2021

Relationship Between Electronic Health Literacy, Locus of Control, Trust in Physicians, Attitudes Towards Providers, and Medication Adherence

Donrie Purcell
Nova Southeastern University

The Relationship Between Electronic Health Literacy, Locus of Control, Trust in Physicians, Attitudes Towards Providers, and Medication Adherence

Donrie Purcell

Nova Southeastern University

Dr. Pallavi Patel College of Health Care Sciences

Department of Health Science

Doctor of Philosophy in Health Science Program

July 16, 2021

Signature Page

Nova Southeastern University

Dr. Pallavi Patel College of Health Care Sciences

We hereby certify that this dissertation, submitted by Donrie J.R. Purcell, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirement for the degree of Doctor of Philosophy in Health Science.

_____ _____
Gesulla Cavanaugh, PhD, MS, MPH Date
Chairperson of Dissertation Committee

_____ _____
Joshua Caballero, PHARMD , BCPP, FCCP Date
Dissertation Committee Member

_____ _____
Raymond Ownby, MD, PhD, MBA Date
Dissertation Committee Member

Approved:

_____ _____
Moya Alfonso, PhD, MSPH Date
Program Director, Doctor of Philosophy

_____ _____
Akiva Turner PhD, JD, MPH Date
Chair, Department of Health Science

_____ _____
Guy Nehrenz, Sr., EdD., MA, RRT Date
Dean, Dr. Pallavi Patel College of Health Care Science

Abstract

Health literacy is related to a variety of health outcomes, including diseases, quality of life, and even death. Few studies have investigated the relation of e-health literacy to outcomes or the mechanism by which they may be related. The purpose of this study was to evaluate the relation of e-health literacy to patients' attitudes toward health care providers, trust in physicians, and medication adherence as well as the extent to which these relations were mediated by locus of control. Data were collected on participants 40 years and older having at least one chronic health condition from the Fostering Literacy for Good Health Today and the Spanish-related project named Vive Desarollando Amplia Salud at Nova Southeastern University. Participants included 335 persons (mean age 57.5 years; 42 Whites and 293 Nonwhites; 161 men, 164 women, 9 transgender, 1 participant self-described as Other; and a sample mean education of 11.9 years). After controlling for age, education, gender, and race, the health literacy scale score was significantly related to Attitudes Towards Health Care Providers and trust in physicians, but not to medication adherence. The Electronic Health Literacy Scale score was significantly related to locus of control. Analysis of indirect effects showed that the relations between e-health literacy and Attitudes Towards Health Care Providers, trust in physicians, and medication adherence were mediated by internal locus of control. These findings have implications for research aimed at improving patient-provider communications through programs and policies that increase patients' efficacy in using the internet to access health information.

Keywords: electronic health literacy, locus of control, attitudes towards providers, trust in physicians, medication adherence

Acknowledgments

This dissertation research study would not have been possible without the patience, help and support of a number of people whom I would like to thank:

Dr. Gesulla Cavanaugh, my chair, for all her advice, support, emails, and phone calls keeping me on track and motivated.

Dr. Joshua Caballero, for serving on my committee and supporting my efforts in so many ways.

Dr. Raymond Ownby for his invaluable time even when I constantly interrupted him during his meetings without an appointment or due warning, his consistent efforts in providing guidance and feedback on the dissertation material, and for serving on my committee.

All the professors and staff within the Department of Health Science, Doctor of Philosophy in Health Science Program for all their assistance throughout the years.

The members of my cohort for their friendship, support, and encouragement throughout the entire program.

To my wife Dr. Kamilah Thomas-Purcell for all her sacrifices through this process, and the members of my family for their support throughout the years and for believing that I can be the spark that encourages others to go this far.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

This chapter discusses the background of electronic health (eHealth) literacy and its role in health outcomes. The statement of the problem details the use of eHealth literacy measures and the development of the Electronic Health Literacy Scale (eHEALS). The purpose and relevance of the study is outlined along with elements (i.e., the theoretical framework) used to guide this dissertation study. The study questions and hypotheses will further explain the decision of the investigator of this dissertation study to incorporate a mediating variable (locus of control) that can shed light on the nature of patient-provider relationships.

Background to the Problem

The importance of the internet as a source of health information for the general public is continuously growing (Takahashi et al., 2011). In the United States of America (US), of the 63% of Americans who access the internet (128 million people), 66% of them sought health and medical information (Fox & Fallows, 2003). On a typical day, over 6 million people in the US search for health-related information online, which is greater than the number of physician office visits (2.27 million) and ambulatory care visits to hospital outpatient and emergency departments (2.75 million) combined (Fox & Rainie, 2000). Electronic health (eHealth) literacy is defined as the ability to seek, find, understand, and appraise health information from electronic sources and the application of the knowledge gained to address or solve a health problem (Norman & Skinner, 2006b). eHealth literacy uses emerging information and communication technology, especially the internet, to improve or enable health and healthcare (Eng, 2001). The eHealth Literacy Scale (eHEALS) was designed to assess consumers' perceived skills at using information technology for health and to aid in determining the fit between eHealth programs and consumers (Norman & Skinner, 2006a). eHEALS is currently the only instrument that aims

to measure an individual's confidence in their ability to locate and evaluate online health information (Norman & Skinner, 2006b), and it has been proven to be a valid and reliable measure of self-reported eHealth literacy among patients with chronic disease in the US (Paige et al., 2017).

The use of the internet for health-related purposes poses particularly important challenges (Beck et al., 2014). It has been shown that wrong or incomplete information available on the internet may have negative consequences for the patient (Cline & Haynes, 2000), inclusive of patient-physician relationships, participation in prevention and screening programs, and adherence to medical treatment (Tan & Goonawardene, 2017). According to the American Medical Association (2020), a patient-physician relationship exists when a physician serves a patient's medical needs. Generally, the relationship is entered into by mutual consent between physician and patient (or surrogate). Trust is one of the central features of a patient-physician relationship and rapid changes in the healthcare system are feared by many to be a threat to patients' trust in their physicians (Pearson & Raeke, 2000). O'Leary et al. (2015) found that patients' attitudes have a strong influence on technology adoption and accountability for health, which have implications for patient-provider relationships. Medication adherence is defined as the extent to which a patient's behavior (e.g., taking medications with respect to timing, dosage, and frequency) corresponds with agreed-upon recommendations from a health care provider (America Pharmaceutical Association, 2020). Notably, medication adherence is influenced not only by patient-related factors (such as demographics and disease characteristics) but also by patients' beliefs about medication and their use of mass media, for example, the internet (Horne et al., 2013; Im & Huh, 2017).

The patient-provider relationship has been well documented as an important factor in the successful delivery of health care (Kerse et al., 2004; Strasser, 1992; Taylor, 2009). Patients' trust in their physician can be defined as a collection of expectations that the patients have for their provider (Anderson & Dedrick, 1990). Theoretically, patient trust in their physician or provider should serve to reinforce the functioning of the clinical relationship as a health partnership, thereby increasing the probability of patient satisfaction, treatment adherence, and improvement of health status (Pearson & Raeke, 2000). Trust between the patient and their health care providers (e.g., doctors, nurses, pharmacists, physiotherapists/occupational therapists) influences patient management outcomes, especially in the treatment of long-term illness, as well as outcomes of health promotion and prevention initiatives (Rasiah et al., 2020). Safran et al. (1998) argued trust was one of the strongest independent correlates of satisfaction with physicians and adherence to medical treatment. It has been the conclusion of several studies investigating the application of eHEALS that there is a fundamental need to recruit adult participants (an often overlooked and vulnerable group) in online health communication and eHealth research (Paige et al., 2017; Tennant et al., 2015; Tse et al., 2008), and that future research should focus on investigating improved search functionality and e-communication skills in finding age-appropriate, trustworthy health information on the internet (Tennant et al., 2015).

Locus of control (LOC), a function of social learning theory (SLT), describes how individuals view their relationship to the environment (Rotter, 1966). LOC indicates the extent to which individuals believe that they can control certain outcomes (i.e., level of trust in physicians, attitudes towards providers, and adherence to medication) that affect them (Rotter, 1966). Indeed, LOC in terms of patient health or health LOC, is the extent to which individuals attribute their health to their own actions or to external agents, which can affect the patient-provider

relationship (Brincks et al., 2010). In order to better understand why or how a relationship between health outcome variables occur, mediation analysis is often used (Allen, 2017). According to MacKinnon (2011), the use of a mediating variable (for example, LOC) to help understand relations between patient factors and health outcomes may produce practical and theoretical information that leads to useful interventions. This sort of conceptual approach has received considerable support in the literature (Chen, 1990; Lipsey, 1993; Sidani & Sechrest, 1999).

Statement of the Problem

Research indicated that 74% of adults actively use the internet in the US (Fox, 2011). Of the people who looked online for health information, 59% did so specifically to determine what medical condition they or an acquaintance might have. Measuring technology's impact on health is complicated and research into these questions is ongoing (Dignity Health, 2020). Previous studies of eHealth literacy largely focused on defining the term (Chan & Kaufman, 2011; Norman & Skinner, 2006b), developing measures of eHealth literacy (Chung & Nahm, 2015; Mitsutake et al., 2011; Norman & Skinner, 2006a), and examining the effect of eHealth literacy interventions on people with low levels of the ability (Robinson & Graham, 2010; Xie, 2011). Fewer studies examined the association between eHealth literacy and health-related outcomes (Mitsutake et al., 2016), such as medication adherence (Neter & Brainin, 2019). Also, the evidence is mixed on the influence of online health information on the patient–physician relationship (Tan & Goonawardene, 2017). Further, scholars conducted few research investigations into the exact nature of the relationships between eHealth literacy and particular health outcomes, especially the role of mediating variables (Schulz et al., 2017). The investigator of this dissertation study sought to (a) determine if there is a relationship with the eHEALS score

and trust in physicians, eHEALS score and attitudes towards providers, eHEALS score and adherence to medication; and (b) determine if LOC acts as a mediator between eHEALS and trust in physicians, eHEALS and attitudes towards providers, and eHEALS and adherence to medication among participants of the Fostering Literacy for Good Health Today (FLIGHT) and the related Spanish project named Vive Desarollando Amplia Salud (VIDAS) research study of adults 40 years and older.

Relevance

The purpose of this dissertation study was to explore the possible existence of a relationship(s) between the eHEALS and (a) trust in physicians as measured by the Wake Forest Trust in Physician Scale; (b) attitudes towards providers as measured by a modified version of the Attitudes Towards Health Care Providers Scale so that the scale is more relevant to persons with chronic health conditions; and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions among adults 40 years and older suffering from one or more chronic diseases (e.g.., high blood pressure, diabetes, cancer). Additionally, this study seeks to investigate the role of the construct LOC (as measured by the Multidimensional Health Locus of Control Scale) as a mediating variable between eHEALS and (a) trust in physicians, (b) attitudes toward providers and, (c) adherence to medication. Mediating variables are central to many fields because they are used to understand the process by which two variables are related (MacKinnon, 2011). A major application of mediating variables is the investigation of how an effect occurred after an outcome was observed (MacKinnon, 2011).

This study is significant because the data and findings will add to the limited quantitative knowledge available on the relationship with eHealth literacy, LOC, trust in physicians, attitudes towards providers, and medication adherence in a sample of persons who are 40 years and older.

The decision by the investigator of this dissertation study to explore existing literature to determine whether relations exist between eHEALS and (a) trust in physicians, (b) attitudes toward providers and, (c) adherence to medication, and whether LOC mediates these relations is of particular significance as not many studies have focused on the mediation of LOC on all three outcomes simultaneously. Paige et al. (2017) argued that eHEALS across age groups (i.e., 40 years and older) is not well understood, and that older age groups are more likely to trust the information obtained from Facebook than are younger age groups. This is because older age groups have unique health needs compared to younger adults (Bennett & Flaherty-Robb, 2003), including the need for specialized health information related to chronic disease (Michaels-Fisher & McCabe, 2005). Indeed, some studies revealed that patients trust the information they retrieve online and only half of them consult with their physicians about the information obtained this way (Hayati & Dehghan, 2012; Kaicker et al., 2010). It is unclear how health information on the internet affects the patient-physician relationship, the cornerstone of good medical care (Murray et al., 2003). As such, it is highly plausible that the information derived from this study can serve to better inform the decision-making process of the health promotion experts who address the impact of eHealth literacy on adults (40 years and older) experiencing one or more chronic diseases, their relationships with their providers, and their adherence to medication.

Elements

Theories

Social Learning Theory of Personality and Locus of Control. The construct of interest to the investigator of this dissertation study is LOC. LOC is a personality construct that has been studied extensively in a wide variety of settings (Spector, 1988). LOC reflects one's belief or perception about who controls life and the environment (Lefcourt, 2014). The cognitive

processes used to identify and find solutions are largely dependent upon the person's perception of the amount of personal control they have over their environment (Pannells & Claxton, 2008). Rotter (1966) suggested that this perception of personal control or LOC, could be best explained as the degree to which an individual develops the expectancy that their behavior is associated with either internal or external reinforcements. In other words, a person with an internal LOC believes that his or her rewards in life are guided by their own decisions and efforts. If the individual does not succeed, they believe it is due to their own lack of effort (April et al., 2012; Zimbardo & Gerrig, 2004). A person with an external LOC sees their life as being controlled by luck, chance, or other people, especially others with more power than them. If they do not succeed, they believe it is due to forces outside their control (April et al., 2012; Zimbardo & Gerrig, 2004).

How much an individual believes that they can control what happens in their lives is a core element of understanding how they live (Shapiro et al., 1996). The importance of belief in control over events, especially health-related events, may further explain an individual's motivation in seeking out information about their health via the internet/web. The individual seeking information must feel capable of seeking out the desired health information via the internet, especially if they have been exposed to conflicting information from a health provider. The risk of confirmation bias exists from patient exposure to online information confirming existing beliefs and evaluations of health information (Meppelink et al., 2019). Conflicts or arguments can occur when patients' online findings do not align with physicians' diagnoses or treatments (Sommerhalder et al., 2009), which would raise serious concerns about patient trust in their physicians and satisfaction at their medical appointment (Ahluwalia et al., 2010; Helft et al., 2003). For the purposes of this dissertation study, the investigator used the Multidimensional

Health Locus of Control Scale (a health-specific version of Rotter's 1966 I-E Scale) to analyze if LOC mediates the relationship between the eHEALS score of the participants in the dataset used in this dissertation study and (a) trust in their physician, (b) attitudes towards their providers, and (c) adherence to their medication.

Research Goal

The goal of this research is to assess the extent to which the eHEALS scores from persons 40 years and older are associated with (a) trust in physicians as measured by the Wake Forest Physician Trust Scale, (b) attitudes towards providers as measured by the Attitudes Towards Health Care Providers Scale, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions. The goal of this dissertation study is achieved through the following objectives:

(a) To determine if there is a relationship between eHEALS and (a) trust in physicians as measured by the Wake Forest Physician Trust Scale, (b) attitudes toward providers as measured by a modified version of the Attitudes Towards Health Care Providers Scale, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions.

(b) To determine if LOC, as measured by the Multidimensional Health Locus of Control Scale, mediates the relationship between (a) eHEALS and trust in physicians as measured by the Wake Forest Physician Trust Scale, (b) attitudes toward providers as measured by the modified version of the Attitudes Towards Health Care Providers Scale and, (c) adherence to medication as measured by the Gonzalez and Lu adherence questions.

In order to validate the inferences that emerge from this dissertation study, demographic variables including age, gender, race, ethnicity, income, and education were assessed to understand what role they play in eHEALS, trust in physicians, attitudes towards providers, and adherence towards medication among participants, and if warranted, included as covariates in statistical analyses.

Research Questions and Hypotheses

This dissertation study sought to answer the following research questions to better understand if there is a relationship with eHEALS, trust in physicians, attitudes towards providers, and adherence towards medication among participants 40 years and older.

1. Is there a relationship between eHEALS and trust in physicians as measured by the Wake Forest Physician Trust Scale?
    - H1: There is a relationship between eHEALS and trust in physicians.
2. Is there a relationship between eHEALS and attitudes towards providers as measured by the modified version of the Attitudes Towards Health Care Providers Scale?
    - H2: There is a relationship between eHEALS and attitudes towards providers.
3. Is there a relationship with eHEALS and self-reported adherence to medication as measured by the Gonzalez and Lu adherence questions?
    - H3: There is a relationship between eHEALS and adherence to medication.
4. Does LOC mediate the relationship between eHEALS and the variables trust in physicians, attitudes towards providers, and adherence to medication?
    - H4: LOC mediates the relationship between eHEALS and trust in physicians, attitudes towards providers, and adherence to medication.
5. Are race, age, gender, ethnicity, education, and income related to eHealth Literacy?

- H5: Race, gender, ethnicity, education, and income are related to eHealth Literacy.

Definition of Terms

Chronic Disease and Adults

Chronic diseases are defined in accordance with the definition provided by the Centers for Disease Control and Prevention (2021) as a condition that lasts 1 year or more requiring ongoing medical attention or limiting activities of daily living or both. For the purposes of this dissertation study, adults are defined as participants 40 years and older.

Health Literacy Defined by the eHEALS

For the purpose of this dissertation research study, the investigator uses the eHEALS as the measure of eHealth literacy. The eHEALS is an 8-item measure of eHealth literacy developed to measure consumers' combined knowledge, comfort, and perceived skills at finding, evaluating, and applying electronic health information to health problems (Norman & Skinner, 2006a). Electronic health resources are helpful only when people are able to use them, yet there remain few tools available to assess consumers' capacity for engaging in eHealth (Norman & Skinner, 2006a). Participants rated their skill on each of the measure's 8 items on a 5-point Likert scale. The sum across the eight equally-weighted items is presented as a score out of 40 (Richtering et al., 2017). For the purposes of this dissertation study, there is no fixed cut-off to distinguish high from low eHealth literacy, and it assumed that high scores reflect a high level of eHealth literacy (Noblin et al., 2012).

Locus of Control Defined by the Multidimensional Health Locus of Control Scale

LOC is the degree to which an individual believes that their behavior is controlled by external or internal factors (Kuwahara et al., 2004). LOC has been recognized as an important

construct in understanding and predicting health behaviors (Malcarne et al., 2010). For the purpose of this dissertation study research, the Multidimensional Health Locus of Control Scale will be used as the measure of LOC. The Multidimensional Health Locus of Control Scale has been one of the most effective measures of health-related beliefs for more than a quarter of a century (Moshki et al., 2007). The Multidimensional Health Locus of Control Scale includes 18 items and consists of three subscales, namely Internal Health Locus of Control, Powerful Others Health Locus of Control, and Chance Health Locus of Control (Moshki et al., 2007). Each of these subscales contains six items with a six-point Likert response scale ranging from *Strongly Agree* to *Strongly Disagree*. Scales are scored by summing respective items for a total scale score (Wallston et al., 1978). Higher scores on both the Powerful Others and Chance subscales represent a more External Health Locus of Control and lower scores on the Powerful Others and Chance subscales indicate a more Internal Health Locus of Control (Wallston et al., 1978). Cross et al. (2006) made the assumption that individuals with above median scales scores demonstrated personal responsibility for their health (Internal Health Locus of Control) and were better able to perform behaviors akin to maintaining good health. Researchers should exercise an abundance of caution when interpreting LOC data as internality and externality are not opposite ends of a spectrum. It is possible to have both internal and external beliefs about health status at the same time (Cross et al., 2006).

Attitudes Towards Provider Defined by the Attitudes Towards Health Care Providers Scale

For the purposes of this dissertation study, a modified version of the Attitudes Toward Health Care Providers Scale will be used to measure the participants' attitudes towards their providers. Patients' Attitudes Towards Health Care Providers Scale (ATHCPS) is a 19-item scale that measures patients' attitudes towards providers. Individual items from the ATHCPS were

scored using a six-point Likert-style rating system ranging from *strongly agree* to s*trongly disagree* (Bodenlos et al., 2004). Several studies have suggested that patients' attitudes toward their health care providers affect certain health behaviors, for example adherence to medication (Heckman et al., 2004; Roberts, 2002). According to Bodenlos et al. (2004), items on the scale were positively and negatively worded, and (with a median score of 99.52 out of 114) higher scores indicated more positive attitudes toward HIV health care providers. For the purposes of this dissertation study, the ATHCPS was modified to make it a more generally relevant scale inclusive of chronic and/or other diseases.

Trust in Physicians Defined by the Wake Forest Physician Trust Scale

For the purposes of this study, trust in physicians was measured by the Wake Forest Physician Trust Scale. The scale, sometimes known as the Interpersonal Trust in Physician Scale, was developed by Hall, Camacho, et al. (2002) to measure levels of patient trust in primary care providers. In this dissertation study, the scale will be termed the Wake Forest Trust in Physician Scale, WFTIPS. The WFTIPS asks participants to indicate their trust in their physician on a 10-item scale scored on a 5-point-Likert scale from *totally agree* = 1, to *totally disagree* = 5 (Bachinger et al., 2009). Trust is a defining element in any interpersonal relationship, which is particularly central to the patient-physician relationship (Kao, 1998; Mechanic & Schlesinger, 1996), and trust in one's physician is generally associated with satisfaction with the physician, adherence to treatment, continuity of care, delayed care, unmet care needs and health outcomes (Berrios-rivera et al., 2006; Safran et al., 1998).

Adherence to Medication Defined by the Gonzalez and Lu Questionnaire

For the purposes of this study, adherence to medication is measured by the self-report Gonzalez and Lu questionnaires used in self-reported medication adherence assessment.

Measurement of adherence is a complex task because patients could adhere differently to different drug regiments (Gardner et al., 2008). According to Lu et al. (2008), their self-reported adherence instrument, which uses a six-step scale ranging from *very poor* to *excellent*, has been validated in HIV-positive patients, and it measures patients' average ability to take their medication as prescribed. If a patient scores low on the scale he or she is presumed to be struggling with adherence, and if a patient scores high on the scale, then they are evaluated as more adherent (Lu et al., 2008). The findings from the Gonzalez et al. (2013) study support the validity of easily administered self-reported measures similar to the Lu et al. (2008) study used to assess medication adherence in adults with type 2 diabetes.

Description of Variables

Establishing a functional relationship between the independent and the dependent variable is a primary focus of behavioral analysis. Accurate and reliable description and observation of both the independent and dependent variables are necessary to achieve this goal (Peterson et al., 1982). The independent variable is the variable the researcher changes or controls, which is assumed to have a direct effect on the dependent variable (McLeod, 2019). For the purposes of this dissertation study, the independent variable is eHealth literacy as measured by the eHEALS. Thus, the dependent variable is the variable being tested and measured in the study, and it is dependent on the independent variable (McLeod, 2019). In this dissertation study, there are three dependent variables: (a) trust in physicians as measured by the WFTIPS, (b) attitudes toward providers as measured by the modified version of the ATHCPS, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions. Finally, the mediating variable LOC is measured by the Multidimensional Health Locus of Control Scale.

Rationale

One in ten Americans is living with at least one chronic disease, (e.g.,. heart disease, stroke, cancer, diabetes, among others that are leading causes of death and disability in the US, (Centers for Disease Control and Prevention, 2020), and the self-management of chronic conditions creates considerable burden for patients (O'Leary et al., 2015). The availability and accessibility of health-related information on the internet is an issue, and an agreement of a specified set of quality standards for health websites has recently been proposed as a public health priority (Devine et al., 2016). Also, the problem of providing quality health-related information has become even more complex in the current Web 2.0 environment (Eysenbach, 2008). In recent years, eHealth literacy became increasingly relevant with the development of eHealth tools to support healthcare delivery and management (Chesser et al., 2016; Chung & Nahm, 2015; Tennant et al., 2015). Carpenter et al. (2013) argued physicians, the media, and the internet proved to be the most common sources of conflicting patient health information. Furthermore, conflicting medication information was significantly associated with worse medication adherence. There is a need to establish whether or not a relationship exists with the variables (a) eHEALS and trust in physicians, (b) eHEALS and attitudes towards providers, (c) eHEALS and adherence to medication, and (d) if LOC acts as a mediator in the relationship between eHEALS and trust in physicians, attitudes towards providers, and adherence to medication. The establishment of any relationship(s) between the variables will add to the current knowledge base on the eHEALS, trust in physicians, attitudes towards providers, adherence to medication, and LOC.

eHEALS provides a measure of an individual's self-perceived skill in using information technology for health purposes. Initially, the eHEALS focused principally on individuals 25 years of age and younger (Norman & Skinner, 2006a). Previous studies found eHEALS to be a

reliable and easy to use self-report tool (Brown & Dickson, 2010; Robinson & Graham, 2010) that has been adapted in multiple languages (Koo et al., 2012; Mitsutake et al., 2011). Britt and Hatten (2013) argued despite their eHEALS research study being exclusively focused on young adults in their twenties, there was a strong need for continued eHEALS research in the adult parent population of college students. As such, the investigator in this dissertation study seeks to examine secondary data consisting of a sample population of adults 40 years and older experiencing one or more chronic diseases and low levels of health literacy. Sedrak et al. (2020) argued that patients recently diagnosed with cancer over the last 5 years are more likely to seek health information online, and even after adjustment for age these patients may still have a greater need for digital health resources. Sleath et al. (2003) found patients who sought information from a greater number of sources were more adherent to their antihypertensive medications than were patients who sought information from fewer sources. Furthermore, Norman and Skinner (2006a) argued that health practitioners, eHealth developers, and researchers alike need to know if electronic health tools are suitable methods for effectively promoting population health and aiding health care.

Assumptions

The investigator of this dissertation study makes that assumption that the study design (cross sectional) is appropriate to answer the hypotheses; (a) there is a relationship with eHEALS and trust in physicians as measured by the WFTIPS, attitudes toward providers as measured by the modified version of the ATHCPS, and adherence to medication as measured by the Gonzalez and Lu adherence questions in the study population of adults (40 years and older) with a chronic disease; and (b) LOC mediates the relationship between eHEALS, and the variables trust in physicians, attitudes towards providers, and adherence to medication. There is also the

assumption that a selected sample size for this dissertation study is sufficient to satisfy the study questions undertaken and that selection bias will have no effect on the sample size.

The investigator of this study makes the assumption that the instrumentation and sourcing of data to be used in this dissertation study was conducted in a manner reflective of scientific rigor. Instrumentation becomes a threat when the questionnaires used to collect data do not appropriately address answering the construct for which they were designed. The assumption is made that the interviewers who collected the data for the study did not deviate from the assigned study protocol nor did they introduce priming as a bias when collecting the data. There is also the assumption that when the data were collected that researchers made every effort to not influence the responses of the participants (consciously or unconsciously) by allowing the participants to know the purpose of the study.

Summary

As more people become familiar with the use the internet in their daily lives, it is quickly becoming the norm for people in the US to conduct internet research for information relating to healthcare and disease. This is often the case whenever people desire quick answers to problems relating to personal care for themselves or loved ones in their care. This chapter establishes a statement of the problem, which indicates that there has been increased usage of the internet for health research among all age groups, especially those who are most vulnerable to a chronic health condition. The chapter also establishes that a plausible relationship may exist between eHealth literacy in the population of interest (40 years and older experiencing at least one chronic disease) and attitudes towards providers, trust in physicians, and adherence to medication. However, these relationships were not adequately researched nor addressed in the available literature, neither was the effect of a mediating variable (i.e., LOC) on these

relationships. The significance of the proposed dissertation study, the research question, the definition of terms, assumptions about the study design, sample size, and the assurance that all the study materials used for the dissertation study were collected and conducted with the strictest of scientific rigor.

Chapter 2: Review of the Literature

Introduction to the Chapter

The purpose of this literature review is to gain an understanding of the current state of research literature available, and to provide a critical written account relating to the research questions (a) Is there a relationship between the eHEALS and trust in physicians as measured by the WFTIPS?; (b) Is there a relationship between the eHEALS and attitudes towards providers as measured by the modified version of the ATHCPS?; (c) Is there a relationship between the eHEALS and adherence to medication as measured by the Gonzalez and Lu adherence questions?; (d) Does LOC mediate the relationship between eHEALS, and the variables trust in physicians, attitudes towards providers, and adherence to medication?; (e) Are race, age, gender, ethnicity, education, and income related to eHealth Literacy? Although literature exists on the individual topics and variables of eHealth literacy, trust in physicians, patient attitudes towards providers, adherence to medication, and LOC, none to date have fully explored the relationships between all these variables. This literature review sought to identify what is known or unknown about the relationships between eHEALS and the (a) WFTIPS, (b) ATHCPS, and (c) Gonzalez and Lu adherence questions, and the construct LOC. This literature review included several studies conducted by peer-reviewed scholars in the fields of medicine, public health, psychology, and psychiatry. Examples of work cited in this literature review included that of Norman and Skinner (2006a), which examined the fundamentals of the eHEALS, and that of Rotter (1966), which examined the construct LOC. Most of the peer-reviewed research studies examined for this review included the use of questionnaires, bivariate analysis, factor analysis, and regression modeling, among other instruments and measures.

Historical Overview

Health literacy is defined as the degree to which an individual has the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions (Britt & Hatten, 2013). Today, the relationship between poor literacy skills and health status is better recognized and understood (Nutbeam, 2008). The growing awareness of the relationship between health literacy and health outcomes leads to a range of responses that mitigate the negative effects of ignorance on healthcare issues (Nutbeam, 2008). For example, the rapid rise of internet-based technologies that disseminate health information and services encouraged the use of and acquisition of health information online (Tse et al., 2008; Zhang et al., 2017). Additionally, the concept of eHealth literacy drew the attention of researchers as a condition for utilizing health information and services (Cline & Haynes, 2000; Tse et al., 2008). Weiner (2012) argued this digital revolution will have an impact on how physicians and healthcare systems interact with patients. Given the aforementioned literature, the investigator of this dissertation study seeks to understand if eHealth literacy rates impact the patient-provider relationship. Throughout the body of the literature there are a number of different perspectives on the relationship between eHealth literacy and patients' attitudes towards their providers, trust in their physicians, and adherence to physician-recommended medications. There is also the need to further investigate if another variable mediates the typical relationship between the provider and the patient. As such, SLT and the construct LOC as proposed by Rotter (1966) were most relevant in answering the question of mediation between eHealth literacy rates and patients' attitudes towards their providers, trust in their physicians, and adherence to physician-recommended medications.

Relevant Theory

Social Learning Theory of Personality and Locus of Control

SLT was the stimulus for thousands of studies investigating a wide range of human behavior including personal adjustment and academic achievement (Marshall & Brown, 2004). SLT hypothesized that various behaviors become functionally related (lead to the same or equivalent goals) through a process of learning and generalization (Liverant, 1958). SLT proposed that human behavior can be predicted by two general factors: (a) the expectancies people have that if they behave in a certain way they will be rewarded, and (b) how much they value the reward they are attempting to acquire (Lefcourt, 1981; Rotter, 1954). The cognitive processes used to identify the need for a solution and finding that solution are largely dependent upon a person's perception of the amount of personal control they have (Pannells & Claxton, 2008).

One of the most important and well-researched expectancies within this theory is called LOC (McLeod et al., 2015). The term *locus* refers to the location where control resides either internally to the individual or externally to the individual (Moshki et al., 2007). LOC reflects the extent to which people see a connection between what they do and what happens to them (McLeod et al., 2015). LOC is defined as a generalized expectancy that rewards, reinforcements, or outcomes in life are controlled either (internality) by one's own actions or (externality) by other forces (Spector, 1988). In other words, when an event is perceived as not being entirely contingent upon personal action, but rather by some form of luck or faith, this belief is termed as external control (Rotter, 1966). On the other hand, if the person perceives the event to be contingent upon their own behavior or relatively permanent characteristics, then this belief is termed as internal control (Rotter, 1966).

Multidimensional Health Locus of Control Scale. Of all the complex determinants of health behavior, one's beliefs about one's health received the greatest attention (Wallston, 1992). Foremost among those beliefs were cognitions regarding control over health (Wallston et al., 1987). Wallston et al. (1978) successfully applied Rotter's ideas to the health domain. The authors developed a unidimensional Health Locus of Control Scale, which they began to use in studies throughout the 1970s (Wallston, nd; Wallston et al., 1978). The results from earlier studies with the unidimensional Health Locus of Control Scale convinced Ken Wallston, PhD, that internality and externality were separate dimensions (Moshki et al., 2007). In particular, the researcher Levenson posed serious questions about the conceptualization of the LOC unidimensional nature as a construct (Levenson, 1974a). Levenson argued for separate measurements of internal control and external control via the Chance and Powerful Others subscales (Levenson, 1974a). Levenson developed three 8-item Likert-type scales (Internal, Powerful Others, and Chance-I, P, & C) to measure the generalized LOC beliefs and demonstrated initial evidence of their discriminant validity (Levenson, 1974b).

Wallston et al. (1978) subsequently developed the Multidimensional Health Locus of Control Scales, which consisted of two equal and parallel forms, A & B, which were the "general" health locus of control scales. Wallston et al. (1994) developed Form C of the Multidimensional Health Locus of Control Scales in which they split the Powerful Others dimension into two subscales: Doctors and Other People. Finally, Wallston et al. (1999) added a new subscale assessing beliefs about God as a LOC of one's health status. Alpha reliabilities for the Multidimensional Health Locus of Control Scales (six-item scales forms) ranged from .673 to .767 and, when Forms A & B were combined into 12-item scales, the alpha reliabilities increased (.830 to .859). These figures compared quite favorably to Levenson's 8-item I, P, and C scales'

alpha reliabilities = .508 to .733 (Wallston et al., 1978).

Relevant Concepts

Electronic Health Literacy. The term eHealth or electronic health was widely used to encompass a set of disparate concepts such as online health management (Ghaddar et al., 2011) and information searching (Neter & Brainin, 2012). eHealth literacy is defined as the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem (Chesser et al., 2016). Norman and Skinner 2006(b) argued eHealth literacy consists of six types of core skills and these skills are broadly divided into 2 categories: (a) Context-specific literacy and (b) Analytic literacy.

According to Norman and Skinner (2006b) context-specific literacy consists of:

(a) Computer literacy—familiarity with basic computer terms like webpages, email, the mouse, screen, and one's ability to use the computer to solve basic problems.

(b) Science literacy—This includes familiarity with scientific term, the process of discovery, research applicability, and understanding research and scientific limitations.

(c) Health literacy—This includes but is not limited to familiarity with basic health definitions and understanding directions on medication labels and follow through on self-care directions.

According to Norman and Skinner (2006b) Analytic-specific literacy consists of:

(a) Traditional literacy and numeracy—This includes the ability to read simple language, perform basic mathematic functions, and understand simple charts.

(b) Media literacy—This includes being able to understand the influence of media bias and being able to discern the social and political context of information

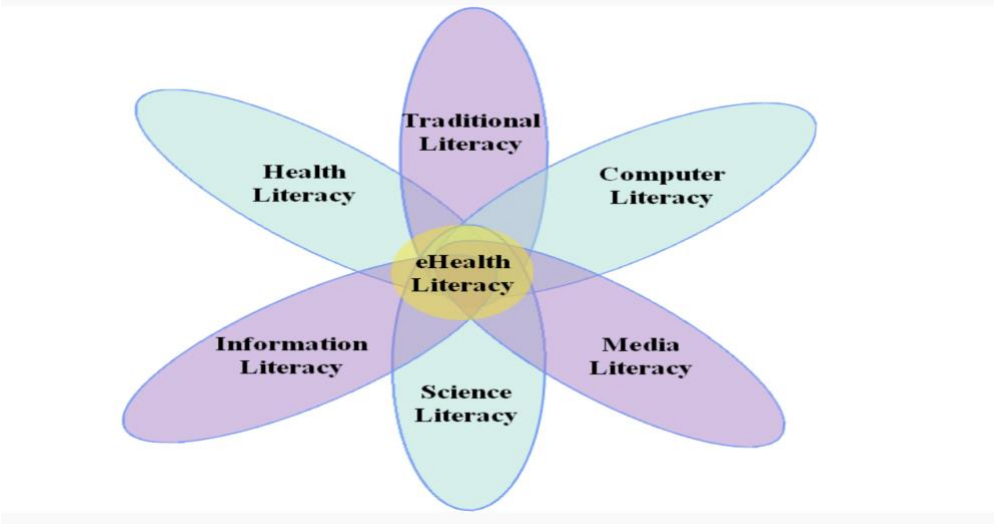
presented by the media.

(c) Information literacy—This includes the ability to make use of and consult appropriate resources for information, correct use of search strategies and terms to filter and extract information.

Norman and Skinner (2006b) elaborated on the construct eHealth literacy using the diagram of the lily model (see Figure 1).

Figure 1

eHealth Literacy Lily Model



Note. From "Ehealth Literacy and Web 2.0 Health Information Seeking Behaviors Among Baby Boomers and Older Adults" by B. Tennant, M. Stellefson, V. Dodd, B. Chaney, D. Chaney, S. Paige, and J. Alber, 2015, *Journal of Medical Internet Research, 17*(3), e70 (https://doi.org/10.2196/jmir.3992)

The individual six literacies are represented as petals on a lily, and the center represents the eHealth literacy, or the pistil of the lily. According to Norman and Skinner (2006b, "The Lily Model," para. 1) "the petals (literacies) feed the pistil (eHealth literacy), and yet the pistil overlaps the petals, tying them together." Internet access, the use of electronic provider communication, and management of individual health are recommended approaches for

obtaining health information and managing individual health in the twenty first century (Gutierrez et al., 2013). In the last decade, eHealth literacy has attracted the attention of the scientific community, as it is associated with the self-management of patients with chronic diseases and the quality and cost of care (Efthymiou et al., 2017).

To find and understand the information they need online, individuals must have the appropriate knowledge and skill sets to accomplish those tasks (Chung & Nahm, 2015). Norman and Skinner (2006b) argued that understanding eHealth literacy is dependent on one's basic reading and writing skills. According to Berkman et al. (2011), individuals with limited health literacy may have less knowledge about their health problems, higher hospitalization rates, higher health care costs, and worse health status than people with adequate literacy. The theoretical grounding and measurement of eHealth literacy has been challenged partially due to the development of social media and users' increasingly versatile approach to information-finding and problem-solving (Norman, 2011b). As such, it is crucial for individuals to develop eHealth literacy skills to better understand, evaluate, and use the health-related information that is disseminated online (Jensen et al., 2010; Sarkar et al., 2010).

Electronic Health Literacy Scale

New measures, such as the eHEALS (Norman & Skinner, 2006a), emerged as a response to the growing need for examining eHealth literacy. The instrument is an 8-item measure of eHealth literacy ($\alpha = .93$) to measure users' knowledge, comfort, and skills at finding, evaluating, and using electronic health information (Norman & Skinner, 2006a). At the time of its development, the eHEALS was explicitly conceived so that it would have been easy to administer, taking into consideration the expressed needs of health professionals who were apprehensive about using long instruments in their practice (Norman, 2011a). The eHEALS

reliably and consistently captures the eHealth literacy concept in repeated administrations, showing promise as tool for assessing consumer comfort and skill in using information technology for health (Norman & Skinner, 2006a). This “strength in simplicity” facilitated the adoption of the eHEALS, and its widespread use has been highlighted in the findings of several literature reviews (Del Giudice et al., 2018). The scale aims to measure an individual's perception of their knowledge and skills in relation to using electronic health information and determine whether an eHealth approach is suited to the individual (Del Giudice et al., 2018 ; Norman & Skinner, 2006a). Internal consistency of the eHEALS was assessed with Cronbach’s α coefficients for the overall scale as well as each subscale. An α of .7 or more was considered to be evidence of reliability (Nunnally & Bernstein, 1994). Stability of the measure was tested using a paired t-test analysis with eHEALS scores of the control group measured at baseline and 8 weeks (Chung & Nahm, 2015). Although the eHEALS is often used without due consideration of its validity and reliability (Sudbury-Riley et al., 2017), van der Vaart (2011) argued the internal consistency of the eHEALS was $\alpha = .92$, which can be interpreted as a good measure of internal consistency. Paige et al. (2017) argued that the results of their study suggest that eHEALS scores among patients living with chronic disease were reliable and representative of the construct of eHealth literacy.

The Internet and Attitudes Towards Providers

A health care provider is a doctor of medicine or osteopathy, podiatrist, dentist, chiropractor, clinical psychologist, optometrist, nurse practitioner, nurse-midwife, a clinical social worker authorized to practice as defined by State law, or a Christian Science practitioner (University of California, n.d.). Individuals who live with chronic disease are considered unique online health information seekers, because they are searching for specialized and sometimes

sophisticated health information that will help them to learn as much as possible about their condition (Paige et al., 2017). Health-related websites have the potential to powerfully influence the attitudes and behavior of patients towards their health care providers (Turan et al., 2015). According to McMullan (2006), the percentage of adults who accessed the internet to look for health information has rapidly increased over the last decade. Ybarra and Suman (2006) noted internet health information seekers are more likely to have health concerns and adult seekers are more likely to rate themselves as having poor health status. However, McMullan (2006) argued the accessing of vast amounts of health information via the internet raises the concern that patients can misunderstand the information or become lost in its complexity.

A study conducted in the US indicated that the majority (91%) of internet users search the internet for medical information about a specific condition for themselves and for others, rather than for information about healthy lifestyles or healthcare services (Fox & Rainie, 2000). Traditionally, health professionals were the main providers of information to patients regarding their diagnosis, prognosis, and treatment options. Until recently, many health professionals felt that patients were unable to cope with bad news and should be kept ignorant of many details of their illness (Coulter, 1998). Patients appear to be no longer satisfied with that notion and as such they want to be fully informed and be a part of treatment decisions (McMullan, 2006). Providers and researchers have raised questions about whether access to health information online will enhance, replace, or impede one's medical care (Cline & Haynes, 2000). Indeed, some may be concerned that information on the internet holds weight with consumers when compared to information from health care providers (Ybarra & Suman, 2006). However, Murray et al. (2003) found that health information on the internet had more of a positive effect than a negative effect on the patient-physician relationship. According to Kim et al. (2018), 18 empirical studies

examined the implications of patients' internet health information seeking behavior and found that most patients did not perceive their internet health information-seeking activities had adversely impacted their patient-physician relationship. Several studies suggested patients' attitudes toward their health care providers affect certain health behaviors (Heckman et al., 2004; HIV Research Network, 2002; Roberts, 2002).

Attitudes Toward Healthcare Providers Scale

Health care providers in medical settings play an important role in the management of diseases (Bodenlos et al., 2007). For the purpose of this dissertation study the Attitudes Toward HIV Health Care Providers Scale (AHHCP) is referred to as the ATHCPS, which is a functional tool that can be utilized in a clinical setting. The AHHCP began with an initial set of 19 items generated from topics discussed in review articles examining patients' relationships with health care providers (Holzemer et al., 1999; Murphy et al., 2000). According to Bodenlos et al. (2004), individual items from the AHHCP were scored using a 6-point Likert style rating system (ranging from *strongly agree* to *strongly disagree*). Internal consistency was evaluated for the total scale and each of the two factors of the AHHCP by computing Cronbach α for the sample. Professionalism Scale was 0.87, and Emotional Support Scale was 0.89 (Bodenlos et al., 2004). Intercorrelations between the AHHCP factors and the ATHCPS Total Scale were calculated using Pearson Product-moment correlations. Values ranged from 0.72–0.95 and were all significant $p < 0.01$ (Bodenlos et al., 2004).

The Internet and Trust in Physicians

According to Merriam Webster Dictionary (2020), a physician is a person skilled in the art of healing, specifically one educated, clinically experienced, and licensed to practice medicine as usually distinguished from surgery. The central importance of trust in medical

relationships has long been recognized (Mechanic, 1996; Parsons, 1951). It promotes improved patient quality of life, adherence to treatment, satisfaction with care, greater use of preventive clinical services, and better health outcomes (Hall, Camacho, et al., 2002; Thom, 2002). According to Luhmann (1988), trust is the glue that holds everything together in social life because it reduces the complexity of how individuals think about the world around them. Patients who trust their physicians are more likely to report being satisfied, and previous good encounters are likely to foster greater trust (Hall et al., 2001).

Thom et al. (2004) argued that a patient who trusts their provider is more likely to seek care and comply with treatments compared to a patient who does not. According to Hart et al. (2004) most patient participants mentioned that they would go to a known health-care practitioner first to discuss a health issue, rather than use any other source, including those to be found on the internet. Gerber and Eiser (2001) argued that if health practitioners with poor information technology skills do not improve their information technology literacy then they may find themselves consistently defending their "expert opinions" in heated moments of consultations. Indeed, Hart et al. (2004) noted it was far more common in their study for health practitioners to view the internet as having profoundly negative powers and expressed the concern that the internet use would encourage patients to challenge their medical authority. Holmes (2002) suggested it may be hypocritical of physicians who argue about patient wellbeing and their internet use. He argued that this concern is merely an effort to protect fragile egos and competence in matters of health. Some researchers have suggested that engagement with internet health information increases a person's levels of medical and health knowledge, thus boosting their comfort participating in their healthcare (Benigeri & Pluye, 2003; Shaw et al., 2006).

Wake Forest Trust in Physician Scale

Researchers' interest in medical trust is burgeoning in the US (Hall, 2006), and researchers have few instruments to measure patients' trust that have been developed and assessed with scientific rigor and are available to measure patient trust (Pearson & Raeke, 2000). The Trust in Physician Scale was published in 1990, when the US experienced a new push for systematic research on patients' trust in their physicians (Hall et al., 2006; Safran et al., 1998). Hall, Zheng, et al. (2002) argued previous conceptualizations of "trust" were inconsistent from existing questionnaires, the initial item candidate pool was very small, the questionnaires were tested on specialized populations only, and no questionnaire had ideal psychometric properties. Therefore, they developed the WFTIPS using former questionnaires and research (Bachinger et al., 2009), and the WFTIPS was developed to measure levels of patient trust in primary care providers (Hall et al., 2006).

According to Hall et al. (2001), the WFTIPS asks participants to indicate their trust in their physician on 10 items scored on a 5-point-Likert scale (*totally agree* = 1, to *totally disagree* = 5). The advantage of using the WFTIPS is that it has good internal consistency ($\alpha = .93$), a good test-retest reliability ($r = 0.75$) and the distribution of the questionnaires is less skewed than that of other questionnaires (Hall, Zheng, et al., 2002). The WFTIPS is now frequently used for trust as researched by Hall and colleagues (Balkrishnan et al., 2003).

Internet and Adherence to Medication

Adherence is defined as the extent to which the patient's behavior matches the agreed recommendations of the prescriber, but the concept of nonadherence varies widely from missing an occasional dose to never taking the prescribed medications (Kane & Robinson, 2010). In the US, medication nonadherence is a significant health risk (Linn et al., 2011), a public health

problem among chronic patients (Zwikker et al., 2014) with an associated cost estimated at $100–$300 billion annually (Madden et al., 2008). Also, it is estimated that approximately 30% to 50% of US adults are not adherent to long-term medications (Marcum et al., 2013). Poor adherence compromises the effectiveness of a treatment and results in suboptimal illness control (Linn et al., 2018). Media sources such as the internet are common sources of conflicting information for patients, and even more dire is the fact that conflicting medication information is associated with worse medication adherence (Carpenter et al., 2013). As the number of patients who use the internet for health information continues to grow, conflicting information could become an even greater issue (Carpenter et al., 2013), especially when online health information is often inaccurate, inappropriate, or not updated (Carpenter et al., 2011; Langille et al., 2010). At the same time, the use of internet-based interventions to improve medication adherence has increased rapidly (Linn et al., 2011).

In addition to their provider, many patients use the internet as an additional source of information (Feathers et al., 2016). However, information from the internet might be biased especially if a website is owned by an organization that has a vested interest such as trying to promote a particular product (Langille et al., 2010). Equally important is the notion that conflicting medication information can come from trusted sources such as physicians (Carpenter et al., 2013). This is likely to confuse patients and may potentially lead to misunderstanding, negative beliefs about medication, and consequently, negative health behaviors such as lower medication adherence (Feathers et al., 2016).

Gonzalez and Lu Questions

In some cases, published self-reported adherence questionnaires are often specific to a disease area or treatment (Mannheimer et al., 2006; Thompson et al., 2000). Indeed, only a few

published questionnaires take into account the fact that patients may adhere differently to multiple medications (Sidorkiewicz et al., 2016). H. Liu et al. (2001) developed a self-reported adherence instrument to be completed by patients for medication adherence using a 6-point Likert scale of the qualitative self-rating items (0, 20, 40, 60, 80, and 100) ranging from *very poor* to *excellent.* Although the scale does not distinguish between different medicines taken at the same time (Garfield et al., 2012), the scale has been validated in 156 HIV-positive patients and measured their average ability to take medication as prescribed (Lu et al., 2008). According to Sidorkiewicz et al. (2016) the scale showed good temporal stability (test-retest), there was good convergent validity with the Morisky Medication Adherence Scale of 4 items (Morisky, Green, & Levine, 1986) and the Lu self-reported adherence instrument (Lu et al., 2008), and there was significant agreement with the adherence evaluations conducted by their physicians.

One of the drawbacks of the Lu ratings is that they were not designed to distinguish between low and zero adherence from patients (Garfield et al., 2012). High was equal to perfect adherence (100%, excellent, taking medication all the time), medium was very good but not perfect adherence (80-< 100%, taking medication most of the time) and all other levels of adherence were classified as low (Garfield et al., 2012; Lu et al., 2008). The questionnaire developed by Lu et al. (2008) to assess adherence to antiretroviral medications was adapted by Gonzalez et al. (2013) to assess adherence to oral diabetes-related medications. As in the Lu et al. (2008) study, participants were asked to respond their medication adherence over the past month (Gonzalez et al., 2013). Whereas Lu et al. (2008) showed qualitative self-ratings to be more accurate than self-reports in predicting Medication Event Monitoring System adherence, Gonzalez et al. (2013) found that percentage-based self-ratings were most strongly associated with Medication Event Monitoring System adherence. Similar findings from the Gonzalez et al.

(2013) study support the validity of easily administered self-report measures in assessing medication adherence in adults with type 2 diabetes.

Relevant Contexts

This is a cross-sectional dissertation study design of adults 40 years and older that examines the relationship with eHealth literacy and three factors (trust in physicians, attitudes towards providers, and adherence to medication in adults). This study design reviews secondary data, which provide a snapshot of what is actually taking place in the sample population at any given time (Hemed, 2017). As such, this study does not permit causal inferences of the relationship between variables reviewed. eHealth literacy is a relatively new field of study that was first introduced to the world of psychometrics by Norman and Skinner in 2006. To date, very little if any research has been embarked on the eHEALS and the adult population. Indeed, Norman and Skinner (2006a) developed the eHealth literacy scale (eHEALS) based on young users (aged < 25 years), which was defined as their ability to read, use computers, search for information, and understand health information. Additionally, research into LOC as a mediating factor affecting the relationships between eHealth literacy and (a) trust in physicians, (b) attitudes towards providers, and (c) adherence to medication has yet to be explored in adults 40 and over. Indeed, longitudinal studies are needed to enable reliable inferences about the directionality of any associations that are found in the data, and there is the risk of recall bias as this is a cross-sectional study design based on patients' self-reported assessments of exposure and outcome.

Summary of the Literature

It has become a common practice for patients to use search engines such as Google to find out about medical treatment and health conditions (Pittet et al., 2014). Thus, a theoretical

and practical appreciation of the eHEALS (dependent on one's basic reading and writing skills) is critical to understanding if any potential relationship exists between eHealth literacy and patient (a) attitudes towards their providers, (b) relationship with physicians, and (c) adherence to their medication. Additionally, investigating the role of confounding variables such as age, race, gender, education, income, and so forth in these relationships may be just as important. It is evident from Rotter's 1966 Social Learning Theory of Personality, which defines LOC as the generalized expectancy of rewards, reinforcements or outcomes in life controlled either by one's own actions (internality) or by other forces (externality), may be an important variable in these relationships. The plausibility of Rotter's 1966 construct LOC having a mediating effect upon the relationship between eHEALS and (a) attitudes towards providers, (b) relationship with physicians, and (c) adherence to medication is worth exploring especially among persons displaying at least one or more chronic diseases.

Chapter 3: Methodology

Introduction to the Chapter

This chapter outlined the proposed method to investigate the research questions, a description of the research study design, the methods of data collection and analysis, study validity, strengths, limitations, and delimitations of the study. As described in chapter 1; the purpose of this dissertation study was to explore the possible existence of a relationship(s) between the eHEALS score and (a) trust in physicians as measured by the modified version of the WFTIPS, (b) attitudes towards providers as measured by the ATHCPS, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions among adults 40 years and older suffering from at least one chronic disease.

Within the context of the study, the following questions were investigated:

1. Is there a relationship between eHEALS and trust in physicians as measured by the WFTIPS?
2. Is there a relationship between eHEALS and attitudes towards providers as measured by the modified version of the ATHCPS?
3. Is there a relationship between eHEALS and adherence to medication as measured by the Gonzalez and Lu adherence questions?
4. Does LOC mediate the relationship between eHEALS and the variables trust in physicians, attitudes towards providers, and adherence to medication?
5. Are race, age, gender, ethnicity, education, and income health related to eHealth literacy?

Research Design and Methodology

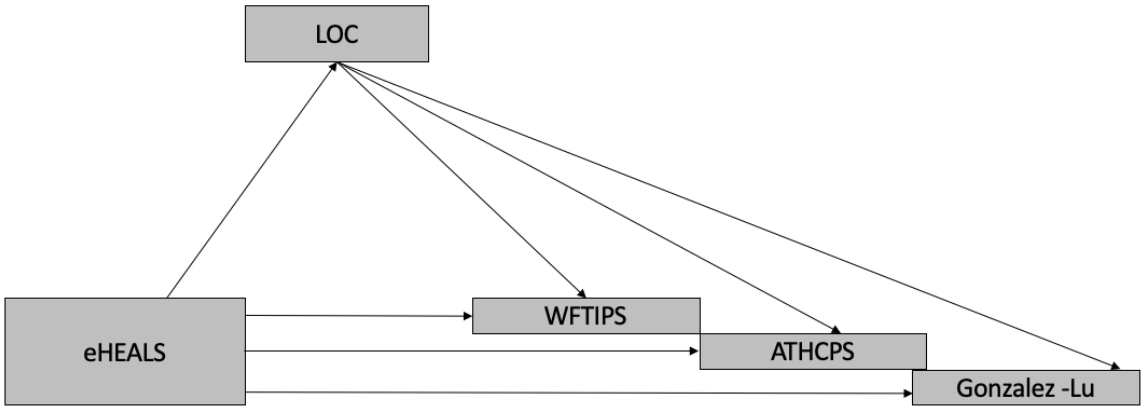
Study Design

This was a cross-sectional study design, which examined deidentified secondary data collected during the period 2016-2019 from the FLIGHT/VIDAS program at Nova Southeastern University. This study explored the relationship between eHEALS, LOC, with attitudes towards providers, trust in providers, and adherence to medication among adults 40 years and older with a chronic disease using a correlational approach. A functional part of this cross-sectional study design was the use of path analysis and the mediation model shown in Figure 2.

Mediating variables are behavioral, psychological, or social constructs that transmit the effect of one variable to another variable (MacKinnon et al., 2007). A mediation model seeks to identify and explain the process, which underlies an observed relationship between an independent variable and a dependent variable via the inclusion of a third variable, known as a mediator variable (Graafland & Lous, 2018). Complex regression procedures like mediation are best explained with a combination of plain language and a figure (Kahn, 2020). The investigator of this dissertation study proposed the conceptual framework of a mediation model (see Figure 1), which summarized how the theoretical construct LOC may have a mediating influence on the relation of e-Health literacy and the variables trust in physicians, attitudes towards providers, and adherence towards medication among adults 40 years and older.

Figure 2

Conceptual Framework of Mediation via LOC



Note. This conceptual framework shows a hypothesized model where LOC mediates the relationship between eHEALS and the variables Trust in Physicians, Attitudes Towards Providers, and Adherence to Medication.

Baron and Kenny (1986) stated that a given variable may be said to function as a mediator (M) to the extent that it accounts for the relation between the predictor (X) and the criterion (Y). In a formula: X → M → Y. Thus, with the mediation model, the investigator considered an intermediate variable (mediator), which helps to explain how or why an independent variable influences an outcome (Gunzler et al., 2013). Mediation analysis facilitates a better understanding of the relationship between the independent and dependent variables (Graafland & Lous, 2018). In this dissertation study, the investigator hypothesized that LOC mediates the impact of the eHEALS on trust in physicians, attitudes towards providers, and medication adherence among adults 40 years and older.

Rationale

The investigator of this dissertation study elected to use secondary data collected during period 2016-2019 from the FLIGHT/VIDAS Program at Nova Southeastern University. The use

of secondary datasets for cross-sectional study designs is widely common in public health research studies, allowing the investigator of the dissertation study to compare several variables at the same time. According to Windle (2010), the use of secondary analysis allows the student (aspiring researcher) to complete a project in a shorter period of time than would be necessary for primary data collection and analysis. This is a great help to graduate students who have good ideas but are unable to find the time and finance required of longitudinal studies to fully test their ideas (Cheng & Phillips, 2014).

Threats

One of the potential threats to the internal validity of this cross-sectional dissertation study design is the pitfall of drawing causal inferences from the study results where none is possible. Grimes and Schultz (2002) argued that with cross-sectional study designs, temporal associations between putative causes and effects can be unclear. Another plausible threat to the validity of this dissertation study design was experimenter bias. This tends to occur when the researcher(s) responsible for collecting the data consciously or unconsciously influence(s) the responses of the participants by allowing the participants to know the purpose of the study or priming the participants while administering the questionnaire. The confounding effect of one variable upon another was also another threat that needed to be control for via regression analysis. Other threats to the study include omitted or missing data, which were addressed by using the data analysis software Mplus with Full Information Maximum Likelihood (FIML) to avoid the implicit effect of biases.

Strengths and Weaknesses of Design

It should be noted that this dissertation study design focused primarily on the collection of quantitative data. Rahman (2016) argued that the use of quantitative study designs stress

heavily on measuring variables that exist in the social world. One of the strengths of this dissertation study design was that it was concluded in a short time and with a lower cost than would a longitudinal cohort study. According to Ownby et al. (2017) the researchers who collected the data used in this dissertation study were careful to observe strict scientific protocol and rigor. The cross-sectional study design of this dissertation study allowed the investigator to reduce or minimize subjectivity. Active measures were taken to ensure clarity of methodology of the tests and results allowing for the study to be easily replicated. On the other hand, a weakness of the study design was that the data reviewed were able to provide only a snapshot of the period 2016 to 2019, whereas a longitudinal study would have permitted the investigator to establish sequences of events and observable trends over a longer period of time. An additional weakness of the study design is the inability of the investigator to draw any causal inferences from the study results, and as such the study was unable to show causation.

Specific Procedures

This was a cross-sectional study design, which examined secondary data collected over the period 2016 to 2019 at the FLIGHT/VIDAS program, Nova Southeastern University. The data were collected via self-response questionnaires in the Audio Computer-Assisted Self-Interview Software (ACASI). The demographic questionnaire used in the FLIGHT/VIDAS program collected variables of interest like age, gender, education, and income in order to understand their effect upon the independent and dependent variables in the relationship(s) reviewed. The independent variable of interest was the eHEALS. The dependent variables reviewed were (a) Trust in physician as measured by the WFTIPS, (b) Attitudes towards providers as measured by a modified version of the ATHCPS, (c) and adherence to medication as measured by the Gonzalez and Lu adherence questions. The mediating variable of interest, LOC,

was collected using the Multidimensional Health Locus of Control Scale. All the data collected for this study were stored on a password-protected computer. When formulating the study narrative (i.e., the historical background and literature review), key words and search terms (i.e., electronic health literacy, trust, attitudes, provider, adherence to medication, locus of control) were entered into the Cochrane Central Register of Controlled Trials, Trip Medical Database, Medline's PubMed and Medical Subject Headings (MeSH®), and Google Scholar to find relevant scholarly peer-reviewed articles on best practices for defining the variables examined. Boolean operators AND and OR were also used as conjunctions to produce more focused and productive results.

Subjects

The secondary data used in the dissertation study were collected from the FLIGHT/VIDAS Program at Nova Southeastern University from 2016-2019. The data collected from the FLIGHT/VIDAS program were collected from a diverse and heterogenous sample of participants within Broward and surrounding counties in Florida.

Power

Power analysis was evaluated with simulation analysis using percentile bootstrap, which tends to have the highest power and the best type I error control. For the purpose of this dissertation study, power was equal to the number of times out of 5,000 that the resampling confidence intervals were able to detect a mediated effect in the sample (*N*).

Sample Size

As a nonparametric test, the bootstrapping method used by the Mplus V8.4 did not violate assumptions of normality and was therefore recommended for small sample sizes. *N* =

335 observations were used to achieve power and detect type I error rates using bootstrap and the asymmetric confidence interval test.

Inclusion Criteria

The inclusion criteria for this dissertation study were participants 40 years and older taking medication for one or more chronic disease diagnosis, and a low health literacy score as verified by the short form version of the Rapid Estimate of Adult Literacy in Medicine, REALM. All study procedures were completed under an approved protocol by the Institutional Review Board (IRB) of Nova Southeastern University.

Exclusion Criteria

The exclusion criterion for this dissertation study was participants with a college graduate degree.

Characteristics

The participants of this dissertation study were persons who satisfied the inclusion criteria. The methodological framework of this dissertation study relied primarily on the secondary dataset collected over the period 2016 to 2019 by FLIGHT/VIDAS Program, which examined the eHEALS, a modified version of the ATHCPS, the WFTIPS, Gonzalez and Lu adherence questions, and the Multidimensional Health Locus of Control Scale. The data were collected via self-response questionnaires in ACASI, and the data collected were examined to answer the research questions as proposed by this dissertation study.

Recruitment Procedures

Recruitment of the participants who provided the secondary data used in this dissertation study was executed in the form of flyers, and viral marketing (word of mouth) among the participants. The data collected over the period 2016-2019 were from the FLIGHT/VIDAS

Program that conducted several computer-administered health literacy studies at Nova Southeastern University. This dissertation study used deidentified secondary data for the analysis of subject participants and as such there were no associated recruitment procedures with this dissertation study.

Resource Requirements

Resources that contributed to the completion of the dissertation study included secondary data collected using different assessment tools from the FLIGHT/VIDAS database. Other resources included IRB approval from Nova Southeastern University, a password-protected computer, IBM Statistical Package for Social Sciences (SPSS) Version 27, Mplus v8.4 with FIML, and Microsoft Excel Stat plus.

Reliability and Validity

The most significant threat to external validity in this dissertation study was the potential for experimenter bias in terms of "priming" of participants by the original data collectors. The reliability and validity of the instruments used to collect the variables of interest were established by previous studies. For example, Chung and Nahm (2015) noted prior studies have shown that eHEALS is a reliable and valid tool to assess eHealth literacy among younger adults and older adults. Findings from a study by Katz and Edelstein (2018) provided support for the psychometric properties of the WFTIPS and its use with older adults. The ATHCPS was found to be a reliable and valid instrument for use in assessing patient's attitudes toward their health care providers (Bodenlos et al., 2004). Similarly, there is ample evidence in the literature that the Multidimensional Health Locus of Control Scale validly assesses health locus of control beliefs. Nevertheless, caution should be used when making generalizations regarding the validity of the Multidimensional Health Locus of Control Scale to new theoretical or situational contexts

(Wallston, 2005). According to Brown et al. (2013), ACASI may enhance the validity of self-report data in research and clinical settings by reducing measurement bias. Also, the data collected via ACASI may be more accurate than are data that were collected via face-to-face interviews (Adebajo et al., 2014).

Timeline

Table 1 shows an estimated timeline of necessary actions to bring the dissertation study to a practical conclusion. The timeline included submission of the completed proposal draft, proposal defense, institutional review board (IRB) approval of the protocol, study implementation date, data analyses, completion of the dissertation report, dissertation defense, and graduation.

Table 1

Timeline of Actions to Complete the Study

Start Date	Completion Date	Action
9/1/2020	09/15/2020	Request for Dissertation Committee Members
9/19/2020	09/23/2020	Official Formation of Dissertation Committee with Chair
09/26/2020	10/10/ 2020	Submission of Draft Dissertation Idea to Committee for Revision
10/11/2020	10/30/2020	Return of revised Dissertation Idea to Committee for approval
11/01/2020	11/17/2020	Submission of Final edits for approval of Dissertation Idea
11/19/2020	11/20/2020	Approval to begin work on Chapters 1 to 3 from Dissertation Committee Chair
11/20/2020	11/25/2020	Approval to begin work on IRB submission from Dissertation Committee Chair

11/26/2020	12/20/20	Submission of Draft Chapters 1 to 3 to Dissertation Committee
12/23/2020	12/28/2021	Return of revised Chapters 1 to 3 to Dissertation Committee
02/08/2021		Submission of IRB study Approval
01/25/2021	01/29/2021	Submission of Final edits for Chapters 1 to 3 to dissertation Committee
02/08/2021	02/12/2021	Proposal defense
02/19/2021		IRB approval granted
03/19/2021	04/02/2021	Submission of Draft Chapters 4 to 5 to Dissertation Committee
04/05/2021	04/23/2021	Return of revised Chapters 4 to 5 to Dissertation Committee
04/26/2021	05/14/2021	Submission of Final edits for Chapters 4 to 5 to dissertation Committee
05/16/2021	06/04/2021	Submission of Final Dissertation Report and Certification of Authorship to Committee Chair
06/04/2021	06/16/2021	Dissertation defense
06/18/2021	07/30/2021	Approval for Graduation Paperwork
08/08/2021		Graduation

Note. This timeline may be subject to changes to due unforeseen occurrences.

Ethical Considerations and Review

The dissertation study involved the use of secondary data for analysis purposes. As such there were a few concerns that were limited to, but not exclusive to, this type of research. According to the American Psychological Association (2019), researchers are to only conduct studies within the boundaries of their competence, based on their education, training, and

supervised experience. This dissertation study met this requirement as it was chaired by Gesulla Cavanaugh, Ph.D., Director of Nursing Research within the College of Nursing at Nova Southeastern University, with capable team members who have worked in, or are specialists in, the research area of interest, namely Raymond Ownby, M.D., PhD Chair of the Department of Psychiatry and Behavioral Medicine at Nova Southeastern University, College of Osteopathic Medicine, and Joshua Caballero, Pharm.D., Chair of the Department of Clinical and Administrative Sciences, Larkin University College of Pharmacy. Additionally, the data collected by the investigator of this dissertation study were deidentified and unable to be matched to any individual participant. This minimized one of the key ethical principles of data collection argued by Mark et al. (1999), the need to ensure that risk to the participant is minimized such that research should take place only if the potential benefit outweighs the risk. Noteworthy, the secondary data used in this dissertation study were initially collected with IRB approval from the Nova Southeastern University IRB (see Appendix). In the end, the IRB is the final arbiter of the scientific validity of the research in the context of protecting the human subjects from what may otherwise be an unsound query (Melnyk & Morrison-Beedy, 2018), and the investigator of this dissertation study completed the CITI training on research ethics and possesses a current CITI training certificate.

Funding

This was an unfunded dissertation research study.

Study Setting

The proposed dissertation study was a secondary data analysis of deidentified, quantitative data, and consequently does not have a physical study setting.

Instruments and Measures

The instruments used for data collection and measurements were the eHEALS, the WFTIPS, a modified version of the ATHCPS to include particpants older than 26 with chronic diseases, and the Gonzalez and Lu adherence questions. The instruments and measures used in this dissertation study were electronically recorded into ACASI by participants 40 years and older (experiencing one or more chronic disease) from Broward and surrounding counties, Florida at the FLIGHT/VIDAS Program during the period 2016 to 2019.

Data Collection Procedures

IRB approval was sought to use the secondary data collected by the FLIGHT/VIDAS Program. After receiving IRB approval, contact was made with Raymond Ownby, MD, PhD, Director of the FLIGHT/VIDAS Program, and Chair of the Department of Psychiatry and Behavioral Medicine, Nova Southeastern University to gain access to the dataset collected containing information on a diverse and heterogenous sample of participants from Broward and surrounding county areas, Florida. All the deidentified participant data were collected in a password-protected Microsoft Excel spread sheet and loaded into password-protected SPSS and Mplus v8.4 with FIML data files for analysis. The data were thereafter stored on a password-protected computer. The investigator of this dissertation study was blinded to the participants' identity, removing the potential for selection bias within the study.

Data Analyses

The IBM Statistical Package for Social Sciences (SPSS) version 27 was used to calculate the internal reliability of the scales used in the study, and Mplus v8.4 with FIML was used to conduct further data analysis. Statistical significance was determined at the 95% confidence level for the proposed statistical tests necessary to satisfy the study outcome. Frequency and

descriptive statistics were conducted on variables collected. As shown by the conceptual framework (see Figure 2), the eHEALS was operationalized as the independent variable, LOC as the mediation variable, and (a) trust in physicians as measured by the WFTIPS, (b) attitudes toward providers as measured by the ATHCPS, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions were operationalized as the three dependent variables.

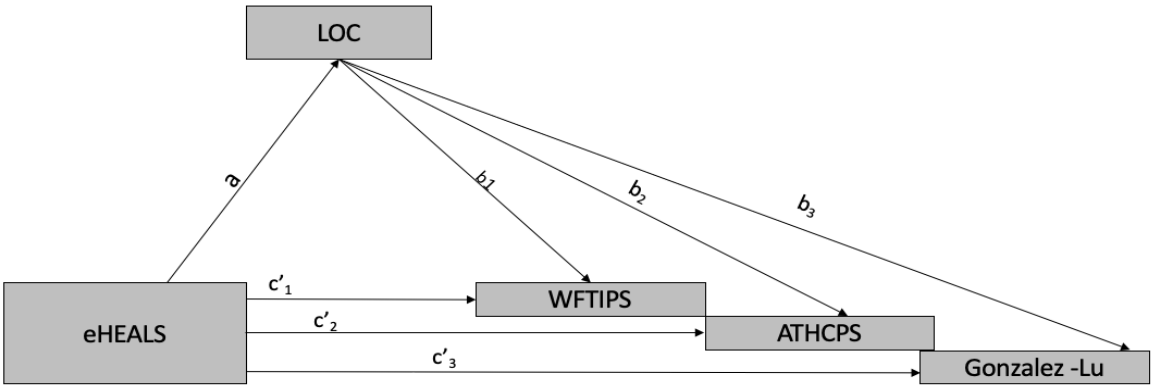
The investigator of the dissertation study conducted correlation analyses using Pearson's correlation coefficient to determine the strength of association between eHEALS and (a) trust in physicians as measured by the WFTIPS, (b) attitudes toward providers as measured by the modified version of the ATHCPS, and (c) adherence to medication as measured by the Gonzalez and Lu adherence questions. Regression analysis was used to determine if trust in physicians, attitudes towards providers, and adherence towards medication among adults 40 years and older were significantly related to eHEALS scores. The demographic variables collected (income, age, education, and race) were included in regression models to understand their role as potential confounders. In place of the four-step mediation analysis by Baron and Kenny (1986), this mediation analysis was conducted using Mplus v8.4 to determine the model fit or significance as illustrated in the statistical diagram (see Figure 3).

The total effect of the model and the effect size was calculated using a bootstrapping resampling method of 5,000 iterations, which adequately accounted for an accurate confidence interval and a power analysis of .8. Multivariate regression coefficients via a path model with the values of a_1 and b_1 (see Figure 3) were used to calculate the indirect effect of the eHEALS via LOC on the outcome variables (a) trust in physicians, (b) attitudes towards providers, and (c) adherence to medication. Similarly, the results of regression coefficients for c_1, c_2, and c_3 (see Figure 3) represented the direct effect of eHEALS on (a) trust in physicians, (b) attitudes towards

providers, and (c) adherence to medication, respectively. These values were used to confirm whether or not the eHEALS was a significant predictor of (a) trust in physicians, (b) attitudes towards providers, and (c) adherence to medication. The effects and significance values produced by the Mplus V8.4 software was able to show if LOC had any mediating effect on the relationships between eHEALS and trust in physicians, attitudes towards providers, and adherence to medication.

Figure 3

Statistical Diagram of Mediation Process



Note. This statistical diagram shows the regression coefficients associated with the mediation model.

Format for Presenting Results

The results from the analysis of the dissertation study were presented in tabular format.

Anticipated Limitations and Delimitations

This dissertation study was limited by the data available for analysis (i.e., secondary data of participants 40 years and older diagnosed with at least one chronic disease, and a low health literacy score). As such, caution should be exercised when attempting to extrapolate any of the

findings to a wider population. According to Zeidner et al. (2012) self-report measures contain inherent limitations due to response bias and their reliance on self-appraisals. The dissertation study was also limited by the fact that it was a cross-sectional study. Therefore, the data observed were able to provide only a snapshot in time, and analysis of the measures used in this dissertation study reflected only the period 2016-2020. It is plausible that the effects of eHealth literacy upon the patient-provider relationship evolved significantly since the advent of SARS-CoV-2. Possible confounding variables (i.e., gender, age, and education) could have influenced the relationships for the examined period and consequently longitudinal studies will be better able to answer questions relating to trends on patient eHealth decision making and health outcomes over time. Delimitations stemmed from the scope of the study and the dissertation study did not consider the analysis of data addressing questions on specific chronic diseases diagnoses that may have prompted an adult (40 years and older) to engage eHealth options affecting the patient-provider relationship, and consequent medication adherence. Additionally, the participants who gave their information did so voluntarily, which means that it was possible that many eligible participants did not respond to and were not represented in this study. As such, additional research should be extended to these populations.

Summary of the Chapter

This chapter outlined the demographics of the sample population, study questions, and the study design in accordance with the established conceptual framework, and instrumentations necessary to conduct the study. Additionally, the results and analysis of the data were outlined. The proposed methods and procedures were used to provide some insight into the relationships between eHealth literacy, trust in physicians, attitudes towards providers, adherence to medication, and LOC among adults (persons 40 years and older).

Chapter 4: Findings

Introduction to the Chapter

This chapter presented an overview of the collected data, the statistical measures used to conduct the analysis, and the significance of the results. Additionally, the chapter presented and discussed the findings from the analyses carried out in support of determining the relationship between the eHEALS score, trust in physicians as measured by the WFTIPS, attitudes towards providers as measured by the modified version of the ATHCPS, medication adherence as measured by the Gonzalez and Lu adherence questions, and LOC. The instruments used for the purpose of data analysis were Microsoft Excel, IBM Statistical Package for Social Sciences Version 27 and Mplus V8.4 with FIML.

Data Analysis

Descriptive Statistics

Several variables reflected the demographics of the participants. For example, the demographics questionnaire asked the participants to identify their (a) age, (b) gender, (c) race, (d) ethnicity, and the (e) years of school completed. Ethnicity was not reported in the study as less than 3% of participants identified as Hispanic or Latino. The sample consisted of $N = 335$ consented adult participant observations, of which 48% ($n = 161$) identified as men, 49% ($n = 164$) identified as women, 2.7% ($n = 9$) identified as transgender, and 0.3% ($n = 1$) self-identified as Other. The mean age of the participants was 57.4 ($SD = 8.42$). Most of the participants (65.4%, $n = 219$) attained 12 years of education or less, and 54% ($n = 180$) earned less than $10,000 annually. African Americans accounted for the 83.3% of participants, Whites (12.5%), and other racial groups constituted 4.2% (See Table 2).

Table 2

Socio-Demographic Characteristics of Participants at Baseline

Baseline Characteristics	***n***	***%***
Race		
White	42	12.54
Black/AA	279	83.28
Others	14	4.18
Income		
Less than $10,000	180	53.70
$10,000 or more	175	46.30
Gender		
Male	161	48.10
Female	164	49.00
Transgender	9	2.70
Other	1	0.30
Education		
12 years and under	219	65.4%
Over 12 years	116	34.6%

Note: N = 335

The score results of the study participants (*n* = 296) who took the eHEALS was *M* =27, (*SD* = 8.45, min=8, max=40). Of the 304 participants who took the internal LOC,the results were *M* = 26.28, and *SD* = 5.51. Similarly, the participants (*n* =304) who took the ATHCPS had a score result of (*M* = 96, *SD* = 15.39). The results of the WFTIPS score were *M* = 40 and *SD* = 15.39. Factor analysis (principal factors) was conducted on the four Gonzalez-Lu questions and regression factors were scored as an item-weighted measure of medication adherence (in *z* score form) for which the results among the participants (*n* = 303) showed a mean score of .006 and standard deviation of 0.95 (see Table 3).

Additionally, the internal reliability of the scales used in the dissertation study was calculated, and the results are presented in Table 4.

Table 3

Psychometric Properties/Variables of Participants at Baseline

Variable	***n***	***M***	***SD***	***Skewness/Kurtosis***
Age	335	57.52	8.42	0.452, 0.501
eHEALS	296	26.99	8.45	-.531, -0.428
LOC Internal	304	26.28	5.51	-0.484, -0.045
WFTIPS	301	40.10	7.35	-0.711, 0.278
ATHCPS	304	95.90	15.39	-1.446, 1.998
Gonzalez-Lu	303	0.006	0.95	-1.486, 1.635

Note: N = 335 (*n* represents the values associated with the participants)

Table 4

Reliability Table for Researched Variables

Variable	**# Of items**	**Cronbach alpha (α)**
eHEALS	8	.96
ATHCPS	19	.89
WFTIPS	10	.89
ILOC (MHLOC)	6	.69

Note: Analysis with IBM Statistical Package for Social Sciences (SPSS) Version 27

Bivariate Analysis

To address Research Questions 1, 2, and 3 Pearson product-moment correlation and linear regression analyses were performed to understand the strength of association between the variables. Results of the Shapiro-Wilks test for normality showed the variables eHEALS, WFTIPS, ATHCPS, and Gonzalez-Lu questions were not normally distributed, $p < 0.01$. According to Kwak and Kim (2017), one should not concern themself with normality of data for sample sizes ≥ 30 as the central limit theorem states that the larger the sample becomes, the

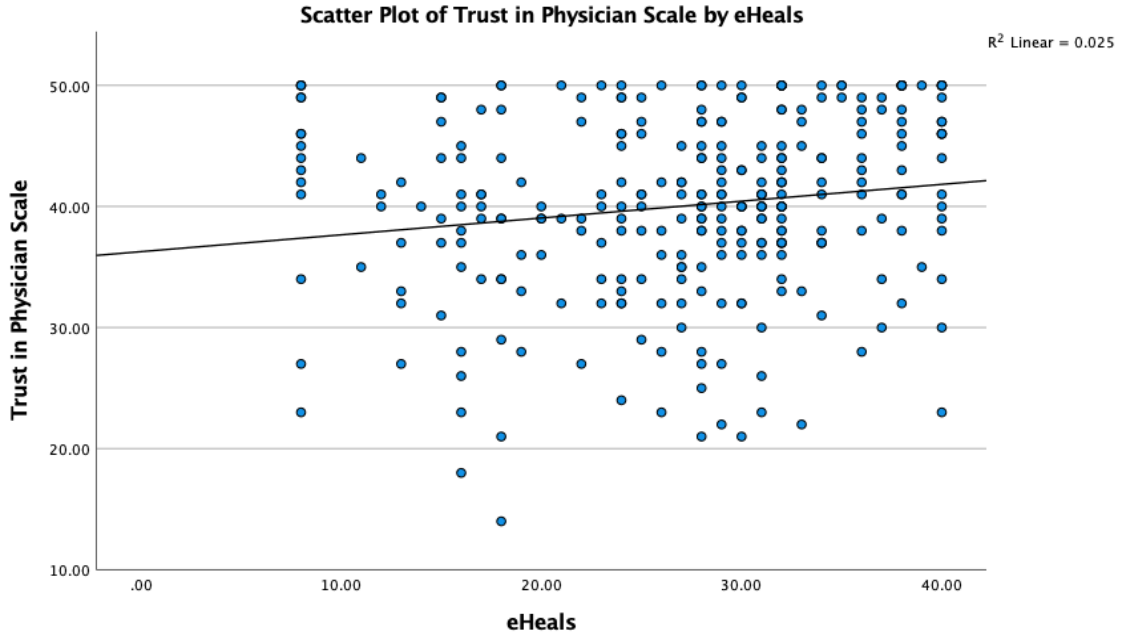
distribution of the sample means approximates a normal distribution. Additionally, individual bivariate scatterplots using a line of best fit were produced to determine if a linear relationship exists between the variables and the existence of extreme outliers (See Figures 4-6).

Research Question 1. Is there a relationship between eHEALS and trust in physicians as measured by the WFTIPS?

$$H_0 : \rho_S = 0$$

$$H_1 : \rho_S \neq 0$$

Figure 4



Note. Each dot represents an individual participant's score.

Correlation analysis was performed on the variables of interest (eHEALS and the WFTIPS) in Mplus with FIML. The results showed that there was a small, positive correlation between eHEALS and the WFTIPS (r = .166, n = 301, p = .003). As such, the null hypothesis

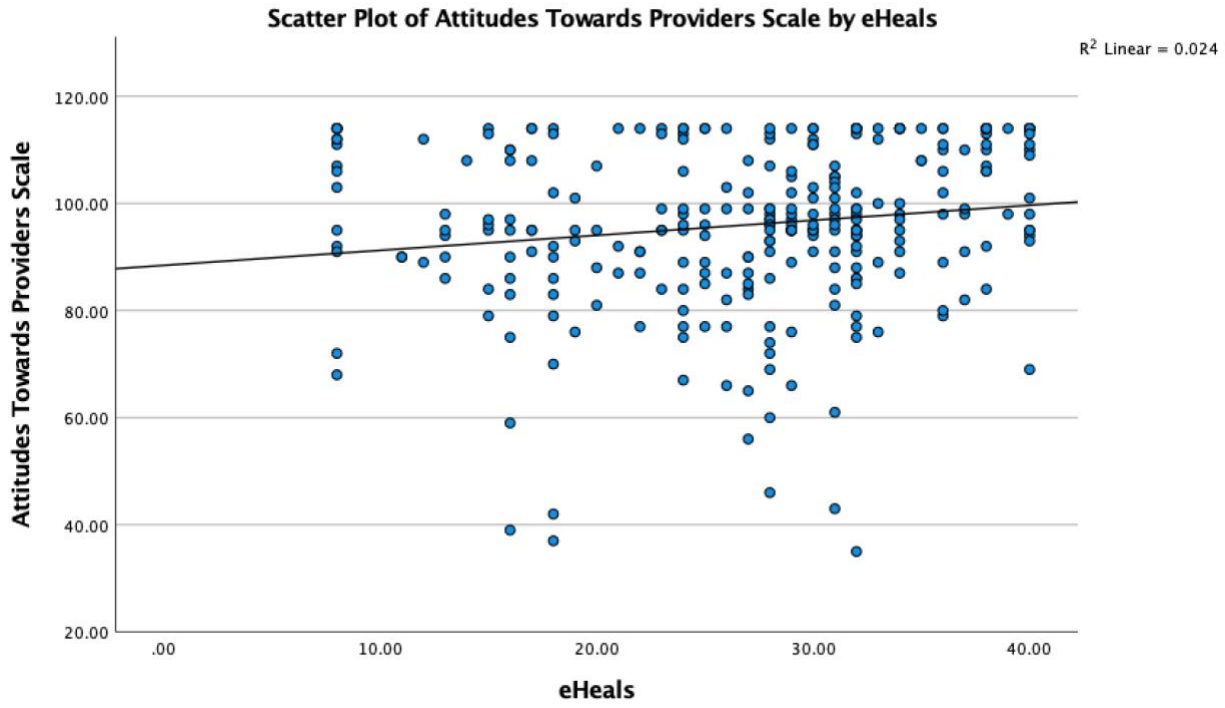
was rejected, concluding that there was a small yet positive statistically significant association between eHEALS and WFTIPS.

Research Question 2. Is there a relationship between eHEALS and attitudes towards providers as measured by the modified version of the ATHCPS?

$H_0 : \rho_S = 0$

$H_1 : \rho_S \neq 0$

Figure 5



Note. Each dot represent an individual participant's score.

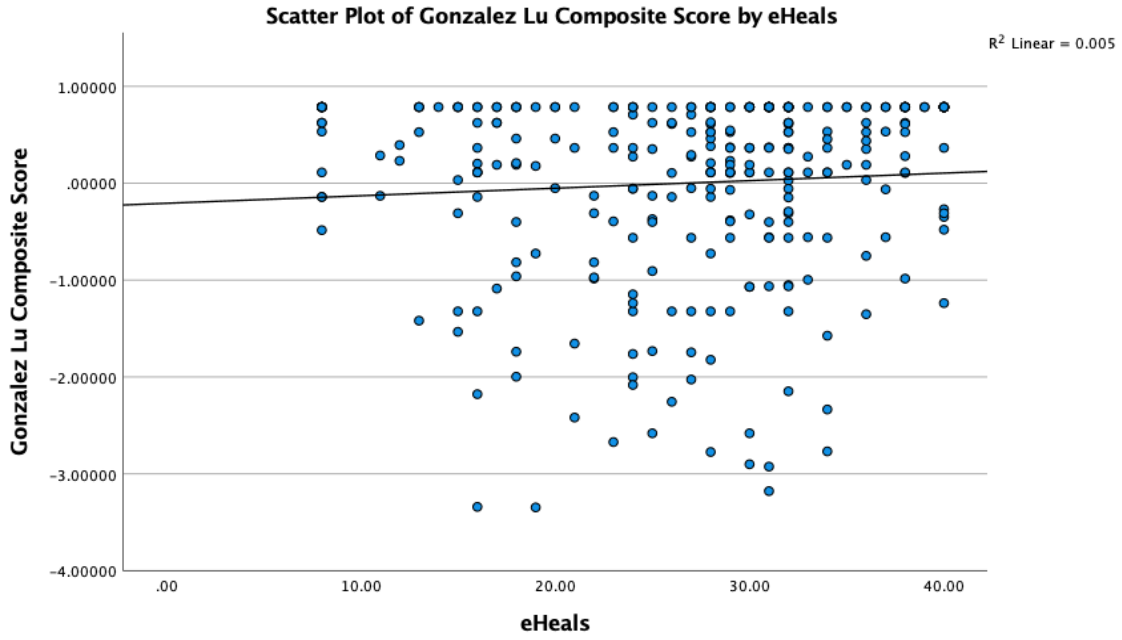
Correlation analysis was performed on the variables of interest (eHEALS and the ATHCPS) in Mplus with FIML. For Research Question 2 a small positive correlation was also found between eHEALS and ATHCPS (r = .167, n = 304, p = .003). As such, the investigator rejected the Null hypothesis (H_0) and accepted the alternative hypothesis (H_1)

Research Question 3. Is there a relationship with eHEALS and self-reported adherence to medication as measured by the Gonzalez and Lu adherence questions?

$H_0 : \rho_S = 0$

$H_1 : \rho_S \neq 0$

Figure 6



Note. Each dot represent an individual participant's score.

Correlation analysis was performed on the variables of interest (eHEALS and the Gonzales-Lu Questions) in Mplus with FIML. Visual inspection of the plot of eHEALS scores and the results showed that unlike the results of Research Questions 1 and 2, zero-order correlation analysis provided no evidence of a relationship between eHEALS and the Gonzalez-Lu adherence questions (r = .066, n = 303, p = .251) and therefore the H_0 was accepted and the H_1 rejected (see Table 5).

Table 5

Bivariate Correlation of Psychometric Properties at Baseline

Variable	eHEALS		
	n	*r*	*p*
WFTIPS	301	.166	.003
ATHCPS	304	.167	.003
Gonzalez-Lu	303	.066	.251

Note: Analysis with Full Information Maximum Likelihood (FIML)

Mediation Analysis

In furthering the analysis on Research Questions 1, 2, and 3, and to effectively answer Research Questions 4 and 5, mediation analysis was conducted using Mplus version 8.4 where the variable eHEALS was denoted as the independent variable, LOC as the mediating variable, and the WFTIPS, ATHCPS, and the composite Gonzalez-Lu questionnaire as the dependent variables. The covariates age, gender, income, and education were controlled for in the analysis to examine their effects on eHEALS. All missing variables were coded -999 and FIML was used in the analysis to deal with missing data, inclusive of issues related to the precision of estimated standard errors, confidence intervals, and plausible bias estimates of the results. This methodology was supported by Fairchild and McDaniel (2017) who noted that statistical software packages such as Mplus allow for estimation techniques while facilitating the use of FIML to handle missing data in mediation models. Bootstrapping was performed on the analysis with 5,000 iterations in Mplus and the number of observations recorded was 335. Race was recoded to reflect Whites and all other races were grouped together. Income was coded from

very low to high as an ordinal variable, and gender was coded to reflect females and the rest of values grouped together and referred to as others.

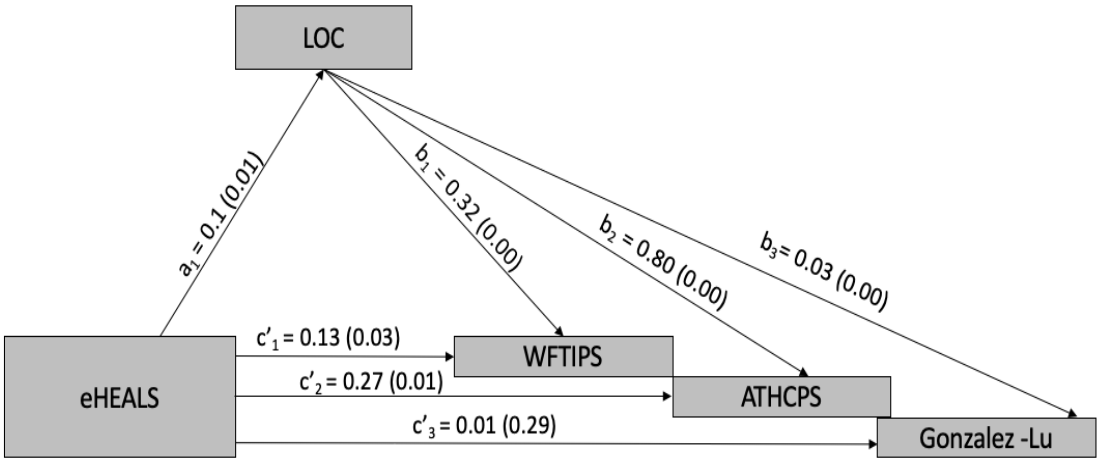
Research Question 4. Does LOC mediate the relationship between eHEALS, and the variables trust in physicians, attitudes towards providers, and adherence to medication?

Mediation Effects

The results of the Mplus V8.4 statistical analysis showed that eHEALS was positively related to the WFTIPS (β =.13, *SE* =.06, *z*=2.22, *p*=0.03) and ATHCPS (β =.27, *SE*=0.11, *z*=2.49, *p*=0.01), and eHEALS was also positively related to LOC (β =.11, *SE* =.04, *z*=2.74, *p*=0.01). Similarly, LOC was positively related to ATHCPS (β =.80, *SE*=0.19, *z*=4.29, *p*=0.00), WFTIPS (β =.32, *SE*=0.09, *z*=3.68, *p*=0.00), and the Gonzalez-Lu adherence questions (β =.03, *SE*=0.01, *z*=3.30, *p*=0.00, see Table 6 and Figure 7).

Figure 7

Regression Coefficients and p-values for the Relationships Between eHEALS, LOC, WFTIPS, ATHCPS, and Gonzalez-Lu questionnaire



Note. Analysis conducted in Mplus with FIML

Further, the results of the indirect effects of the model support the hypothesis that LOC mediates the relationship between (a) eHEALS and WFTIPS (β = 0.03, p = 0.03, 95% CI [0.01, 0.07]), (b) eHEALS and ATHCPS (β = 0.09, p = 0.02, 95% CI [0.04, 0.16]), and (c) eHEALS and Gonzalez-Lu questions β = 0.00, p = 0.03, 95% CI [.00, 0.01] (see Table 6 and Figure 8).

Table 6

Path Estimates, Coefficients, and Effects of Mediation Model

	Path Coefficients				Indirect Effects		
	Trust in Physician	ATHCPS	Gonzalez-Lu	LOC	Estimates	Bias Corrected Bootstrap 95% C.I.	*p*-Value
eHEALS	.13 (0.026)	0.274(.013)	.006 (0.287)	.17(0.006)			
LOC	.317(0.000)	.798(.000)	.032 (0.001)				
eHEALS to Trust in Physician Scale via LOC					0.034	0.014, 0.066	0.030
eHEALS to ATHCPS via LOC					0.085	0.038, 0.158	0.018
eHEALS to Gonzalez-Lu via LOC					0.003	0.001, 0.007	0.032

Note: Data analyzed with Mplus v8.4

The results of the effect of eHEALS upon (a) ATHCPS, (b) WFTIPS, and (c) Gonzalez-Lu Questionnaire via Internal LOC established that internal LOC mediated the relationship between eHEALS and the variables related to trust in physicians (WFTIPS), attitudes towards providers (ATHCPS), and adherence to medication (Gonzalez-Lu questionnaire).

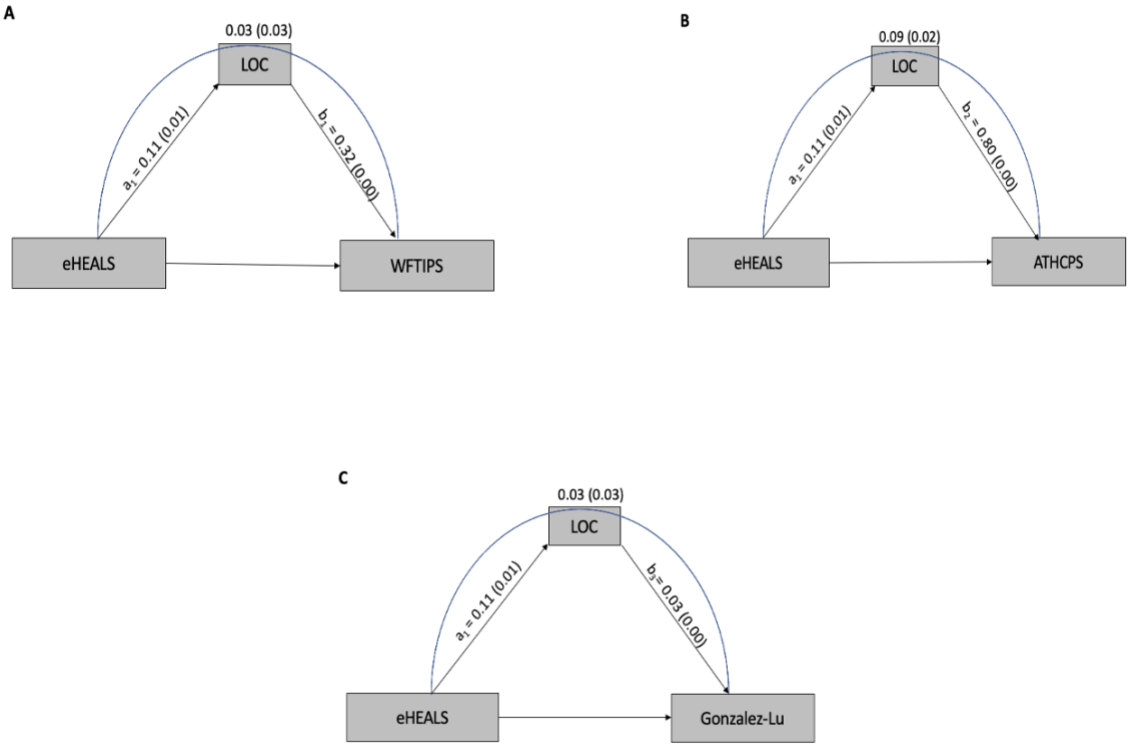
Research Question 5. Is race, age, gender, ethnicity, education, and income health related to eHealth Literacy?

To answer Research Question 5, the investigator regressed eHEALS on the covariates of interest (i.e., race, age, gender, ethnicity, education, and income). The results showed that the

variables age and education were positively and significantly related to the eHEALS, $p < 0.01$ (see Table 7).

Figure 8

Indirect Effect of eHEALS Upon (a) ATHCPS, (b) WFTIPS, and (c)Gonzalez-Lu Questionnaire Via LOC



Note. Analysis conducted by Mplus V8.4 FIML

Table 7

Regression Analysis of Covariates on eHEALS

Variable	Estimate	SE	Est./SE	Two-Tail *p*-value
Age	-0.23	.52	-4.49	0.00
Education	0.91	.26	3.52	0.00
Race	-1.13	1.64	-0.69	0.49
Gender	-0.25	0.93	-0.27	0.79
Income	0.53	0.33	1.618	0.11

Note: Analysis performed with Mplus v8.4, $p<0.01$

Model Fit

Path analysis is a technique that allows for testing of direct and indirect relations between variables having theoretical and empirical support. Thus, enabling comparison of a priori and a posteriori models with various goodness-of-fit indexes to determine model fit (Phan, 2009). Direct relations between the variables in this dissertation study were tested and evaluated by means of path analytical procedures using Mplus V8.4.

According to Hu and Bentler (1999), a good model fit is defined as having a nonstatistically significant ($p > 0.05$) chi square value, a Root Mean Square Error of Approximate Estimate (REMSEA) less than 0.05, and a Comparative Fit Index /Tucker Lewis Index (CFI/TLI) greater than 0.90. The initial results of the study showed a statistically significant chi square test, $p = 0.00$, a REMSEA greater than 0.07, and a CFI/TLI less than 0.90. After establishing a path from Internal Health LOC to the race, and adding the covariance between income, education, and race to the model, adequate model fit was achieved for the data model as the overall chi square values changed (see Table 8).

Table 8

Model Fit Statistics

Chi-Square test		Prior to Modification	After Modification
	Values	47.42	7.67
	Degrees of Freedom	11	10
	p-Value	0.00	0.66
REMSEA			
	Estimate(90% CI)	0.10 (0.07-0.13)	0.00 (0.00-0.05)
CFI		.89	1.00
TLI		.66	1.00

Note: Analysis performed with Mplus v8.4

Summary of the Chapter

This chapter presented and described the demographic characteristics of the study participants (N = 335). Additionally, descriptive statistics presented the frequency and the percentage distributions of the variables analyzed. A Pearson product-moment correlation was conducted on the operationalized variables of interest (i.e., eHEALS for eHealth literacy, with WFTIPS for trust in physicians, ATHCPS for attitudes towards health care providers, and the Gonzalez-Lu questions for adherence to medication). The results found a statistically significant relationship/association ($p < 0.05$) between the variables eHEALS and (a) the WFTIPS, and (b) the ATHCPS among adults (40 years and older) unlike the Gonzalez-Lu questionnaire where $p > 0.05$. Mediation analysis results showed that internal LOC mediated the relationship between eHEALS and all 3 outcome variables (a) WFTIPS, (b) ATHCPS, and (c) the Gonzalez-Lu questionnaire. The results showed that the variables age and education were positively and significantly related to the eHEALS, $p < 0.01$. The data presented in the mediation model achieved model fit X^2 (10, N = 335) =7.67, p=0.67, Probability REMSEA ($\leq$0.5) = 0.96, CFI = 1.00, TLI = 1.0.

Chapter 5: Discussion

Introduction to the Chapter

This chapter describes and interprets the significance of the findings obtained from Pearson product-moment correlations, regression, and mediation analysis on the relationships between eHEALS, trust in physicians as measured by the WFTIPS, attitudes towards providers as measured by the modified version of the ATHCPS, medication adherence as measured by the Gonzalez and Lu adherence questions, and Internal LOC. These findings were reviewed in light of what was already known about technology use for health purposes, trust in physicians, attitudes towards providers, adherence to medication, and internal health LOC among adults 40 years and older. Additional consideration was also given to new insights about plausible links between internal health LOC and the other variables examined in the cohort, notwithstanding the argument put forward by Berg-Beckhoff et al. (2017) that cross-sectional studies make it possible to estimate the association between two variables of interest at any one time.

Summary of the Findings and Integration of Findings with Previous Literature

The results of the internal reliability on the scales used in the dissertation study did not differ much from previously established peer-reviewed research. For example, Cronbach alpha (α) for the eHEALS score in this study was no more different than what was reported by Norman and Skinner (2006a). Similarly, the α reported in this dissertation study for ATHCPS was exactly the same value produced by Bodenlos et al. (2004). There were not any discernable differences between the values produced by Hall et al. (2001) on the WFTIPS and the calculations found in this study. Finally, the Cronbach alpha found in this study for internal health LOC was slightly higher than the alpha reliability for the MHLC (six-item scales forms) produced by Wallston et al. (1999).

The average self-reported eHEALS scores in the dissertation study did not differ significantly from another study conducted by Paige et al. (2017) on similar participants suffering from at least one chronic disease, albeit the average age for the participants in each study differed respectively. Indeed, the Pew Research Center (2021), and Smith (2014) argued that 88% of baby boomers and more than half (59%) of adults 65 years and older in the US over have access to the internet. The recent uptick in availability and use of the internet and cellular phone technology by the sample population of this study (often considered as "late adopters") may further explain why the results of this dissertation study were comparable to that of Britt and Hatten (2013) whose study population consisted of university undergraduate students. According to Hu et al. (2012), one explanation for the similarity in the eHealth literacy scores among the different cohorts is the increase in the number of adult patients seeking health-related information prior to their doctor visits. Consistent with previous research by Kim et al. (2018), this study found that education and age had an effect on eHealth literacy.

One of the key strengths of the dissertation study was the ability to show which of the operationalized variables were associated with eHEALS in the sample population. These findings provided a unique insight into the way in which eHealth literacy affects patient attitudes towards providers, their trust in physicians, and their self-reported adherence to medication. According to Li et al. (2016), trust between a physician and a patient has always been a major concern in any societal structure, and Shiferaw et al. (2020) argued that chronic disease patients persistently seek out the internet for medication information, nutrition, disease management, information regarding disease preventive actions, and so forth. Notably, many of the current Healthy People 2030 objectives placed a specific focus on health communication and eHealth

information, which lends to the use of public health policies for the improvement of eHealth literacy across the US (National Institutes of Health, 2021).

Tan and Goonewardene (2017), McMullan (2006), Pearson and Raeke (2000), and Wald et al. (2007) argued that few studies have synthesized and analyzed how patients' internet health information seeking behaviors have affected the patient-physician relationship. In this dissertation study, the correlation analysis performed on the eHEALS and WFTIPS in response to Research Question 1 of the study adds to the current body of empirical evidence by showing a statistically significant positive relationship between eHEALS and WFTIPS. Indeed, Hu et al. (2012) noted that increasingly more patients are seeking eHealth information prior to their doctor's appointment, and research by Sillence et al. (2007), confirmed that patients with high electronic literacy rates tend to do so first. Also, Peng et al. (2020) noted that the perceived usefulness of online health information can urge patients to interact effectively with their doctors. However, Eysenbach and Köhler (2002) cautioned that reliance on faulty online health information can compromise a patient's health or result in inappropriate requests for clinical interventions.

The results of Research Question 2 showed a positive correlation between attitudes towards health care providers and eHealth literacy. This was not quite different from the results of a study by Newnham et al. (2006), which showed that 40% of participants felt that patient-physician relationships were unaffected by online health information searching, 24% of the participants felt it improved the relationship, and only 8% felt it adversely affected the relationship. Dolnicar and Grün (2007) argued that results are only as good as the data on which they are based and as such, the investigator of the dissertation study acknowledged that several

variables may concomitantly contribute to a patient's attitudes towards their provider inclusive of their eHEALS score.

After a review of the literature the majority of the available evidence seemingly pointed in the same direction. For example, Li et al. (2016) conducted cross-tabulations to measure respondents' attitudes toward their health care providers after online health related searches. Their data results showed that despite the vastly varied demographic background of their study participants, the majority (88.9%) of 40 to 60 year olds continued to have high levels of trust in their health care providers. Normally, a doctor-patient relationship is focused on the delivery of high quality medical care (Ayoub et al., 2015), and as Newnham et al. (2006) noted, more than 70% of patients who searched for online health information discussed their findings with a medical practitioner and most found their providers open to doing so. However, argumentative conflicts between patients and their providers can result from the discussion of online information during consultation (Tan & Goonawardene, 2017).

Medication adherence has been recognized as an important yet complex behavior (Linn et al., 2018), yet little is known about the differences in internet exploring behavior between different age groups and how this may influence medication adherence (Zavorotnyy et al., 2020). The results of the correlation analysis performed in Research Question 3 suggested that there was not a statistically significant relationship between eHEALS and adherence to medication as measured by the Gonzalez and Lu questions. Notably, Linn et al. (2019) found no differences in medication adherence between patients who used the internet throughout treatment and patients who did not at baseline and 6 months after. On the other hand, Im and Huh (2017) noted that the frequency of increased patient online seeking behavior was positively related to nonadherence. In a systematic review of 13 studies Linn et al. (2011) found two studies (one high-quality study

and one low-quality study) that revealed no effect of the internet on patient medication adherence. In the dissertation study, the finding of no association between eHEALS and adherence to medication may be plausibly related to the poor psychometric properties of the Gonzalez-Lu adherence questionnaire compared to other scales or variability in adherence among the drugs taken by different patients.

Arbuckle et al. (2019), argued that personal beliefs on any subject are derived from a complex interplay of individual knowledge, experience, and interactions with others, and that beliefs surrounding prescription medication are no exception. Therefore, when interpreting the results of Research Questions 1, 2, and 3 of the dissertation study, it should be noted that bivariate correlations are limited to linear relationships between variables (i.e., eHEALS and Gonzalez-Lu questionnaire), and even if the correlation coefficient is zero, a nonlinear relationship may very well exist. It should also be noted that all measures in the study were self-reported, and these associations may to some extent reflect common method variance (Podsakoff et al., 2003).

Many factors can facilitate or impede behavioral performance including personal skill and will power, all of which are internal to the individual (Ajzen, 1985). Indeed, an internal health LOC is indicative of one's own doing, their will power, and sustained efforts towards positive health (Brincks et al., 2010). Research Question 4 of the dissertation study sought to investigate the mediating role of these internal factors as a function of the relationship between two or more variables. The results of Research Question 4 indicated that internal LOC, as put forward by Rotter (1966) and Walston et al. (1978), did mediate the relationship between eHealth literacy and trust in physician as seen in the submodel A of Figure 8. These findings suggested that belief in oneself and the acceptance of health outcomes as a result of personal

actions had a statistically significant indirect mediation effect on the relationship between eHealth literacy and trust in physicians. According to Connolly (1980), for persons with internal LOC, key links exist between behavior and consequences, personal effort, and outcome.

The same analysis was borne out in submodel B of Figure 8 between eHealth literacy and attitudes towards providers. In submodel B of Figure 8, the results showed that internal health LOC had a statistically significant indirect mediating effect upon the relationship between eHealth literacy and attitudes towards health care providers, despite the lack of a bivariate correlation between eHealth literacy and medication adherence nor an appreciable direct effect of eHealth literacy upon medication adherence among the study participants (see Figure 7). The results of the dissertation study suggested that a person's internal health LOC successfully mediated an indirect relationship between eHealth literacy and adherence to medication (see submodel C of Figure 8). In other words, having a high eHealth literacy means that you probably know that you have to take your medication but without a sufficient internal health LOC you would not adhere to medication recommendations. Contrary to the results of the dissertation study, Pourhoseinzadeh et al. (2017) found no significant relationships between health LOC (internal) and health-related behaviors.

Finally, given the initial results of the global model fit indices, the investigator of the study decided to modify the indices to achieve model fit. This decision was not taken lightly as the investigator of the study deferred to MacCallum et al.(1992) who argued that models should be modified only if there is a strong and defensible theoretical reason for doing so, and that authors should always report model modifications, whether guided by the modified indices or other considerations, thus allowing other researchers the ability to review and opine the decision. In this dissertation study, modification of indices related to global model fit was supported by

peer reviewed research from Zang and Yang in 2017, and Boyd and Wilson (2020). These research studies confirmed race to be significantly associated with internal and external health LOC. Similarly, articles from the Pew Research Center (2021), Owenby (2017), and Simms et al.(2009) have provided substantial evidence of a relationship between income, race, and education. Having justified that there was sufficient theory to perform these modifications, the indices related to the global model fit for the study became coherent and consistent with a good model fit as proposed by Hoffman (2014), see Table 8. Emerging from the dissertation study was an abundance of research data linking each of the operationalized variables to each other while providing a foundation for the five hypotheses that had been adopted. Additionally, this study successfully established that LOC mediates the relationship between eHEALS, and (a) trust in physicians, (b) attitudes towards providers, and (c) adherence to medication.

Implications of the Findings

The dissertation study was pursued in an effort to contribute to the current paucity of research evidence on how eHealth literacy directly affects health outcomes such as trust in physicians, attitudes towards health care providers, and medication adherence via a mediating variable (internal health LOC). The implications of this study and the findings are relevant in three areas: education, future research, and public policy.

Implications for Education

It was always the intention of the dissertation study investigator to provide and make readily accessible the study results as an additional source of material that educators can use as a reference source on mediation analysis when using cross-sectional data. Previous studies on mediation analysis have relied on SPSS, AMOS, Process Macros by Andrew Hayes, and other statistical packages to conduct the analysis, which resulted in routine deletion of important data

via listwise and pairwise methodologies. The use of Mplus v8.4 with FIML allowed the investigator to use all the available data even when bootstrapping without having to lose vital data points in the process of analysis, thus allowing the validity of the analysis to be more rigorous and sound. The dissertation study offers a sound methodology and platform for future reference especially for students who are interested in the use of mediation and path analysis for research purposes.

Implications for Future Research

Given the exploratory and interpretive nature of this study, a few questions surfaced with respect to the results that present a unique opportunity for further future research. Indeed, more research will be necessary to refine and further elaborate some of the novel findings. There was a contrast in the findings showing the absence of a bi-variate correlation between the eHEALS score and medication adherence among participants, $p > 0.05$. This in itself violated one the tenants of mediation analysis as put forward by Baron and Kenny (1986), which stated that the predictor variable (i.e., eHEALS) must be related to the criterion (i.e., medication adherence). Despite the violation of this criterion, further analysis and results of the dissertation study suggested that there was an indirect mediation of the eHEALS score upon medication adherence via LOC among the adults population (40 years and older), $p < 0.05$. This result reinforced the need for longitudinal cohort studies with large samples sizes that may provide more definitive results allowing for a better understanding of the relationships. This is especially true as longitudinal studies tend to produce more reliable study outcomes over time. Similarly, where the aim would be to study clinic-level or practice-level effects on quality of provider-patient communication and/or medication adherence, cluster-randomized designs that engage multiple health care systems are suggested.

Implications for Public Policy

The positive nature of the study results provided a useful platform for continued research and investment by health practitioners and policymakers into longitudinal studies that will establish causal inferences of the results. Hans (2000) and Newberry and Lindsay (2000) argued that the LOC trait is malleable, meaning that it can be changed over time through careful intervention. It is therefore instructive that public policy interventions are directed toward communities that have been consistently plagued by poor health outcomes and poverty (e.g., the diabetes belt of the US). Public investment and the renewal of focus in terms of reshaping ideas and minds will likely enhance communal disposition towards internal LOC by encouraging persons to (a) change the blame game, (b) take charge of one's health decisions and eventual health outcomes, and (c) embrace failure as a functional part of success. Previous research suggested the best way to achieve this sort of internal change is through community-based educational outreach (Nutbeam, 2008). Indeed, the belief that individuals can have some special control over their health (internal control) automatically has a positive psychological and behavioral effect on them (Pourhoseinzadeh et al., 2017) that may affect their relationship with their providers and consequent medication adherence.

Recommendations

The investigator of this study recommends the use of qualitative studies for future research questions. Qualitative studies may serve to provide a more in-depth understanding of the personal experiences of adults (40 years and older) who use available internet and technology. Such studies would uncover trends in thoughts and opinions in terms of participants' outlook on life (internality or externality), and the way that outlook affects their health outcomes. The current study, being an exploratory study, provided a snapshot of what was most likely

taking place in the adult population (40 years and older) and consequently provides a framework for future studies. The investigator recommends the use of longitudinal cohort studies with large sample sizes that may provide more definitive results allowing for a better understanding of the relationships between variables. This is especially true as longitudinal studies tend to produce more reliable inferences about directionality and associations with study outcomes over time. In light of the results of the dissertation study, public policy should invest in community-based eHealth literacy training programs, the effects of which would contribute to improved population health outcomes, greater health equity, reduced health costs (to patients as well as health systems), and to strengthened mutual provider-patient understanding and satisfaction.

Limitations

The design (cross sectional) of this dissertation study did not permit causal inferences regarding relationships between the variables reviewed. There may have been a high risk of recall bias in this dissertation study mostly because cross sectional studies are based on self-reported assessments of an occurrence for a specific period in time. Additionally, the respondents' perception of the questions used in any of the questionnaires may have been different for different participants and completely out of the researcher's control. Furthermore, the data from this study did not include information about a participant's history of technology use for personal health research, which may have influenced the results of the relationship between (a) trust in physician (b) attitudes towards providers, and (c) medication adherence. Some important variables such as physical activity, stress management, and coping strategies were not analyzed in this study, which may have had a moderating effect on the relationship between eHEALS, predicting the outcome variables (a) trust in physician, (b) attitudes towards providers, and (c) medication adherence. Finally, the investigator of this dissertation study

believes that a more robust scale for the measurement of medication adherence apart from the Gonzalez-Lu adherence questions collected from the secondary data source may have yielded a more reliable positive correlation between the eHEALS and medication adherence.

Summary

The statistically significant results of the mediation analysis between the eHEALS and (a) WFTIPS, (b) ATHCPS, and (c) the Gonzalez-Lu via internal health LOC among adults 40 years and older with a chronic disease (a) eHEALS and ATHCPS, (b) eHEALS and WFTIPS, and (c) eHEALS and Gonzalez-Lu questions provides a useful background for policy makers who are interested in understanding how belief in oneself can affect health decision-making and outcomes. After controlling for the covariates age, race, educational level, and income, the author did not find a statistically significant relationship between the variables (race and income) with eHEALS among adults. This further underscores the need for longitudinal cohort studies that can provide more definitive conclusions about the relationship between eHealth literacy and (a) trust in physicians, (b) adherence to medication, and (c) adherence to medication among adults experiencing chronic diseases in the wider population. Future research should focus on potential factors that moderate these relationships including traditional covariates, self-efficacy, and environmental factors.

References

Adebajo, S., Obianwu, O., Eluwa, G., Vu, L., Oginni, A., Tun, W., … , & Karlyn, A. (2014). Comparison of Audio Computer Assisted Self-Interview and Face-To-Face Interview Methods in Eliciting HIV-Related Risks among Men Who Have Sex with Men and Men Who Inject Drugs in Nigeria. *PLoS One, 9,* e81981. https://doi.org/10.1371/journal.pone.0081981

Ahluwalia, S., Murray, E., Stevenson, F., Kerr, C., & Burns, J. (2010). A heartbeat moment': qualitative study of GP views of patients bringing health information from the internet to a consultation. *British Journal of General Practice, 60* (571), 88–94. https://doi.org/10.3399/bjgp10X483120

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. K. J. Beckman (Ed.), *Action-control: From cognition to behavior* (pp. 11-39). Springer.

Allen, A. (2017). The sage encyclopedia of communication research methods. In (Vol. 1-4). Thousand Oaks, CA: SAGE Publications, Inc.

America Pharmaceutical Association. (2020). *Defining Adherence*. https://www.pharmacist.com/defining-adherence

Anderson, L. A., & Dedrick, R. F. (1990). Development of the Trust in Physician Scale: A Measure to Assess Interpersonal Trust in Patient-Physician Relationships. *Psychological Reports, 67*(3), 1091–1100. https://doi.org/10.2466/pr0.1990.67.3f.1091

April, K. A., Dharani, B., & Peters, K. (2012). Impact of Locus of Control Expectancy on Level of Well-Being. *Review of European Studie, 4*(2), . https://doi.org/10.5539/res.v4n2p124

Ayoub, F., Fares, Y., & Fares, J. (2015). The Psychological Attitude of Patients toward Health Practitioners in Lebanon. *North American journal of medical sciences*, *7*(10), 452–458. https://doi.org/10.4103/1947-2714.168663

Bachinger, S. M., Kolk, A. M., & Smets, E. M. A. (2009). Patients' trust in their physician—Psychometric properties of the Dutch version of the "Wake Forest Physician Trust Scale." *Patient Education and Counseling*, *76*(1), 126–131. https://doi.org/10.1016/j.pec.2008.11.020

Balkrishnan, R., Dugan, E., Camacho, F. T., & Hall, M. A. (2003). Trust and satisfaction with physicians, insurers, and the medical profession. *Med Care*, *41*(9), 1058-1064. https://doi.org/10.1097/01.MLR.0000083743.15238.9F

Beck, F., Richard, J. B., Nguyen-Thanh, V., Montagni, I., Parizot, I., & Renahy, E. (2014). Use of the internet as a health information resource among French young adults: results from a nationally representative survey. *Journal of Medical Internet Research*, *16*(5), e128. https://doi.org/10.2196/jmir.2934

Benigeri, M., & Pluye, P. (2003). Shortcomings of health information on the Internet. *Health Promotion International*, *18*(4), 381–386. https://doi.org/10.1093/heapro/dag409

Bennett, J. A., & Flaherty-Robb, M. (2003). Issues affecting the health of older citizens: Meeting the challenge. *The Online Journal of Issues in Nursing*, *8* (2), 2. https://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume82003/No2May2003/OlderCitizensHealthIssues.html

Berrios-rivera, J. P., Street, R. L., Garcia Popa-lisseanu, M. G., Kallen, M. A., Richardson, M. N., Janssen, N. M., … , & Suarez-almazor, M. E. (2006). Trust in physicians and elements of the medical interaction in patients with rheumatoid arthritis and systemic

lupus erythematosus. *Arthritis & Rheumatism*, *55*(3), 385–393. https://doi.org/10.1002/art.21988

Bodenlos, J. S., Grothe, K. B., Kendra, K., Whitehead, D., Copeland, A. L., & Brantley, P. J. (2004). Attitudes Toward HIV Health Care Providers Scale: Development and Validation. *AIDS Patient Care and STDs*, *18*(12), 714–720. https://doi.org/10.1089/apc.2004.18.714

Bodenlos, J. S., Grothe, K. B., Whitehead, D., Konkle-Parker, D. J., Jones, G. N., & Brantley, P. J. (2007). Attitudes Toward Health Care Providers and Appointment Attendance in HIV/AIDS Patients. *Journal of the Association of Nurses in AIDS Care*, *18 doi:10.1016/j.jana.2007.03.002* (3), 65–73. https://doi.org/10.1016/j.jana.2007.03.002

Boyd, J. M., & Wilcox, S. (2020). Examining the relationship between health locus of control and God Locus of Health Control: Is God an internal or external source? *Journal of Health Psychology*, *25*(7), 931-940. https://doi.org/10.1177/1359105317739099

Brincks, A. M., Feaster, D. J., Burns, M. J., & Mitrani, V. B. (2010). The influence of health locus of control on the patient–provider relationship. *Psychology, Health & Medicine*, *15*(6), 720–728. https://doi.org/10.1080/13548506.2010.498921

Britt, R. K., & Hatten, K. N. (2013). Need for Cognition and Electronic Health Literacy and Subsequent Information Seeking Behaviors Among University Undergraduate Students. *SAGE Open*, *3*(4), 1-10. https://doi.org/10.1177/2158244013508957

Brown, C. A., & Dickson, R. (2010). Healthcare students' e-literacy skills. *Journal of Allied Health*, *39*(3), 179–184. https://pubmed.ncbi.nlm.nih.gov/21174023/

Carpenter, D. M., DeVellis, R. F., Hogan, S. L., Fisher, E. B., DeVellis, B. M., & Jordan, J. M. (2011). Use and perceived credibility of medication information sources for patients with

a rare illness: Differences by gender. *Journal of Health Communication*, *16*, 629–642. https://doi.org/10.1080/10810730.2011.551995

Carpenter, D. M., Elstad, E. A., Blalock, S. J., & DeVellis, R. F. (2013). Conflicting Medication Information: Prevalence, Sources, and Relationship to Medication Adherence. *Journal of Health Communication*, *19*(1), 67-81. https://doi.org/10.1080/10810730.2013.798380

Centers for Disease Control and Prevention. (2020). *National Center for Chronic Disease Prevention and Health Promotion(NCCDPHP): Chronic Disease* https://www.cdc.gov/chronicdisease/index.htm

Chan, C. V., & Kaufman, D. R. (2011). A framework for characterizing eHealth literacy demands and barriers. *Journal of Medical Internet Research*, *13*(4), e94. https://doi.org/10.2196/jmir.1750

Chen, H. T. (1990). *Theory-driven evaluations*. Sage.

Cheng, H. G., & Phillips, M. R. (2014). Secondary analysis of existing data: opportunities and implementation. *Shanghai Archives of Psychiatry*, *26*(6), 371–375. https://doi.org/10.11919/j.issn.1002-0829.214171

Chesser, A., Burke, A., Reyes, J., & Rohrberg, T. (2016). Navigating the digital divide: A systematic review of eHealth literacy in underserved populations in the United States. *Informatics for Health and Social Care*, *41*(1), 1-19. https://doi.org/10.3109/17538157.2014.948171

Chung, S.-Y., & Nahm, E.-S. (2015). Testing reliability and validity of the eHealth Literacy Scale (eHEALS) for older adults recruited online. *CIN: Computers, Informatics, Nursing*, *33*(4), 150-156. https://doi.org/10.1097/cin.0000000000000146

Cline, R., & Haynes, K. (2000). Consumer health information seeking on the Internet: the state of the art. *Health Education Research*, *16*(6), 671–692. https://doi.org/10.1093/her/16.6.671

Coulter, A. (1998). Evidence based patient information. is important, so there needs to be a national strategy to ensure it. *BMJ (Clinical research ed.)*, *317*(7153), 225–226. https://doi.org/10.1136/bmj.317.7153.225

Cross, M. J., March, L. M., Lapsley, H. M., Byrne, E., & Brooks, P. M. (2006). Patient self-efficacy and health locus of control: relationships with health status and arthritis-related expenditure. *Rheumatology*, *45*(1), 92–96. https://doi.org/10.1093/rheumatology/kei114

Del Giudice, P., Bravo, G., Poletto, M., De Odorico, A., Conte, A., Brunelli, L., Arnoldo, L., & Brusaferro, S. (2018). Correlation Between eHealth Literacy and Health Literacy Using the eHealth Literacy Scale and Real-Life Experiences in the Health Sector as a Proxy Measure of Functional Health Literacy: Cross-Sectional Web-Based Survey. *Journal of Medical Internet Research*, *10*(10), e281. https://doi.org/10.2196/jmir.9401

Devine , T., Broderick, J., Harris, L. M., Wu, H., & Hilfiker, S. W. (2016). Making Quality Health Websites a National Public Health Priority: Toward Quality Standards. *Journal of Medical Internet Research*, *18*(8:e211). https://doi.org/10.2196/jmir.5999

Dignity Health. (2020). *Technology's Impact on Health: Anxiety, Depression, and Social Network Use*. Dignity Health. https://www.dignityhealth.org/articles/technologys-impact-on-health-anxiety-depression-and-social-network-use

Efthymiou, A., Middleton, N., Charalambous, A., & Papastavrou, E. (2017). The Association of Health Literacy and Electronic Health Literacy With Self-Efficacy, Coping, and Caregiving Perceptions Among Carers of People With Dementia: Research Protocol for a

Descriptive Correlational Study. *Journal of Medical Research Protocol 6*(11), :e221. https://doi.org/10.2196/resprot.8080

Eng, T. R. (2001). *The eHealth landscape : a terrain map of emerging information and communication technologies in health and heath care*. Robert Wood Johnson Foundation.

Eysenbach, G. (2008). Medicine 2.0: social networking, collaboration, participation, apomediation, and openness. *Journal of Medical Internet Research*, *10*(3). https://doi.org/10.2196/jmir.1030

Feathers, A., Yen, T., Yun, L., Strizich, G., & Swaminath, A. (2016). Internet searches about therapies do not impact willingness to accept prescribed therapy in inflammatory bowel disease patients. *Digestive Diseases and Sciences*, *61*(4), 1013–1020. https://doi.org/10.1007/s10620-015-3981-5

Fox, S. (2011). *The Social Life of Health Information: Health Topics* Pew Research Center https://www.pewresearch.org/internet/2011/05/12/health-topics/

Fox, S., & Fallows, D. (2003). *Pew Internet American Life Project: Internet Health Resources*. https://www.pewinternet.org/wp-content/uploads/sites/9/media/Files/Reports/2003/PIP_Health_Report_July_2003.pdf.pdf

Fox, S., & Rainie, L. (2000). The Online Health Care Revolution. https://www.pewresearch.org/internet/2000/11/26/the-online-health-care-revolution/

Gardner, E. M., Sharma, S., Peng, G., Hullsiek, K. H., Burman, W. J., MacArthur, R. D., … , & Mannheimer, S. B. (2008). Differential adherence to combination antiretroviral therapy is associated with virological failure with resistance. *AIDS 22*(1), 75–82. https://doi.org/10.1097/qad.0b013e3282f366ff

Garfield, S., Eliasson, L., Clifford, S., Willson, A., & Barber, N. (2012). Developing the Diagnostic Adherence to Medication Scale (the DAMS) for use in clinical practice. *BMC Health Services Research*, *12*(1), 350. https://doi.org/10.1186/1472-6963-12-350

Ghaddar, S. F., Valerio, M. A., Garcia, C. M., & Hansen, L. (2011). Adolescent Health Literacy: The Importance of Credible Sources for Online Health Information. *Journal of School Health*, *82*(1), 28–36. https://doi.org/10.1111/j.1746-1561.2011.00664.x

Gonzalez, J. S., Schneider, H. E., Wexler, D. J., Psaros, C., Delahanty, L. M., Cagliero, E., & Safren, S. A. (2013). Validity of Medication Adherence Self-Reports in Adults With Type 2 Diabetes. *Diabetes Care*, *36*(4), 831–837. https://doi.org/10.2337/dc12-0410

Graafland, J., & Lous, B. (2018). Income Inequality, Life Satisfaction Inequality and Trust: A Cross Country Panel Analysis. *Journal of Happiness Studies*, *20*, 1717–1737. https://doi.org/10.1007/s10902-018-0021-0

Gunzler, D., Chen, T., Wu, P., & Zhang, H. (2013). Introduction to mediation analysis with structural equation modeling. *Shanghai Archives of Psychiatry*, *25*(6), 390-394. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4054581/pdf/sap-25-06-390.pdf

Gutierrez, N., Kindratt, T. B., Pagels, P., Foster, B., & Gimpel, N. E. (2013). Health Literacy, Health Information Seeking Behaviors and Internet Use Among Patients Attending a Private and Public Clinic in the Same Geographic Area. *Journal of Community Health*, *39*(1), 83–89. https://doi.org/10.1007/s10900-013-9742-5

Hall, M. A. (2006). Researching medical trust in the United States. *Journal of Health Organization and Management*, *20*(5), 456–467. https://doi.org/10.1108/14777260610701812

Hall, M. A., Camacho, F., Dugan, E., & Balkrishnan, R. (2002). Trust in the Medical Profession: Conceptual and Measurement Issues. *Health Services Research, 37*(5), 1419–1439. https://doi.org/10.1111/1475-6773.01070

Hall, M. A., Camacho, F., Lawlor, J. S., DePuy, V., Sugarman, J., & Weinfurt, K. (2006). Measuring Trust in Medical Researchers. *Medical Care*, *44*(11), 1048–1053. https://doi.org/10.1097/01.mlr.0000228023.37087.cb

Hall, M. A., Dugan, E., Zheng, B. Y., & Mishra, A. K. (2001). Trust in physicians and medical institutions: What is it, can it be measured, and does it matter? . *Milbank Quarterly*, *79*(4), 613-639. https://doi.org/\10.1111/1468-0009.00223

Hall, M. A., Zheng, B., Dugan, E., Camacho, F., Kidd, K. E., Mishra, A., & Balkrishnan, R. (2002). Measuring Patients' Trust in their Primary Care Providers. *Medical Care Research and Review*, *59*(3), 293–318. https://doi.org/10.1177/1077558702059003004

Hayati, Z., & Dehghan, L. (2012). A Survey of Acquaintance and Application of Web Information Quality Criteria: A Case Study of Post-Graduate Students in Shiraz University. *Journal of Information Processing & Management*, *27*(4), 1011–1031. https://doaj.org/article/ddacd4deea0d474b90d47b4916ee314a

Heckman, B. D., Catz, S. L., Heckman, T. G., Miller, J. G., & Kalichman, S. C. (2004). Adherence to antiretroviral therapy in rural persons living with HIV disease in the United States. *AIDS Care*, *16*(2), 219–230. https://doi.org/10.1080/09540120410001641066

Helft, P. R., Hlubocky, F., & Daugherty, C. K. (2003). American oncologists' views of internet use by cancer patients: a mail survey of American Society of Clinical Oncology members. *Journal of Clinical Oncology*, *21*(5), 942–947. https://doi.org/10.1200/jco.2003.08.007

Hemed, M. (2017). *Training Course in Sexual and Reproductive Health Research Geneva 2017: Cross sectional studies*. UNICEF. https://www.gfmer.ch/SRH-Course-2017/research-methodology/pdf/Cross-sectional-studies-Hemed-2017.pdf

HIV Research Network. (2002). Hospital and outpatient health services utilization among HIV-infected patients in care in 1999. *Journal Acquired Immune Deficiency Syndrome, 1*(30), 21-26. https://doi.org/10.1097/00126334-200205010-00003.

Holzemer, W. L., Corless, I. B., Nokess, K. M., Turner, J. G., Brown, M. A., Powell-Cope, G. M., … , & Portillo, C. J. (1999). Predictors of Self-Reported Adherence in Persons Living with HIV Disease. *AIDS Patient Care and STDs*, *13*(3), 185–197. https://doi.org/10.1089/apc.1999.13.185

Horne, R., Chapman, S., Parham, R., Freemantle, N., Forbes, A., & Cooper, V. (2013). Understanding patients' adherence-related beliefs about medicines prescribed for long-term conditions: A meta-analytic review of the necessity-concerns framework. *PLoS One, 8*(e80633). https://doi.org/10.1371/journal.pone.0080633

Im, H., & Huh, J. (2017). Does health information inmass media help or hurt patients? Investigation of potential negative influence of mass media health information on patients' beliefs and medication regimen adherence. *Journal of Health Communication7, 22*, 214–222. https://doi.org/10.1080/10810730.2016.1261970

Jensen, J. D., King, A. J., Davis, L. A., & Guntzviller, L. M. (2010). Utilization of internet technology by low-income adults: The role of health literacy, health numeracy, and computer assistance. *Journal of Aging and Health*, *22*(6), 804-826. https://doi.org/10.1177/0898264310366161

Kahn, J. (2020). *Reporting Mediation and Moderation*. http://my.ilstu.edu/~jhkahn/medmod.html

Kaicker, J., Debono, V. B., Dang, W., Buckley, N., & Thabane, L. (2010). Assessment of the quality and variability of health information on chronic pain websites using the DISCERN instrument. *BMC Medicine*, *8*(1). https://doi.org/10.1186/1741-7015-8-59

Kane, S. V., & Robinson, A. (2010). Review article: understanding adherence to medication in ulcerative colitis - innovative thinking and evolving concepts. *Alimentary Pharmacology & Therapeutics*, *32*(9), 1051–1058. https://doi.org/10.1111/j.1365-2036.2010.04445.x

Kao, A. C. (1998). The Relationship Between Method of Physician Payment and Patient Trust. *JAMA*, *280*(19). https://doi.org/10.1001/jama.280.19.1708

Kerse, N., Buetow, S., Mainous, A. G., Young, G., Coster, G., & Arroll, B. (2004). Physician-patient relationship and medication compliance: A primary care investigation. *Annals of Family Medicine*, *2*(5), 455–461. https://doi.org/10.1370/afm.139.

Koo, M., Norman, C. D., & Chang, H. (2012). Psychometric evaluation of a Chinese version of the eHealth literacy scale (eHEALS) in school age children. *International Electronic Journal of Health Education*, *15*, 29-36 http://iejhe.com/archives/2012/4219-14188-1-CE.pdf

Kuwahara, A., Nishino, Y., Ohkubo, T., Tsuji, I., Hisamichi, S., & Hosokawa, T. (2004). Reliability and Validity of the Multidimensional Health Locus of Control Scale in Japan: Relationship with Demographic Factors and Health-Related Behavior. *The Tohoku Journal of Experimental Medicine*, *203*(1), 37–45. https://doi.org/10.1620/tjem.203.37

Langille, M., Bernard, A., Rodgers, C., Hughes, S., Leddin, D., & van Zanten, S. V. (2010). Systematic review of the quality of patient information on the internet regarding

inflammatory bowel disease treatments. *Clinical Gastroenterology and Hepatology*, *8*(4), 322–328. https://doi.org/doi:10.1016/j.cgh.2009.12.024

Lefcourt, H. M. (1981). *Locus of control: Current trends in theory and research* (2nd ed.). Erlbaum.

Lefcourt, H. M. (2014). *Locus of Control: Current Trends in Theory & Research* (2nd ed.). Psychology Press.

Levenson, H. (1974a). Activism and Powerful Others: Distinctions within the Concept of Internal-External Control. *Journal of Personality Assessment*, *38*(4), 377–383. https://doi.org/10.1080/00223891.1974.10119988

Levenson, H. (1974b). Multidimensional Locus of Control in Prison Inmates. *Proceedings of the Division of Personality and Society Psychology*,, *1*(1), 354–356. https://doi.org/10.1177/0146167274001001119

Linn, A. J., van Weert, J. C. M., Gebeyehu, B. G., Sanders, R., Diviani, N., Smit, E. G., & van Dijk, L. (2018). Patients' Online Information-Seeking Behavior Throughout Treatment: The Impact on Medication Beliefs and Medication Adherence. *Health Communication*, 1–8. https://doi.org/10.1080/10410236.2018.1500430

Linn, A. J., Vervloet, M., van Dijk, L., Smit, E. G., & C., V. W. J. (2011). Effects of eHealth interventions on medication adherence: a systematic review of the literature. *Journal of Medical Internet Research*, *5*(13), :e103. https://doi.org/10.2196/jmir.1738

Lipsey, M. W. (1993). Theory as method: Small theories of treatments. In L. B. Sechrest & A. G. Scott (Eds.), *Understanding causes and generalizing about them: New directions for program evaluation* (pp. 5–38). Jossey-Bass.

Liverant, S. (1958). The use of Rotter's social learning theory in developing a personality inventory. *Psychological Monographs: General and Applied*, *72*(2), 1–23. https://doi.org/10.1037/h0093781

Lu, M., Safren, S. A., Skolnik, P. R., Rogers, W. H., Coady, W., Hardy, H., & Wilson, I. B. (2008). Optimal Recall Period and Response Task for Self-Reported HIV Medication Adherence. *AIDS and Behavior*, *12*(1), 86–94. https://doi.org/10.1007/s10461-007-9261-4

MacKinnon, D. P. (2011). Integrating Mediators and Moderators in Research Design. *Research on Social Work Practice*, *21*(6), 675–681. https://doi.org/10.1177/1049731511414148

MacKinnon, D. P., Fairchild, A. J., & Fritz, M. S. (2007). Mediation analysis. *Annual review of psychology*, *58*, 593–614. https://doi.org/10.1146/annurev.psych.58.110405.085542

Madden, J. M., Graves, A. J., Zhang, F., Adams, A. S., Briesacher, B. A., Ross-Degnan, D., . . . , & Adler, G. S. (2008). Cost-related medication nonadherence and spending on basic needs following implementation of medicare part D. *JAMA*, *299*(16), 1922–1928. https://doi.org/10.1001/jama.299.16.1922

Malcarne, V. L., Drahota, A., & Hamilton, N. A. (2010). Children's Health-Related Locus of Control Beliefs: Ethnicity, Gender, and Family Income. 47-59. https://doi.org/10.1207/s15326888chc3401_4

Mannheimer, S. B., Mukherjee, R., Hirschhorn, L. R., Dougherty, J., Celano, S. A., Ciccarone, D., … , & Finkelstein, R. (2006). The CASE adherence index: A novel method for measuring adherence to antiretroviral therapy. *AIDS Care*, *18*(7), 853–861. https://doi.org/10.1080/09540120500465160

Marcum, Z. A., Sevick, M. A., & Handler, S. M. (2013). Medication nonadherence: a diagnosable and treatable medical condition. *JAMA, 309*(20), 2105-2106. https://doi.org/10.1001/jama.2013.4638

Marshall, M. A., & Brown, J. D. (2004). Expectations and realizations: The role of expectancies in achievement settings. *Motivation and Emotion, 28*(4), 347-361. https://doi.org/10.1007/s11031-004-238

McLeod, M., Carter, V., Nowicki, S., Tottenham, D., Wainwright, P., & Wyner, D. (2015). Evaluating the Study Abroad Experience using the framework of Rotter's Social Learning Theory. *Frontiers: The Interdisciplinary Journal of Study Abroad, 26*(1), 30-38. https://doi.org/10.36366/frontiers.v26i1.353

McLeod, S. (2019). *What are Independent and Dependent Variables?* Simple Psychology. https://www.simplypsychology.org/variables.html

McMullan, M. (2006). Patients using the Internet to obtain health information: how this affects the patient-health professional relationship. *Patient Education and Counseling, 63* (1-2), 24-28. https://doi.org/10.1016/j.pec.2005.10.006

Mechanic, D. (1996). Changing Medical Organization and the Erosion of Trust. *The Milbank Quarterly, 74*(2), 171. https://doi.org/10.2307/3350245

Mechanic, D., & Schlesinger, M. (1996). The impact of managed care on patients' trust in medical care and their physicians. *JAMA, 275*(21), 1693-1697. https://doi.org/10.1001/jama.1996.03530450083048

Melnyk, B., & Morrison-Beedy, D. (2018). *Intervention Research and Evidence-Based Quality Improvement, Second Edition: Designing, Conducting, Analyzing, and Funding* Springer Publishing Company.

Meppelink, C. S., Smit, E. G., Fransen, M. L., & Diviani, N. (2019). I was Right about Vaccination": Confirmation Bias and Health Literacy in Online Health Information Seeking. *Journal of Health Communication, 24*(2), 129-140. https://doi.org/10.1080/10810730.2019.1583701

Michaels-Fisher, H., & McCabe, S. (2005). Managing chronic conditions for elderly adults: The VNS CHOICE Model. *Health Care Financing Review, 27*(1), 33-45. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4194907/

Mitsutake, S., Shibata, A., Ishii , K., & Oka, K. (2016). Associations of eHealth Literacy With Health Behavior Among Adult Internet Users. *Journal of Medical Internet Research, 18*(7:e192). https://doi.org/10.2196/jmir.5413

Mitsutake, S., Shibata, A., Ishii, K., Okazaki, K., & Oka, K. (2011). Developing Japanese version of the eHealth literacy scale (eHEALS). *Nihon Koshu Eisei Zasshi, 58, 361-371.*, *58*(5), 361-371. https://pubmed.ncbi.nlm.nih.gov/21905612/

Moshki, M., Ghofranipour, F., Hajizadeh, E., & Azadfallah, P. (2007). Validity and reliability of the multidimensional health locus of control scale for college students. . *BMC Public Health, 7*(1). https://doi.org/10.1186/1471-2458-7-295

Murphy, D. A., Roberts, K. J., Martin, D. J., Marelich, W., & Hoffman, D. (2000). Barriers to Antiretroviral Adherence among HIV-Infected Adults. *AIDS Patient Care and STDs, 14*(1), 47–58. https://doi.org/10.1089/108729100318127

Murray, E., Lo, B., Pollack, L., Donelan, K., Catania, J., White, M., … , & Turner, R. (2003). The Impact of Health Information on the Internet on the Physician-Patient Relationship. *Archives of Internal Medicine, 163*(14), 1727. https://doi.org/10.1001/archinte.163.14.1727

National Institutes of Health. (2021). *Clear Communications: Health Literacy*. https://www.nih.gov/institutes-nih/nih-office-director/office-communications-public-liaison/clear-communication/health-literacy

Neter, E., & Brainin, E. (2012). eHealth Literacy: Extending the Digital Divide to the Realm of Health Information. *Journal of Medical Internet Research*, *14*(1). https://doi.org/10.2196/jmir.1619

Neter, E., & Brainin, E. (2019). Association Between Health Literacy, eHealth Literacy, and Health Outcomes Among Patients With Long-Term Conditions. *European Psychologist*, *24*(1), 68-81. https://doi.org/10.1027/1016-9040/a000350

Noblin, A. M., Wan, T. T., & Fottler, M. (2012). The impact of health literacy on a patient's decision to adopt a personal health record. *Perspective in Health Information Management*, *9*, 1-13.

Norman, C. D. (2011a). eHealth literacy 2.0: problems and opportunities with an evolving concept. *Journal of Medical Internet Research*, *13*(14), e125. https://doi.org/10.2196/jmir.2035

Norman, C. D. (2011b). eHealth Literacy 2.0: Problems and Opportunities With an Evolving Concept. *Journal of Medical Internet Research 13*(4), e125. https://doi.org/10.2196/jmir.2035

Norman, C. D., & Skinner, H. A. (2006a). eHEALS: The eHealth Literacy Scale. *J Med Internet Res*, *8*(4), e27. https://doi.org/10.2196/jmir.8.4.e27

Norman, C. D., & Skinner, H. A. (2006b). eHealth Literacy: Essential Skills for Consumer Health in a Networked World. *J Med Internet Res*, *8*(2), e9. https://doi.org/10.2196/jmir.8.2.e9

Nunnally, J., & Bernstein, I. (1994). *Psychometric Theory*. McGraw-Hill.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine, 67*(12), 2072-2078. https://doi.org/10.1016/j.socscimed.2008.09.050

O'Leary, K., Vizer, L., Eschler, J., Ralston, J., & Pratt, W. (2015). Understanding patients' health and technology attitudes for tailoring self-management interventions. *AMIA Annual Symposium proceedings*, 991–1000. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4765611/

Paige, S. R., Krieger, J. L., Stellefson, M., & Alber, J. M. (2017). Ehealth literacy in chronic disease patients: An item response theory analysis of the ehealth literacy scale (eHEALS). *Patient Education and Counseling*, *100*(2), 320–326. https://doi.org/10.1016/j.pec.2016.09.008

Pannells, T. C., & Claxton, A. F. (2008). Happiness, Creative Ideation, and Locus of Control. *Creativity Research Journal, 20*(1), 67–71. https://doi.org/10.1080/10400410701842029

Parsons, T. (1951). *The social system*. Free Press.

Pearson, S. D., & Raeke, L. H. (2000). Patients' trust in physicians: many theories, few measures, and little data. *Journal of general internal medicine*, *15*(7), 509–513. https://doi.org/10.1046/j.1525-1497.2000.11002.x

Peterson, L., Homer, A. L., & Wonderlich, S. A. (1982). The integrity of independent variables in behavior analysis. *Journal of Applied Behavior Analysis*, *15*(4), 477–492. https://doi.org/10.1901/jaba.1982.15-477

Phan, H. P. (2009). Relations between goals, self-efficacy, critical thinking and deep processing strategies: a path analysis. *Educational Psychology*, *29*(7), 777–799. https://doi.org/10.1080/01443410903289423

Pittet, V., Rogler, G., Mottet, C., Froehlich, F., Michetti, P., … , & de Saussure, P. (2014). Patients' information-seeking activity is associated with treatment compliance in inflammatory bowel disease patients. *Scandinavian Journal of Gastroenterology, 49*(6), 662–673. https://doi.org/10.3109/00365521.2014.896408

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*(5), 879–903. https://doi.org/10.1037/0021-9010.88.5.879

Pourhoseinzadeh, M., Gheibizadeh, M., Moradikalboland, M., & Cheraghian, B. (2017). The Relationship between Health Locus of Control and Health Behaviors in Emergency Medicine Personnel. *International journal of community based nursing and midwifery, 5*(4), 397-407. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5635559/

Rasiah, S., Jaafar, S., Yusof, S., Ponnudurai, G., Chung, K. P. Y., & Amirthalingam, S. D. (2020). A study of the nature and level of trust between patients and healthcare providers, its dimensions and determinants: a scoping review protocol. *British Medical Journal Open, 10*(1), e028061. https://doi.org/10.1136/bmjopen-2018-028061

Richtering, S. S., Morris, R., Soh, S.-E., Barker, A., Bampi, F., Neubeck, L., … , & Redfern, J. (2017). Examination of an eHealth literacy scale and a health literacy scale in a population with moderate to high cardiovascular risk: Rasch analyses. . *PLOS ONE. doi:10.1371/journal.pone.0175372 12*(4), e0175372.

Roberts, K. J. (2002). Physician-Patient Relationships, Patient Satisfaction, and Antiretroviral Medication Adherence Among HIV-Infected Adults Attending a Public Health Clinic.

AIDS Patient Care and STDs, *16*(1), 43–50. https://doi.org/10.1089/108729102753429398

Robinson, C., & Graham, J. (2010). Perceived Internet health literacy of HIV-positive people through the provision of a computer and

Internet health education intervention. *Health Information & Libraries Journal*, *24*(7), 295-303. https://doi.org/10.1111/j.1471-1842.2010.00898.x

Rotter, J. B. (1954). *Social learning and clinical psychology Social learning and clinical psychology*. Prentice-Hall.

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, *80*(1), 1–28. https://doi.org/10.1037/h0092976

Safran, D. G., Taira, D. A., Rogers, W. H., Kosinski, M., Ware, J. E., & Tarlov, A. R. (1998). Linking primary care performance to outcomes of care. *Journal of Family Practice*, *47*(3), 213-220. https://pubmed.ncbi.nlm.nih.gov/9752374/

Sarkar, U., Karter, A. J., Liu, J. Y., Adler, N. E., Nguyen, R., López, A., & Schillinger, D. (2010). The literacy divide: Health literacy and the use of an internet-based patient portal in an integrated

health system—Results from the Diabetes Study of Northern California (DISTANCE). *Journal of Health Communication: International Perspectives*, *15*, 183–196. https://doi.org/10.1080/10810730.2010.499988

Schulz, P. J., Fitzpatrick, M. A., Hess, A., Sudbury-Riley, L., & Hartung, U. (2017). Effects of eHealth Literacy on General Practitioner Consultations: A Mediation Analysis. *Journal of Medical Internet Research*, *19*(5), e166. https://doi.org/10.2196/jmir.6317

Shapiro, D. H., Schwartz, C. E., & Austin, J. A. (1996). Controlling ourselves, controlling our world. *American Psychologist, 51*(12), 1213-1230. https://doi.org/10.1037/0003-066X.51.12.1

Shaw, B., Gustafson, D. H., Hawkins, R., McTavish, F., McDowell, H., Pingree, S., & Ballard, D. (2006). How underserved breast cancer patients use and benefit from ehealth programs: Implications for closing the digital divide. *American Behavioral Scientist, 49*(6), 823–834. https://doi.org/10.1177/0002764205283803

Sidani, S., & Sechrest, L. (1999). Putting program theory into operation. *American Journal of Evaluation, 20*(2), 227–238. https://doi.org/10.1016/S1098-2140(99)00022-3

Sidorkiewicz, S., Tran, V.-T., Cousyn, C., Perrodeau, E., & Ravaud, P. (2016). Development and validation of an instrument to assess treatment adherence for each individual drug taken by a patient. *BMJ Open, 6*(5), e010510. https://doi.org/10.1136/bmjopen-2015-010510

Sommerhalder, K., Abraham, A., Zufferey, M. C., Barth, J., & Abel, T. (2009). Internet information and medical consultations: experiences from patients' and physicians' perspectives. *Patient Education Counsel., 77*(2), 266–271. https://doi.org/10.1016/j.pec.2009.03.028

Spector, P. E. (1988). Development of the Work Locus of Control Scale. *Journal of Occupational Psychology, 61*(4), 335–340. https://doi.org/10.1111/j.2044-8325.1988.tb00470.x

Strasser, R. (1992). The doctor–patient relationship in general practice. *The Medical Journal of Australia, 156*(5), 334–338.

Sudbury-Riley, L., FitzPatrick, M., & Schulz, P. J. (2017). Exploring the Measurement Properties of the eHealth Literacy Scale (eHEALS) Among Baby Boomers: A

Multinational Test of Measurement Invariance. *J Med Internet Res*, *19*(2), e53. https://doi.org/10.2196/jmir

Takahashi, Y., Ohura, T., Ishizaki, T., Okamoto, S., Miki, K., Maito, M., Akamatsu, R., Sugimori, H., Yoshiike, N., & Miyaki K., S. (2011). Internet use for health-related information via personal computers and cell phones in Japan: a cross-sectional population-based survey. *Journal of Medical Internet Research*, *13*(4). https://doi.org/10.2196/jmir.1796

Tan, S. S., & Goonawardene, N. (2017). Internet Health Information Seeking and the Patient-Physician Relationship: A Systematic

Review. *Journal of Medical Internet Research 19*(1), e9. https://doi.org/10.2196/jmir.572

Taylor, S. E. (2009). *Health psychology*. McGraw Hill.

Tennant, B., Stellefson, M., Dodd, V., Chaney, B., Chaney, D., Paige, S., & Alber, J. (2015). Ehealth literacy and web 2.0 health information seeking behaviors among baby boomers and older adults. *Journal of Medical Internet Research*, *17*(17(3):e70). https://doi.org/10.2196/jmir.3992

Thom, D. H. (2002). Patient trust in the physician: relationship to patient requests. *Family Practice*, *19*(5), 476–483. https://doi.org/10.1093/fampra/19.5.476

Thompson, K., Kulkarni, J., & Sergejew, A. A. (2000). Reliability and validity of a new Medication Adherence Rating Scale (MARS) for the psychoses. *Schizophrenia Research*, *42*(3), 241–247. https://doi.org/10.1016/s0920-9964(99)00130-9

Tse, M. M., Choi, K. C., & Leung, R. S. (2008). E-health for older people: The use of technology in health promotion. *CyberPsychology & Behavior*, *11*(4), 475–479. https://doi.org/10.1089/cpb.2007.0151

Turan, N., Kaya, N., & Aydın, G. Ö. (2015). Health Problems and Help Seeking Behavior at the Internet. *Procedia - Social and Behavioral Sciences*, *195*, 1679–1682. https://doi.org/10.1016/j.sbspro.2015.06.248

University of California. (n.d.). *Who is considered a Health Care Provider/Practitioner?* https://hr.berkeley.edu/node/3777

Wallston, K. A. (1992). Hocus-Pocus,the Focus Isn't Strictly on Locus: Rotter's Social Learning Theory Modified for Health *Cognitive Therapy and Research*, *16*(2), 183–199. https://doi.org/10.1007/bf01173488

Wallston, K. A. (2005). The Validity of the Multidimensional Health Locus of Control Scales. *Journal of Health Psychology*, *10*(5), 623–631. https://doi.org/10.1177/1359105305055304

Wallston, K. A. (nd). *Multidimensional Health Locus of Control (MHLC) Scales*. Vanderbilt School of Nursing https://nursing.vanderbilt.edu/projects/wallstonk/index.php

Wallston, K. A., Strudler Wallston, B., & DeVellis, R. F. (1978). Development of the Multidimensional Health Locus of Control (MHLC) Scales. *Health Education Monographs*, *6*(1), 160–170. https://doi.org/10.1177/109019817800600107

Wallston, K. A., Wallston, B. S., Smith, S., & Dobbins, C. J. (1987). Perceived control and health. *Current Psychological Research and Reviews*, *6*, 5-25. https://nursing.vanderbilt.edu/projects/wallstonk/pdf/perceivedcontrolandhealth.pdf

Xie, B. (2011). Effects of an eHealth literacy intervention for older adults. *Journal of Medical Internet Research*, *13*(4), :e90 . https://doi.org/10.2196/jmir.1880

Ybarra, M. L., & Suman, M. (2006). Help seeking behavior and the Internet: A national survey. *International Journal of Medical Informatics*, *75*(1), 29–41. https://doi.org/10.1016/j.ijmedinf.2005.07.029

Zavorotnyy, M., Ehrlich, F., & Nenadic, I. (2020). Health-related Internet use and treatment adherence: A transdiagnostic comparison of outpatients with major depressive disorder and schizophrenia. *PsyCh Journal*, *9*(2), 174-184. https://doi.org/10.1002/pchj.355

Zhang, A., & Jang, Y. (2017). The Role of Internal Health Locus of Control in Relation to Self-Rated Health in Older Adults. *Journal of Gerontological Social Work*, *60*(1), 68-78. https://doi.org/10.1080/01634372.2016.1267672

Zhang, X., Wen, D., Liang, J., & Lei, J. (2017). How the public uses social media wechat to obtain health information in China: A survey study. BMC Med. Inform. Decis. Mak. 2017, 17, . *BMC Medical Informatics and Decision Making*, *17*(S2), 71–100. https://doi.org/10.1186/s12911-017-0470-0

Zimbardo, P., & Gerrig, R. (2004). *Psychology and Life* (17th ed.). Allyn & Bacon.

Zwikker, H. E., van den Bemt, B. J., Vriezekolk, J. E., van den Ende, C. H., & van Dulmen, S. (2014). Psychosocial predictors of non-adherence to chronic medication: Systematic review of longitudinal studies. *Patient Preference and Adherence*, *8*, 519–563. https://doi.org/10.2147/PPA.S47290

Appendix

NOVA SOUTHEASTERN UNIVERSITY
Institutional Review Board

MEMORANDUM

To: Donrie Purcell
Dr. Pallavi Patel College of Health Care Sciences

From: Monique Mokha, PhD LAT ATC CSCS
College Representative, Dr. Pallavi Patel College of Health Care Sciences

Date: February 18, 2021

Subject: IRB Exempt Initial Approval Memo

TITLE: The relationship between eHealth Literacy, Locus of control, trust in physicians, attitudes towards providers, and medication adherence.– NSU IRB Protocol Number 2021-68

Dear Principal Investigator,

Your submission has been reviewed and Exempted by your IRB College Representative or their Alternate on **February 18, 2021**. You may proceed with your study.

Please Note: Exempt studies do not require approval stamped documents. If your study site requires stamped copies of consent forms, recruiting materials, etc., contact the IRB Office.

Level of Review: Exempt

Type of Approval: Initial Approval

Exempt Review Category: Exempt 4: Use of previously-collected records, data, specimens, tissues, etc.

Post-Approval Monitoring: The IRB Office conducts post-approval review and monitoring of all studies involving human participants under the purview of the NSU IRB. The Post-Approval Monitor may randomly select any active study for a Not-for-Cause Evaluation.

3301 College Avenue • Fort Lauderdale, Florida 33314-7796
(954) 262-5369 • 866-499-0790 • Fax: (954) 262-3977 • Email: irb@nova.edu • Web site: www.nova.edu/irb

Annual Status of Research Update: You are required to notify the IRB Office annually if your research study is still ongoing via the *Exempt Research Status Update xForm.*

Final Report: You are required to notify the IRB Office within 30 days of the conclusion of the research that the study has ended using the *Exempt Research Status Update xForm*.

Translated Documents: No

Please retain this document in your IRB correspondence file.

CC: Monique Mokha, PhD LAT ATC CSCS

Gesulla Cavanaugh