1996) for standardization of the ILS and the original development of the two-factor model. Because there was variance in the clinical sample scores, only a few of the subscale items were eliminated from the models. The larger the number of variables (test items) included in a CFA model, the larger the sample size should be in order to obtain an accurate representation of the data. This may have been what affected the results of model 4, which indicated a non-permissible solution. With a larger number of participants' scores per variable (item), the two-factor model would likely fit the clinical sample data for the HS subscale as well.

One possible explanation for the poor fit of the Health and Safety subtest was that it assesses a variety of domains (hygiene, bathing safety, physical issues, emergencies, medication maintenance) in one subtest, while the Managing Money subtest is more focused, resulting in a factor structure that may differ from the original two-factor model. Nevertheless, the findings from the Managing Money model (model 3) indicate that the two-factor structure of the ILS Managing Money subscale as developed by Loeb (1996) is upheld when assessing a clinical population of individuals.

The ILS was originally developed to evaluate an individual's ability to complete instrumental activities of daily living, especially in situations when their competency may be in question. The current study tested this theory and our findings indicate that the two subscales (ILS-MM and ILS-HS) were validated in a nonclinical sample and one of the subscales (ILS-MM) was validated in a clinical sample. In other words, despite the differences in the two samples evaluated in this study, the Problem Solving and Performance/Information factors fit the data in both, validating the psychometrics and robustness of the measure. These results are important considering the uniqueness of our clinical sample undergoing evaluation for competency and it's comparability to the population for which the ILS was intended. These findings expand our understanding of the ILS as a measure of instrumental activities of daily living and how it works within a clinical and a normative sample of individuals. Previous research has indicated that the factors of the ILS are valid measures of problem solving and performance tasks relating to activities of daily living. As shown in a study by Revheim & Medalia (2004), the Problem Solving factor of the ILS was able to successfully discriminate between three levels of functional outcome for patients with schizophrenia, including living status (maximum, moderate, and minimum levels of supervision). Other studies have found that both clinical symptoms and neurocognitive measures were significantly correlated with the ILS Problem Solving factor and these daily problem-solving skills (as measured by the PS factor) were significantly different in a sample of inpatient versus outpatients with schizophrenia (Revheim et al., 2006).

4.2 Limitations

Though this study addresses an important gap in the literature, some study limitations merit comment. First, the sample size of both the clinical and the undergraduate group are relatively small compared to those normally used in confirmatory factor analyses. Typically, the rule of thumb for sample size in a factor analysis is 10 to 20 participants per variable or about 250 to 500 participants (Schumacker & Lomax, 2004). Had more participants been included, the examination of how these two factor structures operate in both samples would have been more accurate and representative of the population. However, the clinical sample was a distinctive group of individuals undergoing competency evaluation and their assessment offers valuable information on a unique and under-researched population. This clinical sample could be considered the ideal group to be administered the ILS because an evaluation of their competency involves, among other things, the assessment of their ability to solve everyday problems, manage their finances, and keep themselves safe.

Second, because the study included a clinical sample of individuals with various cognitive and functional impairments, not all measures could be administered to every participant, thus reducing the sample size. Still, out of the 131 participants in the clinical sample, about 75% of participants completed the ILS-HS and ILS-MM subscales and were included in the analyses. The clinical sample data, however, are from one forensic evaluator's practice, which may affect the generalizability of the findings. For example, there may be different referral patterns with other clinicians who conduct multidisciplinary evaluations. Additionally, other states have different statues for defining competency and may have different procedures for conducting these evaluations.

Finally, since the ILS was developed by Loeb in 1996, some of the material or item wording may be outdated, which could have affected how participants understand or perform an item task. For example, items 8 and 9 from the Managing Money subscale require the examinee to write out a check for a bill, a method of bill payment that is becoming obsolete as use of electronic payments increase, especially for younger participants.

4.3 Future Research

Future studies should examine the factor structure of the Independent Living Scales with larger normative and clinical sample sizes for more accurate and generalizable results. Additional research should be conducted with a clinical sample like the one assessed in this study and with measures of activities of daily living in order to further our understanding of the capabilities of individuals with psychiatric and neurological diagnoses. This will increase clinician's abilities to maximize the independence and autonomy of these individuals, while also making recommendations and arranging support that will maintain their client's safety and well-being. The studies should further test models of the two-factor structure of this measure in order to replicate the results obtained by Loeb (1996). The exploration and validation of this measure is important because it was developed for use with vulnerable populations including older adults and individuals with cognitive impairment, and to our knowledge, has not been fully replicated since development. Bearing in mind the country's aging population, the need for evaluations of individuals' competency will likely increase. In order to accurately do so, additional studies that examine measures like the ILS and their ability to accurately assess problem solving and performance abilities in important everyday situations are needed.

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APPENDIX A: TABLES

Table 1: Demographic characteristics of the clinical sample and the undergraduate sample

	Clinical Sample		Undergraduate Sample				
Characteristics	*M*	*SD*	*M*	*SD*	*t*	*p*	*df*
Age (years)	52.08	24.96	20.51	3.65	-14.2	.0001**	140.1
Education (years)	11.99	3.22	13.23	1.35	3.7	.0001**	175.9
	n	% of total	*n*	% of total	x^2	*p*	*df*
Gender					.039	.844	1
Female	72	55	38	53.5			
Male	59	45	33	46.5			
Ethnicity					27.03	.0001**	5
White	58	44.3	45	63.4			
African American	68	51.9	14	19.7			
Hispanic/ Latino	2	1.5	8	11.3			
Asian	1	0.8	2	2.8			
Other	2	1.5	2	2.8			
Diagnosis							
Neurological	38	29.2	N/A				
MR/BIF	33	25.4					
Psychiatric	31	23.9					
Both	28	21.5					

Note. Clinical sample total *N* = 131, Clinical sample education level *N* = 121, Clinical sample diagnosis *N* = 130; Undergraduate sample *N* = 71. Both = Neurological and Psychiatric diagnoses; MR/BIF = mental retardation/ borderline intellectual functioning.

$^*p \leq .05$, $^{**}p < .0001$

Table 2: Means, standard deviations, and ANCOVA's of functional and cognitive measures across samples controlling for age and education.

	Undergraduate Sample			Clinical Sample				
Measure	*M*	*SD*	*N*	*M*	*SD*	*N*	*F*	*p*
ILS-MM	48.41	8.07	71	34.54	13.70	98	23.91	.0001**
ILS-MM-PS (raw)	16.86	1.52	71	12.09	4.37	98	28.05	.0001**
ILS-MM-PR (raw)	9.76	2.80	71	6.61	4.15	98	14.55	.0001**
ILS-HS	53.21	5.44	71	36.49	11.40	99	44.75	.0001**
ILS-HS-PS (raw)	26.82	1.80	71	22.02	4.58	99	24.53	.0001**
ILS-HS-PR (raw)	9.37	0.72	71	7.20	1.64	99	36.95	.0001**
MMSE	45.48	12.82	71	21.32	29.70	111	16.01	.0001**
TMT-A	49.20	10.39	71	32.87	12.02	85	29.34	.0001**
TMT-B	50.76	9.50	71	33.04	11.47	68	35.34	.0001**

Note. Undergraduate sample $N = 71$ and clinical sample $N = 131$. ILS-HS = Independent Living Scales Health and Safety; ILS-MM = Independent Living Scales Managing Money; ILS-MM-PS = ILS-MM-Problem Solving factor; ILS-MM-PR = ILS-MM-Performance/Information factor; ILS-HS-PS = ILS-HS-Problem Solving factor; ILS-HS-PR = ILS-HS-Performance/Information factor; MMSE = Mini Mental State Examination; TMT-A = Trail-Making Test, Part A; TMT-B = Trail Making Test, Part B. All measures are reported as *T* scores except PS and PR scores, which are raw total scores. ANCOVA = Analysis of covariance; *F* = test statistic for ANCOVA.

$*p < .05$, $**\ p < .0001$

Table 3: Confirmatory factor analyses results summary for the ILS-Managing Money and ILS-Health and Safety subscales in the clinical and undergraduate sample

Sample	**Subscale model**	***x^2 (CMIN)***	***df***	***p***	***CMIN/df***	***CFI***	***RMSEA***
Undergraduate	ILS-MM: 2-factor model	36.430	35	.402	1.041	.967	.024
	ILS-HS: 2-factor model	46.338	53	.729	.874	1.000	.000
Clinical	ILS-MM: 2-factor model	101.420	76	.027	1.334	.916	.059
	ILS-HS: 2-factor model	-	-	-	-	-	-

Note. CMIN/*df* = Chi-square divided by degrees of freedom; CFI = comparative fit index, RMSEA = root mean-square error of approximation.
**p* < .05, ** *p* < .0001

Table 4: Recommended fit indices and corresponding cutoff values (Hu & Bentler, 1999)

Decision	Goodness of fit indices		Lack of fit index
	p of x^2/df	**CFI**	**RMSEA**
Good	> .05	> .95	< .05
Acceptable	> .05	> .90	< .08
Marginal	> .01	.85-.89	< .10
Reject	< .01	< .85	> .10

Note. x^2 = Chi-square test, *p* = significance value, *df* = degrees of freedom. CFI = comparative fit index, RMSEA = root mean-square error of approximation.

Table 5: Confirmatory factor analyses results and decision matrix for ILS-Managing Money and ILS-Health and Safety models in both samples

Sample	**Subscale model**	***p* of CMIN/*df*** >.05	**CFI** > .95	**RMSEA** < .05
Undergraduate	ILS-MM: 2-factor model	Good	Good	Good
	ILS-HS: 2-factor model	Good	Good	Good
Clinical	ILS-MM: 2-factor model	Marginal	Acceptable	Acceptable
	ILS-HS: 2-factor model	-	-	-

Note. CMIN/*df* = Chi-square divided by degrees of freedom, CFI = comparative fit index, RMSEA = root mean-square error of approximation

Table 6: Inter-item correlation matrix for ILS-Managing Money subscale in the undergraduate sample (model 1)

	MM2	MM3	MM4	MM5	MM6	MM7	MM8	MM9	MM10	MM11	MM12	MM13	MM14	MM15	MM16	MM17
MM2	1															
MM3	**.245***	1														
MM4	-.081	.072	1													
MM5	.153	.010	-.029	1												
MM6	**.423****	.203	-.062	**.304***	1											
MM7	.040	.127	**.569****	-.051	.014	1										
MM8	**.247***	.036	-.080	-.022	.168	.022	1									
MM9	.187	.016	-.077	-.014	.072	.029	**.963****	1								
MM10	.220	.165	.094	.003	**.332****	.165	-.005	-.031	1							
MM11	.028	.042	-.033	**.410****	.051	-.058	-.056	-.048	.131	1						
MM12	.058	-.159	-.036	-.074	-.069	-.064	.031	.042	.082	-.084	1					
MM13	**.241***	-.145	-.019	-.039	.011	-.034	.203	.211	-.040	-.044	**.338****	1				
MM14	.205	.030	-.116	.164	**.337****	-.051	.207	**.243***	.213	.094	-.073	-.039	1			
MM15	.058	.184	-.036	.145	.110	-.064	-.202	-.196	.003	-.084	.090	-.049	-.018	1		
MM16	**.396****	.140	-.028	.111	.015	-.049	.113	.122	.181	-.064	.207	-.037	**.282***	.068	1	
MM17	**.314****	.127	-.025	**.252***	**.261***	-.044	.022	.029	-.052	-.058	-.064	-.034	.103	.188	.143	1

Note. $N = 71$; Each of the following component variables has zero variance and is removed from the scale**: MM1**
*Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 7: Inter-item correlation matrix for ILS-Health and Safety subscale in the undergraduate sample (model 2)

	HS1	HS2	HS3	HS4	HS6	HS7	HS8	HS9	HS11	HS12	HS13	HS14	HS15	HS16	HS17	HS18	HS19	HS20
HS1	1																	
HS2	-.024	1																
HS3	-.083	-.137	1															
HS4	-.055	-.091	.096	1														
HS6	**.702****	-.034	-.118	.068	1													
HS7	-.048	**.482****	-.106	.045	-.068	1												
HS8	.083	.214	-.076	-.054	-.013	**.238***	1											
HS9	-.091	.232	-.062	-.117	-.130	.159	.026	1										
HS11	-.024	.134	.074	**.249***	-.034	.108	.214	-.151	1									
HS12	-.089	**.287***	-.098	-.159	-.126	.104	.053	.152	-.085	1								
HS13	-.024	-.039	.180	.079	-.034	-.079	.061	.040	**.307****	-.085	1							
HS14	.099	**-.238***	-.037	-.061	.141	-.210	-.048	-.087	-.137	.006	.064	1						
HS15	-.040	-.065	-.027	.010	-.056	-.132	-.062	-.070	.100	-.127	-.065	-.014	1					
HS16	**.314****	-.075	-.083	-.176	.191	-.072	.200	.037	.073	.089	-.075	.144	.016	1				
HS17	-.058	**.376****	-.105	-.038	.080	.214	.213	.151	-.001	-.022	-.096	.074	.020	-.023	1			
HS18	-.020	-.034	.064	.215	-.029	-.068	-.145	.200	-.034	-.126	-.034	.141	-.056	-.065	.080	1		
HS19	-.031	-.051	.098	-.120	-.044	-.104	.047	-.115	-.051	-.139	-.051	.216	**.350****	-.099	-.043	-.044	1	
HS20	-.033	-.054	-.073	-.127	-.047	-.110	-.064	-.104	.139	.003	-.054	.229	**.278***	.061	-.028	-.047	.098	1

Note. $N = 71$; Each of the following component variables has zero variance and is removed from the scale**: HS5, HS10**

*Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table 8: Inter-item correlation matrix for the ILS-Managing Money subscale in the clinical sample (model 3)

	MM1	MM2	MM3	MM4	MM5	MM6	MM7	MM8	MM9	MM10	MM11	MM12	MM13	MM14	MM15	MM16	MM17
MM1	1																
MM2	**.240***	1															
MM3	.023	**.430****	1														
MM4	.092	**.271****	.050	1													
MM5	.071	.097	-.042	.098	1												
MM6	.189	**.292****	**.238***	**.222***	-.021	1											
MM7	.195	**.199***	.102	.100	-.030	.197	1										
MM8	.147	.115	.131	.061	-.035	**.257***	**.811****	1									
MM9	.145	.114	.132	.058	-.030	**.253***	**.811****	**1.000****	1								
MM10	.139	.114	.133	.059	-.034	**.257***	**.811****	**.999****	**.999****	1							
MM11	.092	.177	**.280****	.039	.057	**.260****	-.027	.106	.108	.110	1						
MM12	.142	.174	.177	.033	.087	.188	.002	.058	.060	.060	**.216***	1					
MM13	**.364****	**.383****	**.270****	**.380****	**.211***	**.247***	-.031	.002	.003	-.006	**.361****	**.221***	1				
MM14	-.026	-.080	.101	-.037	-.019	.160	-.010	**.575****	**.575****	**.575****	**.214***	.109	.049	1			
MM15	**.277****	**.223***	**.218***	**.205***	-.058	**.209***	.047	-.021	-.019	-.018	**.276****	**.259***	**.414****	-.094	1		
MM16	**.286****	**.399****	**.354****	.067	.005	**.328****	.172	.174	.175	.176	**.354****	**.209***	**.354****	.071	**.407****	1	
MM17	**.380****	**.359****	.185	**.269****	.125	**.372****	.180	.165	.164	.162	**.362****	**.226***	**.633****	.033	**.337****	**.473****	1

Note. $N = 98$.

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Table 9: Inter-item correlation matrix for the ILS-Health and Safety subscale in the clinical sample (model 4)

	HS1	HS2	HS3	HS4	HS5	HS6	HS7	HS8	HS9	HS10	HS11	HS12	HS13	HS14	HS15	HS16	HS17	HS18	HS19	HS20
HS1	1																			
HS2	.120	1																		
HS3	-.058	.146	1																	
HS4	-.078	.180	.099	1																
HS5	**-.265****	.112	.088	**.388****	1															
HS6	.104	.088	**.216***	**.206***	.088	1														
HS7	.092	.179	**.350****	.084	.029	.031	1													
HS8	.012	**.331****	**.223***	.056	-.027	-.044	**.216***	1												
HS9	-.108	.170	**.207***	**.210***	**.214***	.115	.049	.173	1											
HS10	**.215***	.022	.089	.171	.180	.133	.057	.059	**.241***	1										
HS11	.159	**.356****	**.224***	.180	**.203***	**.268****	**.226***	**.224***	**.282****	**.262****	1									
HS12	-.046	.180	**.209***	.112	.156	-.027	.039	.179	.138	**.221***	.099	1								
HS13	-.037	.178	.085	.179	.108	.008	.123	**.273****	.071	.133	.127	**.241***	1							
HS14	-.060	.140	**.326****	.102	**.218***	**.242***	.077	**.240***	.197	.118	**.217***	.153	**.342****	1						
HS15	-.072	.053	.135	-.028	.034	.083	**.207***	.165	.144	.163	**.233***	.124	.188	.126	1					
HS16	-.114	**.235***	.097	**.271****	.195	.069	.023	**.199***	.123	**.203***	.156	**.379****	**.369****	**.222***	.093	1				
HS17	.120	.117	**.409****	-.067	.053	.192	**.202***	.071	.050	.136	**.203***	**.276****	.045	**.240***	**.231***	.161	1			
HS18	-.028	**.257***	**.233***	.079	.081	.146	**.225***	**.237***	.116	.001	**.333****	.173	**.413****	**.224***	.141	**.302****	.099	1		
HS19	.135	.075	.195	.108	.024	.083	**.319****	.149	.039	.050	**.264****	.028	**.296****	**.229***	.053	.091	**.283****	.098	1	
HS20	-.007	.149	**.281****	.126	.145	.150	.143	.128	.103	**.264****	.179	**.332****	**.208***	.195	**.293****	.159	**.395****	.158	.039	1

Note. $N = 99$.
*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

APPENDIX B: FIGURES

ILS Managing Money subscale items

Problem Solving factor (PS)	**1.** "How are you supported financially?" **2.** "Please explain to me what Social Security benefits are." **7.** "Where do you get checks/money orders?" **11.** "Tell me two reasons why it's important to pay your bills." **12.** "Name one thing you can do to keep from being cheated out of your money." **13.** "What is health insurance?" **15.** "Why is it important to read carefully and fully understand any document before signing it?" **16.** "What is the purpose of a will?" **17.** "What is home insurance?"
Performance/ Information factor (PR)	**3.** "By what date, every year, do you have to file your personal income tax return?" **4.** "Now I would like you to count out $1.39 from these coins." **6.** "Suppose you bought a dozen eggs for $1.19. If you gave the clerk $5.00, how much change should you receive? You may use the scratch paper and pencil to do your figuring." **8.** "Now make out one check/money order payable to the Telephone Company for this bill." **9.** "Now make out a check/money order payable to the Gas and Electric Company for this bill." **10.** "Now I want you to deduct the two checks/money orders from the beginning balance and tell me how much money, if any, you will have left over. You may use the sheet of scratch paper to do your figuring." **14.** "Suppose you receive a medical bill for $350.00. If your medical insurance pays 80% of this bill, how much do you owe? You may use the scratch paper to do your figuring."

FIGURE 1: ILS- Managing Money factor indices with corresponding subscale items.

ILS Health and Safety subscale items

Problem Solving factor (PS)	**2**. "If you didn't have a regular doctor and you need medical help quickly, how could you get it?" **4.** "Suppose you are home alone and not expecting anyone. There is a knock on your door about ten o'clock at night. What would you do?" **6.** "Tell me two ways you would know that it's safe to cross a busy street." **7.** "If you had a pain in your chest, on your left side, and you were having trouble breathing, what would you do?" **8.** "Suppose you smelled a gas odor in the house. What would you do?" **9.** "If you accidentally cut your hand and it was bleeding badly, what would you do?" **10.** "Tell me three things that are important to do to take good care of your body." **11**. "Tell me two things about the condition of your health during the past 5 years." **12.** "If you unintentionally lost 10 pounds in 4 weeks, what would you do?" **13.** "Let's suppose you have to take medication three times a day. How would you remember when to take it?" **14.** "Why is it important to know about the side effects of the medicine you are taking?" **15.** "Tell me two reasons why bathing is important." **16.** "Tell me two safety precautions you can take when bathing or showering." **19.** "Suppose you injured your hip, and the doctor told you it would take much effort and months of physical therapy to be able to walk again. What would you do?" **20.** "What are two dangers of staying in bed all the time?"
Performance/ Information factor (PR)	**1.** "Show me how to call the police." **3.** "Suppose you were outside in your yard and you saw (smelled) smoke coming out of your kitchen window. What would you do?" **5**. "What are two precautions you can take to protect yourself when going out at night?" **17.** "What would you do if you couldn't hear most conversation?" **18.** "What would you do if you could not read small print, like the print in the phone book or on the labels of medicine bottles?"

FIGURE 2: ILS-Health and Safety factor indices with corresponding subscale items

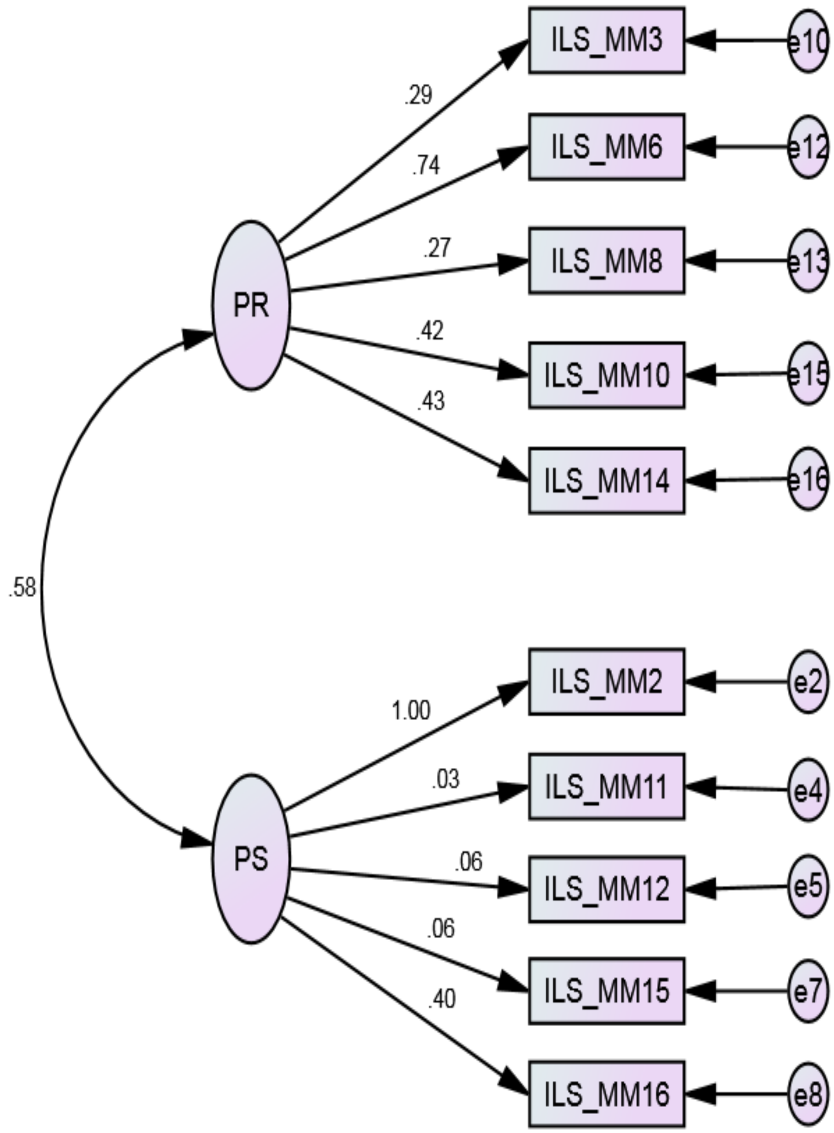

FIGURE 3: Undergraduate sample confirmatory factor analysis [ILS-Managing Money] 2 factor model 1, *N* = 71.

(*Excluding :)
*MM-1 (PS):"How are you supported financially?"
*MM-4 (PR): "Now I would like you to count out $1.39 from these coins."
*MM-5: "About how much does a loaf of bread cost?" (Not included in PS or PR factor).
*MM-7 (PS): "Where do you get checks/money orders?"
*MM-9 (PR): "Now make out one check/money order payable to Gas and Electric Company for this bill."
*MM-13 (PS): "What is health insurance?"
*MM-17 (PS): "What is home insurance?"

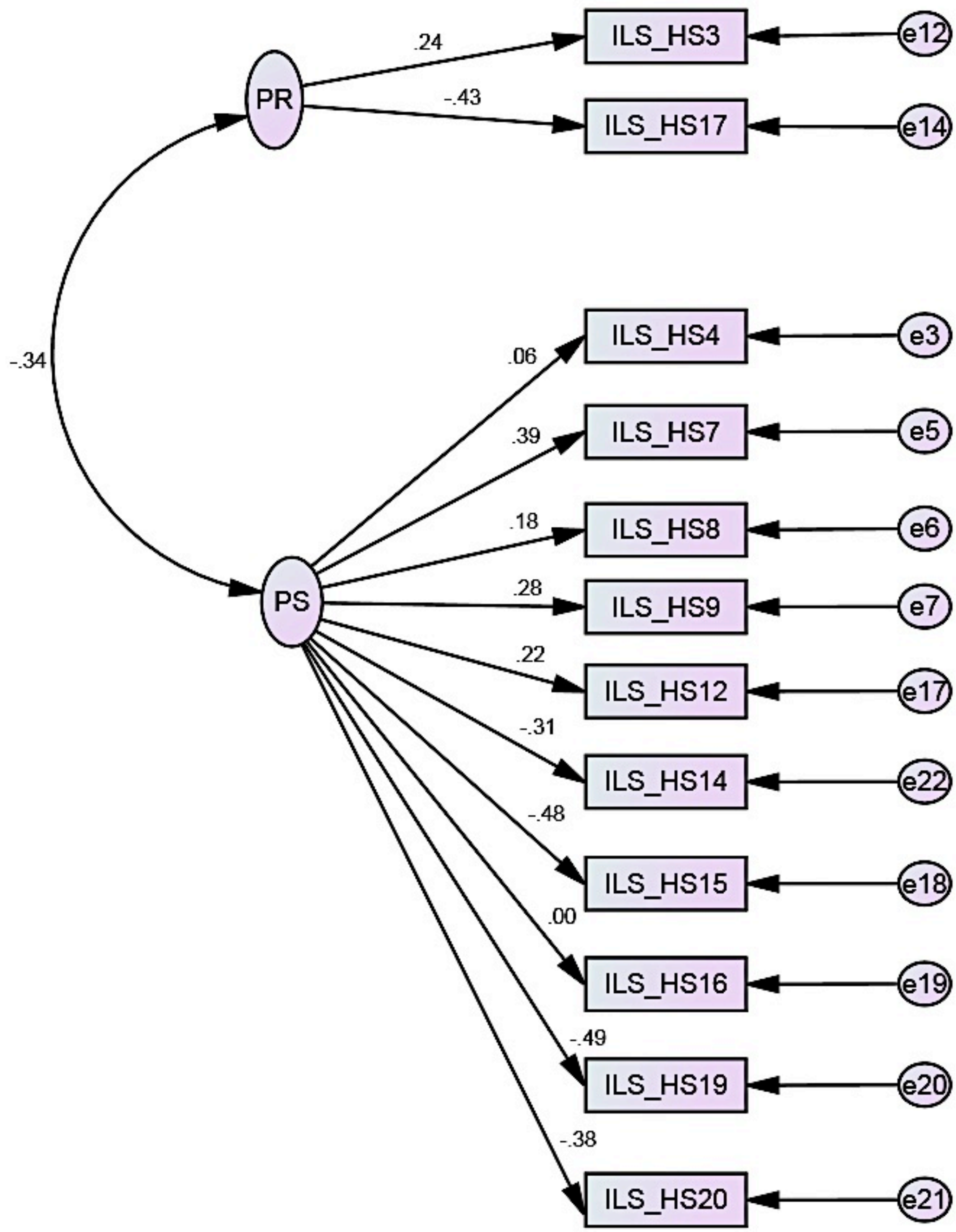

FIGURE 4: Undergraduate sample confirmatory factor analysis [ILS-Health and Safety] 2 factor model 2, $N = 71$.

(*Excluding:)
*HS-1 (PR): "Show me how you call the police."
*HS-2 (PS): "If you didn't have a regular doctor and you needed medical help quickly, how could you get it?"
*HS-5 (PR): "What are two precautions you can take to protect yourself when going out at night?"

*HS-6 (PS): “Tell me two ways you would know that it’s safe to cross a busy street.”
*HS-10 (PS): “Tell me three things that are important to do to take good care of your body.”
*HS-11 (PS): “Tell me two things about the condition of your health in the past five years.”
*HS-13 (PS): “Let’s suppose you have to take medication three times a day. How would you remember when to take it?”
*HS-18 (PR): “What would you do if you could not read small print, like the print in the phone book or on the labels of medicine bottles?”

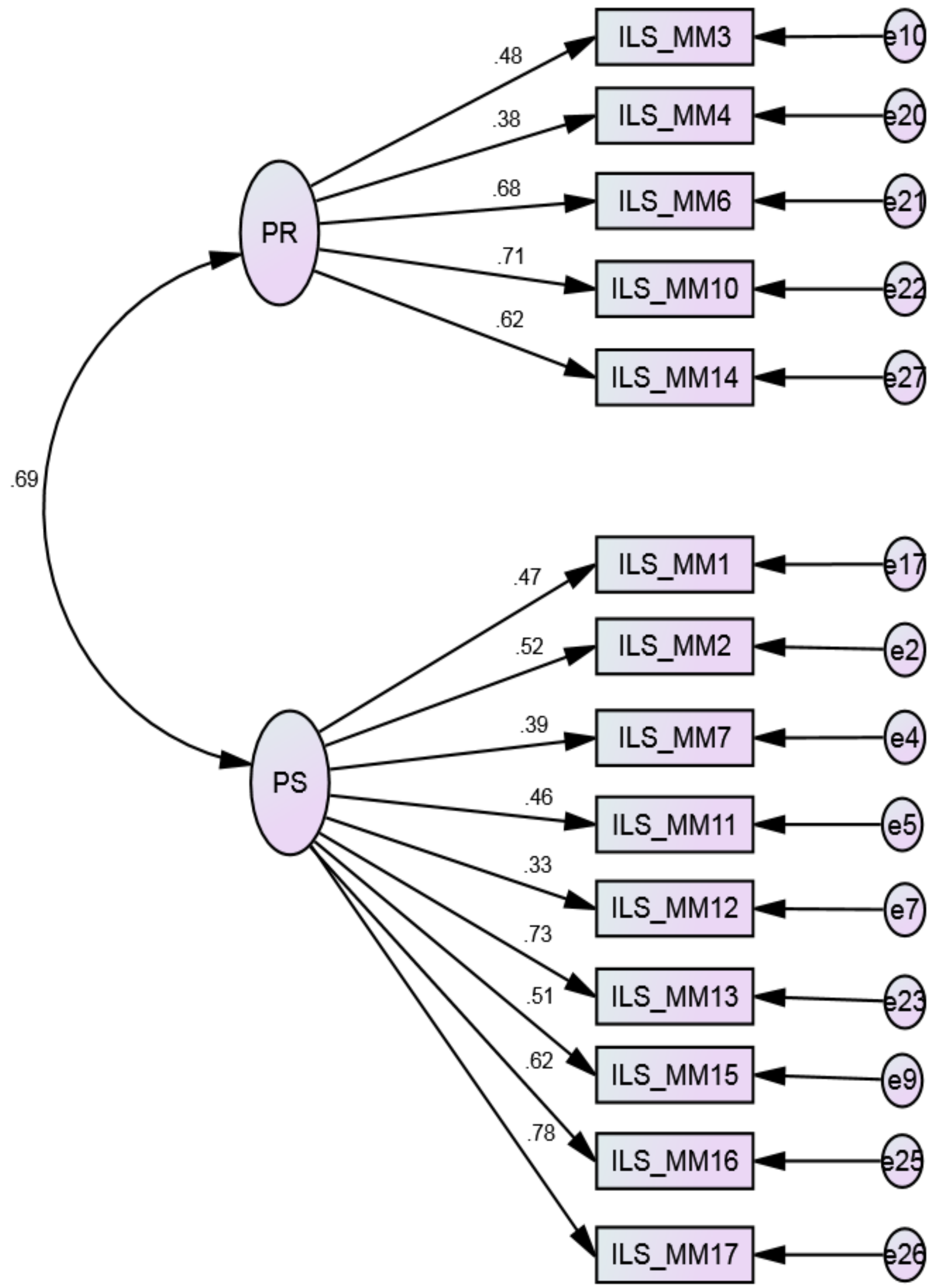

FIGURE 5: Clinical sample confirmatory factor analysis [ILS-Managing Money]
2 factor model 3, $N = 98$.

(*Excluding:)
*MM-5: "About how much does a loaf of bread cost at the store?" (Not included in PS or PR on the ILS)

*MM-8 (PR): “Now make out one check/money order payable to the Telephone Company for this bill.”
*MM-9 (PR): “Now make out one check/money order payable to the Gas and Electric Company for this bill.”

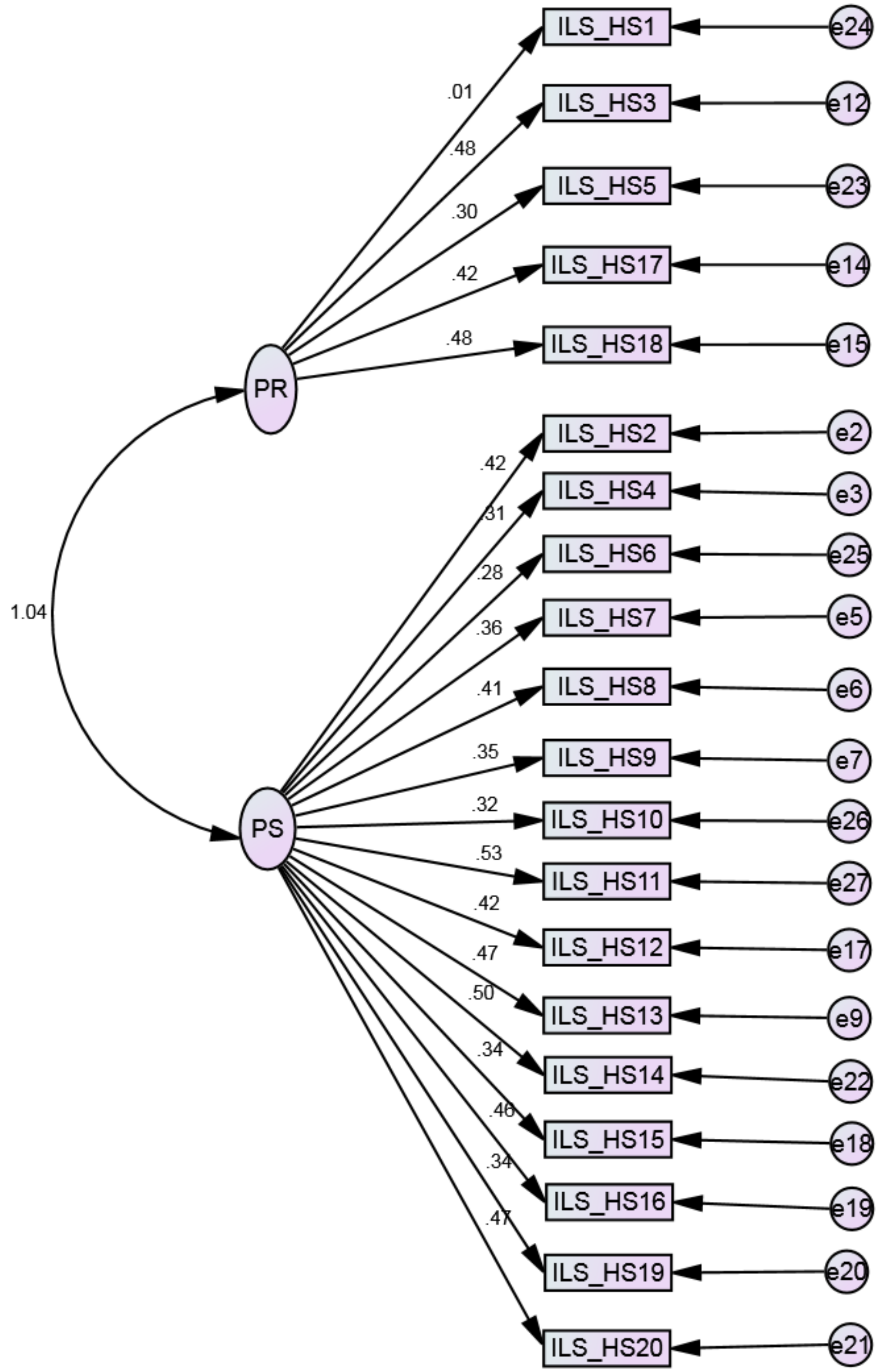

FIGURE 6: Clinical sample confirmatory factor analysis [ILS-Health and Safety] 2 factor model 4, *N* = 99.

No HS items excluded.
Model is not permissible.