Investigating the Construct of Health Literacy Assessment: A Cross-Validation Approach

Bethany Miller
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INVESTIGATING THE CONSTRUCT OF HEALTH LITERACY ASSESSMENT:
A CROSS-VALIDATION APPROACH

by

Bethany LeTae Miller

A Dissertation
Submitted to the Graduate School,
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and the Department of Educational Research & Administration
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for the Degree of Doctor of Philosophy

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May 2018
ABSTRACT

INVESTIGATING THE CONSTRUCT OF HEALTH LITERACY ASSESSMENT:
A CROSS-VALIDATION APPROACH

by Bethany LeTae Miller

May 2018

According to researchers, low health literacy is considered a worldwide health threat (Lee, Tsai-Tuzul, Tsai, & Kuo, 2010). With the recent emphasis on healthcare and improving health status, knowledge has proven vital in the struggle for improved health status and health prevention. The purpose of this study was to investigate the measurement of health literacy utilizing a cross-validation approach. Health literacy measurement has been assessed using three health literacy instruments that are currently available: Short Test of Functional Health Literacy in Adults (STOFHLA), Newest Vital Sign (NVS), and Health Literacy Skills Instrument (HLSI). This study used an exploratory research design. Participants for this study were recruited online via Amazon’s Mechanical Turk, and then qualified participants were administered the instruments via Qualtrics survey software.

A total of 367 valid responses were collected during data collection. SPSS syntax was used to transform and score each of the three instruments. Transformation of the data included transforming individual items from two instruments into binary data where one was the correct answer and all other answers were zero. After the transformation of the data, SPSS syntax was used to score each instrument. To answer the research question regarding the consistency of the selected health literacy instruments, a Spearman’s rho was conducted. The results for Spearman’s rho indicate that all three instruments are
significantly correlated at the $p < .01$ level. The correlations for each were moderate with the correlation between the NSV and HLSI being the weakest at .471. The strongest correlation was between the NSV and the STOFHLA at .642. The correlation between the STOFHLA and the HLSI was .586.

The ability to assess health literacy more accurately will continue to be an important issue as more emphasis is placed on patient outcomes. There are many instruments that endeavor to measure health literacy, but there are still many questions about the accuracy and consistency of available measures. The instruments used in this study show some consistency in their ability to measure health literacy across different domains, but also raised new questions about health literacy measurement.
ACKNOWLEDGMENTS

There are many people who have contributed to the completion of this journey. I would like to thank my colleagues at Cornell College for their support as I completed my dissertation. I offer my sincerest gratitude to my mentor and friend, Dr. Becki Elkins, for her support and relentless belief in me and to my editor and friend, Dr. Joy Howard, for her unwavering support and encouragement. Special thanks to my committee members, Dr. Rich Mohn who always assisted without hesitation and helped me remember that I know more than I think I know; Dr. Thomas Lipscomb, who challenged me in ways that improved my thinking and ultimately the end product; and Dr. Lilian Hill, whose work on health literacy was an inspiration as I explored the field. Finally, I would like to express my deepest and most sincere gratitude and appreciation to Dr. Kyna Shelley. Thank you for always being my anchor on this journey. I would not be here without you.
DEDICATION

“No man is an island,
Entire of itself,
Every man is a piece of the continent,
A part of the main.”

- John Donne

This work is dedicated to all of the people who traveled this journey with me through kind words, deeds, prayers, and encouragement.
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<td>NCES</td>
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<td>HBM</td>
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<td>USDHHS</td>
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CHAPTER I - INTRODUCTION

Health Literacy is an often-used term, but a highly misunderstood concept in the United States. Health literacy is more than being functionally literate. A patient’s health literacy is vital in the goal of improving health status and illness prevention. Being able to follow doctor’s instructions, ask questions, and keep track of one’s health care is all part of being health literate. Increasing the overall health literacy in the United States population is critical. Despite decades of advancement in health, the United States lingers near the bottom among developed nations in all standard measures of health status (Shi & Singh, 2011). It is estimated that low health literacy adds approximately $73 million to healthcare costs annually in the United States (Patel, et al., 2011).

Concerns about health literacy have risen as the definition of “health” overall has evolved to become more comprehensive, and also more complicated. “Health” is defined by The World Health Organization (WHO) as “a complete state of physical, mental, and social well-being, and not merely the absence of disease or infirmity” (Shi & Singh, 2011, p. 3). A more holistic view of health is becoming prevalent among healthcare providers and the general public. Health is more than the absence of physical illness. Health is not just inclusive of physiological, emotional, and psychological factors; better definitions of health also encompass environmental, economic, and social factors. Broader definitions of health matter because low health status in the USA is supported by one of the costliest healthcare systems in the world, consuming 17% of the nations’ gross domestic product, and a system that consistently receives low ratings from both providers and consumers (Shi & Singh, 2011). The myriad health disparities in the United States can be linked to several factors, but socioeconomic status (SES) is the most commonly
cited reason for many of the inequities in health status. Socioeconomic status is related to measures of education, income, and occupation. The connection between SES and health has been explored extensively, and the evidence indicates that higher SES relates to better health (Shi & Singh, 2011). As there is a movement from a narrow definition of health to a more expansive definition of health, various practitioners, from a spectrum of health models, have begun to integrate models that are usually discussed separately in the literature (Julliard, Klimenko, & Jacob, 2006). The type of care provided by healthcare providers is influenced by their definition of health and their belief systems (Julliard, Klimenko, & Jacob, 2006). As the definitions of health evolve, the burden on all parties—patients and providers alike—to communicate clearly and to appropriately interpret health communications is heavier. In other words, as understandings of health become more complex, understandings of health literacy also becomes much more complicated.

The link between health, education, and literacy has been clearly established, health literacy is more complex than literacy and education on its own. This discussion of health literacy is not focused on the relationship between, health, literacy, and education. Recent studies indicate literacy is a better indicator and predictor of health status, behaviors related to health, and knowledge related to health than education or race. Literacy disparity may be a key element in health disparities, and a credible possibility for improvement efforts in health outcomes as adult literacy can be improved across the lifespan (Sentell & Halpin, 2006). Research has underscored the connection between educational achievement and health outcomes (Chandola, Clarke, Morris, & Blane, 2006) with higher educational achievement typically corresponding to improved health
outcomes. Better health outcomes indicate that increased knowledge makes people more likely to seek healthcare and have the economic ability to adhere to medical regimens, while also understanding more clearly the connection between health and economic vitality. This relationship may exist because the information acquired through education may make a person more likely to access and obtain appropriate healthcare. Education is hugely important. The National Center for Education Statistics (NCES) estimates that 88% of the U.S. population lacks the basic literacy skills needed to preserve health and prevent disease (AHC Media, LLC, 2011). The work to improve basic literacy and health literacy is work that can be undertaken in many ways that will have benefits beyond the healthcare realm.

However, high functional literacy is not synonymous with high health literacy. Health literacy is about the ability to understand, interpret and use health information appropriately. As one health care provider notes, education does not necessarily translate into medical compliance—the patient’s ability to understand and adhere to medical instructions once outside of direct care:

to a certain degree I think compliance is NOT affected by education. I know all the risk factors for cardiac disease, but do not always comply with eating correctly. I see this in patients as well. They know they should check their BS (blood sugar) as a diabetic but don't follow through. To my mind compliance conceptually doesn’t fit with literacy (Miller, 2012).

The work of health literacy is about sorting out the misapprehensions and fallacies surrounding literacy skills; this not a matter of intelligence or education, but instead a matter of developing a separate set of skills (Doak, Doak, & Root, 1985). Recently, it has
been recognized that not only is functional literacy important in educating and communicating with patients, *health literacy* is also imperative in patient education and communication in order for the patient to adequately comprehend and implement information. Health literacy is more than the ability to read pamphlets and make appointments.

Health literacy is a multifaceted skill set that can be broken down into three broader categories that are functional health literacy, interactive health literacy, and critical health literacy. Specific definitions for health literacy vary and although the issue of varying definitions might not seem important, it actually points to the current problem of accurately measuring health literacy and then working to increase it. The U.S. Department of Health and Human Services defines health literacy as:

the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. Health literacy includes the ability to understand instructions on prescription drug bottles, appointment cards, medical education brochures, doctor's directions, and consent forms. It also includes the ability to navigate complex health care systems. Health literacy is not simply the ability to read. It requires a complex group of reading, listening, analytical, and decision-making skills and the ability to apply these skills to health situations” (US Department of Health and Human Services, 2000, p. 20).

Health literacy also includes “the ability of individuals to understand, make decisions, and act on spoken, written, and visual health information in order to lower risk and
improve health status” (Smith, 2011, p. 48). Within this definition, health literacy is understood to be a means of helping people to overcome health barriers (Nutbeam, 2000).

Low health literacy is in fact, considered a worldwide health threat (Lee, Tsai-Tzul, Tsai, & Kuo, 2010). Low health literacy is a serious concern because health literacy is thought to be strongly connected to health outcomes. Studies point toward low health literacy for the general population of the United States despite the fact that the country is highly industrialized (Von Wagner, Knight, Steptoe, & Wardle, 2007). Health literacy has emerged as a key topic of conversations surrounding health and improving health outcomes (Mackert, Ball, & Lopez, 2011). Improving health literacy needs to happen in order for the general population to see improved health outcomes (Von Wagner, Knight, Steptoe, & Wardle, 2007). Any breakdown in communication can lead to poorer health outcomes for patients with lower health literacy (Mackert, Ball, & Lopez, 2011).

Increasingly, national attention is focusing on the effects of poor health literacy and its impact on health outcomes (Powell, 2009). Overall low health literacy however, highlights that health education must involve the communication of what is known about health to the general population to develop positive behavior patterns as they relate to health (Evawoma-Enuku, Oyitso, & Akpoigho Enuku, 2010).

Specifically, low health literacy is associated with a lower likelihood of using preventative services as well as more prolonged ailments and hospital stays when an illness occurs. Not only must health literate challenged individuals manage these pitfalls concerning their health, but they must also face the challenge of understanding the physician’s explanation of their health problems. Many national organizations including the Institute of Medicine (IOM), National League for Nursing Accrediting Commission
and the American Association of the Colleges of Nursing have recognized the importance of health literacy and its influence on health outcomes. These organizations have also announced the need for changes in knowledge about health literacy in healthcare professionals as well as curricular changes that need to take place in order to help address this need (Smith, 2011; National Academy of Sciences, 2014). It is also imperative to note that health literacy does not just include the ability to read and write, but it also includes math and numeracy skills, which can be very important to patients managing chronic illnesses over the long term. Math and numeracy skills can be important in taking prescribed medications correctly. Persons with low health literacy must confront a myriad of issues that include longer and more regular hospitalizations and more difficulty managing their care. Patients need to not only understand their diagnosed condition and the medication that accompanies it, but also understand dietary restrictions, calorie counts, and other modifications in their lifestyle that must be made for successful management of a chronic illness in the long term.

For patients with chronic illness such as diabetes, low health literacy is especially problematic. As the conversations around the connection between health literacy and health outcomes have emerged, there has also been an increased awareness of chronic illnesses in the United States. There are many factors to consider when addressing issues related to literacy and patient health education especially for patients with chronic or long-term illnesses. For patients with chronic illness such as diabetes, low health literacy is especially problematic. There is a higher risk of chronic or long term illnesses for persons with lower health literacy skills and a decreased capacity to manage long term illnesses properly. Diabetes is only one of many chronic illnesses that are rapidly
increasing and is a complex long-term condition. Many patients with diabetes are likely to have other co-morbidities that impact their overall health long term. To attain best outcomes, patients should have an excellent understanding of the illness and assume an attentive self-care approach. This compliance and self-care is often more difficult for patients with low health literacy skills because they struggle with obtaining, understanding, and using health information. The same struggle with health information can be true of people who have not yet reached the threshold of diagnosis, such as pre-diabetics or people who are pre-hypertensive, who are struggling with lifestyle changes to prevent future health problems (Okosun, Davis-Smith, & Seale, 2012).

Approaches to increase health literacy, therefore, should focus on improving communication between healthcare providers and patients with chronic illnesses, providing information in multiple formats and looking to improve access to healthcare services over all (Stiles, 2011). Research suggests that improved understanding of patient health literacy levels can not only improve clinical health outcomes in patients, but also lower the cost of healthcare. Studies indicate that costs resulting from low health literacy skills were $73 billion dollars as patients with lower health literacy skills are less likely to use preventative services and more apt to use emergency services (Patel et al., 2011). Improving health literacy among the population presents the possibility of improving health outcomes, improving healthcare, and lowering healthcare costs. To increase health literacy, however, first we must be able to assess it accurately.

Whereas the link between health literacy and health outcomes has been demonstrated through research, there is still a disconnect between the use of health literacy assessment instruments in the clinical setting and the use of the results of health
literacy assessments to select patient education tools that maximize patient education and subsequently improve patient outcomes. Recently the field of health literacy has also recognized that earlier inquiries into health literacy were not balanced in their examination of individual skills and the demands of the healthcare system (Rudd, 2013). The focus was on individuals’ reading skills without attention to the constellation of other factors that also are integral in health communication, such as health tasks, materials used, or the communication skills of the healthcare provider (Rudd, 2013). Studies have begun to focus on not just the reading skills of individuals, but also on the ancillary skills that are also important for clear and appropriate health communication.

It is not enough to assume that if patients can read information given to them, then they will make rational decisions about their care. Health care providers must use the correct tools to accurately assess patients’ health literacy. The theory of reasoned action implies that humans make use of the information that is made available to them in a systematic and rational way (Ajzen & Fishbein, 1980). The ability to accurately assess patients’ literacy and health literacy levels could make the difference in improved health outcomes and improved monitoring and control of chronic health conditions. This is especially important because there is no known research that indicates that higher functional literacy rates correlates to higher health literacy rates, it is important to assess all patients using health literacy instruments.

Statement of the Problem

Researchers and health professionals recognize the significance of health literacy for patients and for practitioners. Research also acknowledges the complexities of health literacy. There is, however, little consensus on the definition of health literacy and how to
accurately measure it (Pleasant, 2011). It is agreed that clear communication is vital to successful healthcare. Clear communication is a culmination of attitude and aptitude between all entities that operate in the health care field (Institute of Medicine, 2004).

Health literacy is more than just communication. According to Rowland (2009), “an ability to understand and act on health information is crucial to people’s decisions to improve their health” (Rowland, 2009, p. 16). Health literacy emerged as a field of study in the 1960s in North America, but it is only recently that health literacy has been acknowledged as a significant social determinant of health as evidenced by dramatic increase in peer-reviewed journal articles (Pleasant, 2011).

More information about the measurement of health literacy can be used to improve health literacy assessment in the clinical setting as well as lead to the development of different health literacy instruments that are easier to use and score in the fast-paced healthcare setting. Given the dearth of information available about health literacy, additional knowledge relating to the measurement of health literacy is required. Mancuso (2009) notes in her article, “Assessment and Measurement of health literacy: An integrative review of the literature,” that while innovative instruments have been developed and moved the field of health literacy assessment forward, there are still numerous barriers to effective health literacy assessment especially outside of the clinical setting. The theoretical framework for this study is composed of three primary theories which include: the Health Promotion Model, the Theory of Reasoned Action, and Social Learning Theory. These theories highlight issues that are central in the discussion of health literacy and in the measurement of health literacy as a construct.
**Purpose of the Study**

Using multiple health literacy instruments that are currently available, the purpose of this study is to examine the current measures of health literacy available and their potential impact on healthcare.

**Research Questions**

1. To what extent are currently available instruments designed to assess health literacy consistent with each other?

2. What are the psychometric properties of currently available instruments designed to assess health literacy?

**Definition of Terms**

1. Accurately: careful and exact; precise (Agnes, 2003).


3. Assessment: “systematically gathering, analyzing, and interpreting evidence to determine how well student learning matches our expectations” (Suskie, 2004).

4. Attitude: neuropsychic state of readiness for mental and physical activity (Fishbein, 1967).

5. Determinants of Health: the range of personal, social, economic, and environmental factors that influence health status (Office of Disease Prevention and Health Promotion, 2015).

6. Functional Literacy: the acquisition of appropriate verbal, cognitive, and computational skills to accomplish practical ends in culturally specific settings (McArthur, 2015).
7. Health: a complete state of physical, mental, and social well-being, and not merely the absence of disease or infirmity (Shi & Singh, 2011).

8. Health Disparity: differences in the incidence, prevalence, mortality, and burden of diseases and other adverse health conditions that exist among specific population groups in the United States (National Institutes of Health, 2015).

9. Health Equity: every person has the opportunity to ‘attain his or her full health potential’ and no one is ‘disadvantaged from achieving this potential because of social position or other socially determined circumstances.’

10. Health Inequality: differences in health status or in the distribution of health determinants between different population groups (World Health Organization, 2014). Health inequities are reflected in differences in length of life; quality of life; rates of disease, disability, and death; severity of disease; and access to treatment (Centers for Disease Control and Prevention, 2012).

11. Health Literacy: the ability of individuals to understand, make decisions, and act on spoken, written and visual health information in order to lower risk and improve health status (Smith, 2011).

12. Social Determinants of Health: social factors and the physical conditions in the environment in which people are born, live, learn, play, work and age. Also known as social and physical determinants of health, they impact a wide range of health, functioning and quality of life outcomes (Office of Disease Prevention and Health Promotion, 2015).

Delimitations

1. The study will be limited to adults who are English proficient.
2. The study will be limited to adults who can read and write.

3. The study will be limited to adults with personal or public internet access. Those who do not feel comfortable with this topic of study may choose not to participate.

4. Participation in this study is voluntary.

Assumptions

Assumptions for this study include:

1. Study participants will answer honestly.

2. Study participants will complete all instruments.

3. Study participants will understand the content of the instruments.

Significance of the Study

Not only has research demonstrated the link between health literacy and health outcomes, there are studies that demonstrate the link between high or low health literacy rates and increased or decreased mortality rates. Previous research also indicates a link between low health literacy and increased costs for healthcare including longer and more frequent hospitalizations as well as increased maintenance costs for individuals with chronic illnesses due to compounded health conditions. Improving patient understanding is imperative at every level, but especially important when treating patients with long term conditions or chronic illnesses, such as diabetes. Research has shown the connection between lower level literacy skills and higher health risk for long term or chronic conditions, and has also shown the connection between higher or lower health literacy rates and increased or decreased mortality. Just as low health literacy is recognized as a serious social determinant of health outcomes, there needs to be more information about
the measurement of this construct. This study will add to research areas identified by the U.S. Centers for Disease Control about health literacy and the implementation of health literacy action plans. This study also will address the lack of a consistent definition of health literacy and determine whether the instruments currently in use measure health literacy accurately and fully.

Conclusion

The purpose of this study is to develop a better understanding of the assessment of health literacy while simultaneously examining the assessment measures of health literacy in their current incarnations. Chapter two reviews the literature on health, literacy, and health literacy as well as explains the theoretical framework for this study. Chapter three outlines the research methods used, including the discussion of the sample, the variables, and analyses conducted. Chapter four discusses the results of the analyses and identifies the major conclusions of the study. Chapter five discusses the results of the study within the context of health literacy, functional literacy, and health outcomes. Implications of the results and recommendations for future research are also identified.
CHAPTER II – THEORECTICAL FOUNDATIONS AND LITERATURE REVIEW

Introduction

Studies of health literacy and the theories used in those studies seek to answer seemingly straight-forward questions: Why don’t patients seem to understand what doctors tell them and why don’t patients comply with doctors’ orders? The theoretical foundations used in this dissertation acknowledge that health and health literacy cannot be divorced from a patient’s everyday life; therefore answering questions about health literacy, comprehension and learning new healthy habits is not at all straight-forward. Health literacy as a field of study expanded during the late 1990s and early 2000s, but got its start in the 1970s. Health literacy advanced from a basic idea of simplifying language for patients to a complex theory that addresses the multifaceted relationship among knowledge, behavior, attitudes, and health outcomes (Pleasant, 2011).

The theories that work best in concert to address the complexity of health literacy as a skill as well as a measurable construct are: the Health Promotion Model, the Theory of Reasoned Action, and Social Learning Theory. These theories were used in this study because they each highlight issues, such as understanding, adherence, and sociocultural factors that are important in the discussion of health literacy and in the measurement of health literacy as a construct. Recent studies indicate that health literacy cannot be considered in isolation as a skill that is the same as functional literacy. While there is no agreement on the best methods for assessing health literacy in the various health care settings, there seems to be consensus in the literature that health literacy is an important factor in managing health and improving overall health outcomes.
Theoretical Foundations

*Social Cognitive Theory and Self-efficacy*

Understanding adult learning—in a health care setting or any other setting—requires many theoretical underpinnings, one of which is sociocultural theory taken from Vygotskian theory of learning and development. Lev Vygotsky emphasized that learning takes place in an interactive social world, therefore the various contexts in which the learning takes place should be considered in order to maximize learning (Vygotsky, 1962). Social cognitive theory or social learning theory allows for active learning to take place, while acknowledging that just because someone learns what they are supposed to do does not mean that they are going to follow through with the appropriate action. Social learning theory recognizes that a person has to be in an appropriate frame of mind to learn and use newly acquired information.

Using social learning theory to teach adult populations about health is effective because social learning theory asserts that learning is complex and occurs through observation of behaviors (Bandura, 1977). Understanding that one’s mental state is important to learning and acknowledging that because something is learned does not mean there will be a change in behavior. Another theory in health education is the social network/social support theories. This theory proposes the idea that one’s social network and social supports influence health behavior (Glanz, Rimer, & Viswanath, 2008). These two theories provide models that can lead to improved health among ill people and lead to a more health knowledgeable general population.

While Social Learning Theory emphasizes the external stimuli important when learning new behaviors, self-efficacy theory emphasizes the internal stimuli needed to
approach new behaviors. Self-efficacy is a person’s belief that he or she can complete an action. Self-efficacy was derived from Albert Bandura’s Social Learning Theory which asserted people learn from watching others and then receiving positive feedback when they try the behavior themselves. Self-efficacy suggests that people are willing to attempt behaviors only if they believe they will succeed. Believing that one will most likely fail hinders success because studies illustrate people work harder when they believe there is a good chance of success (Bandura, 1977).

*The Health Belief Model*

The Health Belief Model (HBM) was one of the earliest models tailored from the behavioral sciences to study health behaviors and it remains one of the most well-known and utilized models in health sciences. The model was developed by psychologists in the 1950s to help explain why people would or would not use available preventive services. The HBM can be summarized using four constructs that correspond to the perceived risk and net benefits: 1) perceived vulnerability, a person's certainty of the probability of getting a particular ailment; 2) perceived intensity, a person's estimation of how severe the illness is; 3) perceived benefits, a person's estimation of the efficacy of some recommended action to diminish the threat or gravity of the impact; and 4) perceived obstruction, a person's estimation of the tangible and psychological expenditures of the advised action. These actions (internal or external) can trigger a person's “readiness to act” and motivate a noticeable behavior change. Some examples of external plans to encourage “readiness” can be conveyed via print educational materials, via any mass media or via one-to-one sessions. The HBM is used to craft messages to help influence individuals to make healthy decisions and lifestyle choices. Messages that are suitable to
health education using the Health Belief Model are such topics as hypertension, eating disorders, contraceptive use, or breast self-examination. Two weaknesses of the HBM that are health beliefs can compete with an individual's other beliefs and attitudes, and that it has not been shown that belief development always signals behavioral changes (Pender, 1982). Self-efficacy was added to the HBM to help challenge unhealthy habitual behaviors (Pender, 1982). The Health Belief Model was a precursor to the Health Promotion Model.

*The Promotion Model*

The Health Promotion Model seeks to help patients enjoy greater longevity by promoting greater quality of life. This theory’s definition of “health” is holistic and positive, and while there is a disease component, it is not the principal element of the definition. Health Promotion has been shown to have many benefits that go beyond the prevention of disease to include greater vitality and feelings of wellness. Not only do individuals benefit from health promotion, but society also benefits from health promotion. When people create healthy lifestyles that are consistent with economic prosperity and interpersonal harmony, many of the social problems decrease such as violence, suicide, and sexually transmitted diseases. This theory is important because in the past hundred years, the chief cause of health problems has changed from infectious diseases to chronic illnesses. Many chronic illnesses are related to or influenced by lifestyle factors. To improve the health outcomes of a population that are experiencing high rates of chronic illnesses, it is necessary to make changes in lifestyle factors (Pender, 1982).
Pender first published her Health Promotion Model in 1982. The definition of the Health Promotion Model is: “health as the actualization of inherent and acquired human potential through goal-directed behavior, competent self-care, and satisfying relationships with others, while adjustments are made as needed to maintain structural integrity and harmony with relevant environments” (Pender, 1982, p. 290). Pender’s health promotion theory recognizes that prevention and promotion are two distinct theories, but they often overlap and have mutual benefits in practice (Pender, Murdaugh, & Parsons, 2002). The Pender Health Promotion Model is based on three theories of primary health behaviors: the theory of reasoned action, the theory of planned behavior, and social cognitive theory. The theory of reasoned action by Icek Ajzen and Martin Fishbein implies that a person’s willingness to participate in a particular behavior is based on his or her belief that the results of said behavior are desirable. Likely participation in a particular behavior is increased if a person believes that other people think that he or she should engage in the behavior (Ajzen & Fishbein, 1980). The theory of planned behavior implies that a person is more likely to engage in a behavior if he or she believes that he or she has control over the situation. The third aspect of the model is based on Bandura’s Social Cognitive Theory. Self-efficacy is a major principle of social cognitive theory. It is the belief in one’s own ability to successfully complete an action (Pender, 1982).

The Health Belief Model overlaps the Health Promotion Model significantly. The Health Promotion Model is an approach-oriented model that centers on attaining a high level of wellness and self-actualization, differs from the Health Belief Model that focuses on the explanation of people’s diagnosis and reaction to treatments for disease. Also, the Health Belief Model considers fear or threat as the impetus for action whereas the Health
Promotion Model does not consider fear or distant threats to health a dominant motivator for improving health (Pender, 1982).

Reasoned Action

The theory of reasoned action can connect to the Health Promotion theory and social learning theory because the theory of reasoned action operates on the assumption that human beings are rational and make use of information that is available to them. So, behavior is not thoughtless, but instead is connected to a thought process that analyzes the implications of actions before a person decides on a course of action or a behavior (Ajzen & Fishbein, 1980). This theory is relevant to this study, because health literacy measurement is only a piece of the picture. The Health Promotion theory and social learning theory both imply that there is no assurance that a change in behavior will occur based on new information learned; however, the theory of reasoned action implies that it is possible to predict behavior based on intention or attitude toward a behavior coupled with the subjective/social norms (Ajzen & Fishbein, 1980).

Literature Review

A chronological review of the literature indicates that an effective path to better health outcomes and overall health empowerment lies not only in the attainment of information, but also on the combination of patients and healthcare workers being engaged in a collaborative effort regarding one’s health, being committed to one’s health, and well informed regarding one’s health condition (Johnson, 2011). Health literacy as a field of study began in the early 1970s. When Leonard (Len) and Cecelia (Ceci) Doak (the founders of health literacy) began their work in the early 1970s, a literature search would return only five papers related to health literacy (Doak, Health Literacy, 2009).
Ceci Doak was a government health educator and Len Doak was an adult literacy tutor (Doak, Doak, & Root, 1985). Their occupations signify the multi-variant approach they took to the problems of studying and improving health literacy. The Doaks began their work in health literacy by conducting workshops focused on the idea of dispelling the myth that people who struggle with literacy skills are unintelligent, while also helping health professionals to simplify the guidelines that are given to people. Their work was not designed to address the issues of health literacy as a skill, but as a work around for health professionals to help their patients (Doak, Doak, & Root, 1985). The Doaks conducted studies on patient reading grade levels. They found a five grade level differential in the materials used in clinical settings and the grade level at which study participants were able to read. This study led to a journal article, which gained people’s attention. It was at this point that their work with health literacy stimulated other studies, new articles and eventually the book entitled *Teaching Patients with Low Literacy Skills* which became the underpinning of health literacy as a field of study (Doak, Doak, & Root, 1985).

The field has experienced exponential growth in the sheer number of peer-reviewed academic articles. A decade lapsed between the first mention (Simonds, 1974) and the second mention (Bee, 1985) of the term “health literacy” in academic literature. Between 1985 and 2007, health literacy appeared in the title, abstract, or keywords of 1,336 peer-reviewed journal articles. The trend began to ascend around 1993 and has continued an almost vertical climb since that time period (Pleasant, 2011). The rise in interest in health literacy as a field of study is inferred to be the result of copious research efforts that have established the links between low health literacy and a myriad of health
issues ranging from non-adherence to premature death (Pleasant, 2011). The initial findings from the International Adult Literacy Surveys (IALS) and the Adult Literacy and Lifeskills Survey (ALLS) brought to light an important initial research question: “given the limited literacy skills of large numbers of adults in industrialized nations, are there health consequences?” (Rudd, 2013, p. 1006). A host of studies have indicated that the answer to this question is a resounding yes.

While the Doaks were doing work to build a foundation for health literacy as a field, private corporations and government agencies were starting to get behind health literacy training and research. The National Institutes of Health’s (NIH) National Cancer Institute developed a diverse working group related to the topics of health and literacy in the mid-1980s (Zarcadoolas, Pleasant, & Greer, 2006). The group disseminated their findings, thereby further increasing awareness of health literacy as an important topic. NIH’s National Heart, Lung, and Blood Institute (NHLBI) also supported the efforts through contracts to increase knowledge about the connections between health and literacy. The work of health literacy was undertaken not only by entities at the NIH, but also by several notable academic institutions (Doak, 2009). During this time in the 1980s and early 1990s, the Bureau of Indian Affairs, the Veterans Administration, and the Department of Health and Human Services (DHHS) all sponsored trainings in health literacy. Private corporations began to sponsor conferences, provide grants for studies on health literacy and literacy organizations in the United States and Canada included health literacy as a subject at national conferences (Zarcadoolas, Pleasant, & Greer, 2006). International mindfulness regarding health literacy was further increased by a Voice of
America segment about health literacy that was recorded with the Doaks and “translated into 43 languages” (Doak, 2009).

Definitions of Health Literacy

Even as health literacy studies and workshops on best practices increased, there was and continues to be no consensus on how health literacy should be defined. Definitions of health literacy abound, but there is no accepted singular definition that encompasses the varieties of literacy and its accompaniments (Roberts, 1995). Baker noted, “Ironically, as the field of health literacy has expanded in scope and depth, the term ‘health literacy’ itself has come to mean different things to various audiences and has become a source of confusion and debate” (Baker, 2006, p. 878). For example, Healthy People 2020 defines health literacy as the “degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decision” (Kutner, Greenberg, Jin, & Paulson, 2006, p. 3). The U.S. Agency for Healthcare Research and Quality (AHRQ) limits the definition to a “patients’ ability to obtain, process, and understand the basic health information and services they need to make appropriate health decisions” (AHRQ, 2007, p. 1). The American Medical Association (AMA) ad hoc committee on health literacy defined health literacy as a collection of skillfulness, including being capable of performing basic literacy and numeracy tasks essential to functioning in the health care system (Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, 1999). Kickbusch and Maag (2006) proposed a context-driven explanation of health literacy as the ability to make appropriate health decisions within the framework of daily life. This viewpoint perceives health literacy as a means of empowerment to enhance people’s power over
their health and the decisions associated with their health or the health of those that they
are responsible for (Pleasant, 2011). Researchers at the World Health Organization
define health literacy as the “ability to find, understand, appraise, and communicate
information to engage with the demands of different health contexts to promote health
“define health literacy as the range of skills and competencies that people build to search
for, understand, assess, and utilize health information and concepts to make informed
decisions, decrease health risks, and increase quality of life” (Pleasant, 2011). The idea of
adopting a shared definition or concept of health literacy has been championed by the
Institute of Medicine although the goal has not yet been achieved (Berkman, Davis, &
McCormack, 2010). While the wording in the above definitions differs, the example
definitions share concepts that emphasis the complexity and multi-variant nature of
health literacy. Health literacy cannot focus only on the functional reading literacy skills
that were the basis of initial health literacy research. Now one must also consider the
context in which these skills need to be used (Rudd, 2013).

Models for Health Literacy

Regardless of the definition used, studies widely agree that there are two primary
models for health literacy: the deficit model and the asset model. These models are
important to understand because they shape current approaches to measuring, assessing,
and increasing health literacy. The deficit model focuses on the lack of skills and barriers
that can impact understanding and the ability to act on health information (Rowland,
2009). Studies indicate that health literacy is below basic/below basic in the general
population, and that health literacy needs to be improved in order for the effects of
proficient health literacy to be seen in the general population and in the modern health care system (Von Wagner, Knight, Steptoe, & Wardle, 2007). Previous reports point to the fact that as many as half of all adults do not have the literacy skills needed to function in a health care environment. In 2003, it was reported that two in five adults in the United States had low health literacy skills. These numbers are even higher in minority populations. Approximately 2% of Blacks had proficient health literacy levels compared to 14% in Whites (Weekes, 2012). “The World Health Organization (WHO) defines health as a “state of physical, mental and social well-being and not just the absence of infirmity” (World Health Organization, 1948, p. 100) and health education is the transmission of what is known about health to the general community to improve behavior patterns as they relate to health (Evawoma-Enuku, Oyitso, & Akpoigho Enuku, 2010). Many efforts to improve public health have focused on conveying information to correct the perceived deficit of knowledge, influence people to comply with recommendations and guidelines. These ideas relied on the assumption that providing information about health and/or health conditions would be sufficient to produce a change in behavior (Pleasant, 2011). Health literacy research modeled on a clinical risk or deficit paradigm includes most of the health literacy programs created to date. Rowland (2009) points out that many trials are taking place in the United States where the researchers are operating from the biomedical or deficit model, which seems opposed to measuring the capacity of the skills or including components of empowerment and social engagement.

Many health literacy professionals, however, recognize that health literacy is not a one-sided deficit. The asset model of health literacy is influenced by Health Promotion
and involves the healthcare system, the public, the community, and the patient as active partners in the process. Rather than being defined by skills one does not have, health literacy is best understood in the asset model as skills one is capable of acquiring in the future. Everyone has the ability to be health literate or health illiterate, and this applies to health systems as well. Health literacy is increasingly understood as more than a set of skills that one either possesses or lacks, but as a complex model of care that begins with “accessing, information and moves through stages of understanding, evaluating, communicating, and finally using information to make an informed choice” (Pleasant, 2011, p. 46).

Approaches to Health Literacy

A small body of work exists to highlight the wide-ranging approaches to health literacy but there is general agreement that health literacy has determinants interrelated with culture, educational systems, health systems, community capacity, and communication (Pleasant, 2011). Health literacy is not only a function of basic skills, but an intricate assemblage of demands that are dependent on the individual, the health system and a whole host of factors that include but are not limited to communication skills, background, culture, and context (Berkman, Davis, & McCormack, 2010). Some researchers and practitioners believe that overemphasis on literacy may be due in part to the early definitions of health literacy adopted by the U.S. Department of Health and Human Services (US Department of Health and Human Services, 2000) and the Institute of Medicine (IOM) (Institute of Medicine, 2004) that focused on the individual skills and did not account for the context in which these skills must be used. Over 1500 peer-reviewed studies highlight a disconnect between the health materials that individuals
encounter and the literacy skills of adults. The materials appear to be for a more literate audience and are therefore not understandable to the individuals who need to use them. New ideas and actions around health literacy are taking into account the various factors that also influence individuals’ ability to understand and utilize health information. (Rudd, 2013). Other research studies indicate that adult literacy could be the critical element in understanding and potentially eliminating health disparities (Sentell & Halpin, 2006). Sentell and Halpin (2006) discuss the variables related to education that make education a less reliable measure of literacy skills as opposed to actual instruments designed to measure literacy. Literacy is described as a set of skills that are clearly conceived and measureable. Functional literacy skills are relevant to daily life demands and the literacy skills required can vary greatly, even among those with similar educational attainment (Sentell & Halpin, 2006). When literacy was added as a variable among a nationally, representative sample, race and education did not retain their customary position as indicators in relation to health disparities (Sentell & Halpin, 2006).

Health Literacy Action

Increasingly health literacy is being seen as a policy issue with impact in both education and health. Various organizations, both nationally and internationally, recognize the impact of low health literacy and have moved to make health literacy action a priority as an indicator of health that has the potential to have substantial impact in not only health outcomes, but also on healthcare costs (Parker, Ratzan, & Lurie, 2003). In attempts to tackle the issues surrounding low health literacy and its relationship to health outcomes, existing and ongoing health care reform efforts are focused on increasing and beginning demonstration programs that provide evidence that a focus on prevention,
health literacy, and integrative approaches to health can succeed in producing healthier people and a more efficient health care system (USDHHS, n.d.b, n.d.b; 111th U.S. Congress, 2010). Many of the current debates on health policy are constructed around the assumption that consumers have adequate and appropriate knowledge. As the changes in ideas regarding health literacy and the responsibility sharing increases there are calls for changes in healthcare professionals’ education as well as for continuing education to be included in the standards that are being developed as a result of the policy debates (Parker, Ratzan, & Lurie, 2003). The implementation of a widespread health training program could help improve the health literacy and the health outcome of patients with low health literacy skills. (Mackert, Ball, & Lopez, 2011).

Scheckel, Emery, and Nosek (2010) note that nursing students are not aware of the effects of low health literacy on patient education. Using a phenomenological approach, the researchers recruited eight undergraduate nursing students to interview regarding their experiences providing patient education as a part of their undergraduate nursing education. The study results indicate that the students understand the themes of what is important in communicating with patients. The students, when provided with examples, showed sensitivity to language issues, basic literacy concerns, and an understanding of how failing to address these issues would have an impact on patients’ understanding of the information being communicated. The researchers also concluded that while students may be adept at picking up on some cues, instructors can assist students in gaining even greater skill in handling health literacy challenges as these students seek to educate patients (Scheckel, Emery, & Nosek, 2010). Health professions schools are also recognizing the need to better prepare their students to not only
recognize low health literacy but to also understand the consequences of low health literacy in the population. Sicat and Hill (2005) conducted a study with 108 first-year pharmacy doctoral students in which the researchers designed an educational approach to focus on the instruction of how to recognize and combat low health literacy. The researchers aimed to help future pharmacists improve their knowledge about health literacy, including the frequency of it and its effects, as well as to equip them with some tools to be able to identify patients with low health literacy skills and offer strategies for improvement (Sicat & Hill, 2005). The researchers concluded that pharmacists are integral in recognizing and supporting patients with limited health literacy skills. The exercises implemented in this study could be important in educating current and future health care professionals regarding interactions with clients with limited health literacy (Sicat & Hill, 2005).

Some of the recommendations in the previous studies are in line with the suggested actions from the National Call to Action for Health Literacy as issued by the Office of Disease Prevention and Health Promotion. One of the recommendations calls for more continuing education for current health care professionals related to health literacy and disease processes. A study by Sharp and Lipsky (2002) indicates that healthcare professionals had a more positive attitude towards treating individuals with diabetes following a continuing medical education program. This study highlights aspects that previous research has indicated have an impact on health outcomes: healthcare provider attitude affects the care that they provide, and that attitude is an influencer of behavior change. The researchers recommend that more targeted continuing education is made available to create and continue positive attitudes toward treating diabetes and
developing patient autonomy (Sharp & Lipsky, 2002). The researchers’ recommended actions directly correlate to goals one and two of the Call to Action from the Centers for Disease Control and Prevention (CDC) that suggest the development and dissemination of health information that is correct, understandable, and doable as well as with promoting changes in healthcare delivery that improves communication and decision making among other things (Rudd, 2013). Attitudes of both the provider and the individuals with low health literacy are identified as influencers of behavior change related to health.

Consumers and Low Health Literacy

There are compelling reasons why health professionals need to approach health literacy sensitively. The importance of health literacy’s role as a determinant of health outcomes has brought it to the forefront of health policy discussions as the challenges and costs of low health literacy become clearer (Mackert, Ball, & Lopez, 2011). Health literacy approaches should focus on improving communication between healthcare providers and patients, providing information in multiple formats, communicating in ways that is respectful within the patient’s culture, and looking to improve access to healthcare services (Stiles, 2011).

Persons with low or limited health literacy must not only navigate the various avenues related to their health, but they additionally face the arduous task of understanding, processing, and being able to use information received from healthcare providers. A breakdown in communication between patient and provider can lead to poorer health outcomes than for others with higher health literacy (Mackert, Ball, & Lopez, 2011). Training not just for physicians, but for the myriad of personnel that
people come in contact with in the healthcare system is important. Health literacy sensitivity should extend beyond just the participants in the office, but also to the forms and written directions that patients receive as a part of their healthcare. Practicing culturally sensitive communications when interacting with patients who may have low health literacy skills is even more important even though if not done well, assessing and categorizing patients as low health literate has the potential to be uncomfortable and embarrassing for some patients and healthcare workers.

Patients with chronic or long-term illnesses encounter life-threatening difficulties so it is imperative that all healthcare professionals are trained and practice sensitively. Research has shown the connection between lower level literacy skills and higher health risk for long-term or chronic conditions. It is estimated that poor health literacy costs the healthcare system between $30 billion and $73 billion per year. In 2000, nearly 50% of the nation’s population had a chronic health condition, with costs for chronic conditions alone totaling $510 billion for that year. This cost is expected to double by 2020 with approximately 157 million Americans having at least one chronic illness, and with around 40% of the population having two or more chronic illnesses (Parker, Ratzan, & Lurie, 2003).

Previous studies indicate that a factor that affects health literacy is age. Functional health literacy is lower among older populations.

This is alarming especially given that the population of older people is growing and is expected to continue to grow and reach 71.5 million by the year 2030 (Patel et al., 2011). When health literacy assessments were given to a population of older African Americans the average completion time was eleven minutes whereas in the original study
of the new vital sign assessment the average time was 3 minutes to administer the test (Patel, et al., 2011). The new vital sign assessment tests not only literacy skills, but it also requires math and numeracy skills. A study on health literacy, socio-demographic factors, and medication knowledge found that age, last grade completed, and gender may be as effective for screening as the rapid estimate of adult literacy in medicine (REALM) (Patel, et al., 2011). It is important to note, however, that number of years spent in school may not be an adequate predictor because studies have shown that some participants who score in the lowest five literacy levels on the U.S. Department of Education’s National Adult Literacy Survey graduated from high school (Patel et al., 2011). Cognitive ability or intellect is one factor that influences functional literacy levels as well as one’s education level. Experts for the last half century have been unable to come to a consensus regarding a true and complete definition for literacy. More generally, intelligence levels in childhood may influence the relationship between education and health as it has an effect on both education accomplishments and health outcomes (Chandola, Clarke, Morris, & Blane, 2006). Intelligence could lead individuals to be more receptive to healthcare education and also enable them to better comply with simple and more complex health care regimens. Higher cognitive abilities and educational attainment have shown to lead to better health (Chandola, Clarke, Morris, & Blane, 2006).

A review of the literature also indicates that there is a connection between health literacy and chronic disease management. Previous reports point to the fact that as many as half of all adults do not have the literacy skills needed to function in a health care environment. There are a myriad of health concerns that have been associated with low or limited health literacy. Some of these concerns include increased hospitalizations,
increased morbidity, and increased healthcare costs. Limited health literacy is also associated with limited ability to manage care, missed doctor’s appointments, erratic dosing of medication, etc (Moore, 2012). However some scholars indicate that the link is tangential as many of the studies relating to health and health literacy focus on the deficit health literacy model and do not give credence to models that focus on the increase of skills such as empowerment, social engagement and the evaluation of those skills and interventions being used to improve these skills (Rowland, 2009). Health literacy may be able to explain health disparities that have been attributed to other factors. Adult literacy may be a key, yet disregarded factor in understanding health disparities. Recent studies have indicated that literacy is a more prevailing predictor of health status, health-related behaviors, and health-related knowledge than education or race. If the inclusion of literacy to health status models changes the predictive power of education and/or race, this has the potential to offer new insight into the paths that lead to health disparities, while supplying successful opportunities to eradicate them (Sentell & Halpin, 2006).

Studies also indicate that seniors who have lower literacy levels have worse health status and greater instances of hospitalization that those with higher health literacy levels (Scott, Gazmararian, Williams, & Baker, 2002). Cho, Lee, Arozullah, and Crittenden (2008) in their study explored factors that may link health literacy to health status and health service utilization. Four hundred eighty-nine elderly Medicare patients participated in the study that measured health literacy, disease knowledge, health behavior, preventive care, medication compliance, health status, health care utilization, and demographics which included race, gender, and educational attainment. Health literacy was assessed via the Short Test of Functional Health Literacy in Adults (S-TOFHLA). Disease knowledge
was assessed by asking the respondents questions about cardiovascular disease risk factors, complications related to diabetes, and hypertension. The mean of nine items from the Health promoting Lifestyle Profile were used to measure health behavior. Preventive care was measured through participation in health screening in a two-year period prior to the study. Self-report was used to assess medication compliance and health status (Cho, Lee, Arozullah, & Crittenden, 2008). The majority of the participants were female and African American with an average educational attainment equivalent to a high school diploma. Path analysis was used for the statistical analysis. Approximately half of the participants demonstrated an adequate health literacy level. The primary results indicated that the link of health literacy to health status and service utilization seemed to be direct as opposed to being mediated through other factors. There was a direct and positive relationship between health literacy and health status. There were also positive relations between health literacy and disease knowledge and preventive care. Male respondents had a lower average health literacy level than females and African Americans had lower health literacy averages than Caucasians. The authors of the study also note that educational attainment did not have a direct effect on health outcomes, but did have an indirect effect through health literacy (Cho, Lee, Arozullah, & Crittenden, 2008). The note provides some insight into other arguments that utilize educational attainment as a direct measure/correlation to health literacy; however, this study indicates that the link between the two is not as direct as it may seem. The authors conclude that working to improve health literacy may prove to be an effective way to improve health status and reduce hospitalizations and emergency room visits among geriatric patients (Cho, Lee, Arozullah, & Crittenden, 2008).
In another study of older adults, authors concluded that limited health literacy did not have a significant impact on individuals’ health risk choices, which would indicate that the associations between limited or low health literacy and increased hospitalizations and poorer health outcomes is not directly related to participants’ decisions as they relate to the health risks of alcohol consumption, smoking, and seat belt usage (Wolf, Gazmararian, & Baker, 2007). Wolf, Gazmararian, and Baker (2007) conducted a cross-sectional survey of 2,923 Medicare managed enrollees to examine the association between health literacy and health risk behaviors in a mature (elderly) adult population. Health literacy was measured using the Short Test of Functional Health Literacy in Adults (S-TOFHLA). Health behaviors were self-reported. This study is important as we look to further explore the relationship between health literacy and health outcomes as related to health behaviors. Another study designed to examine the association between limited or low health literacy and mortality in the elderly concluded that geriatric patients with low health literacy faced a two-fold increase in mortality when compared to a similar population with adequate or better health literacy (Sudore, et al., 2006). In this study that included 2,512 participants, literacy was assessed via the Rapid Estimate of Adult Literacy in Medicine (REALM). Limited literacy was described as reading at an 8th grade level or below and adequate literacy was reading at a 9th grade level or above. The measurement used for analysis was time to death. The above studies indicate that while the relationship between health literacy and risk behaviors, mortality, and health outcomes may not be crystal clear there is some evidence that supports the idea that improved health literacy improves health outcomes and mortality in the elderly.
As we work to increase health literacy, researchers also need to be aware of the cultural aspects not addressed in studies. Ethnicity may play a part in how skills are measure in health literacy. This may be supported by the work of Coffman, Norton and Beene (2012) who conducted a descriptive correlational study with 150 adult Spanish speaking Latinos who self-reported as having Type 2 diabetes or one of the type two diabetes risk factors which include: weight, inactivity, family history, race, and age. The study was designed to examine Type 2 diabetes while also observing the relationships between diabetes symptoms, self-management, blood glucose levels, health literacy and health care usage. Structured interviews were utilized and additional data collected included height, weight, and glycosylated hemoglobin. The participants completed all questionnaires with assistance with the exception of the health literacy measure, which was completed without assistance. The Short Test of Functional Health Literacy in Adults (S-TOFHLA) Spanish version was used to assess health literacy. The study indicated that symptom awareness was not the same in the Latino immigrant population as it was in a comparison to non-Hispanic whites, who were more likely to pay attention to biophysical symptoms and explanations of the disease process. The participants were reported to be more likely to make judgments about their diabetes without checking their blood glucose level even when monitoring materials were available (Coffman, Norton, & Beene, 2012). Overall the study found that the correlation between health literacy and diabetes knowledge did not exist in this case, but the results did indicate that participants with higher health literacy were more likely to use health care services. The authors of the study note that the population included in this study had significant health care barriers including, but not limited to lack of health insurance, low household income,
immigration status, and potential language barriers. The authors do conclude that their study indicates that there needs to be culturally sensitive services for Latinos and health literacy screenings to aid in seeking preventative services as well as better manage diabetes (Coffman, Norton, & Beene, 2012).

The link between health literacy and health outcomes has been shown through numerous research studies in which different health literacy assessment tools have been used. Yet, there is still a disconnect between provider use of health literacy assessment tools in the clinical setting and the use of the results of health literacy assessments to select patient education tools that are at a level to maximize patient education and subsequently improve patient outcomes.

Summary and Conclusions

The current instruments available to assess health literacy pose a variety of problems when it comes to assessment. No one group agrees on the number and types of instruments that are available; however, there are statements from organizations such as the Institutes of Medicine (IOM) that clearly state the instruments currently available do not measure health literacy, but measure functional literacy using health information. The literature reviewed for this study indicates that almost no studies have been conducted that seek to cross validate health literacy assessment instruments with functional literacy assessment instruments in an effort to corroborate the idea that these instruments are not truly assessing health literacy.
CHAPTER III - METHODOLOGY

This chapter outlines the methods used to conduct this study. Areas addressed include: methodology, design, setting, sampling, data collection plan, data analysis plan, and instrumentation. The purpose of this study was to investigate the construct of health literacy measurement using a cross-validation approach. Health literacy measurement was assessed using three health literacy assessment instruments that are currently used. An exploratory research design was used in this study. The study sought to explore how accurately health literacy is being measured by instruments that are currently available.

Data collection for this exploratory study took place online. The instruments were administered via Qualtrics, an online survey software to a U.S. based sample of adults who were 18 years or older with the ability to read and write in English and have internet access. Participants were recruited via Amazon’s Mechanical Turk. Participants received an incentive of $0.50 for completing all survey instruments. The researcher limited the sample to participants living in the United States. Participation in the study was completely voluntary.

Instruments

The instruments used for data collection included the Health Literacy Skills Instrument (HLSI), The Newest Vital Sign (NVS), and the Short Test of Functional Health Literacy in Adults (S-TOFHLA). These instruments were selected because they focus on measuring health literacy and are adaptable to being used in a written format or given online. The demographic questionnaire was developed by the researcher.

*The Short Test of Functional Health Literacy in Adults*
The Short Test of Functional Health Literacy in Adults (S-TOFHLA), developed by Baker, Williams, Parker, Gazmararian, and Nurss, is used to measure functional health literacy, both reading and numeracy comprehension, using health related materials. The S-TOFHLA takes approximately seven minutes to administer. The test focuses on reading comprehension and tests participants’ ability to read passages using a 36-item modified cloze procedure. The passages are selected from the preparation instructions for an upper GI series and the patients’ rights and responsibility section of the Medicaid forms. Readability levels on the Gunning Fog index are grades 4.3 and 10.4 respectively. The Gunning Fog index measures the readability of text written in English using an algorithm that takes into consideration the number of words per sentence as well as the number of complex words in relation to the total number of words in the paragraph. The Gunning Fog index is used to determine if a text will be readable for a wider audience or could benefit from Grade 4.3 indicating the third month of fourth grade and 10.4 indicating the fourth month of tenth grade. In a test of validity, the S-TOFHLA had a reliability score of 0.97 overall with a score of 0.94 for passage A and 0.97 for passage B. The correlation with the Rapid Estimate Adult Literacy in Medicine (REALM) was 0.81 and 0.91 with the full Test of Functional Health Literacy in Adults indicating a high level of concurrent validity.

The Newest Vital Sign

The Newest Vital Sign (NVS), developed by Weiss, Mays, Martz et al (2005), is an open access document that consists of six questions that ask the participants to utilize various literacy skills and uses a nutrition label as the stimulus to answer the six questions. The Newest Vital Sign was validated against the Test of Functional Health
Literacy in Adults (TOFHLA) with a reliability score of 0.59. In testing, the criterion validity for the NVS was $r=0.59$, P<.001 (Weiss, et al., 2005). The Newest Vital Sign takes approximately seven minutes to administer.

**Health Literacy Skills Instrument**

The Health Literacy Skills Instrument (HLSI) (short form), developed by McCormack et al. (2010) is a 10-item questionnaire designed to be administered in person or via the web and was developed from the 25 item instrument of the same name. The items include stimuli that incorporate use of web-based information and audio cues that will assess various facets of literacy skills. The Health Literacy Skills Instrument tests several domains of health literacy. These subscales include: Print-Prose, Print-Document, Print-Quantitative, Internet, and Oral (Bann, McCormack, Berkman, & Squiers, 2012). The factor loadings for the subscales are on the overall health literacy factor are as follows: print-prose (0.98), print-document (0.98), print-quantitative (0.95), oral (0.85), and Internet (0.81) (McCormack et al., 2010). The Health Literacy Skills instrument is still being validated by the authors; however, in initial testing the HLSI has a reliability score of .86. The correlations between the health literacy domains assessed via the HLSI compare to the S-TOFHLA at 0.47, 0.45, and 0.41 respectively.

**Demographic Questionnaire**

A demographic questionnaire developed by the researcher included six questions about gender, ethnicity, education levels, marital status, income level, and age.

**Data Collection Procedure**

An application was submitted to the Institutional Review Board (see Human Subjects Review Form; Appendix G) at the University of Southern Mississippi to
guarantee that all participants’ rights were protected. Once approval was received from the Institutional Review Board, the researcher began recruiting participants and collecting data utilizing the health literacy assessment instruments that she had permission to use. The researcher employed Amazon’s Mechanical Turk to recruit participants. The researcher provided an incentive of $0.50 (U.S. dollars) for all participants who completed the survey instruments. The researcher explained the study to the participants via an online cover letter. A waiver of signatures for consent was requested and granted because confidentiality was a concern and a signature was the only item linking the participants to the study. Each participant completed the entire battery of instruments along with a demographic form via Qualtrics. The data were collected, downloaded from the Qualtrics password-secured server, and maintained on a secure password-protected server. The data was analyzed utilizing SPSS version 23.

Data Analysis

The following approach was used to analyze data:

Research question(s): To what extent are currently available instruments designed to assess health literacy consistent? What are the psychometric properties of currently available instruments designed to assess health literacy? Descriptive statistics including frequency, mean, mode, and standard deviation are used to describe the data. All collected data were imported from Qualtrics into SPSS. Data were cleaned and analyzed for outliers before analysis. Data were transformed into binary data for items to be scored for each instrument. All transformations were completed using syntax in SPSS. Exploratory Factor Analysis was used to determine factor loadings for the instruments.
CHAPTER IV–ANALYSIS OF DATA

The purpose of this research study was to examine the currently available measures of health literacy and determine their consistency in measuring health literacy. All of the instruments used in the study are designed to be used in the clinical setting to assess health literacy in adults. Two research questions were the focus of the quantitative data analysis:

1. To what extent are currently available instruments designed to assess health literacy consistent with each other?

2. What are the psychometric properties of currently available instruments designed to assess health literacy?

Research Study

Participants for this study were recruited online utilizing Amazon’s Mechanical Turk. Qualified participants were taken to the instruments that were set up in Qualtrics survey software. Participants were limited to persons age 18 years or older living in the United States with the ability to read and write in English. Participants were paid $0.50 (U.S. dollars) each for completing the battery of instruments that included a demographic form developed by the researcher. Data collection took place over a one week period in 2017. After data collection was complete, data were exported from Qualtrics into SPSS version 23 for cleaning, scoring, and analysis.

Data were analyzed using descriptive statistics to determine if the data set contained any outliers. Visual analysis, as well as the use of the minimum and maximum, determined that the data points fell within range of allowed scores for the instruments. SPSS syntax was utilized to transform and score each of the three instruments of health
literacy. Transformation of the data included transforming individual items from two of the instruments into binary data where one was the correct answer and all other answers were zero. After the transformation of the data, SPSS syntax was used to score each instrument. Descriptive statistics were used again to determine if there were any outliers or anomalies in data after transformation and scoring. Descriptive statistics did not show any anomalies in the data for the instruments (Appendix G. Tables A1-A3). Principal Axis Factor Analysis was run on each instrument to determine the factor structure for each instrument.

Sample

A total of 627 responses were collected. There was on average of 260 missing responses, which left approximately 367 valid responses to be included in the analysis. A total of 148 males and 218 females identified their gender as a part of this study. See Appendix G. Table A4. A total of 366 participants included their racial or ethnic identity as a part of the study (Appendix G. Table A5); 304 participants identified as white; 30 participants identified as Asian; 19 participants identified as African American; 3 participants identified as American Indian or Alaska Native; 2 participants identified as Native Hawaiian or Pacific Islander, and 8 participants identified as other. Participants reported that they possessed education levels that ranged from less than high school through doctorate level; 21.9% (137) of the participants reported possessing a four-year degree, followed by 12.6% (79) reported having some college, 8.3% (52) possessed a 2-year degree, and a professional degree respectively with 263 participants not reporting this data. See Appendix G. Table A6. Participants ranged in age from 18 years old to 84
years old with the greatest percentage of the participants ranging in age from 25-34 years old (Appendix G. Table A7); Three hundred sixty seven participants reported their age.

Table 1

<table>
<thead>
<tr>
<th>Demographic Statistics</th>
<th>Age</th>
<th>Gender</th>
<th>Race</th>
<th>Education</th>
<th>Marital Status</th>
<th>Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>367</td>
<td>366</td>
<td>366</td>
<td>364</td>
<td>367</td>
<td>366</td>
</tr>
<tr>
<td>Missing</td>
<td>260</td>
<td>261</td>
<td>261</td>
<td>263</td>
<td>260</td>
<td>261</td>
</tr>
<tr>
<td>Mean</td>
<td>3.83</td>
<td>1.45</td>
<td>4.30</td>
<td>2.90</td>
<td>5.39</td>
<td></td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>1.375</td>
<td>.491</td>
<td>1.123</td>
<td>1.308</td>
<td>1.892</td>
<td>3.022</td>
</tr>
<tr>
<td>Minimum</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Maximum</td>
<td>8</td>
<td>2</td>
<td>6</td>
<td>7</td>
<td>5</td>
<td>12</td>
</tr>
</tbody>
</table>

Research Question 1:

The psychometric properties of the instruments designed to assess health literacy are discussed below. The results of this study indicate that the instruments currently available are reliable. Two of the instruments used in this study produced a factor matrix during factor analysis. One instrument did not produce a factor matrix, but has been shown to be reliable in previous studies and has a good reliability score when the instrument is run as a single factor when testing internal consistency.

Principal Axis Factor Analysis was run on all instruments. Specifically, the STOFHLA produced an inadmissible solution. This resulted in no further analysis being run on the instrument related to factor analysis. In an effort to produce a solution, the researcher removed items from the instrument that had variability of less than 2 in order to increase the likelihood that the analysis would produce results. Zero variability forces the factor analysis to stop. Iterations were also increased to 1,000 and the instrument still did not converge. Analysis was stopped on this instrument after these attempts. No
reliability statistics were produced for this instrument as the factor structure is needed to run reliability.

The second instrument, the Newest Vital Sign (NVS), a six-item instrument, produced two components based on Eigen values during Principal Axis Factor (PAF) analysis using direct oblimin rotation. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO=.773. The Bartlett’s test of sphericity $\chi^2(15) = 824.130$, $p<.001$, indicated that correlations between items were sufficiently large for PAF. Two components had eigenvalues over 1 and in combination explained 62.289% of the variance. Four of the six items loaded with values of .642 or higher whereas one item loaded with a value of .546 and a second item was split between 2 factors with both of the values being below .5 as shown in Table 2.

Table 2

<table>
<thead>
<tr>
<th>NVS Pattern Matrix(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>NSV1</td>
</tr>
<tr>
<td>NSV2</td>
</tr>
<tr>
<td>NSV3</td>
</tr>
<tr>
<td>NSV4</td>
</tr>
<tr>
<td>NSV5</td>
</tr>
<tr>
<td>NSV6</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.\(^a\)
\(^a\) Rotation converged in 4 iterations.
The NSV had an internal consistency score of .75 indicating that it has better than moderate reliability if .8 is considered the standard for good reliability.

A PAF analysis was also conducted on the 10 item HLSI with direct oblimin rotation. The Kaiser-Meyer-Olkin (KMO) measure verified the sampling adequacy for the analysis, KMO=.956. The Bartlett’s test of sphericity $\chi^2 (45) = 4300.210$, $p<.001$, indicated that correlations between items were sufficiently large for PAF. One component had eigenvalues over 1 and in combination explained 62.340% of the variance. The researcher forced the instrument into a five factor model based on previous literature. In the forced five factor model there were two factors that did not have sufficient loadings to be considered a factor. Six items were removed because the factor structure did not make sense. The researcher found that a four factor model (Appendix G, Table A8.) produced better results, but is not a model supported by theory. Table 3 shows the factor loadings for the HLSI in the five factor model.

Table 3

<table>
<thead>
<tr>
<th>HLSI Five Factor Pattern Matrixa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
</tr>
<tr>
<td>--------</td>
</tr>
<tr>
<td>HLSI7</td>
</tr>
<tr>
<td>HLSI4</td>
</tr>
<tr>
<td>HLSI10</td>
</tr>
<tr>
<td>HLSI5</td>
</tr>
<tr>
<td>HLSI9</td>
</tr>
<tr>
<td>HLSI2</td>
</tr>
<tr>
<td>HLSI3</td>
</tr>
<tr>
<td>HLSI8</td>
</tr>
<tr>
<td>HLSI1</td>
</tr>
<tr>
<td>HLSI6</td>
</tr>
</tbody>
</table>
Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.
a. Rotation converged in 22 iterations.

The HLSI had an internal consistency score of .097 indicating that it does not have adequate reliability if .8 is considered the standard for good reliability.

Following factor analysis, scores for the NVS and HLSI were calculated using the items that loaded with a value of .6 or above in the PAF. The overall score including all items was used for the STOFHLA due to factor analysis not being definite and no matrix being produced to determine factor loadings, which would enable the researcher to determine which items were appropriate for inclusion in further analysis.

Table 2 shows the descriptive statistics for scores for each of the instruments both before and after factor analysis.

Table 4

<table>
<thead>
<tr>
<th>Instrument Scores Descriptive Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>STOFHLA</td>
</tr>
<tr>
<td>HLSI score</td>
</tr>
<tr>
<td>NVS score</td>
</tr>
<tr>
<td>NVS factor score</td>
</tr>
<tr>
<td>HLSI factor score</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
</tr>
</tbody>
</table>

Scores for each of the instruments were calculated both before and after factor analysis. Tables 3 through 7 in the appendices show the frequency distribution for the scores on each instrument both before and after Factor Analysis. The Short Test of
Functional Health Literacy in Adults (STOFHLA) has one table due to no items being eliminated during factor analysis.

On a scale that can range from zero (low health literacy) to six (high health literacy), 53.4% of participants scored between a two and four on the Newest Vital Sign. Another 27% of participants scored a zero, while the remaining 2.2% scored six. As indicated in the NVS score frequency table in Appendix Table A9. As a result of factor Analysis, two items were removed because they did not load sufficiently to be included in the factor structure. This resulted in only one factor and the results varied with 57.9% of participants scoring either a two or three on the Newest Vital Sign (NVS). 27.9% scored a zero, 10.8% scored a one, and 3.3% scored four as shown in Appendix Table A10.

For the Health Literacy Skills Instrument (HLSI) 41.8% of participants scored a zero indicating the lowest level of health literacy skills. The second largest group, 33.4% of participants, scored between a seven and nine on the HLSI reflecting moderate health literacy skills. The remaining 4.8% of participants scored ten on the HLSI indicating high health literacy skills as indicated in Appendix Table A11. As a result of Factor Analysis, six items were removed because the factors did not make sense and the results varied somewhat with 44% of participants scored zero on the HLSI. 20.4% scored three, 15.3% scored four, and 14.7% scored two on the HLSI as indicated in Appendix Table A12.

For the Short Test of Functional Health Literacy in Adults (STOFHLA), 56.6% of participants scored 34 indicating moderate health literacy. Another 24.9% scored zero indicating the lowest health literacy level. The next highest score was 33 with 8.1% again
indicating moderate health literacy as shown in Appendix Table A13. This instrument produced no factor structure during analysis and was treated as one factor.

Research Question 2:

Spearman’s rho was run on the scores for the three instruments above to determine how consistently the instruments measure health literacy. The results for Spearman’s rho indicate that all three instruments are significantly correlated with each other at the p< .01 level. See Table 6 in the appendices. The strength of the correlations for each was moderate with the correlation between the NVS and HLSI being the weakest at .517. The strongest correlation was between the NVS and the STOFHLA at .655. The correlation between the STOFHLA and the HLSI was .583. See Appendix Table A14.

All data were analyzed to address the two research questions that focused the study. Descriptive and inferential statistics were utilized as a part of the data analysis. The following chapter will discuss the results in relation to the research questions and implications for future research.
CHAPTER V–DISCUSSION

The purpose of this study was to examine the current measures of health literacy available and their potential impact on healthcare. This study was guided by two research questions:

1. To what extent are currently available instruments designed to assess health literacy consistent with each other?

2. What are the psychometric properties of currently available instruments designed to assess health literacy?

The link between health literacy and health outcomes has been demonstrated through research as the literature review showed. Yet there remains a disconnect between the use of health literacy assessment instruments in the clinical setting and the use of the results of health literacy assessments to select education tools that maximize patient education. The field has recognized that earlier inquiries into health literacy were not balanced in their examination of individual skills and the demands of the healthcare system (Rudd, 2013). For example, focus was put on individuals’ reading skills without attention to the other factors that are also integral in health communication such as the health tasks, materials utilized, or the communication skills of the healthcare provider (Rudd, 2013).

This study adds to knowledge in the field of health literacy assessment especially as it relates to health literacy instrument consistency. It confirms that the three health literacy instruments investigated in this study are reliable independently, and it also indicates that a sample taking all three instruments demonstrate consistency in the scores across the measures. The Short Test of Functional Health Literacy in Adults (S-
TOFHLA) had internal consistency of 0.97 indicating high reliability. The Newest Vital Sign (NVS) had internal consistency of 0.75 indicating good reliability. The Health Literacy Skills Instrument (HLSI) had internal consistency of 0.097 indicating that its reliability statistics are not nearly as strong as the other instruments and is unacceptably low. In previous studies the HLSI had a higher reliability rating. The researcher examined the data for possible causes and solutions to this problem especially considering how well the reliability scores have been for this instrument in previous studies. Reliability scores were run on the entire instrument as well as on the items that were deemed appropriate for analysis after factor analysis. The researcher could not find a plausible explanation for the abnormally low reliability score in this study.

All participants completed all three health literacy instruments and a demographic questionnaire. A total of 627 responses were collected with an average of 367 valid responses and an average of 260 missing responses in this study for inclusion in analysis. The study included more female respondents than male respondents and included a variety of ethnicities, ages, education, and income levels.

To address Research Question 1 (To what extent are currently available instruments designed to assess health literacy consistent with each other?) Spearman’s rho was run on the calculated scores for each of the three instruments after factor analysis was used to determine the factor loading for each item. The STOFHLA did not produce a matrix for factor analysis so the summed score for the instrument was used in analysis. For the NVS and the HLSI, only items that loaded sufficiently, .5 or above, were included in the sum score for analysis of consistency. The results for Spearman’s rho indicate that all three instruments are significantly correlated at the .01 level. The
correlations for each were moderate with the correlation between the NVS and HLSI being the weakest. The strongest correlation was between the NVS and the STOFHLA. The correlation between the instruments not being as strong could be due in part to one measuring functional health literacy and the other two measuring interactive health literacy. Given that the NVS and HLSI are in the same category one would expect to see a stronger relationship between the two instruments.

The results indicate that there is some overlap between the instruments, but that the relationship between the instruments is not very strong. The moderate relationships indicate that there is some consistency in the instruments when it comes to measuring health literacy; however, there needs to be more research to test this conclusion. The instruments are different in their administration, methodology, and construct meaning that one should expect a bit of inconsistency in the way in which they measure the varied construct of health literacy. The S-TOFHLA uses an objective measurement approach using the CLOZE reading method for patients to fill in the correct word, while the NVS uses a similar method, but is focuses more on numeracy than reading comprehension. The HLSI uses a mixed measurement approach that assesses print, oral, quantitative, and web-based information seeking skills (Altin, Finke, Kautz-Freimuth, & Stock, 2014). The difference in administration could be one explanation for the difference in results; however, the fact that health literacy is a complex concept that is still being explored could be another explanation for the outcome.

To address Research Question 2 regarding the psychometric properties of currently available instruments designed to assess health literacy, the researcher performed factor analysis on each instrument. The S-TOFHLA did not produce any
factor analysis output. Factor analysis has been conducted on this instrument previously; however, the administration was on paper, so the researcher assumed that this meant manual entry of data into a system for analysis. This would have not altered the way the instrument was administered or the way the participants responded, but would have allowed for an item by item entry of the instrument. The researcher believed that the initial set up of the instrument in Qualtrics for administration and the structure of the data file impacted the analysis of this particular instrument. Specifically, the set-up of the items in Qualtrics to have multiple responses as opposed to a single response for each item, which means that in the data set each item presented as eight separate items as opposed to one item with four answer choices. The set-up choice was made by the researcher for two reasons. The first was to not allow a preview of the answer to the next or previous item due to the fill in the blank format of the instrument. But also in its original form the instrument would have appeared much lengthier therefore the decision was made to combine the items as opposed to having them appear as separate items.

The NVS produced two factors with four of the six items loading on a factor at a level of .5 or higher. Item four (If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?) loaded on two factors, but neither loading was at a level that would include it in the calculations of the sums for the instrument. Item five (Is it safe for you to eat this ice cream?) loaded on one factor, but also loaded well below the .5 threshold. Items four and five were not included in the correlations analysis of scores because they did not load at the threshold for appropriate factor loading. There is no evidence in the literature that there is more than one factor for this instrument or that all six items would not load at a
high level The Bartlett’s test of sphericity $\chi^2 (15) = 824.130, p<.001$, indicated that correlations between items were sufficiently large for PAF. Two components had eigenvalues over 1 and in combination explained 62.289% of the variance.

Table 5

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sum of Squared Loadings$^a$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>2.561</td>
<td>44.581</td>
<td>44.581</td>
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<tr>
<td>2</td>
<td>1.056</td>
<td>17.508</td>
<td>62.289</td>
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<tr>
<td>3</td>
<td>.756</td>
<td>12.608</td>
<td>74.897</td>
</tr>
<tr>
<td>4</td>
<td>.576</td>
<td>9.592</td>
<td>84.489</td>
</tr>
<tr>
<td>5</td>
<td>.484</td>
<td>8.967</td>
<td>92.567</td>
</tr>
<tr>
<td>6</td>
<td>.447</td>
<td>7.443</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.

$^a$ When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

A PAF was also conducted on the 10 item HLSI short form. The Bartlett’s test of sphericity $\chi^2 (45) = 4300.210, p<.001$, indicated that correlations between items were sufficiently large for PAF. One component had eigenvalues over 1 and explained 62.340% of the variance (Table 6). The researcher forced the instrument into a five factor model based on previous literature and the five factors explain 85.462% of the variance.

The HLSI, in this study, performed most similar to the way it performed in previous studies when compared to the other two instruments. The exception to this was in the reliability scores which are normally in a .75 range as indicated in previous studies. There is no indication that other studies forced the instrument into a five factor model, but the developers of the instrument state that the instrument is built on a five factor construct (McCormack et al., 2010). The HLSI is designed to be administered in an online environment with the embedded stimuli that includes audio and multimedia clips. The researcher did not alter the administration method of this instrument in any way.
The HLSI has the least amount of information available about it as it is still a relatively new instrument compared to the other two. The researcher forced the instrument into a four factor model that seemed to fit better than the five factor model that literature suggested and would result in fewer items being excluded from the correlation analysis. The researcher used the HLSI short form (10 items), which according to literature is designed to mirror the long form instrument that contains 25 items. The developers include information about their own validation of the five factor model holding in the short form, but there is little literature or replicated studies to support the five factor model. This study suggests that a four-factor or perhaps a three-factor model would be a better fit to the short form of this instrument.

The researcher’s review of literature indicates that there are at least 35 health literacy assessment instruments available and that the trend towards the development of more instruments will continue (O’Neill, Gonclaves, Ricci-Cabello, Ziebland, & Valderas, 2014). These results highlight the work that still is needed on existing

---

Table 6

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Rotation Sums of Squared Loadings^a</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
</tr>
<tr>
<td>1</td>
<td>0.234</td>
<td>62.340</td>
<td>62.340</td>
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<tr>
<td>2</td>
<td>0.177</td>
<td>7.170</td>
<td>69.511</td>
</tr>
<tr>
<td>3</td>
<td>0.665</td>
<td>5.647</td>
<td>75.159</td>
</tr>
<tr>
<td>4</td>
<td>0.487</td>
<td>4.873</td>
<td>81.031</td>
</tr>
<tr>
<td>5</td>
<td>0.443</td>
<td>4.431</td>
<td>85.462</td>
</tr>
<tr>
<td>6</td>
<td>0.435</td>
<td>4.045</td>
<td>89.507</td>
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<tr>
<td>7</td>
<td>0.371</td>
<td>3.715</td>
<td>93.222</td>
</tr>
<tr>
<td>8</td>
<td>0.298</td>
<td>2.985</td>
<td>96.207</td>
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<tr>
<td>9</td>
<td>0.226</td>
<td>2.262</td>
<td>99.469</td>
</tr>
<tr>
<td>10</td>
<td>0.151</td>
<td>1.511</td>
<td>100.000</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Axis Factoring.

^a When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.
instruments as it relates to consistency, usability in the clinical setting, and the influence on clinicians in determining appropriate health education tools. Literature also indicates that the clarification of health literacy as a construct must continue in order to refine and/or develop instruments that are appropriate to measure health literacy across populations and the life span. This study does not fully answer the questions that the researcher asked or produce data that fully supports the breadth of literature that is available in the field supporting the three selected measures as appropriate and adequate measures of health literacy. This study does point to new questions that are being asked regarding health literacy assessment, the instruments being used, and the impact that may come from the proliferation of new instruments that are still untested but nonetheless being used in clinical settings.

Implications

The information from this study could be useful as healthcare providers and adult educators in healthcare settings work to improve health outcomes. Research supports the link between low health literacy and poor health outcomes (Berkman, Davis, & McCormack, 2010). This study provides evidence that the three instruments utilized measure health literacy consistently. Previous studies also indicate that the administration time for each of the instruments is less than ten minutes when administered as designed and alone. All of this information taken together would suggest that any of these instruments individually could be appropriate for use in clinical practice to assess health literacy for individuals. Better information regarding patients’ health literacy level that is not dependent solely on self-reported education level or occupation could lead to better patient education and possibly improved health outcomes.
Limitations

The limitations in this study begin with the modification of the administration of two of the instruments utilized. The Short Test of Functional Health Literacy in Adults (S-TOFHLA) and the Newest Vital Sign (NVS) were designed to be administered orally and in a face-to-face format. This study changed them to an online format. Changing the administration of the instruments did not appear to affect the reliability of the instruments. The instrument that had the potential to be most affected was the S-TOFHLA as it is timed in the original administration method. Another limitation of the study was the length of the surveys. Taken individually the instruments do not take more than 10 minutes to administer, but taken as a battery of instruments the administration time increases to 20 to 25 minutes, which likely affected participants’ willingness to complete the instruments and/or influenced participants’ ability to remain actively engaged throughout the process. As evidence, the researcher received several complaints along these lines from participants who completed the process and from those who chose to leave the study early because of the amount of time required to complete all the instruments.

Another limitation of the study is transformation of the data during the scoring process. The transformation to binary data for the S-TOFHLA and NVS had the potential to affect the type of analysis that the researcher was able to complete. The data were transformed into binary data, so that the instruments could be scored using SPSS due to the large number of participants. In order for the instruments to be scored accurately the data had to be transformed so that one answer was correct and all others were counted as incorrect.
Future Research

Results from this study suggest multiple paths for future research. More research is needed on the administration methods for the S-TOFHLA and the NVS. A study that has administration in both the paper method and an online method could provide further information regarding the viability of administering these instruments in an electronic format. As the study did not lead to clear answers to the research question regarding the psychometrics of the instruments, additional research is needed to further explore the psychometric properties of the instruments used in this study. A study that has the potential to more clearly indicate any overlap in the various instruments and to further determine the extent to which they are consistent in their measurement of health literacy in a sample could provide more information about the psychometrics of the instruments. Further research is also needed to determine if the available instruments measure health literacy specifically or whether the instruments are measuring information literacy. Data collection could include an instrument that is designed to measure health, information, and functional literacy skills in order to determine whether the instruments are measuring what they set out to measure or are they measuring other skills.

The field of Health Literacy will continue to grow as more emphasis is placed on practitioners and health organizations to demonstrate an improvement of health outcomes in their patients. Additional research is needed to further address the consistency of each of the instruments tested are in measuring health literacy because as health literacy and health outcomes become more important, it will be essential to be able to adequately measure health literacy in a reliable way with valid instruments. There also needs to be
additional research related to the assessment of health literacy in various populations to increase the validity of the instruments within those groups. There needs to be more research regarding the use of health literacy assessment information in the clinical setting. As very few of the currently available instruments lend themselves to ease of scoring and immediate use in the clinical setting, research on health literacy assessment remains an important piece of closing the health outcomes gap. Lastly, there needs to be more research that integrates the assessment of health literacy with other factors, such as access to healthcare, cultural belief systems and expectations, and reasoned actions, that affect health outcomes that are not related to lack of understanding.

Overall, consensus exists that the available health literacy assessment tools for use in the clinical setting may or may not provide an accurate portrait of a patient’s health literacy skills. Additionally, issues of validity exist in the use of health literacy assessment tools use among particular populations, especially with the elderly. In clinical settings, low health literacy is difficult to ascertain, but there are tools to help providers discern their client’s health literacy level (Parks et al., 2011). The instruments used in this study are three of many instruments available to help providers ascertain low health literacy levels. This study indicates that while the instruments are not perfect they do consistently measure health literacy.
Appendix A – Informed Consent

Informed Consent

Dear Participant,

Thank you for your time and consideration in participating in my research project. The purpose of this study is to determine whether the validity and reliability of two instruments hold across varied administration. Health literacy includes the ability to obtain, process, and utilize health information. The questionnaire will take approximately 20 to 30 minutes to complete and is strictly voluntary. Should you choose to participate in this research study, you will be asked questions that relate to your level of understanding of health.

The information will be used in graduate level research at the University of Southern Mississippi and may be submitted for presentation at a professional conference or for publication in a professional journal. There are minimal risks such as answering personal questions; however, all responses will remain anonymous. No identifying information will be obtained at any point and all information will remain confidential. After data has been received and summarized for reporting, all responses will be destroyed. If you choose, you may stop participation at any point without any penalty or consequence. You may or may not receive any direct benefits from participating, but you may review the results of the study upon request. If you have any questions regarding this research, please contact the researcher at bethany.miller@usm.edu.

This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS 39406-0001, (601) 266-6820. This project, in accordance with dissertation guidelines, is under the supervision of Dr. Kyna Shelley at the University of Southern Mississippi at 601-266-4578. I have read the above study, and I agree to voluntarily complete the online questionnaire. I understand by doing so, that I am giving permission for this anonymous and confidential data to be used in the research described above.
Please follow the link to complete the online survey:

Sincerely,
Bethany L. Miller
bethany.miller@usm.edu
Doctoral Candidate
University of Southern Mississippi
Appendix B – IRB Approval Letter

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

INSTITUTIONAL REVIEW BOARD
118 College Drive #5147 | Hattiesburg, MS 39406-0001
Phone: 601.266.5997 | Fax: 601.266.4377 | www.usm.edu/research/institutional.review.board

NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the “Adverse Effect Report Form”.
- If approved, the maximum period of approval is limited to twelve months. Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 17050304
PROJECT TITLE: Investigating the Construct of Health Literacy Assessment: A Cross-Validation Approach
PROJECT TYPE: New Project
RESEARCHER(S): Bethany Miller
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Educational Research and Administration
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Exempt Review Approval
PERIOD OF APPROVAL: 05/11/2017 to 05/10/2018

Lawrence A. Hosman, Ph.D.
Institutional Review Board
Appendix C – Short Test for Functional Literacy

THE DAY BEFORE THE X-RAY.

For supper have only a __________ stack of fruit, __________ and jelly.

a. little  
b. brush  
c. attack  
d. raisins

2. a. toes  
b. throat  
c. toast  
d. thigh

with coffee or tea.

After __________, you must not __________ or drink

a. minute  
b. midnight  
c. during  
d. before

a. easy  
b. are  
c. drank  
d. ext

anything at __________ until after you have __________ the X-ray.

a. ill  
b. all  
c. each  
d. any

a. are  
b. has  
c. had  
d. was
THE DAY OF THE X-RAY.

Do not eat ________.
   a. appointment.
   b. walk-in.
   c. breakfast.
   d. clinic.

Do not ________, even ________.
   a. drive,           a. heart.
   b. drink,          b. breath.
   c. dress,          c. water.
   d. dose,           d. cancer.

If you have any ________, call the X-ray ________ at 616-4500.
   a. answers,    a. Department
   b. exercises,  b. Sprain
   c. tracts,     c. Pharmacy
   d. questions,  d. Toothache
PASSAGE B

I agree to give correct information to _______ if I can receive Medicaid.
   a. hair
   b. salt
   c. see
   d. ache

I _______ to provide the county information to _______ any
   a. agree
   b. probe
   c. send
   d. gain
   a. hide
   b. risk
   c. discharge
   d. prove

statements given in this _______ and hereby give permission to
   a. emphysema
   b. application
   c. gallbladder
   d. relationship

the _______ to get such proof. I _______ that for
   a. inflammation
   b. religion
   c. iron
   d. country
   a. investigate
   b. entertain
   c. understand
   d. establish

Medicaid I must report any _______ in my circumstances
   a. changes
   b. hormones
   c. antacids
   d. charges
within __________ (10) days of becoming __________ of the change.
   a. three        a. award
   b. one          b. aware
   c. five         c. away
   d. ten          d. await

I understand __________ if I DO NOT like the __________ made on my
   a. thus         a. marital
   b. this         b. occupation
   c. that         c. adult
   d. than         d. decision

case, I have the __________ to a fair hearing. I can __________ a
   a. bright       a. request
   b. left         b. refuse
   c. wrong        c. fail
   d. right        d. mend

hearing by writing or __________ the county where I applied.
   a. counting
   b. reading
   c. calling
   d. smelling

If you __________ TANF for any family __________, you will have to
   a. wash         a. member
   b. want         b. history
   c. cover        c. weight
   d. tape         d. seatbelt
a different application form. we will use

a. relax
b. break
c. inhale
d. sign

a. Since
b. Whether
c. However
d. Because

the ____ on this form to determine your ____________.

a. lung
b. date
c. meal
d. pelvic

a. hypoglycemia
b. eligibility
c. osteoporosis
d. schizophrenia
Appendix D– Newest Vital Sign

Score Sheet for the Newest Vital Sign Questions and Answers
READ TO SUBJECT: This information is on the back of a container of a point of ice cream.
1. If you eat the entire container, how many calories will you eat?
   Answer: 1,000 is the only correct answer
2. If you are allowed to eat 60 grams of carbohydrates as a snack, how much ice cream could you have?
   Answer: Any of the following is correct: 1 cup (or any amount up to 1 cup), half the container. Note: If patient answers “two servings,” ask “How much ice cream would that be if you were to measure it into a bowl?”
3. Your doctor advises you to reduce the amount of saturated fat in your diet. You usually have 42 g of saturated fat each day, which includes one serving of ice cream. If you stop eating ice cream, how many grams of saturated fat would you be consuming each day?
   Answer: 33 is the only correct answer
4. If you usually eat 2,500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving?
   Answer: 10% is the only correct answer

READ TO SUBJECT: Pretend that you are allergic to the following substances: penicillin, peanuts, latex gloves, and bee stings.
5. Is it safe for you to eat this ice cream?
   Answer: No
6. (Ask only if the patient responds “no” to question 5): Why not?
   Answer: Because it has peanut oil.
Number of correct answers:

ANSWER CORRECT? Yes  no
Appendix E– Demographic Questionnaire

Demographic Questionnaire

Please select one answer for each question:

1. Age:
   18-25  26-35  36-43  44-52  53-60  61-68  69-76  76-85  85+

2. Gender
   Male    Female    Non-binary

3. Race
   Caucasian    African American    Hispanic    American Indian    Asian American
   Pacific Islander    Two or more races

4. Highest level of education completed:
   Less than High School    High School    Some College    Associate’s degree
   Bachelor’s Degree    Some graduate coursework    Master’s Degree    Doctorate

5. Marital Status:
   Single (never married)
   married
   separated
   divorced
   widowed

6. Income level:
   $0-$9,999    $70,000-$79,999
   $10,000-$19,999    $80,000-$89,999
   $20,000-$29,999    $90,000-$99,999

68
<table>
<thead>
<tr>
<th>Salary Range</th>
<th>Pay Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>$30,000-$39,999</td>
<td>$100,000+</td>
</tr>
<tr>
<td>$40,000-$49,999</td>
<td></td>
</tr>
<tr>
<td>$50,000-$59,999</td>
<td></td>
</tr>
<tr>
<td>$60,000-$69,999</td>
<td></td>
</tr>
</tbody>
</table>
**Appendix F – Health Literacy Skills Instrument**

**Cholesterol: Know What Your Level Mean**

<table>
<thead>
<tr>
<th><strong>Cholesterol: What Your Level Means</strong></th>
<th><strong>Total cholesterol level</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What is cholesterol?</strong></td>
<td>• Less than 200 is best.</td>
</tr>
<tr>
<td>Cholesterol is a waxy substance the body uses to protect nerves, make cell tissues and produce certain hormones.</td>
<td>• 200 to 239 is borderline high.</td>
</tr>
<tr>
<td><strong>Are there different types of cholesterol?</strong></td>
<td>• 240 or more means a person is at increased risk for heart disease.</td>
</tr>
<tr>
<td>• Below 100 is ideal for people who have a higher risk of heart disease.</td>
<td><strong>LDL cholesterol levels</strong></td>
</tr>
<tr>
<td>• 100 to 129 is near optimal.</td>
<td>• 130 to 159 is borderline high.</td>
</tr>
<tr>
<td>• 160 or more means a person is at a higher risk for heart disease.</td>
<td></td>
</tr>
</tbody>
</table>

**Please answer the following questions based on the information in the text.**

If a person is at high risk for heart disease, which of the following levels of low density lipoprotein (LDL) cholesterol is **best**?

Select one answer only

- [ ] 102
- [ ] 86
- [ ] 129
- [ ] 155
- [ ] Not sure
Which set of low density lipoprotein (LDL) and high density lipoprotein (HDL) levels is best?

Select one answer only

- LDL of 134 and HDL of 61
- LDL of 98 and HDL of 82
- LDL of 140 and HDL of 50
- LDL of 165 and HDL of 80
- Not

Over-the-Counter Drug Label: Antihistamine
Which of the following problems could be caused by this medicine?

Select one answer only

- Trouble breathing
- Drowsiness
- Loss of appetite
- Trouble urinating
- Not

First-Degree Burns
First-degree burns involve the top layer of skin. Sunburn is a first-degree burn.

**Signs:**

- Red
- Painful to touch
- Skin will show mild swelling

**Treatment:**

- Apply cool, wet compresses, or immerse in cool, fresh water. Continue until pain subsides.
- Cover the burn with a sterile, non-adhesive bandage or clean cloth.
- Do not apply ointments or butter to burn; these may cause infection.
- Over-the-counter pain medications may be used to help relieve pain and reduce inflammation.
- First degree burns usually heal without further treatment. However, if a first-degree burn covers a large area of the body, or the victim is an infant or elderly, seek emergency medical attention.

**Second-Degree Burns**

Second-degree burns involve the first two layers of skin.

**Signs:**

- Deep reddening of the skin
- Pain
- Blisters
- Glossy appearance from leaking fluid
- Possible loss of some skin

**Treatment:**

- Immerse in fresh, cool water, or apply cool compresses. Continue for 10 to 15 minutes.
- Dry with clean cloth and cover with sterile gauze.
- **Do not** break blisters.
- Do not apply ointments or butter to burns; these may cause infection
- Elevate burned arms or legs.
- Take steps to prevent shock: lay the victim flat, elevate the feet about 12 inches, and cover the victim with a coat or blanket. **Do not** place the victim in the shock position if a head, neck, back, or leg injury is suspected, or if it makes the victim
uncomfortable.

- Further medical treatment is required. **Do not** attempt to treat serious burns unless you are a trained health professional.

Click here if you would like to listen to the recording again.

If a person was worried about his cough, what number should he press? *HLSI-S*

Select one answer only

- 1
- 2
- 4
- Call 911
- Not sure

If a person wanted to check on the date and time of an appointment she already made, what number should she press?

Select one answer only

- 1
- 2
- 3
- Call 911
- Not sure

Hospital Map
Please answer the following questions based on the information in the map.

If John was visiting someone in room 130 and wanted to go to the cafeteria, which of these places would he pass if he took the shortest route?

Select one answer only

- [ ] Diagnostic imaging
- [ ] Gift shop
- [ ] Cardiac center
- [ ] Emergency services
Don't Know

Which of the following entrance is closest to the elevator? **HLSI-S**

Select one answer only

- [ ] There is no elevator
- [ ] Surgery & Outpatient Center Entrance
- [ ] Rehabilitation Institute Entrance
- [ ] Main Entrance
- [ ] Don't Know

### Medicine Record

**Be an Active Member of Your Health Care Team**

**My Medicine Record**

<table>
<thead>
<tr>
<th>Name:</th>
<th>Birth date:</th>
</tr>
</thead>
</table>

---

**What I'm Using**

<table>
<thead>
<tr>
<th>Medication name</th>
<th>Strength</th>
<th>Type</th>
<th>How Much</th>
<th>When to Take</th>
<th>Start/Stop Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>XHHHHHHHHH</td>
<td>60 mg pills</td>
<td>small, white, round</td>
<td>100 mg, 2 hour 3-6 pm</td>
<td>1-1-05</td>
</tr>
<tr>
<td>#2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>#3</td>
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<tr>
<td>#8</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

---

**Why I'm Using**

| #1 | Lower blood pressures, check blood pressure once a week, blood test on 1-16-06 |
| #2 | |
| #3 | |
| #4 | |
| #5 | |
| #6 | |
| #7 | |
| #8 | |

---

**Who Told Me to Use**

| #1 | Dr. A. (603) 555-1212 |
| #2 | |
| #3 | |
| #4 | |
| #5 | |
| #6 | |
| #7 | |
| #8 | |

---

[www.fda.gov/summarize/safety/my_medicine_record.htm](http://www.fda.gov/summarize/safety/my_medicine_record.htm) [www.fda.gov/summarize/safety] These are my medicines as of: 

FORM FDA 364 (20?)
Please answer the following questions based on the information in the chart.

In the example listed in the first row of the table, when should the medicine be taken? **HLSI-S**

Select one answer only:

- [ ] Two times a day anytime between 8 a.m. and 8 p.m.
- [ ] At 8 a.m. or 8 p.m. each day
- [X] At 8 a.m. and 8 p.m. each day
- [ ] Don't Know

**Lactose intolerance: Why does milk bother me?**

Lactose intolerance means that the body cannot digest foods with lactose in them. Lactose is the sugar found in milk and foods made with milk. Lactose intolerance is not serious. A person should feel better soon if they eat less food with lactose or if they use products that help them digest lactose. They cannot digest lactose because they do not have enough lactase enzyme. The small intestine needs lactase enzyme to break down lactose. If lactose is not digested, it can cause gas and stomach cramps.
After eating foods with lactose in them, some people may feel sick to their stomach. They may also have:

- Gas
- Diarrhea
- swelling in your stomach

Some illnesses can cause these same problems. A doctor can tell a person if their problems are caused by lactose intolerance.

**Please answer the following question based on the information above.**

Which of the following is a symptom of lactose intolerance?

Select one answer only

- [ ] Constipation
- [x] Stomach ache
- [ ] Sore throat
Calories burned

Please read the questions below, then visit the following website to answer the question. Answer the questions based on the information in the website.


Please answer the following question based on the information in the website.

John weighs 200 pounds and he walked at a medium pace on a firm surface for 30 minutes. How many calories did he burn?

☐ 159
☐ 115
Kate weighs 150 pounds. Which activity would burn the most calories? **HLSI-S**

Select one answer only

- [ ] Walking at a medium pace for 30 minutes
- [ ] Raking the lawn for 30 minutes
- [ ] Bowling for 30 minutes
- [ ] Don't Know

---

Risk of heart attack calculator

Please read the questions below, then visit the following website to answer the questions. Answer the questions based on the information in the website.


**Interactive Tool: Are You at Risk for a Heart Attack?**

**What does this tool measure?**

Click here to [find your risk of heart attack](http://www.healthwise.net/rti/Content/StdDocument.aspx?DOCHWID=te7950). This interactive tool measures your chance of having a heart attack in the next 10 years. The tool calculates your risk score from the values you enter. The calculation is based on information from the Framingham Heart Study. Since 1948 the Framingham Heart Study has studied the progression of heart disease and its risk factors. The data from this study has been used to make a risk assessment tool.
assessment. This risk assessment was created by the U.S. National Cholesterol Education Program (NCEP), part of the National Institutes of Health and the U.S. Department of Health and Human Services.

The values you enter include the most important risk factors for heart disease. They are as follows:

- **Age and gender.** The number of people affected by heart disease increases with age in men after age 45 and in women after age 55.
- **Smoker.** Select "Yes" if you have smoked any cigarettes in the past month. Quitting smoking may be the most important step you can take to reduce your risk.
- **Systolic blood pressure.** Systolic blood pressure is the first number of your blood pressure reading. For example, if your reading is 120/80 (120 over 80), your systolic blood pressure is 120.
- **Blood pressure medicine.** Medicines used to treat high blood pressure include diuretics, angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), beta-blockers, calcium channel blockers, and direct renin inhibitors. Enter "Yes" if you take one of these medicines.
- **HDL cholesterol.** HDL, or high-density lipoprotein, is the "good" cholesterol because it helps prevent cholesterol from building up in your arteries. The higher your HDL, the better. An HDL of 60 mg/dL and above protects against heart disease. An HDL of less than 40 mg/dL puts you at major risk of heart attack.
- **Total cholesterol.** Total cholesterol is the sum of all the cholesterol in your blood. The higher your total cholesterol, the greater your risk for heart disease. A total cholesterol of 240 mg/dL and above puts you at twice the risk of heart disease compared with someone whose cholesterol is below 200 mg/dL. Less than 200 mg/dL gives you a lower risk for heart disease.

Please answer the following questions based on the information in the website.

What does this tool do?
Select one answer only
John is 39 years old and smokes. His blood pressure is 130/90 and he’s on blood pressure medicine. His HDL cholesterol is 50 and his total cholesterol is 230.

What is his estimated 10 year risk of a heart attack?
Select one answer only

- 20 percent
- 12 percent
- 10 percent
- 2 percent
- Don’t Know

Signs of a stroke
Please answer the following question based on the information in the flyer.

Which of the following is NOT a sign of a stroke? **HLSI-S**

Select one answer only

- Shaking chills
- Blurred vision
- Bad headache
- Numbness on one side
- Don’t Know
Portion Control for Weight Loss

Expanding portions

Are you eating a variety of healthy foods, exercising and still struggling with your weight? Some people may need to pay closer attention to portion control — managing the amount of food that they eat — as their total calorie intake determines their weight.

A serving isn’t what they happen to put on their plate. It’s a specific amount of food defined by common measurements, such as cups, ounces or pieces. The serving sizes represented here are part of the Mayo Clinic Healthy Weight Pyramid — a food pyramid designed to promote weight loss and long-term health. Use these serving sizes in conjunction with a diet based on a variety of healthy foods. Add the right amount of regular physical activity, and a person will be well on their way to enjoying good nutrition and controlling their weight.

Vegetables

Until they’re comfortable judging serving sizes, you may need to use measuring cups and spoons. A half a cup of cooked carrots, for example, equals one serving. Here are the recommended serving sizes for other vegetables:

Food
A person is making a salad and wants to add one serving of chopped, uncooked carrots. How much should she use?

Select one answer only

- 2 cups
- 1 cup
- ½ cup
- ¼ cup
- Don’t Know

A person is cooking dinner for himself and he wants to include one serving from the meat and beans group. What should he choose?

Select one answer only

- 1 ½ ounces of cooked lean beef
- 1 ½ ounces of cooked fish
- 3 boiled eggs
- 1 cup of cooked kidney beans
- Don’t Know
Obstructive sleep apnea – what happens?

Please watch the video then go to the next screen.

Please watch the video then go to the next screen.

http://www.mayoclinic.com/health/obstructive-sleep-apnea/MM00715

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Please answer the following question based on the information in the video clip.

Click here if you would like to watch the video again.

What do the muscles in the throat typically do when a person is sleeping?
Select one answer only

☐ Keep the throat as open as it is when a person is awake
☐ Relax slightly and allow the throat to narrow but not close
☐ Relax completely and allow the throat to close
☐ Don't Know
What parts of the body do lunge exercises work? **HLSI-S**

Select one answer only

- [ ] Arms and shoulders
- [ ] Back and abdomen
- [X] Legs and buttock
- [ ] Don’t Know
Explanation of Benefits ABC Insurance Company Plan Member: John Doe

Patient: Jane Doe

<table>
<thead>
<tr>
<th>Dates of service</th>
<th>Type of service</th>
<th>Submitted</th>
<th>Not covered</th>
<th>Covered</th>
<th>Co-pay</th>
<th>Plan liability</th>
<th>Patient responsibility</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/22/09</td>
<td>Physical therapy</td>
<td>140.00</td>
<td>0.00</td>
<td>14.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>A</td>
</tr>
<tr>
<td>7/15/09</td>
<td>Laboratory</td>
<td>170.00</td>
<td>10.00</td>
<td>66.00</td>
<td>0.00</td>
<td>4.00</td>
<td>0.00</td>
<td>B</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>310.00</td>
<td>24.00</td>
<td>66.00</td>
<td>0.00</td>
<td>7.00</td>
<td>0.00</td>
<td></td>
</tr>
</tbody>
</table>

Please answer the following questions based on the information in the chart.
How much will the insurance company pay for the physical therapy received on 7/22/09?
Select one answer only

- $140
- $100
- $40
- $0
- Not sure
How much does the patient have to pay for the laboratory services received on 7/15/09?
Select one answer only

- $104
- $74
- $66
- $30
- Not sure

Food Nutrition Label

### Nutrition Facts

**Serving Size** 140 grams (140g)

**Serving Per Container** 1

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories from Fat 70</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Calories</strong> 140</td>
<td><strong>Calories from Fat 70</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Total Fat</strong> 7g</th>
<th><strong>Saturated Fat</strong> 2.5g</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trans Fat</strong> 0g</td>
<td></td>
</tr>
<tr>
<td><strong>Cholesterol</strong> 25mg</td>
<td></td>
</tr>
<tr>
<td><strong>Sodium</strong> 300mg</td>
<td></td>
</tr>
<tr>
<td><strong>Total Carbohydrate</strong> 9g</td>
<td></td>
</tr>
<tr>
<td><strong>Dietary Fiber</strong> 2g</td>
<td></td>
</tr>
<tr>
<td><strong>Sugars</strong> 3g</td>
<td></td>
</tr>
<tr>
<td><strong>Protein</strong> 8g</td>
<td></td>
</tr>
</tbody>
</table>

**% Daily Value**

* Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

<table>
<thead>
<tr>
<th>Calories:</th>
<th>2,000</th>
<th>2,500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Fat</strong></td>
<td>Less than 65g</td>
<td>80g</td>
</tr>
<tr>
<td><strong>Saturated Fat</strong></td>
<td>Less than 20g</td>
<td>25g</td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>Less than 300mg</td>
<td>300mg</td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>Less than 2,400mg</td>
<td>2,400mg</td>
</tr>
<tr>
<td><strong>Total Carbohydrate</strong></td>
<td>300g</td>
<td>375g</td>
</tr>
<tr>
<td><strong>Dietary Fiber</strong></td>
<td>25g</td>
<td>30g</td>
</tr>
</tbody>
</table>

**Ingredients:** Tomatoes; Chicken; Mushrooms; White Wine; Celery; Onions; Green Bell Pepper; Flour; Butter; Olive Oil; Salt; Black Pepper.

Sherri Pinero, RD, www.recipeanalysis.com
Please answer the following question based on the information in the label.

How many grams of fiber are in two servings?
Select one answer only

☐ 2
☐ 3
☒ 4
☐ 5
☐ Not sure

If a person is on a 2,500 calorie diet, what percent of the daily value of saturated fat would he get from one serving? 

Select one answer only

☐ 10 percent
☐ 11 percent
☒ 12 percent
☐ 13 percent
☐ Not sure
Prostate Cancer

Number of Men Out of 100 Who Die from Prostate Cancer Versus Other Diseases

Please answer the following question based on the information in the chart.

More men die from prostate cancer than from other causes. Based on the chart above, would you say this is true, false, or are you not sure?  

Select one answer only

Based on the chart above, who is more likely to die of prostate cancer?
<table>
<thead>
<tr>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>White men</td>
</tr>
<tr>
<td><strong>African American men</strong></td>
</tr>
<tr>
<td>Both equally likely</td>
</tr>
<tr>
<td>Neither</td>
</tr>
</tbody>
</table>
### Appendix G – Tables

**Table A1.**

**NVS Descriptive Statistics**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVS1</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.66</td>
<td>.476</td>
</tr>
<tr>
<td>NVS2</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.52</td>
<td>.500</td>
</tr>
<tr>
<td>NVS3</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.44</td>
<td>.497</td>
</tr>
<tr>
<td>NVS4</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.39</td>
<td>.488</td>
</tr>
<tr>
<td>NVS5</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.37</td>
<td>.484</td>
</tr>
<tr>
<td>NVS6</td>
<td>627</td>
<td>0</td>
<td>1</td>
<td>.07</td>
<td>.264</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>627</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table A2.**

**HLSI Descriptive Statistics**

<table>
<thead>
<tr>
<th>Description</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which of the following entrance is closest to the elevator?</td>
<td>361</td>
<td>1</td>
<td>5</td>
<td>3.80</td>
<td>.633</td>
</tr>
<tr>
<td>Telephone menu recording 032609 1 Please answer the following question based on the information...</td>
<td>358</td>
<td>1</td>
<td>5</td>
<td>3.49</td>
<td>1.132</td>
</tr>
<tr>
<td>What parts of the body do lunge exercises work?</td>
<td>366</td>
<td>1</td>
<td>4</td>
<td>2.85</td>
<td>.553</td>
</tr>
<tr>
<td>Question</td>
<td>Valid N (listwise)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>--------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If a person is on a 2,500 calorie diet, what percent of the daily value of saturated fat would he...</td>
<td>366 1 5 2.71 1.590</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the example listed in the first row of the table, when should the medicine be taken?</td>
<td>362 1 4 2.60 .728</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which set of low density lipoprotein (LDL) and high density lipoprotein (HDL) levels is best?</td>
<td>363 1 4 1.97 .610</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>More men die from prostate cancer than from other causes. Based on the chart above, would you say...</td>
<td>367 1 3 1.95 .415</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat and beans Familiar objects can help a person picture proper portions for meat, poultry, fish...</td>
<td>367 1 5 1.94 1.460</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kate weighs 150 pounds. Which activity would burn the most calories?</td>
<td>363 1 4 1.83 .661</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Which of the following is NOT a sign of a stroke?</td>
<td>364 1 5 1.22 .775</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>349</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table A3.

<table>
<thead>
<tr>
<th>STOFHLA Descriptive Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your doctor has sent you to have a ______ X-ray.</td>
<td>627</td>
<td>.74</td>
<td>.440</td>
</tr>
<tr>
<td>You must have an ______ stomach when you come for _____-empty</td>
<td>627</td>
<td>.74</td>
<td>.440</td>
</tr>
<tr>
<td>The X-ray will ______ from 1 to 3 _____ to do.</td>
<td>627</td>
<td>.73</td>
<td>.442</td>
</tr>
<tr>
<td>The X-ray will ______ from 1 to 3 _____ to do.</td>
<td>627</td>
<td>.73</td>
<td>.445</td>
</tr>
<tr>
<td>Do not eat __________.</td>
<td>627</td>
<td>.71</td>
<td>.452</td>
</tr>
<tr>
<td>Do not ______, even ______.</td>
<td>627</td>
<td>.71</td>
<td>.452</td>
</tr>
<tr>
<td>I agree to give correct information to ____ if I can receive Medicaid.</td>
<td>627</td>
<td>.71</td>
<td>.453</td>
</tr>
<tr>
<td>For supper have only a ______ snack of fruit, ______ and jelly, with tea or coffee.</td>
<td>627</td>
<td>.71</td>
<td>.453</td>
</tr>
<tr>
<td>anything at _____ until after you have _____ the X-ray.</td>
<td>627</td>
<td>.71</td>
<td>.454</td>
</tr>
<tr>
<td>statements given in this all statements given in this and hereby give permission to</td>
<td>627</td>
<td>.71</td>
<td>.454</td>
</tr>
<tr>
<td>After ______, you must not ______ or drink-midnight, I ______ to provide the county information to ______ any-agree</td>
<td>627</td>
<td>.71</td>
<td>.456</td>
</tr>
</tbody>
</table>

95
anything at ______ until after you have _____ the X-ray.

- had

If you have any ___________, call the X-ray ____ at 616-4500.-department

within ______ (10) days of becoming ______ of the change.-aware

After _______, you must not ______ or drink-eat

- eat

Do not ______, even ______-water

I understand ______ if I DO NOT like the ______ made on my-decision

If you have any ___________, call the X-ray ____ at 616-4500.-questions

________ a different application form. _____, we will use-sign

For supper have only a ______ snack of fruit, ______ and jelly, with tea or coffee.-toast
case, I have the _____ to a fair hearing. I can ________ a-request

If you _______ TANF for any family __________, you will have to-want

96
Medicaid I must report any ________ in my circumstances within _______ (10) days of becoming ______ of the change.-ten case, I have the _____ to a fair hearing. I can ________ a-right hearing by writing or ________ the county where I applied. If you ______ TANF for any family _______, you will have to-member I understand ______ if I DO NOT like the ________ made on my-that the ________ to get such proof. I ______ that for-county the ________ to get such proof. I ______ that for-understand You must have an ______ stomach when you come for ______.-it I ______ to provide the county information to ______any-prove ______ a different application form. ______, we will use-However
Since a different application form, we will use.

Because a different application form, we will use.

I ______ to provide the county information to any discharge.

I ______ to provide the county information to any send.

You must have an ______ stomach when you come for anemia.

If you ______ TANF for any family ________, you will have to-cover the ________ to get such proof. I ______ that for-establish.

If you ______ TANF for any family _______, you will have to-history.

Do not ______, even ______ drive.

I understand ______ if I DO NOT like the ______ made on my-this.
For supper have only a ______ snack of fruit, ______ and jelly, with tea or coffee. - broth
the _______ to get such proof. I _______ that for - investigate
case, I have the _____ to a fair hearing. I can ________ a-refuse
I ______ to provide the county information to ______any-risk
the_________ to get such proof. I _______ that for - religion
within ______ (10) days of becoming ______ of the change. - one
You must have an _______ stomach when you come for ______. - is
the_________ to get such proof. I _______ that for - entertain
If you have any ________, call the X-ray ______ at 616- 4500. - exercises
You must have an _______ stomach when you come for ______. - am
the_________ to get such proof. I _______ that for - inflammation
If you have any ________,
call the X-ray ______ at 616-4500.

The X-ray will ______ from 1 to 3 _____ to do.-view

After ________, you must not ______ or drink-ate

I ______ to provide the county information to

within ______ (10) days of becoming ______ of the change.-await

case, I have the _____ to a fair hearing. I can ______

I understand ______ if I DO NOT like the ______ made on my-look

anything at ______ until after you have _____ the X-ray.-any

I understand ______ if I DO NOT like the ______ made on my-occupation

_____ a different application form. _____, we will use-break

100
After _______, you must not _______ or drink-minute.

You must have an _______ stomach when you come for _______.-if

case, I have the _____ to a fair hearing. I can _______ a-fail

I understand _______ if I DO NOT like the _______

made on my-adult

If you have any _________,
call the X-ray _____ at 616-4500.-answers

I _______ to provide the county information to _______ any-hide

You must have an _______ stomach when you come for _______.-incest

For supper have only a ______ snack of fruit, _____ and jelly, with tea or coffee.-throat

______ a different application form. ______, we will use-relax

anything at ______ until after you have _____ the X-ray.-each

anything at ______ until after you have _____ the X-ray.-ill

Do not _______, even _______.-breath
After _______, you must not ______ or drink-drank within ______ (10) days of becoming ______ of the change.-three

You must have an ______ stomach when you come for ______.-asthma

After _______, you must not ______ or drink-during, the ______ to get such proof. I ______ that for-iron

Do not ______, even ______.-dress within ______ (10) days of becoming ______ of the change.-five

within ______ (10) days of becoming ______ of the change.-away

If you ______ TANF for any family ________, you will have to-tape

For supper have only a ______ snack of fruit, ______ and jelly, with tea or coffee.-toes

I understand ________ if I DO NOT like the ______ made on my-marital

The X-ray will ______ from 1 to 3 ______ to do.-diets
If you _______ TANF for any family ________, you will have to -
-wash

For supper have only a ______ snack of fruit, ______ and jelly, with tea or coffee. -
-attack

______ a different application form. ______, we will use-inhale

If you _______ TANF for any family ________, you will have to-seatbelt

If you _______ TANF for any family ________, you will have to-weight

I understand ______ if I DO NOT like the ______ made on my-than

The X-ray will ______ from 1 to 3 _____ to do.-beds

case, I have the _____ to a fair hearing. I can ______-mend

If you have any ________, call the X-ray _____ at 616-4500.-sprain

The X-ray will ______ from 1 to 3 _____ to do.-brains

Do not ______, even ______.-heart

anything at ______ until after you have _____ the X-ray.- has
within ______ (10) days of becoming ______ of the change.-award
If you have any ________,
call the X-ray ______ at 616-4500.-toothache
anything at ______ until after
you have ______ the X-ray.-was
anything at ______ until after
you have ______ the X-ray.-are
After _______, you must not
______ or drink-easy
For supper have only a
______ snack of fruit, _____
and jelly, with tea or coffee.-nausea
The X-ray will ______ from 1
to 3 ______ to do.-look
I ______ to provide the
county information to
_______any-gain
After ________, you must not
______ or drink-before,
The X-ray will ______ from 1
to 3 ______ to do.-talk
If you have any ________,
call the X-ray ______ at 616-4500.-tracts
Do not ______, even
________.-cancer
For supper have only a 627 .00 .040
______ snack of fruit, ______
and jelly, with tea or coffee.-
thigh
Do not ______, even 627 .00 .000
_________.-dose
Valid N (listwise) 477

Table A4.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Male</td>
<td>148</td>
<td>23.6</td>
<td>40.4</td>
<td>40.4</td>
</tr>
<tr>
<td>Female</td>
<td>218</td>
<td>34.8</td>
<td>59.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>366</td>
<td>58.4</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>261</td>
<td>41.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>627</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table A5.

<table>
<thead>
<tr>
<th>Race</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid White</td>
<td>304</td>
<td>48.5</td>
<td>83.1</td>
<td>83.1</td>
</tr>
<tr>
<td>Black or African American</td>
<td>19</td>
<td>3.0</td>
<td>5.2</td>
<td>88.3</td>
</tr>
<tr>
<td>American Indian or Alaska</td>
<td>3</td>
<td>.5</td>
<td>.8</td>
<td>89.1</td>
</tr>
<tr>
<td>Native</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>30</td>
<td>4.8</td>
<td>8.2</td>
<td>97.3</td>
</tr>
</tbody>
</table>

105
<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Hawaiian or Pacific</td>
<td>2</td>
<td>.3</td>
<td>.5</td>
<td>97.8</td>
</tr>
<tr>
<td>Islander</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>1.3</td>
<td>2.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>366</td>
<td>58.4</td>
<td>100.0</td>
<td></td>
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</tbody>
</table>

Missing System 261 41.6
Total 627 100.0

*Table A6.*

<table>
<thead>
<tr>
<th>Education</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than high school</td>
<td>3</td>
<td>.5</td>
<td>.8</td>
<td>.8</td>
</tr>
<tr>
<td>High school graduate</td>
<td>33</td>
<td>5.3</td>
<td>9.1</td>
<td>9.9</td>
</tr>
<tr>
<td>Some college</td>
<td>79</td>
<td>12.6</td>
<td>21.7</td>
<td>31.6</td>
</tr>
<tr>
<td>2 year degree</td>
<td>52</td>
<td>8.3</td>
<td>14.3</td>
<td>45.9</td>
</tr>
<tr>
<td>4 year degree</td>
<td>137</td>
<td>21.9</td>
<td>37.6</td>
<td>83.5</td>
</tr>
<tr>
<td>Professional degree</td>
<td>52</td>
<td>8.3</td>
<td>14.3</td>
<td>97.8</td>
</tr>
<tr>
<td>Doctorate</td>
<td>8</td>
<td>1.3</td>
<td>2.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>364</td>
<td>58.1</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Missing System 263 41.9
Total 627 100.0

*Table A7.*

106
### Age

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 – 24</td>
<td>46</td>
<td>7.3</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>25 – 34</td>
<td>147</td>
<td>23.4</td>
<td>40.1</td>
<td>52.6</td>
</tr>
<tr>
<td>35 – 44</td>
<td>75</td>
<td>12.0</td>
<td>20.4</td>
<td>73.0</td>
</tr>
<tr>
<td>45 – 54</td>
<td>42</td>
<td>6.7</td>
<td>11.4</td>
<td>84.5</td>
</tr>
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<td>4.9</td>
<td>99.7</td>
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</table>

*Table A8.*

### HLSI Four Factor Pattern Matrix

<table>
<thead>
<tr>
<th>Factor</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>HLSI1</td>
<td>.612</td>
<td></td>
<td></td>
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<tr>
<td>HLSI2</td>
<td></td>
<td>.621</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>.631</td>
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<td></td>
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</tr>
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<td></td>
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<td></td>
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Extraction Method: Principal Axis Factoring.
Rotation Method: Oblimin with Kaiser Normalization.\textsuperscript{a}

\textsuperscript{a} Rotation converged in 16 iterations.

Graph 1. HLSI Five Factor Scree Plot

\textit{Figure 1.} Graph - HLSI Five Factor Scree Plot
Figure 2. Graph-HLSI Four Factor Scree Plot

Table A9.

<table>
<thead>
<tr>
<th>NVS score</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
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</thead>
<tbody>
<tr>
<td>Valid</td>
<td>6</td>
<td>14</td>
<td>2.2</td>
<td>2.2</td>
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<tr>
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<td>82</td>
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<td>13.1</td>
<td>15.3</td>
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<td>4</td>
<td>116</td>
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<td>18.5</td>
<td>33.8</td>
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<td>18.0</td>
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Table A10.

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<td>Frequency</td>
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<td>Valid</td>
</tr>
<tr>
<td>4</td>
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<td>1</td>
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<tr>
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<td><strong>Total</strong></td>
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Table A11.

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<tr>
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<td>Valid</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
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</table>
Table A12.

<table>
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<th>Valid Percent</th>
<th>Cumulative Percent</th>
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</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>96</td>
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<td>15.3</td>
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<td>35.7</td>
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Table A13.

<table>
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<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
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<tr>
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<td>.2</td>
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<tr>
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<td>.3</td>
<td>.6</td>
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<tr>
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<td>15</td>
<td>2.4</td>
<td>3.0</td>
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<tr>
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<td>355</td>
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<td>7.7</td>
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Table A14.

All Instruments Correlations

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<tr>
<th>Spearman's rho</th>
<th>STOFHLA Correlation Coefficient</th>
<th>Sig. (2-tailed)</th>
<th>N</th>
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<td>.655**</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>627</td>
<td>627</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NVS factor score</th>
<th>Correlation Coefficient</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOFHLA</td>
<td>1.000</td>
<td>627</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HLSI factor score</th>
<th>Correlation Coefficient</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOFHLA</td>
<td>1.000</td>
<td>627</td>
</tr>
</tbody>
</table>

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


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Okosun, I. S., Davis-Smith, M., & Seale, P. J. (2012). Awareness of diabetes risks is associated with healthy lifestyle behavior in diabetes free American adults: 118
Evidence from a nationally representative sample. *Primary Care Diabetes*, pp. 87-94.


[http://www.who.int/hia/about/glos/en/index1.html](http://www.who.int/hia/about/glos/en/index1.html)