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IMPROVING HEALTH LITERACY AS A METHOD OF INCREASING ADHERENCE IN
INSTITUTIONALIZED GERIATRIC PHYSICAL THERAPY PATIENTS

By

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Bachelor of Science, University of Montana, Missoula, Montana, 2017

Professional Paper

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IMPROVING HEALTH LITERACY AS A METHOD OF INCREASING ADHERENCE IN INSTITUTIONALIZED GERIATRIC PHYSICAL THERAPY PATIENTS

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The global population of long-term care facility (LTCF) residents ≥ 65 years of age has high rates of sedentary behavior, and is expected to increase in number in the coming years. LTCF residents benefit from physical therapy, which can increase patients' activity levels while treating symptoms of the inevitable aging process. A novel method is needed to increase LTCF resident adherence to physical therapy programs (PTPs). Health literacy (HL), which is the ability to interpret and understand health related information, presents as one such method to increase patient adherence. The geriatric population has the lowest HL rates out of all adult age groups, but LTCF physical therapists are in a prime position to successfully educate their patients. Within this paper are recommendations to increase the health literacy and consequent PTP adherence of elderly LTCF patients. Recommendations were organized within the Social-Ecological Model to account for the unique influence of the LTCF environment. Four Intrapersonal, one Interpersonal, two Organization and three Community recommendations were produced to increase patients' health literacy. The substantiating evidence for the Intrapersonal and Interpersonal recommendations were strong overall, while the Organization and Community recommendations had a wider range of evidence strength ratings. Health literacy offers a promising intervention to increase the program adherence of elderly physical therapy patients in LTCFs, though all levels of recommendations require further validation before being implemented in a clinical setting.

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Chapter 1 – Introduction

Statement of Problem

The world's elderly population is increasing yet has high rates of physical inactivity, necessitating a novel method to promote exercise adherence. The global population of people over the age of 60 is expected to increase significantly in the next 30 years [1]. Improvements in adolescent and elderly mortality rates are two explanations for this substantial geriatric population growth [1]. As the international population ages, the need for institutional elderly care increases accordingly [2-8].

Within the United States, 1.5 million people lived in long-term care facilities (LTCFs) as of 2016 [9]. Professional healthcare is often provided to residents in LTCFs, for age-related chronic comorbidities and decline in overall functional capacity [2, 5, 6, 8, 10]. Aging-related physical declines that necessitate LTCF placement include increases in disease risk, gait alterations, percentage of body fat and blood pressure, as well as decreases in aerobic capacity, muscle strength, bone density and balance [4, 7, 11-17]. Physical activity (PA) mitigates and delays many of these declines and produces new benefits, such as prolonging the ability to perform activities of daily living (ADLs) and remain independent, as well as decreasing the rate of cognitive decline and the occurrence and risk of disease [2, 4, 11-14, 16-19]. Accordingly, the American College of Sports Medicine (ACSM) recommends the following minimum exercise guidelines for elderly persons: [11]

- 30 – 60 minutes a day, approximately 5 days a week, for a total of 150 minutes a week of *moderate* exertion, with ≥ 2 days a week of flexibility and resistance training
- OR
- 20 – 30 minutes a day, approximately 3 days a week, for a total of 75 – 150 minutes a week of *vigorous* exertion, with ≥ 2 days a week of flexibility and resistance training

Alternatively, de Souto Barreto et al. recommends the following exercise prescription specifically for institutionalized elderly who are able to perform a sit-to-stand movement but require assistance with ADLs: [20]

- 35 – 45 minutes a day, at least 2 days a week, for a total of at least 70 – 90 minutes a week of *moderate* exertion, with flexibility and balance training performed when practical and appropriate

Exercise is known to counteract symptoms of the aging process, though programs need to be specialized to accommodate the needs of elderly patients.

The appropriate design of exercise programs for the older population includes accounting for their varied functional status. The rate at which the elderly achieve physical independence differs based on health status and fitness level. In addition, significant differences between chronological aging and physical aging can produce varied exercise tolerances and abilities for aged individuals [1, 2, 11]. To counteract age-related variations in physical functionality, ACSM recommends a geriatric exertion scale individualized to each subject's fitness, from 0 (sitting, at rest) to 10 (greatest possible exertion) [11]. The recommended exertion scale is used in place of the traditional metabolic equivalent (MET) scale for all other adults, in which exertion is estimated by energy output [11]. Exertion scales customized to each patient allows for symptoms of aging to be taken into account.

The geriatric population requires further treatment program alterations in the form of specified rehabilitation therapy. Medically vulnerable long-term care patients are regularly treated by physical therapists (PTs), who administer exercise programs and provide structured PA opportunities to counteract sedentariness. Physical therapy programs (PTPs) are incorporated within ACSM's "exercise is medicine" agenda, and can decrease reliance on pharmacological interventions as well as present an effective, upstream treatment option to prevent injury and disease related to lack of PA [2, 8, 18, 21-26]. In geriatric patients specifically, PTPs can increase strength, flexibility and balance [27], in order to prevent falls [27, 28], which can cause subsequent injury, disability, and death [27-29]. Unfortunately, geriatric physical activity rates are low, a fact that is particularly true within LTCFs [24]. As of 2014, only 12% of Americans ≥ 65 years of age and 5% of Americans ≥ 85 years of age were meeting the minimum federal requirements for physical activity [11, 30]. Additionally, only 35% of elderly outpatient physical therapy subjects self-reported adhering to semi-regular exercise [31], with 22% and 41% considered non-compliant or partially compliant, respectively [31, 32]. Specific to LTCFs, one study found sedentary behavior in nursing home (NH) residents for an averaged 65.5% of a 13 hour observation period [2, 6, 33]. The same study also found the NH residents only engaged in self-propelled movement for an average of 0.9% of 13 hours [6], while Bootsman et al. found residential aged care facility (RACF) residents walking only an average of 0.5 hours a day [10]. Institutionalized inactivity rates coupled with a projected increase of the elderly population connotes a need to develop effective

physical therapy treatment adherence methods [15]. Potential solutions to the sedentary trend of institutionalized residents include changing the institutional environment to encourage activity, educating institutional care providers on safe PA options for residents, and improving the health literacy levels of the residents themselves.

Health Literacy (HL) offers a potential solution to the problem of institutional inactivity. HL measures a person's capability to interpret and understand health related knowledge [34, 35], and has the potential to be increased through purposeful education [36, 37]. A physical therapist's ability to communicate, as well as the client's ability to understand the medical communication, are both important in the patient's success in rehabilitation outcomes [38]. Health literacy tasks include being able to read and understand medical consent forms, prescription bottles, physical therapy instructions, and food labels, as well as research healthcare providers, services and topics, and understand and implement healthy lifestyle modifications [35, 39-41]. Health literacy levels (defined at length in Chapter 2) are categorized as Proficient, Intermediate, Basic and Below Basic, though level names and score parameters vary depending on the type of HL measurement test utilized. A subject's HL status acts as a strong indicator of their current or future overall health status [34, 35, 39, 42-48]. Decreased HL is associated with increased mortality and hospitalization, as well as decreased treatment adherence, physical and mental health [34, 35, 38-44, 47-55]. Increased HL is preliminarily linked to improved overall health via increased health behavior education, adherence and self-empowerment [34, 47, 51, 56]. However, the elderly population currently measures lowest in health literacy rates across all adult populations, indicating a need for improvement [34, 35, 41, 48, 56]. There is preliminary evidence of a positive relationship between health literacy levels and adherent behavior in both the general adult population [43, 44, 57] and the elderly population [34], as well as health education (HE) interventions and exercise adherence in adult populations [58] and the elderly specifically [17]. However, further research is needed to investigate the strength of this relationship [44, 59], develop health literacy intervention potency [44], and derive specific modalities to increase geriatric therapeutic program adherence [44]. The positive effects of health literacy on health status make it a means through which treatment adherence can be increased in older people. LTCF physical therapists are inimitably positioned to enhance HL and ultimately improve health status.

Long-term care facility physical therapists' frequent client interactions produce strong relationships and incisive health literacy assessments, providing an ideal environment for

successful health education. The close therapist-patient proximity in LTCFs allows for regular encouragement, feedback and patient trust to develop, improving patient empowerment, motivation, exercise program adherence and treatment outcomes [14, 19, 31, 32, 50, 60-64]. Patients with lower HL levels are less likely to voluntarily access preventative medical care [34, 35, 38, 45, 48, 49, 55], but in an LTCF, familiarity with the physical therapist could ameliorate this barrier. In addition, LTCF PTs can more accurately observe patient's HL abilities, motivators and barriers than other medical providers who see them less frequently [12, 35]. As an accepted presence in the care center, LTCF PTs often deliver facility-wide programs, and being a familiar community member may increase the reception and retention of such education [8]. LTCF PTs have the access and ability to increase their patient's HL, physical activity and treatment adherence, though require a model to organize planned interventions within [35].

The Social-Ecological Model (SEM), as expanded upon in Chapter 2, is an organizational framework within which different methods of enhancing health literacy can be considered. The SEM is made up of five increasingly broad levels of social and environmental factors to target, in order to induce behavioral change. Furthermore, the SEM is central to the discussion of interventions in long-term care because it allows for an examination of the individual, social and environmental influences on health literacy, and is particularly effective in examining the effect the environment (such as an LTCF) has on the residents [11, 12, 22]. As noted by McArthur et al., there are copious peer-reviewed physical therapy studies focused on institutionalized residents, but few of the papers examine LTCF physical therapy at the facility and system levels [8]. As treatment adherence affects treatment outcome, it's plausible that successful interventions at each of these SEM levels have the potential to improve patient's physical therapy program adherence rate [32, 65]. Education to improve patients' health literacy is one such methodology that can be organized within the SEM's levels, depending on what social and environmental factors the intervention targets. Categorizing the planned health literacy interventions within appropriate SEM levels is necessary to bring focus, efficiency and clarity to the research.

Purpose of Study

The purpose of this study is to analyze research on geriatric health literacy improvement methodologies, with a focus on its relationship to physical activity and exercise adherence specific to prescribed physical therapy protocols within long-term care facilities. At the conclusion of this

paper, the author will produce a list of evidence-based recommendations for geriatric physical therapists within LTCFs to increase treatment adherence, via the improvement of patient’s health literacy.

Significance of Study

The content of this paper will focus on methodologies that purport to increase the health literacy and treatment adherence or activity levels of physical therapy patients ≥ 65 years of age living in long-term care facilities. In regard to this understanding, previous research studies and literature reviews have focused on health literacy and adherence to healthy behavior in middle aged and elderly adults [43, 44, 47, 59, 66, 67], as well as physical therapy and exercise interventions in long-term care [2-4, 7, 8, 17, 28, 33, 64, 68-72]. HL guidelines to increase PTP adherence in LTCF patients above the age of 65 have yet to be established [44], though this paper aims to rectify that deficit. Furthermore, as illustrated in Figure 1, this paper unifies community health and behavioral change, rehabilitative sciences, and exercise science. Such a combination of academic fields is an incipient area of research, but valuable and worthy of further investigation.

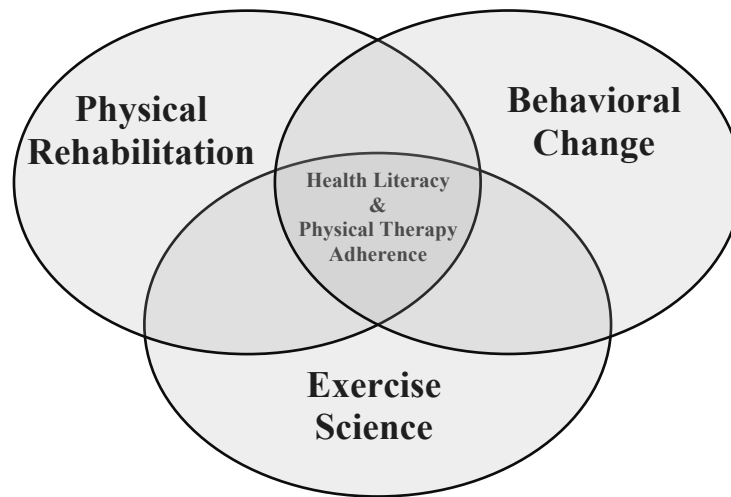


Figure 1. The combination of health subjects that contributed to this paper’s content.

Limitations & Delimitations

There are five delimitations within this paper. First, this paper’s working definition of “elderly” is defined as subjects ≥ 65 years old [11]. Second, research performed on subjects with diagnosed dementia or cognitive comorbidities that could affect motivation, adherence and ability to retain health literacy knowledge will be excluded [36, 73]. Third, health literacy methodologies

within this paper will be organized using the Social-Ecological Model. Fourth, this author intends to apply the paper's conclusions to physical therapy programs, specifically within long-term care facilities. Finally, collected research will be restricted to literature available in English.

Additionally, there are five limitations to this study. First, there is relaxed consensus in the literature regarding the definition of elderly, which is generally defined as older than 55, 60, or 65 years of age. ACSM further notes that patients between the ages of 50 and 64 with significant physical restrictions can be quantified as elderly [11]. Second, institutionalized elderly with diagnosed dementia or cognitive disorders represents a significant population of institutionalized exercise adherence literature which will be unavailable to this study. Third, components from the Transtheoretical Model (TTM) and Self-Efficacy Theory (SET) are more commonly used to organize health literacy interventions than the Social-Ecological Model and have increased validation in the literature. Fourth, LTCF physical therapy is a small subset of the overall physical activity and exercise programs that institutionalized elderly residents engage in, which could present difficulties in locating an adequate amount of relevant research and limits the population that this paper's recommendations can be applied to. Finally, there are likely papers published in non-English languages that would positively contribute to the research within this paper, but are inaccessible to the author at this time.

Basic Assumptions

Five assumptions are made within this paper. First, it is assumed that the age parameters denoting elderly patients is representative of the majority of the target population within long-term care facilities. Second, it's assumed that excluding studies focused on patients with cognitive comorbidities will not restrict the remaining sample size of research severely enough to bias this paper's conclusion. Third, it is assumed that the Social-Ecological Model is applicable to the organization of health literacy intervention within long-term care facilities without limiting the available data. Fourth, it's assumed there will be a large enough sample size of peer-reviewed literature on health literacy interventions increasing adherence to the activity levels within institutional settings for the author to draw valid conclusions and form preliminary recommendations. Finally, it is assumed that the available sample size of peer-reviewed literature in English, being the primary language for refereed science world-wide, reflects current consensus on the topic.

Section Summary

Effective and specialized physical therapy options are necessary to treat the growing and generally inactive geriatric patient population in long-term care facilities. Interventions to increase exercise adherence are needed to lessen this decline. Increasing the health literacy of institutionalized elderly patients presents a cost-effective and pragmatic approach to increasing therapeutic program adherence. Further research is needed in the domain of geriatric physical therapy patients residing in LTCFs. The Social-Ecological Model presents a framework within which this information can be better organized and understood.

Definition of Terms

- **Adherence** within the scope of this paper refers to the rate at which subjects maintain the guidelines or instructions given to them by a healthcare professional or an academic researcher [32, 44, 74].
- **Barthel Index** is a measure of physical skills independence, comprised of ten scored activities of daily living, for an overall score range of 0 – 100 [4].
- **Community-Dwelling** refers to people who live independently in their own homes, outside of a structured care program [75].
- **Dual-Task** describes a test commonly performed on elderly patients to assess their ability to perform two separate actions simultaneously (for instance, walking while talking) [10].
- **Elderly**, for the purpose of this paper, refers to anyone 65 years of age or older [11]. Unless otherwise noted, within this paper the terms elderly, aged, geriatric, and older all refer to those ≥ 65 years of age.
- **Exercise** is a subcategory of physical activity, and is any structured and intentional rhythmic physical movement that expends energy in pursuit of increasing physical fitness [11, 13, 32].
- **Functional Ability**, for the purpose of this paper, is the results of task-specific ability from measures of a geriatric patient's functional skills, including the timed up-and-go test, activities of daily living, risk of falling, physical ability, handgrip strength, and mobility [33, 68].
- **Health Literacy** is a person's ability to access, understand, communicate and make decisions about health-related information, with the purpose of promoting and maintaining their own health [34, 36-39, 41-56, 59, 67, 76-79].
- **Long-Term Care Facility** refers to any inpatient facility that aids a geriatric person in their medical or everyday needs [80]. For the purpose of this paper, LTCF is an umbrella term that includes nursing homes, skilled nursing facilities, residential care facilities and assisted living homes [3, 28, 33, 80]. The term institutionalized refers to any person residing within an LTCF.
- **Moderate Intensity Physical Activity**, specific to geriatric exercise and for the purpose of this paper unless otherwise noted, is 5-6 on a perceived physical exertion scale of 0-10, with a discernible increase in heart rate and respiration rate [11].
- **Numeracy** is a person's capability to comprehend and utilize quantifiable information (i.e. numbers and calculations) and can contribute to a person's overall health literacy level [57, 81].
- **Physical Activity** is any physical movements borne from contracting skeletal muscle that cause the body's caloric requirements to significantly exceed its resting energy expenditure [11, 13, 32, 59].

- **Physical Environment** is the attributes of the physical setting within which people live, work and learn [82].
- **Physical Therapy** is a treatment of the body with the purpose of decreasing pain and increasing or regaining physical ability, functional ability, mobility and activity level [4, 18, 62].
- **Readability** is the literacy level, writing and formatting techniques, and the subject of a written piece of work, all affecting the reader's ability to accurately interpret the material [83].
- **Retirement Community** denotes a housing subdivision in which a concentration of older people lives independently within their own homes. The population is generally ≥ 65 years of age, though this is not guaranteed [84].
- **Self-Efficacy** is a patient's self-confidence in their ability to properly execute an action, skill or behavior [85, 86].
- **Short Physical Performance Battery Test** measures the functional status of a patient by scoring multiple tasks: balance while standing, gait velocity and sit-to-stand exercises [87].
- **Vigorous Intensity Physical Activity**, specific to geriatric exercise and for the purpose of this paper unless otherwise noted, is ≥ 7 on a perceived physical exertion scale of 0-10, with a substantial increase in heart rate and respiration rate [11].

Abbreviation of Terms

AAHLS = All Aspects of Health Literacy Scale
ACSM = American College of Sports Medicine
ADL = Activity of Daily Living
BMI = Body Mass Index
BPG = Best Practice Guideline
HALS = Health Activity Literacy Scale
HE = Health Education
HL = Health Literacy
LTCF = Long-Term Care Facility
MET = Metabolic Equivalent
NAAL = National Assessment of Adult Literacy
NH = Nursing Home
NVS = Newest Vital Sign
OT = Occupational Therapists
OTP = Occupational Therapy Program
PA = Physical Activity
PT = Physical Therapist
PTP = Physical Therapy Program
RACF = Residential Aged Care Facility
RCF = Residential Care Facility
RCT = Randomized Controlled Trial
REALM = Rapid Estimate of Adult Literacy in Medicine
RNAO = Registered Nurses' Association of Ontario
RT = Resistance Training
SAHLSA = Short Assessment of Health Literacy for Spanish-Speaking Adults
SD = Standard Deviation
SEM = Social-Ecological Model
SET = Self-Efficacy Theory
SILS = Single Item Literacy Screener
SNF = Skilled Nursing Facility
SPPB = Short Physical Performance Battery Test
SSQ = Single Screening Question
S-TOFHLA = Shortened Version of the Test of Functional Health Literacy in Adults
TOFHLA = Test of Functional Health Literacy in Adults
TTM = Transtheoretical Model

Chapter 2 – Review of the Literature

Physical Therapy in the Geriatric Population

Overview

The specific domain of geriatric physical therapy, particularly in LTCFs, is an emergent field of inquiry that requires additional investigation. Existing studies on physical therapy programs in long-term care facilities have yet to delineate the best practice methods of the PTP [8]. The LTCF physical therapists' primary treatment outcomes are similar to outpatient PT outcomes, but with a significant emphasis on preservation of functional ability, as well as decreasing fall risk and pain levels [3, 68, 88]. The availability of physical therapy to LTCF residents was found to be 43.9% in American resident care facilities (RCFs) [28]. LTCF residents actively enrolled in PT services was found to be 11% in select U.S. nursing homes [89], compared to an averaged 10.1% in sampled United Kingdom NHs [90], and 67.3% of Dutch NH residents ≥ 55 years old [91]. Though these statistics vary and, in some cases, appear unexpectedly low, these discrepancies may be due to the examined data being collected from multiple LTCF subtypes, within several countries [8], and comprising both private and publicly-funded PT [90]. The leading diagnoses within skilled nursing facilities (SNFs) include muscle weakness and necessary post-joint replacement care [92], both conditions which can significantly benefit from rehabilitative treatment. Customized and purposeful rehabilitation therapy is known to have positive effects on elderly patient's physical and functional skills, fall risk, and pain levels, including those who are institutionalized [3, 28, 69]. Physical therapy within LTCFs improves geriatric patient's physical outcomes but requires further study to determine the best methods of promoting adherence.

Physical therapy interventions in long-term care have known benefits to patient health, but need additional research. Experimental physical therapy interventions at the long-term care resident level engage the subject more frequently and may be shorter in time commitment, on average, than interventions at the facility level [8]. The majority of LTCF physical therapy studies utilize a multi-targeted exercise program in a group format [8]. Prevalent outcome measures in LTCF PT studies include measures of functional ability, cognitive status, strength, balance, flexibility, ability to perform ADLs, and mood [4, 8]. Physical therapy interventions in long-term

care are less common in the literature than outpatient studies are, though the current results are promising.

Inherent institutional barriers to physical activity exist, however, physical therapy can ameliorate these barriers. Within long-term care facilities, common barriers to physical activity include the presence of pain, concerns about health status, and potential future decline [12]. Additional PA barriers reported by the general population 60 years and older include inadequate direction, lack of demonstration, and low self-efficacy and motivation [12, 32]. Within LTCFs, physical therapists are a healthcare resource that can allay resident anxieties and communicate the benefits of PA's effects on health status. Additionally, physical therapy treatment is known to decrease pain, and provides an opportunity to direct and demonstrate accurate exercise techniques as well as give positive feedback that increases self-efficacy and motivation. Institutional physical therapists are in the position to alleviate the physical activity barriers faced by residents, as well as provide the many benefits of physical therapy programs.

Benefits of Geriatric Physical Therapy

Physical therapists are highly-trained health professionals that provide specified exercise programs to their patients with the purpose of decreasing pain and increasing physical function and activity levels [4, 18, 62]. Physical activity can increase geriatric patients' fitness and functional abilities and decrease their chance of injury due to falls [11]. Falls constitute both the leading cause of emergency department visits [93] and the leading cause of non-disease death [87, 93] in the entire elderly population, as well as part of the fifth leading cause (along with trauma) of possibly preventable hospitalization in nursing home patients within 12 months of their death [94]. Furthermore, the medical conditions most frequently suffered by RCF residents include hypertension, heart disease, osteoporosis and diabetes [95, 96], which are known to be improved with physical activity and exercise [11, 20, 97]. Specific to LTCF residents, observed benefits include significantly higher balance and dual-task results, as well as significantly decreased occurrences of hypertension in RACF patients with medium to high PA levels [10]. In addition, PTPs are an opportunity for geriatric patients to consistently exercise and acquire the benefits of physical activity in a safe, supervised and social environment. Within LTCFs, compliance-supervised and instructor-led exercise programs have known positive effects on patient outcomes [15, 31], and group exercise programs have produced higher adherence rates than unsupervised

solitary exercise [98]. Multiple supervised exercise intervention programs within LTCFs have produced significant improvements in strength [2, 70, 99], gait velocity [2, 70], balance [2, 70], functional abilities [70], and decreased occurrence of falls [2, 70, 99]. In an additional study, Lorenz et al. found that a combination of resistance training (RT), walking, and individual social interaction produced the greatest increase in institutionalized subjects' functional abilities compared to social activities alone or the typical activities occurring in an LTCF [33]. Alternately, Lacroix et al.'s meta-analysis reported the effects of supervision on patient exercise program adherence rates is mixed, and states that more research is needed to determine whether self-report bias and lack of comparison groups are confounding results [15]. Though requiring further study, there is strong evidence that supervised and socialized exercise programs, such as those provided by a physical therapist, counteract the leading causes of infirmity and provide health benefits for LTCF patients.

Specific to institutional physical therapy interventions, the benefits of rehabilitation can be seen in a multitude of outcomes. Within inpatient facilities such as hospitals, physical and occupational therapies specific to geriatric populations have demonstrated an increase in functional abilities and decreased risk of nursing home admission and mortality, though PTP and occupational therapy program (OTP) results weren't separated [18]. In addition, PTPs as well as health education classes can be a source of social interaction for LTCF patients [6, 19]. Zasadzka et al. found improved functional capacity in geriatric patients who underwent daily personalized PTPs while hospitalized for 35 days [68]. Additionally, Martinez-Velilla et al. found hospitalized geriatric patients made greater gains in physical performance, ability to regain ADL performance, cognitive status and quality of life when receiving rehabilitation encompassing balance, strength, and gait [26]. Ultimately, there is a dearth of information on PTPs in long-term care, as well as the physical therapist's role within LTCFs compared to outpatient rehabilitation [100]. Studies that have been published on the topic of geriatric rehabilitation in LTCFs often have the researchers themselves delivering the physical therapy intervention to the residents, which prevents results from being generalizable to physical therapists [8]. There is strong evidence for the health advantages that physical therapy yields for institutionalized geriatric patients, though there are also unavoidable and accompanying risks.

Risks of Geriatric Physical Therapy

In a vulnerable population such as the institutionalized elderly, safety during any type of physical activity is a relevant and paramount concern. Fall risk was found to be significantly higher in patients receiving rehabilitation in an inpatient location, compared to outpatient and home rehabilitation locations [101]. As noted by Arrieta et al., PA in LTCF residents is most commonly limited by caretakers due to the risk or fear of falls [2]. In addition, when asked what the disadvantages of exercise were for older adults, subjects living in a continuing care community all answered with some variation of “potential for injury and/or falling” [19]. Paradoxically, avoiding PA for fear of falling is associated with physical deterioration in the elderly [102, 103], which can increase the probability of a fall due to low fitness levels [29] and balance abilities. Additional potential adverse effects of physical activity or rehabilitation include increased pain and risk of hospitalization [7, 99, 104]. However, results from a comprehensive study on community-dwelling elderly indicated physical activity programs produced no greater risk of serious fall injuries or overall rate of hospitalization, but did significantly decrease rates of major mobility disability, compared to subjects in health education programs [104-106]. Ultimately, with vigilance and awareness, geriatric PTs can provide the multitude of physical activity’s benefits while mitigating the risks.

Health Literacy

Overview

Evidence suggests that increasing a patient’s health literacy increases exercise adherence and is a potential intervention to increase PT adherence [17]. Health literacy represents a person’s capability to interpret and understand health knowledge [34, 35], and contributes to a patient’s ability to consent to procedures, accurately self-administer medications, adhere to provider’s directions, as well as investigate health topics and make autonomous healthcare decisions [35, 39-41]. In 2003, the United States Department of Education provided the results of the first nationwide health literacy assessment within the National Assessment of Adult Literacy (NAAL), demonstrating HL’s relevance in modern healthcare [41, 78, 79]. The levels of HL competency as defined by the NAAL are seen in Table 1. Those with Basic and Below Basic levels are considered unable to satisfactorily manage their own healthcare [42].

<i>Health Literacy Level</i>	<i>Definition</i>	<i>Example</i>
Proficient	Subjects are able to draw abstract inferences, compare, contrast and apply multiple, complicated pieces of information found within complex pieces of writing.	<ul style="list-style-type: none"> • Using a table of variable monthly costs, calculate an employee’s share of health insurance costs for a year • Evaluate information to determine which legal document is applicable to specific health care situations
Intermediate	Subjects are able to interpret or apply information presented in the form of complex graphs, tables, or written pieces.	<ul style="list-style-type: none"> • Use BMI graph to determine a healthy weight range for someone with a given height • Using a medication label, identify three substances that can interact with that medication
Basic	Subjects are able to find information of increased complexity in pieces of writing that are of longer length than those in the Below Basic level.	<ul style="list-style-type: none"> • Given a clearly written pamphlet, identify two reasons someone without specific disease symptoms should be tested for that disease • Using a one-page article, explain why it’s difficult for people to know if they have a specific medical condition
Below Basic	Subjects are able to find straightforward pieces of information in short, simple pieces of writing.	<ul style="list-style-type: none"> • Given a clearly written pamphlet, identify how often a person should undergo a specific medical test • Circle the date of a medical procedure on a hospital appointment slip

Table 1. Information adapted from Kutner et al. 2006 National Assessment of Adult Literacy describing the levels of health literacy competency [41]. BMI = body mass index.

Results of the NAAL found low HL present in all ethnicities, age groups, socioeconomic and education levels, though more prevalent in certain subgroups, including the elderly [41, 79]. Education and socioeconomic status are two demographic factors whose association with HL levels is often examined, though a full review of these relationships is outside the scope of this paper. Briefly, socioeconomic factors (i.e. income amount, employment level, etc.) are positively associated with health literacy levels for all adult age ranges including the elderly [34, 41], though other studies report no associative relationship [34]. Similarly, several authors have reported a positive relationship between terminal education level and current health literacy level for all adult age ranges, including the elderly [34, 41], while other authors found no positive association between HL and greatest education level achieved [34]. Importantly, practitioners are cautioned against assuming a universal and linear relationship between education level and HL [34, 81] or general literacy level [83]. As of 2014, 10% of all community-dwelling elderly Americans were at or below the poverty line, 22.5% were classified as low income, 31.1% as middle income, and

36.4% as high income [30]. Though exact socioeconomic numbers for all LTCF residents are unclear, Costello et al. did note that long-term care residency often requires a higher income [19]. However, a 2013 population of long-term care Medicare recipients were reported to have decreased incomes compared to their community-dwelling counterparts [30]. Additionally, 41% of residential care community patients had achieved education beyond the 12th grade level [95], compared to a separate study showing 26.7% of community-dwelling elders who hold a Bachelor's degree or higher [30]. Overall, associations between HL and ethnicities, education level, socioeconomic status, and gender have yet to be definitively substantiated and require further research [34]. Within all adult age groups, general consensus is that those ≥ 65 years of age have the lowest rates of HL, however, it's unknown which subgroup of this older age group (septuagenarians, octogenarians, nonagenarians etc.) have the lowest HL [34]. Health literacy is associated with health status and adherence, and is particularly relevant to the geriatric population, though further research on specific interventions are necessary.

Health literacy is a personal characteristic with a variety of internal and external influences, requiring a multifaceted measurement type [55]. HL is typically measured using tests quantifying understanding of the reading, and assembling letters into words or sentences and knowing what they mean [35]. HL measurement tests include: [34-37, 39, 40, 42, 44, 46, 78]

- Test of Functional Health Literacy in Adults (TOFHLA)
- Shortened Version of the Test of Functional Health Literacy in Adults (S-TOFHLA)
- Rapid Estimate of Adult Literacy in Medicine (REALM)
- Short Assessment of Health Literacy for Spanish-Speaking Adults (SAHLSA)
- Newest Vital Sign (NVS)
- Single Item Literacy Screener (SILS)
- All Aspects of Health Literacy Scale (AAHLS)
- Single Screening Question (SSQ)
- Health Activity Literacy Scale (HALS)

The most-widely used health literacy measures are the TOFHLA and the REALM [36]. The full version of the TOFHLA takes 25 minutes to complete, and measures a subject's ability to comprehend a 50-word reading test as well as simulated provider and prescription instructions [34, 36]. The REALM takes 3 minutes to complete, and scores subjects on their ability to recognize and pronounce 66 health-related words [36]. The multitude of HL tests have drawn criticism from some, who claim different tests produce varied scores for the same subject, time required to complete tests is too long, and the tests measure general literacy instead of health literacy

specifically [34, 44, 78]. Health literacy assessment methods utilized by clinicians include either individually screening each patient and communicating in accordance with their HL level, or communicating at the same universal level with all patients [39]. A wide range of HL testing methods have been developed, reflecting the multitude of influences affecting the characteristic.

Due to its importance in health outcomes, healthcare providers should be particularly attuned to their patient's health literacy levels. Indicators of low health literacy levels include regularly missed therapy appointments, inability to consistently complete home exercise plans or take medications, difficulty naming or describing the effect of prescribed medications, partially completed or incorrect information on registration forms, and inability to make follow-up referral appointments or tests [35, 107]. Decreased HL levels have been associated with decreased adherence to directions dispensed by healthcare providers [39]. Alternatively, increased HL levels have been associated with increased rate of occurrence and time spent performing physical activity [59]. Health literacy presents a potential methodology with which to increase patient adherence and consequently, patient health.

Geriatric Health Literacy

As with many fields within medicine, health literacy is vitally relevant to the physical therapy profession, as patients take an active role in their own treatment and the burgeoning client-centered model is normalized [38, 108]. Frequent patient interaction allows for increased patient-therapist relationship quality, making physical therapists ideal health educators [38, 61]. Patient's trust in their physical therapists has been linked with increased treatment adherence and engagement [60]. McArthur et al. noted that physical therapy is often a short-term treatment bound by strict outcome benchmarks, limited therapist availability, and financial limitations [8]. In counteraction to this, increasing patients' health literacy allows for greater healthcare and treatment independence, instead of being reliant on the physical therapist [39]. Research by Liu et al. found significant association between higher health literacy levels and decreased health risk behaviors (including decreased PA) in subjects ≥ 60 years of age [67]. Comparatively, Wolf et al. found decreased physical function, mental health, and activity ability in community-dwelling geriatric subjects with inadequate health literacy levels, when controlling for factors including education and income [55]. Health literacy presents not only an opportunity for physical therapists to increase patient education and health status, but self-efficacy and independence as well.

Unfortunately, the geriatric population has the lowest health literacy out of all age groups, though overall rates vary among researchers [34, 41, 42, 56]. To the best of this author's knowledge, statistics on the health literacy levels of elderly institutionalized patients in America have yet to be reported [67]. The lack of knowledge in LTCF HL is likely due to unstable health statuses, high study attrition [22] and difficulties gaining consent. However, Liu et al. did report mean health literacy levels of 73.68 (SD 29.42) out of 196 possible points in a sample of 1,486 Chinese nursing home subjects, a result defined as low health literacy by the study's authors [45]. Results from the 2003 NAAL showed that in the general population ≥ 65 years old, 3% were Proficient (the lowest Proficient percentage of all age groups), 38% were Intermediate, 30% were Basic and 29% were Below Basic (the highest Below Basic percentage of all age groups) in regards to HL levels [41, 42, 49]. A Geboers et al. review reported that in older-aged populations low health literacy comprised 30-68% of people [44], while Paasche-Orlow et al.'s review found rates of low or marginal health literacy in community-dwelling geriatrics to be 26% and 20%, respectively [42, 52, 109]. Wolf et al. and Gazmararian et al. both studied health literacy levels of community-dwelling elderly Medicare patients. Wolf et al.'s subjects measured 11.3% marginal and 22.2% inadequate HL levels [55], while Gazmararian et al. found 33.9% English-speaking and 53.9% Spanish-speaking subjects with HL levels deemed inadequate or marginal [40]. Though exact statistics differ, all of the aforementioned studies found a significant proportion of geriatric subjects with low health literacy, indicating a need for improvement. Those ≥ 65 years of age have the highest rates of low health literacy of all adult age groups, which puts seniors at greater risk for deleterious health behaviors and outcomes. A novel methodology is necessary to encourage the development of health literacy and physical activity, in order to deliver health benefits to the elderly.

Health Literacy and Exercise Adherence

Increased health literacy in geriatric patients can increase exercise program adherence through patient education and empowerment [108]. Elderly, institutionalized patients have a reported interest in furthering their health education as well as becoming an independent advocate for their own health instead of relying on the expertise of healthcare professionals [45, 49]. Adherence to treatment programs is important, as implied by Fairhall et al. who found increased treatment effect in subjects with increased intervention adherence [65]. However, geriatric patients

often have low levels of exercise motivation and unique motivating influences [71]. Health literacy is a novel intervention to address motivational influences, educate patients and improve activity program adherence in the institutionalized elderly population.

The link between health literacy and exercise adherence in the elderly population is known, but requires further study. Increased adherence has been linked to favorable pain, physical function and ability outcomes, and decreased adherence is associated with an increased number of prescribed medications and occurrence of depression [32, 44]. Geboers et al. discovered significantly decreased adherence to PA guidelines in subjects ≥ 55 years of age with inadequate health literacy, as well as a predictive relationship between inadequate HL levels and low PA self-efficacy in the same population [43]. Comparatively, Lam & Leung's review found increased physical activity levels in patients who underwent health education interventions, however, this review focused on diabetic subjects 45 to 67.2 years of age and was unable to draw a decisive conclusion due to the low sample size and quality of the literature [59]. In studying the effects of health literacy on adherence to physical activity and exercise programs, the importance of using a health behavior model has been noted by multiple authors [14, 23, 32].

The Social-Ecological Model presents a novel and comprehensive health behavior model within which health literacy and exercise adherence interventions can be organized. The most common motivators to people 60 years and older are social support, benefits of increased health and enjoyment of the activity [12]. Specific to LTCF residents, prevailing motivators were positive preceding experiences with activity, social support, and family responsibilities [12]. The Social-Ecological Model, as outlined in Table 2, is made up of increasingly broader levels of determinants providing motivators or barriers to an action [12]. Physical therapists can address these determinants to effect change in the adherence patterns of their geriatric patients. The SEM organizes the variety of motivational determinants for physical therapists to address, which is more likely to be successful than targeting one level of motivational determinants alone [32, 110]. There are five total SEM levels, but four – Intrapersonal, Interpersonal, Organization and Community – are the most pertinent to geriatric physical therapy and LTCFs, and will be utilized in the organization of this paper.

<i>Social-Ecological Model Level</i>	<i>Definition</i>	<i>Geriatric Physical Therapy Example</i>
Intrapersonal	Individual or personal characteristics that impact behavior, actions, knowledge, attitudes, beliefs, and personality traits. [11, 12, 22, 76, 110, 111]	<ul style="list-style-type: none"> • Interest in or enjoyment from exercise • Health status allows for exercise • Having time to exercise • Patient feels safe performing exercise and believes exercise will benefit health [12, 76]
Interpersonal	Input, interaction tone and opinions of a person's primary social support whom they have regular contact with, including family, friends and peers. Influenced by this level is social identity, support, and role definition. [11, 12, 22, 76, 110, 111]	<ul style="list-style-type: none"> • Support or lack thereof from friends and/or family to exercise • Physician's advocacy or dissuasion of exercise [11, 12, 76]
Organization	Formal, organized social groups and institutions such as schools and worksites, the leaders of those organizations, and any formal or informal rules those groups have. [110, 111]	<ul style="list-style-type: none"> • The institution's rules or policies on physical activity • The institution's culture supporting (or not) physical activity • The attitudes or beliefs of the institution's authority figures [110, 111]
Community	Rules, social norms, social networks and informal structures between groups and organizations, which may limit or encourage specific behaviors. [12, 22, 76, 111]	<ul style="list-style-type: none"> • Access and transport to exercise facilities that are safe, appropriate, affordable • Confidence in instructor's abilities • Whether living environment and those that populate it are supportive of exercise [12, 76]
Policy	The overall community and policies or laws within them, the opinions of policy makers and general members of the community. [110, 111]	<ul style="list-style-type: none"> • Creating official public policies or laws targeting health behavior [110, 111]

*Table 2. Table adapted from McLeroy et al. and Baert et al., illustrating the health literacy levels within the Social-Ecological Model [12, 111]. The **bolded** levels are the focus of this paper.*

While the Public Policy level is an important section of the SEM, it falls outside the scope of what can be directly affected by a physical therapist within long-term care, and as such will not be elaborated on within this paper. The Social-Ecological Model organizes the variety of levels at which physical therapists can affect health literacy, and consequent physical activity motivation and adherence, within LTCFs.

Once organized within the SEM, there are several important characteristics of program adherence to consider. Previous research has found exercise program adherence varies depending on length of treatment, education levels, and disability percentages [14, 31, 98]. Additionally, an active role in therapy design and goals is preferred by patients, and adherence is more likely if treatment or health materials have been customized to the patient's individual needs [14, 31, 38, 50, 63]. Thus far, the majority of adherence studies in the older population have been focused on the association between health literacy and adherence to medication regimens [32, 34, 44]. Program adherence is affected by a multitude of factors, potentially including health literacy.

Peer-reviewed literature on the association between health literacy and physical activity rates are promising. In a multiyear analysis, researchers compared the effects of a physical activity program versus a health education program on the health outcomes of community-dwelling subjects 70-89 years old [104-106, 112]. Though not an intervention-targeted measurement, subject attendance for the health education sessions was higher overall than the physical activity session attendance [104, 105]. In a separate study by Gibney & Doyle, data from the 2011 European Health Literacy Survey showed a significant relationship in adults ≥ 50 years of age who exercised almost every day and had higher self-reported health literacy scores [66]. The study stated significant relationships were found between higher exercise rates and accessing as well as understanding health promotion and understanding disease prevention information [66]. Within Gibney & Doyle's study, the chances of exercising most days was increased 18% with a corresponding one point increase in disease information comprehension scores [66]. Furthermore, Papadopoulos & Jager compared the effects of an exercise program against a combined exercise and health education program in elderly subjects in assisted living homes [17]. The study found a significantly increased program adherence rate in the combined group compared to the group that solely exercised, as well as significantly increased functional abilities, quality of life, and resistance-training proficiency in the combination group as compared to baseline values [17]. Comparably, Mauer et al. studied community-dwelling subjects 50-80 years old who either underwent an exercise program or health education program for eight weeks, both focused on osteoarthritis of the knee [113]. Results indicated that health education alone produced significant increases in strength, with no significant difference between the HE and the exercise group for strength gains, suggesting that the increased health knowledge motivated patients to perform increased exercise [17, 113]. Influences of exercise program adherence within the geriatric

population require further inquiry, but nevertheless suggest a link between increased health education and increased exercise program adherence and health outcomes [17].

Health Literacy Intervention Methodologies

As physical therapists work to improve the health literacy of their geriatric patients, they should recognize that statistically, many of their clients will have low baseline HL. In addition, considering the social setting and cultural context of individual patients is important when targeting health literacy levels [37], such as those within an institutionalized geriatric population. Fortunately, there are several methodologies that can be utilized to increase patient knowledge. As noted by the authors of the NAAL, health information can be presented in a variety of ways [41]. Materials such as newspapers, magazines, books and pamphlets are considered traditional print sources [41]. Media sources are divided into nontraditional print references, including the internet, and nonprint references, encompassing radio and television [41]. Adults with lower health literacy scores were least likely to seek out health information from print sources, as well as the Internet, and more likely to access the information via the radio or television [41]. Social sources of health information, including family, friends and healthcare workers, were more likely to be utilized for health information by subjects with higher health literacy levels [41]. Results from the NAAL indicate that older adults, with the highest proportion of low HL, are most likely to consult media sources such as radio and television, as well as their healthcare provider, in gaining education on health topics [41]. Identifying the geriatric population's preferred source of healthcare information focuses the investigation of effective health education methodologies for the same group.

Several methodology types specific to increasing health literacy in the elderly have been studied. The traditional method of improving health literacy is paper handouts, such as brochures or home exercise plans that many healthcare offices prepare for patients. While the most accessible medical education materials should be prepared at a fifth or sixth grade reading level, (the level most accessible to Medicaid patients), Ennis et al. reviewed several sources that found the writing level of the majority of health education materials to be written at or greater than a 10th grade level [35, 77]. Protheroe et al. noted that patient information leaflets are not always well written, and that 75.7% of 345 patient information leaflets studied in the United Kingdom failed to be written at or below a sixth-grade reading level [77]. A review by Cutilli found that medicinal adherence rates among geriatric patients improved when their instructions were designed at a lower reading

level, across multiple instruction methodologies (written, illustrated etc.) [34]. In addition, illustrated print materials have demonstrated an increase in treatment comprehension compared to traditional print materials in the general adult population [78]. Print methodologies for increasing health literacy are extensively peer-reviewed, have relatively low production cost, and are easily dispersed, though don't always meet the literate level of the target audience.

While health education on paper is the conventional methodology, health education via technology is becoming increasingly commonplace, with mixed results. In a review by Valenzuela et al., adherence to exercise programs centered around technology or video games, also known as exergames, was found to be higher in geriatric patients across all testing settings, degree of supervision, and delivery method [71, 98]. Additionally, educational videos have demonstrated an increase in health knowledge across the entire adult population [78]. Though many exergames provide an exercise opportunity for patients, there has not been a vast amount of research on their use in furthering the patient's health education. Furthermore, these digital improvements don't necessarily coalesce well with a geriatric target population. In general, though adults (of all age ranges) with lower health literacy scores are more likely to seek out health information from the media sources of radio and television, they also self-reported accessing health information via the internet less frequently [41]. In addition, older members of the geriatric population (those ≥ 85 years of age) have been shown to trust the internet less so than social sources such as healthcare providers, LTCF staff, and immediate family and friends [114]. Increasing the health literacy of geriatric patients in an appropriate manner is important because currently, 38% of seniors report accessing the world wide web (an increasing number) but may fail to ensure the source's validity or timeliness, and only one third corroborated the information with their doctor [49, 54]. A trained allied health professional such as a physical therapist could educate members of the elderly population on health literacy more accurately than others, using evidence-based research. A benefit of web-based education is the low cost of program administration and ease of access to the material, particularly for patients lacking transportation [51, 53]. Nonetheless, the additional cost of electronics and internet service subscription needed to access the internet can further exacerbate health inequalities due to low income [53]. Certainly, further research is needed to determine the efficacy of specified multimedia methods to increase health literacy in the current elderly population.

Section Summary

Health literacy presents a viable intervention to increase the program adherence of geriatric physical therapy patients residing in long-term care. Physical therapy has known functional, physical, mental and social benefits and acknowledgeable risks of falling, injury and pain for those ≥ 65 years of age. The elderly are especially vulnerable to low health literacy and the accompanying deleterious health effects. Organized within the Social-Ecological Model, motivators and barriers to physical activity can be targeted to increase program adherence by increasing HL. A variety of methodologies have been researched thus far to increase health literacy in the elderly, providing a basis for the development of HL education recommendations specifically for those living in LTCFs.

Chapter 3 – Methodology

Research Design

The research herein is formatted within a professional paper, analyzing a compilation of published research findings on the effects various health literacy intervention methodologies have on exercise program adherence in geriatric physical therapy patients residing within LTCFs. The research in the above literature review formed the basis for the theories discussed below, which culminated in the author forming preliminary recommendations for LTCF physical therapists regarding health literacy and exercise treatment adherence.

Methodology & Research Procedures

In the initial research stages, peer-reviewed literature written or translated into English was primarily accessed via the online research publication database PubMed, with some additional initial searches performed on EBSCOhost. If an adequate number of relevant citations in a specific topic area could not be located on PubMed and EBSCOhost, further publications were looked up on PsycINFO and Google Scholar. Search terms included different combinations of applicable keywords including (but not strictly limited to) health literacy, health education, aged, elderly, geriatric, older, 65, long-term care facility, long-term care, assisted living, nursing home, residential aged care, physical activity, exercise, physiotherapy, physical therapy, adherence, and compliance. The date range within which the author searched for and collected research articles was August 2018 to April 2020. The publishing dates of literature cited within this paper are 1988 to 2019. No publication date restrictions were placed on the research included in this document, up to the latest date at which searches were performed. In the latter stages of the literature analysis process, relevant publications were primarily identified within the body of published works and their respective reference lists. This approach to obtaining relevant publications became increasingly necessary due to the specific parameters of this paper's ideal target population, the duplication of titles between separate research databases, and the irrelevancy of a high volume of database search results (including a large amount of studies on patients with cognitive dysfunction and those who were community-dwelling). Finally, certain demographics, statistics and recommendations within this paper were collected from grey literature, including federal and international reports.

Throughout the research process, utilized research material focused on those ≥ 65 years of age or the results of the studied research was generalizable to the afore-mentioned age group. Ideal populations of studied literature featured elderly patients residing in long-term care facilities, but when necessary the author generalized results from geriatric populations that were home-bound, within long-term rehabilitation, undergoing in-patient hospital rehabilitation or, if ultimately necessary, community-dwelling. Experimental interventions, investigated patient preferences, relevant reviews, expert opinion papers and compiled federal reports were consulted to create the recommendations within this paper.

Research Findings

In performing research for this paper, many combinations of relevant keywords were searched across several databases. Table 3 contains the number of results that arise from searching keywords including those listed previously in this Chapter. When database search results were more than 100 titles (approximately), the author typically stopped scanning the results list when titles consistently stopped being relevant to this paper’s focus. Duplicate titles did result when searching different databases and alternatively worded searches within the same database, though these duplicates are not excluded from the manuscript counts in this Table. Additionally, this Table does not contain an exclusive list of the search words or combination of search words used in the course of this author’s research, but does well summarize the research effort.

PubMed	
<u>Keywords</u>	<u>Search Results (n)</u>
“health literacy elderly physical therapy adherence”	30
“long-term care health education adherence”	976
“long-term care health education physical therapy adherence”	119
“long-term care facility health education”	4573
“long-term care facility health literacy”	63
“assisted living health literacy adherence”	19
“assisted living health literacy physical therapy”	6
“nursing home health literacy physical activity”	9
“long-term care facility health literacy physical therapy”	1
“long-term care facility physical therapy adherence”	41

“long-term care facility physical therapy compliance”	36
“institutionalized elderly health literacy”	17
“institutionalized elderly physical activity adherence”	17
“institutionalized geriatric physical therapy adherence”	3
“institutionalized geriatric physical activity adherence”	6
EBSCOhost	
<u>Keywords</u>	<u>Search Results (n)</u>
“health literacy or health education” AND “adherence or compliance” AND “physical therapy or physiotherapy or rehabilitation” AND “geriatrics or older adults or elderly” AND “long-term care or nursing home or residential care or assisted living”	27
“health literacy or health education” AND “adherence or compliance” AND “physical therapy or physiotherapy or rehabilitation” AND “geriatrics or older adults or elderly”	126
“health literacy” AND “physical therapy or physiotherapy or rehabilitation” AND “geriatrics or older adults or elderly”	199
“health literacy” AND “physical therapy or physiotherapy or rehabilitation” AND “long-term care or nursing home or residential care or assisted living”	262
“health literacy or health education” AND “exercise or physical activity or fitness” AND “geriatrics or older adults or elderly” AND “long-term care or nursing home or residential care or assisted living”	254
“health literacy or health education” AND “exercise or physical activity or fitness” AND “geriatrics or older adults or elderly” AND “long-term care or nursing home or residential care or assisted living” AND “physical therapy or physiotherapy or rehabilitation”	46

Table 3. A summary of results from searches performed in the research databases primarily utilized for this paper. Search results (n) are accurate as of April 2020.

Ultimately, approximately 235 papers were reviewed by the author, and exactly 146 references were cited in the final manuscript. 16 main references and 29 supplementary references were used to substantiate the proposed recommendations in Chapter 4. The count of supplementary references includes all references used to substantiate the SEM recommendations, the written and electronic materials guidelines, and does not include citations that were utilized as a main reference

for one recommendation and supplementary evidence for a separate recommendation. Table 4 categorizes the main papers referenced in Chapter 4, organized by the ideal sample population characteristics for this paper. Supplementary references are not included in this Table. An important note is that not all recommendation references will be counted in boxes c. and d., some references may be counted in both boxes, and some may be counted within box c. or d. twice. For instance, a paper could focus on PTPs without including education of any kind, an HL intervention could be performed with no measurement of activity outcomes, or a paper could examine both outcome measures of PA and functional ability. Furthermore, in instances where references offered multifaceted interventions, within this Table they are only counted in the category for which they were cited within this manuscript. For instance, a randomized controlled trial (RCT) cited for its experimental exercise training intervention, that also included an educational control group that was not cited, will only be included in category c., and would not be counted in category d. Finally, though the same references may be used for multiple recommendation citations, they are only counted once within this Table.

<i>Sample Population Characteristics of Recommendation References</i>		(n)
a.	≥ 65 years of age	10 [†]
	60+, 55+, 50+ etc. years old*	6
b.	Long-Term Care Facility	6
	Inpatient or Institutionalized Population Outside of LTCF	1
	Outpatient and Community-Dwelling	9
c.	Physical Therapy Outcome	1
	Physical Activity Outcome	6
	Exercise Outcome	6
	Functional Ability Outcome	3
d.	Health Literacy Focus	2
	Health Education Focus	5

*Table 4. A summary of literature utilized to form the recommendations in Chapter 4, organized by sample population characteristics. **Bolded** characteristics are the ideal sample population for this paper.*

** this sample characteristic counts studies that included subjects both younger and older than 65 years of age within their overall sample, or studies whose populations were exclusively younger than 65 years old.*

† this count includes the sample population of Cohen-Mansfield & Sommerstein, who stated an average sample population age of 85 years but did not provide the total participant age range. The count also includes one report written for the “older adult” population but which did not provide a specific age.

Evidence Rating System

The intention of this paper was to produce recommendations to improve the health literacy of elderly institutionalized patients, and consequently improve their program adherence. Due to the dearth of data in this specified population, the experimental recommendations (described in Chapter 4) were conceptualized using multiple reference types. Table 5 contains the rating system used to evaluate the strength of those reference types in substantiating the recommended intervention. The Registered Nurses' Association of Ontario (RNAO) utilized this evidence rating method in their best practice guideline (BPG) "Preventing Falls and Reducing Injury from Falls" (4th ed.), as adapted from the work of additional authors. The basis for this rating system is the assumption that certain reference types have less inherent sources of bias in their conclusions than others [29]. Within this rating system, the smaller the number and more primary the alphabetical letter, the higher the strength of evidence [29]. For the purpose of this work graded references will be assumed to be well-designed unless they have obvious or stated methodological problems. Finally, it is possible for a recommendation to have multiple evidence ratings, if said recommendation is substantiated by several diverse reference types [29].

<i>Level Name</i>	<i>Level Description</i>
Ia	Recommendation is substantiated by at least one of the following: <ul style="list-style-type: none"> • Meta-analysis • Systematic review of randomized controlled trials • Synthesis of several studies (the majority of which are quantitative)
Ib	Recommendation is substantiated by: <ul style="list-style-type: none"> • ≥ 1 randomized controlled trial
IIa	Recommendation is substantiated by: <ul style="list-style-type: none"> • ≥ 1 pilot randomized controlled trial*
IIb	Recommendation is substantiated by at least one of the following: <ul style="list-style-type: none"> • ≥ 1 study that's well-designed, controlled, lacking randomization • ≥ 1 study that's well-designed, randomized, lacking control group*
IIc*	Recommendation is substantiated by: <ul style="list-style-type: none"> • ≥ 1 quasi-experimental study

II d*	Recommendation is substantiated by at least one of the following: <ul style="list-style-type: none"> • ≥ 1 study that's well-designed, quasi-experimental, lacking randomization • ≥ 1 pilot quasi-experimental study
III	Recommendation is substantiated by: <ul style="list-style-type: none"> • Synthesis of several studies (the majority of which are qualitative)
IV	Recommendation is substantiated by: <ul style="list-style-type: none"> • Observational study that's well-designed and non-experimental
V	Recommendation is substantiated by at least one of the following: <ul style="list-style-type: none"> • Expert opinion • Committee reports • Expert clinical experiences

Table 5. The evidence grading system used to evaluate the strength of the references that the Chapter 4 Recommendations are based on. This system is adapted from the Registered Nurses' Association of Ontario's BPG "Preventing Falls and Reducing Injury from Falls" (4th ed.) [29].

**Modification made by this author to the RNAO's evidence rating system.*

Section Summary

The conclusions of this paper were based on published peer-reviewed results as well as opinions and suggested guidelines from experts in the field. The rating system for this paper's recommendation references determine the strength of the substantiating evidence. Based on the constraints outlined currently, it was necessary to draw generalizations from papers outside of the ideal sample population, due to the small amount of research that's been performed specifically on institutionalized physical therapy patients ≥ 65 years old. Nevertheless, the health literacy improvement recommendations resulting from this paper are intended for physical therapists working in LTCFs who aim to increase their geriatric patient's program adherence.

Chapter 4 – Recommendations & Discussion

Overview

Health literacy presents as an experimental intervention to increase the institutionalized elderly's motivation to participate in physical therapy and consequently increase treatment adherence [17, 86, 108, 115] and outcome successes [65]. As previously discussed, physical therapy and exercise programs have known physical, functional, and epidemiological benefits in institutionalized geriatric patients, making PT treatment success imperative to the maintenance of good health [2, 10, 70, 99]. Thus far, experimental interventions targeting geriatric rehabilitation outcomes have had modest effects [72], and studies of geriatric physical therapy adherence regularly focus on adherence factors (such as motivators, barriers and associated demographic characteristics), with less emphasis on specific intervention methodologies [116]. As expounded upon in Chapters 1 and 2, there is evidence to suggest that a relationship exists between health literacy and patient adherence [17, 39, 43, 59], though further research is warranted [34, 43, 44, 59], particularly in elderly LTCF residents. Importantly, low health literacy levels are hypothesized to be augmented through intervention [36, 37]. Physical therapists working within long-term care have the capacity and access to increase the health literacy of their elderly patients [38, 61] at four different levels of the Social-Ecological Model. Within this chapter are recommendations to improve the health literacy and subsequent adherence to physical therapy and activity programs of elderly residents living within LTCFs, evidence ratings for the validity of each recommendation, and supporting evidence for recommendation implementation.

Recommendations

The recommendations within Table 6 are intended to inform practitioners who promote the health literacy and consequent physical therapy program adherence of long-term care facility patients who are ≥ 65 years of age. Evidence ratings for the assumed strength and validity of the evidence supporting each recommendation are included within this Table. References are rated if they support the recommendation's main concept, but are not included in the rating if they exclusively provide minor details for the recommendation's implementation. Additionally, evidence rating categories are only listed once per recommendation, even if that recommendation has multiple pieces of evidence that fall within the same rating category.

<i>Social-Ecological Model Level</i>	<i>Health Literacy Recommendation</i>	<i>Evidence Rating</i>
Intrapersonal	<ol style="list-style-type: none"> 1. Fill-in-the-blank treatment journal [72, 117] 2. Illustrated PTP pictures [72, 118] 3. Educational brochure [115, 119] 4. Confirm knowledge [115] 	<ol style="list-style-type: none"> 1. Ib, IIb 2. IIa, IIb 3. Ib 4. Ib
Interpersonal	<ol style="list-style-type: none"> 1. Health discussions with immediate friends and family [87] 	<ol style="list-style-type: none"> 1. Ib
Organization	<ol style="list-style-type: none"> 1. Peer-led education and exercise [120, 121] 2. Health literacy material focus group [81, 83, 122] 	<ol style="list-style-type: none"> 1. Ia, II d 2. III, IV, V
Community	<ol style="list-style-type: none"> 1. Group education and exercise classes [20, 123, 124] 2. Distribute or display examples of active counterparts [125, 126] 3. Display educational posters [115] 	<ol style="list-style-type: none"> 1. Ib, IV, V 2. Ib, IV 3. Ib

Table 6. Health literacy recommendations to improve physical therapy adherence for geriatric patients in long-term care facilities. Health literacy recommendations are organized by the SEM level that they target, and are accompanied by the evidence rating they've been assigned according to their substantiating reference's study design. The Policy SEM level has been purposefully omitted from this analysis.

Intrapersonal Level

The Intrapersonal level of the Social-Ecological Model is comprised of the personal influences on the patient's own beliefs about, and actions concerning, physical therapy and exercise [11, 12, 22, 76, 110, 111], and can be impacted by LTCF physical therapists in numerous ways. General Intrapersonal adherence level factors in the elderly include overcoming the preconception of physical activity and gender role expectations [127], noting the patient's previous exercise history and experiences [128], thoroughly discussing the patient's anticipated treatment objectives and the potential for relapse at treatment outset [127], customizing the plan to those expectations [127], and requesting patient feedback periodically throughout treatment [127]. LTCF physical therapists have stated their own Intrapersonal impetus to increase patient PA is focused on improving and preserving the patient's physical state and functional skills [97]. There are a variety of methods for long-term care physical therapists to encourage program adherence at the Intrapersonal level, including specific health literacy recommendations.

The first Intrapersonal level recommendation is for physical therapists to provide a customizable treatment journal for patients to fill out at the initiation of therapy [72, 117]. A patient journal can provide an illustrative connection between the patient's treatment objectives and their PTP [72]. Items to be recorded within this journal can include the patient's status at treatment onset, the patient's treatment objectives [129], the patient's behavioral reflections throughout treatment, a record of activity adherence [117, 130] and treatment objective attainment [72], as well as a space to document education notes or questions for the PT [83]. In one aspect of their intervention, Lenze et al. had rehabilitation practitioners of elderly post-acute care institutionalized subjects present a customizable sheet with the patient's treatment objectives, the exercises necessary to achieve those objectives, and a graph of their improvement [72]. The authors observed significantly increased active therapy participation and Barthel Index scores [72]. However, the authors administered the various behavioral change methods as one collective treatment, so the individual methods' results are not distinguishable, and the intervention appeared to lose effectiveness after the study concluded [72]. Within this paper, Lenze et al. also substantiates Intrapersonal Recommendation #2. Additionally, Martinson et al. examined the effects of a PA maintenance intervention in community-dwelling subjects 50 – 70 years old [117]. As part of a multifaceted intervention, Martinson et al. provided subjects with an activity ledger accompanying supplementary PA opportunities for the purpose of increasing motivation, in addition to a workbook of health education material, HE coursework, and PA objectives [117, 129]. Post-intervention, the experimental subjects had significantly increased energy expenditure compared to the control group, and 97% of the subjects in the final satisfaction sample reported finding the workbook “moderately” or “very” helpful [117]. Finally, to increase the chance of adherence, PTs should encourage patients to post the treatment goals and objectives from the journal in a highly visible location within their personal residence, as a cue to maintain their PA even when outside of the clinic environment [119]. The first Intrapersonal recommendation of providing a treatment journal to patients was given an evidence rating of *Ib* [117], *Iib* [72]:

- **Ib** – Martinson et al. performed a two-arm parallel researcher-blinded randomized controlled trial comparing a physical activity maintenance intervention to usual managed care treatment.
- **Iib** – Lenze et al. performed a two-arm parallel double-blind randomized clinical trial comparing a group receiving enhanced medical rehabilitation and a group receiving usual therapeutic care.

The second Intrapersonal health literacy recommendation is to provide the patient with personal copies of illustrations of physical therapy exercise positions or typical physical activities, in order to increase the patient's health literacy of exercise maneuvers in a non-written medium [72, 118]. Derived from the same Lenze et al. study as discussed in Intrapersonal Recommendation #1, subjects organized illustrated cards by preference in order to establish therapy objectives and strengthen motivation [72]. Such illustrations present as a potential tool to increase both exercise literacy in a visual medium, as well as treatment adherence in an LTCF therapeutic population. Lenze et al. found that use of the illustrated activity cards, in addition to the aforementioned treatment journal (Intrapersonal Recommendation #1) and other interventional behavioral change strategies, was significantly associated with increased time patients spent actively participating in their rehabilitative therapy, as well as significantly increased Barthel Index scores [72]. The full study limitations are discussed in Intrapersonal Recommendation #1's discussion. Additionally, Cohen-Mansfield & Sommerstein studied subjects in geriatric communal housing with an average age of 85 years, utilizing illustrated exercises with written descriptions as one part of a larger intervention to increase subject's self-efficacy and consequent PA adherence [118]. Adherence (quantified as PA session attendance) was significantly higher for Cohen-Mansfield & Sommerstein's intervention emphasizing the patient's self-efficacy and social relationships, when compared to the alternative intervention [118]. The second Intrapersonal recommendation of providing personal copies of PTP illustrations to patients was given an evidence rating of *Ila* [118], *Iib* [72]:

- **Iia** – Cohen-Mansfield & Sommerstein conducted a two-arm parallel non-blinded pilot randomized controlled trial testing the adherence effects of a physical activity group against physical activity with a social adherence intervention.
- **Iib** – Lenze et al. performed a two-arm parallel double-blind randomized clinical trial comparing a group receiving enhanced medical rehabilitation and a group receiving usual therapeutic care.

The third Intrapersonal recommendation for LTCF PTs is to make educational brochures or concise informational sheets available to patients [115, 119]. Providing educational materials to patients is thought to increase their exercise self-efficacy [115, 118] and potentially, their program adherence [43, 86, 115, 118, 131]. Health education material that's passively displayed within the clinic is dependent upon the patient taking enough interest and initiative to select and

review the material themselves. Alternatively, physical therapists can actively present and review the materials with clients at their initial meeting, periodically throughout treatment, or at group education and exercise classes. As one component of a larger educational program, Martin Ginis et al. utilized a pamphlet in their study on community-dwelling elders to explain the relationship between the predicted resistance training benefits and the patient's functional abilities [115]. Martin Ginis et al.'s subjects showed significantly increased ADL consciousness and self-efficacy [115]. Though Martin Ginis et al.'s subjects did not demonstrate a significant increase in actual ADL ability, the study authors hypothesized this was due to their healthy community-dwelling sample population, and that long-term care populations with poorer health and physical function may significantly increase ADL ability with the same intervention [115]. The remainder of Martin Ginis et al.'s experimental intervention substantiates Intrapersonal Recommendation #4 and Community Recommendation #3 within this paper. Additionally, Resnick provided and regularly reiterated content to educate geriatric institutionalized females on the value of exercise and exercise maintenance methods, as part of a broader intervention to increase health outcomes and exercise rates, though length of the provided educational material was not mentioned [119]. Subjects exposed to Resnick's intervention spent a significantly increased amount of time performing exercise and physical activity, and had significantly increased self-efficacy scores [119]. The third Intrapersonal recommendation of providing concise educational health information to patients was given an evidence rating of *Ib* [115, 119]:

- **Ib** – Martin Ginis et al. performed a two-arm parallel researcher-blinded randomized controlled trial, with the experimental group receiving resistance training and an educational intervention aimed at improving ADLs, and the control group receiving resistance training and placebo educational sessions.
- **Ib** – Resnick et al. conducted a two-arm parallel randomized controlled trial, comparing an experimental intervention group receiving activity, education, barrier counseling and reminders to a control group given typical health treatment. Blinding was not discussed, but is not believed to have occurred.

Similar to the third Intrapersonal recommendation, the fourth recommendation also targets the self-efficacy of LTCF elderly to increase health literacy, by giving patients the opportunity to confirm their health knowledge after a therapy session or educational class with their physical therapist [115]. During the same Martin Ginis et al. resistance training intervention as cited for Intrapersonal Recommendation #3, the authors asked geriatric community-dwelling patients to

name the ADL task that could be improved by the exercise they had just completed [115]. This confirmation of knowledge, as part of a larger educational intervention (discussed in Intrapersonal Recommendation #3 and Community Recommendation #3) and RT program, was associated with increased ADL self-efficacy and consciousness [115]. The limitations of Martin Ginis et al.'s study are stated within Intrapersonal Recommendation #3's discussion. The teach-back method, in which the patient summarizes in their own words what they've just learned [39], is a widely recommended strategy used to increase HL [81, 132, 133], and to confirm the patient's health knowledge. However, to this author's knowledge teach-back has not been studied regarding increased PA or therapeutic program adherence in the LTCF elderly specifically. Measures of patient recall can be utilized by the LTCF PT to determine the extent to which patients are responding to the HL interventions, including the Netherlands Patient Information Recall Questionnaire, utilized in a modified form by Meppelink et al. in a study of community-dwelling subjects ≥ 55 years old with various health literacy levels [134]. The recommendation to increase a patient's self-efficacy through a confirmation of knowledge was given an evidence rating of *Ib* [115]:

- **Ib** – Martin Ginis et al. performed a two-arm parallel researcher-blinded randomized controlled trial, with the experimental group receiving resistance training and an educational intervention aimed at improving ADLs, and the control group receiving resistance training and placebo educational sessions.

Health literacy recommendations at the Intrapersonal social-ecological level are validated by good quality evidence, and have a higher number of main and supplementary substantiating evidence when compared to similar recommendations at broader SEM levels. However, each recommendation within this level was made based on evidence that is one component of a larger intervention, and generalizing these results to independent clinical interventions should thus be interpreted with caution. Customizable treatment journals, illustrated exercise visuals, providing health education materials and patient confirmation of personal health knowledge are all categorized into the Intrapersonal SEM level because they educate and act solely on the individual patient's personal beliefs and feelings regarding their activity. The Intrapersonal level is the most self-contained SEM level, and is less expansive in potential patient influences than the Interpersonal level.

Interpersonal Level

The Interpersonal level of the Social-Ecological Model encompasses the influences and actions of the patient's immediate friends and family that they interact with on a regular basis [11, 12, 22, 76, 110, 111], including the LTCF physical therapist. The importance of social interaction on elderly patient's activity adherence is well known [33, 118], and occurs most immediately at the Interpersonal SEM level. Specific to LTCF elderly PT patients, Interpersonal level influences can include the support and enthusiasm levels of the patient's close friends, family and physician regarding the patient performing physical activity [11, 12, 76, 86, 135, 136], the skill of the exercise instructor [136], and discussing physical activity opportunities and achievements [135]. PTs working in long-term care report their own Interpersonal motivator of encouraging patient social relationships [97]. Though much is known about the Interpersonal barriers and motivators to activity in the elderly, there is a paucity of Interpersonal interventions to increase health literacy and program adherence, indicating further research is needed.

The single Interpersonal recommendation to increase health literacy and program adherence is for the facility's PT to organize small group discussions [87] focused on the patient's therapy and physical activity needs. In a population of sedentary community-dwelling elderly, McMahan et al. found that small group discussions, including Interpersonal subject matters, in addition to an administered PA program and a wearable PA measurement device, was associated with significantly increased time performing PA as well as significantly increased short physical performance battery (SPPB) test scores [87]. Furthermore, the gains of McMahan et al.'s Interpersonal experimental subjects remained significantly higher six months after the intervention had concluded [87]. An important distinction of LTCFs is the different Interpersonal relationships that occur due to geographical restrictions [135], resulting in institutionalized elderly more frequently interacting with medical staff and residents and less frequently seeing community-dwelling family and immediate friends. Though McMahan et al.'s small group participants were not guaranteed to know one another prior to treatment initiation, adapting this recommendation to an LTCF includes suggesting small group participants that are immediate family members or close friends, in addition to the subject and the physical therapist. Enthusiasm of the LTCF resident's relatives and healthcare practitioners with regards to exercise interventions may positively affect the resident's treatment adherence [29]. de Souto Barreto et al. recommends educating members of the patient's immediate social circle on the LTCF resident's PA needs [20], while Schoberer et

al. designed fall prevention educational material specifically for resident's family members [122], demonstrating their collaborative value in the treatment process. In addition, increased patient adherence is associated with a feeling of trust in their physical therapist [60]. Patients with low health literacy can feel discomfited regarding their knowledge deficit [137], but may be more comfortable receiving HE with their closest family and friends present, compared to other less immediate social contacts. This recommendation to include the patient's immediate social circle in small group health discussions was given an evidence rating of *Ib* [87]:

- **Ib** – McMahon et al. administered a 2 x 2 factorial randomized controlled trial that studied the results of interpersonal and intrapersonal interventions on subjects' physical activity levels. Within this study, data analyzers were not blinded, and the blinding status of subjects and interventionists was unclear.

The Interpersonal recommendation to increase patient HL and adherence is substantiated by a singular reference, though the reference evidence rating is high, and there are six supporting references. However, the recommendation was adapted from a study performed on a community-dwelling population that received an intervention encompassing more than a small group discussion, and as such requires further validation before being applied in a clinical population. The recommendation to host small group health discussions including the patient's immediate friends and family is categorized into the Interpersonal SEM level because it only acts upon the relationship between the resident, their physical therapist, and potentially the resident's immediate family and friends. In limiting the recommendation to involving no more than the resident's immediate social circle, the Interpersonal recommendation is distinguished from the recommendations in the broader Organization SEM level.

Organization Level

The Organization level of the Social-Ecological Model is made up of the rules and norms of the unofficial as well as formal organizations within the patient's place of work or learning [110, 111]. These factors can include the organization's policies, conventions and overall culture regarding physical activity and therapy [110, 111]. Within an LTCF, this level can be made up of the organized groups the resident interacts with throughout the facility at consistent times and in structured settings, analogous to the community-dwelling organizational groups suggested by McLeroy et al. – activity classes, religious services, and volunteer projects [111]. This SEM level

is often omitted from physical activity behavioral change models and is less common than Intrapersonal and Interpersonal interventions [110], particularly in healthcare settings [110], and as such requires further study.

The first Organization recommendation to increase health literacy and consequent adherence is to create a peer-education and exercise program [120, 121]. Defined by Burton et al. as residents of the same age cohort, who are well-educated on the topic and demonstrably necessary to the program's success, peer mentors can teach small groups and provide one-on-one support to encourage activity adherence [120]. In a systematic review and meta-analysis of studies with at least 50% of participants ≥ 60 years of age and community-dwelling, Burton et al. found that peer-facilitated activity programs had similar adherence rates as those led by non-peers, including healthcare providers, though the corresponding meta-analysis did not reach the same conclusion [120]. Furthermore, Tse et al. tested the effect of community-dwelling peer leaders ≥ 50 years of age hosting HE classes, exercise routines and reflection sessions in a nursing home population ≥ 60 years old, for the purpose of decreasing pain levels [121]. Authors observed significant increases in happiness for the peer-led group, as well as significant decreases in pain and ratings of loneliness, and significant increases in ADL abilities in both the peer-led and researcher-led groups [121]. Similar results from Burton et al. and Tse et al. indicate the potential of peer-led HE and exercise as an economical replacement to adherence interventions traditionally taught by healthcare providers [120, 121]. Engaging peers as health educators and exercise partners may increase adherence on behalf of the patient [120], gives the peer educator a feeling of fulfillment [138], puts the patient at ease [121] and furthers the health education and socialization opportunity of both residents and their peer leaders [120]. Building upon this evidence, LTCF PT clinics with multiple therapists could schedule the same patient's appointments concurrently each week. Additionally, pairs of PT patients and volunteer LTCF residents could be matched to exercise in the PT gym at the same time or attend facility group exercise classes and health education classes together [118]. The recommendation to utilize peers as leaders in LTCF health education and exercise was given an evidence rating of *Ia* [120], *IId* [121]:

- **Ia** – Burton et al. performed a systematic review and meta-analysis on the effects of peer instruction in physical activity and exercise adherence outcomes.
- **IId** – Tse et al. conducted a two-arm parallel cluster quasi-experimental pilot study comparing a peer-led experimental group and a researcher-led control group. Blinding of subjects was not explicitly mentioned, however, it was noted that contamination

between study groups was precluded by the geographical barrier of residing in separate nursing homes.

The second Organization health literacy recommendation for LTCF PTs to increase therapy adherence of elderly residents is to organize an educational materials focus group [81, 83, 122]. Schoberer et al. demonstrated the feasibility of employing focus groups to develop health education materials targeting distinct audiences of nursing home residents, their families, and their healthcare providers [122]. At the conclusion of the study, Schoberer et al. produced materials that were motivating to, and well received by, the target populations [122]. Furthermore, the National Action Plan to Improve Health Literacy recommends incorporating those with low health literacy levels into the health material composition and trialing process [81], though the Plan wasn't specifically making recommendations for the institutionalized or elderly. In their review of printed health education methodology for occupational therapists (OTs), Griffin et al. recommended incorporating the preliminary testing of HE materials and opinion sampling of the eventual targeted audience into therapeutic practice [83]. A health literacy materials focus group allows residents to give their input on new patient education materials developed by the therapist, to ensure the material contains applicable information [83] and is written and presented at an HL level appropriate for the target population. In low HL populations, patient participation in creating education materials is associated with better patient outcomes [81] and knowledge comprehension [139], however, adherence is an outcome that requires further investigation. Additionally, comments and suggestions from residents provide the opportunity for customization of materials to each individual LTCF community, which has been previously stated in this paper to be a patient preference [50] as well as associated with increased adherence [14, 31] and understanding [83]. The recommendation to form a health literacy materials focus group was given an evidence rating of *III* [83], *IV* [122], *V* [81]:

- **III** – Griffin et al. reviewed evidence and recommended strategies to increase the quality of health education materials, specifically intended for occupational therapists.
- **IV** – Schoberer et al. conducted qualitative focus groups to develop health education materials specified to nursing home residents, resident families, and healthcare providers.
- **V** – the United States Department of Health and Human Services, Office of Disease Prevention and Health Promotion produced a comprehensive report to summarize the

detrimental effects of health literacy and recommend methods to increase HL in all adults.

Both recommendations within the Organization level are supported by multiple main references, however, those references generally have lower evidence ratings than main references of other SEM levels within this manuscript. Furthermore, though each Organization recommendation was substantiated by one main reference involving an LTCF population, none were performed within the ideal age parameter of ≥ 65 years of age (though several were conducted or focused on older adults). Peer-educators as well as HE material focus groups are categorized into the Organization social-ecological level as they encourage resident interaction and normalize physical activity among group members who are acquaintances but outside of each other's immediate social circle. The recommendations within this Organization section target small groups of residents within the facility, and differs from the recommendations for the broader Community section as the latter is focused on all facility residents.

Community Level

The Community level of the Social-Ecological Model consists of the rules and norms of all organizations within the entire community setting that the patient resides in [12, 22, 76, 111]. Included in this SEM level are the policies, conventions and overall culture of the official and unofficial communal groups, in regards to exercise [110, 111]. Non-health literacy factors that may increase program adherence of elderly LTCF patients include the composition of exercise groups and the physical therapy clinic's physical environment. Within this level, LTCF PTs report their own motivators to increase the PA of residents as supporting their therapeutic objectives and maintaining patient interest in physical activity [97]. There are several recommendations to improve the health literacy of elderly LTCF residents at the broad Community level and consequently, improve the resident's physical therapy program adherence.

The first Community recommendation to increase patient health literacy and adherence is to host group health education, exercise and activity classes available to all facility residents, including those not enrolled in physical therapy [20, 123, 124]. Group exercise in the older adult population may produce better outcomes than exercise undertaken independently [123], including motivation [27] and program adherence [27, 98, 123]. Within their five recommendations to increase PA for older residents within aged care facilities, de Souto Barreto et al. included

scheduled group sessions of PA or recreational activities [20]. Accordingly, Finnegan et al. investigated LTCF resident adherence to group activity classes taught by PTs, and gave all facility residents the opportunity to attend the activity class, regardless of their position as a study subject [124]. Though the group exercise opportunity should be open to all facility residents [124], the structure of each group can be consciously designed. Beauchamp et al. found that in a sample of community-dwelling geriatrics, group exercise classes with subjects of similar age and both genders as well as classes containing similar age and same genders produced significantly higher attendance rates than group exercise classes with a combination of ages and both genders [123]. In an LTCF setting, fellow exercise and education class members are more likely to be of the same age, and can be either the same gender or mixed gender, with both options having the same positive effect on adherence [123]. In addition, evidence exists that older (≥ 50 years old) patients, particularly females [136], prefer group exercise class instructors within their age group [118, 136]. Acting upon these recommendations, LTCF physical therapists could have able and trained facility residents lead exercise or education classes [140] accompanied or supervised by the therapist [120], to introduce modeling behavior [86, 120] that may in turn promote self-efficacy [86] and consequent adherence [43, 115, 118]. The health education class content can include health advantages conferred by exercise and PTPs, methods to set therapy goals and confront motivation and activity barriers, as well as adverse symptoms warranting immediate discontinuation of exercise [86]. Finally, LTCF PT clinics can promote “open gym” hours where all medically-cleared residents are invited to perform autonomous exercise alongside other residents, while under the therapist’s supervision [86]. Providing the opportunity for LTCF residents to improve their health literacy and physical status in a large group setting not only allows for improvements in resident health, but normalizes the act of physical activity throughout the entire LTCF community. The recommendation to host group education classes available to the entire LTCF was given an evidence rating of *Ib* [123], *IV* [124], *V* [20]:

- **Ib** – Beauchamp et al. performed a three-arm parallel randomized controlled trial, with the respective experimental groups containing subjects of the same age and gender or participants of the same age and either gender. Researchers were reportedly blinded to treatment while blinding status of subjects was not stated.
- **IV** – Finnegan et al. performed a nested cohort analysis, analyzing information collected within a clustered randomized controlled trial, examining adherence dynamics of group exercise class subjects.

- V – de Souto Barreto et al. produced a comprehensive taskforce report proposing physical activity guidelines for the institutionalized aged population.

The second recommendation to promote program adherence via increased health literacy at the Community level is to display visual examples of LTCF residents participating in PT and HE throughout the facility [125, 126]. Potential examples include age-matched subjects in photos demonstrating correct exercise form displayed in the PT clinic, photos [125] or descriptions [126] of active counterparts in newsletters distributed within the LTCF [125, 126], or organized group exercise classes held in LTCF common areas. In a study of elderly residential care center residents, Koeneman et al. found that those exposed to a news headline and photographs focused on physically active counterparts self-reported significantly higher rates of physical activity themselves [125]. Similarly, as an ancillary component within a post-hoc examination of adherence to a study in community-dwelling elderly, Schmidt et al. utilized a newsletter delivering study updates and general HE to subjects [126]. Schmidt et al.'s newsletter was disseminated to study subjects for the purpose of promoting study adherence, though was not part of the experimental intervention [126]. Additionally, images may be more effective alone or accompanying text for patients with low HL, low general literacy skills or cognitive deficits [122]. Positive activity competitions can be organized by the facility's physical therapist, such as step-counts or program attendance, with progress and results displayed publicly and small rewards or public recognition for those with the highest achievement, most improvement or best adherence [20, 87, 117]. Martinson et al. used both step-counts and participation incentives as part of an intervention to successfully sustain PA levels in community-dwelling subjects 50-70 years of age, though these methods were used as support for the study's primary intervention [117]. Furthermore, McMahon et al.'s subjects significantly increased their PA levels and functional scores when exposed to an intervention that included subjects comparing their objectively measured PA and PA routines [87]. If residents are unwilling to have their personal photos or activity results displayed or disseminated, stock photos of physically active elderly and elderly observational study testimonials of exercise's benefits can be a viable alternative. The recommendation to display visuals of active elders throughout the LTCF community was given an evidence rating of *Ib* [125], *IV* [126]:

- **Ib** – Koeneman et al. performed a single-blind two-arm parallel randomized controlled trial with the experimental group viewing material focused on physical activity, and the control group material concerning generic, non-physical activity information.
- **IV** – Schmidt et al. conducted a post-hoc descriptive analysis of data from a two-arm parallel randomized controlled trial comparing autonomously timed exercise with classes led by an instructor.

The third recommendation for LTCF PTs to increase health literacy at the Community level is to display educational posters next to each exercise machine or area in the physical therapy clinic or other public exercise areas in the facility (such as walking trails, facility common areas or hallways) [115]. Posters can contain information such as exercise machine operating instructions as well as lists of ADLs [115] and health characteristics impacted by exercise. Martin Ginis et al. administered a comprehensive health education and RT intervention, including interactive posters developed in real time by the subject, with specific ADLs affected by different exercise machines [115]. Martin Ginis et al.'s community-dwelling elderly subjects showed significantly increased recognition of the consequence of resistance training on ADLs as well as select ADL self-efficacy scores [115]. Limitations of the Martin Ginis et al. study have been discussed previously in Intrapersonal Recommendation #3. Additionally, the models used to display proper form in these posters could be patients and residents from that same facility, or stock photos with models the same age as the residents, in order to normalize PA within the entire LTCF community [125]. The recommendation to display educational posters throughout the LTCF community was given an evidence rating of *Ib* [115]:

- **Ib** – Martin Ginis et al. performed a two-arm parallel researcher-blinded randomized controlled trial, with the experimental group receiving resistance training and an educational intervention aimed at improving ADLs, and the control group receiving resistance training and placebo educational sessions.

Recommendations to increase health literacy and program adherence within the Community social-ecological level are numerous, however, work remains to be done in validating these recommendations before they are applied to clinical populations. Half of the main references substantiating recommendations within this chapter have low evidence ratings, and three out of the six are additionally being cited for one component of a more comprehensive intervention or set of guidelines. The recommendations to host group exercise and education classes, display visuals of active seniors, and display educational posters regarding physical

activity are categorized within the Community social-ecological level because they apply to the entirety of LTCF residents. Many methods exist to improve the health literacy of institutionalized elderly patients, however, more research needs to be done to determine the most efficacious implementation factors.

Written Material

Across all SEM levels, printed educational materials are widely used to increase health literacy, but educational materials which are poorly executed are self-defeating [83]. As noted by Griffin et al. in the occupational therapy adult population with low general literacy, both HE material's subject and its construction are key factors in the literature's accessibility [83]. Though a complete review of written and electronic educational material composition methods is outside the scope of this paper, a brief report of guidelines is included here, to aid in the implementation of the previously discussed health literacy and adherence recommendations.

The correct composition of health education materials can significantly impact a document's readability [83]. For all adults with low health literacy, the following is recommended [137] and may increase patient interest [83], memory [134], understanding [78, 83, 134], material efficacy [78], and accessibility [83]:

- Clear and legible fonts [137]
- Dark font printed on a light background [83]
- Conventional use of upper and lowercase letters [83]
- Line length ≤ 50 characters [137]
- Large borders and spaces [83, 137]
- Clear section headings [83, 137] in bolded font [83]
- Listed information delineated by bullets [137]
- Unembellished, straightforward text [83, 134], including layman's terms [83, 137]
- Monosyllabic or disyllabic words [83]
- Active [83, 137] and second person [83] voice
- Illustrations [78] without excessive detail [83, 134]

In general, written health material recommendations for all ages can be used for geriatric patients as well. However, specifically for elders, the following has been utilized to encourage understanding [115] of health materials and forms:

- Large-sized font [115]
- Color coding systems [115]

The accessibility of the educational material's content is equally important to its construction, and can be similarly improved for the patient's benefit [83]. The following recommendations have been made to increase patient understanding [57, 83] and interest [83] for all adults:

- Display facts singularly, or prior to accompanying secondary knowledge [57]
- Organize paragraphs with critical and previously declared knowledge first, followed by less significant and novel knowledge [57, 83]
- Give synopsis at end of new material [83]
- Write concise sentences explaining only one subject [83]

Numeracy is a subcategory of health literacy that contributes to a person's capability to comprehend and utilize quantifiable information [57, 81]. With numerical health information, the following recommendations have been made to increase understanding [57] and interest [81] for all adult patients:

- In quality ratings, equate larger numbers with increased quality [57]
- Use consistent denominators when comparing percentages [57]
- Utilize relevant illustrations alongside numbers [57]
- Utilize graphs to display health information [81]

Finally, there are several objective tools that PTs can utilize to assess the accessibility of their prepared educational materials, including the Flesch Reading Ease [83, 133], the Flesch-Kincaid grade level assessment [133], the Gunning-Fog Index [83], the Dale-Chall Formula [83], the SMOG Grading [83] and the Microsoft Word reading level assessment [83]. Guidelines to improve the readability quality of written health education materials are well-researched and validated, and can increase comprehension and adherence for patients with low health literacy.

Electronic Material

Health education materials delivered via the worldwide web and electronic methods are increasingly available, though not necessarily preferable to, patients sixty-five years of age and older. Gordon & Hornbrook predicted the popular opinion's movement to electronic HE would most significantly affect geriatric citizens [141], however, those ≥ 85 reportedly trust electronic education references less than other health information sources [114] and utilize the Internet to access health information with diminished frequency [141]. Valenzuela et al.'s review did find increased program adherence in the elderly for exercise performed using electronic methods such

as video games [98]. Within the geriatric population, those most likely to have low health education technology access and ability are African-Americans, Latinos and Filipinos, and those ≥ 75 years of age [141]. A brief outline of electronic HE material delivery methods, as well as HE technology preferences of older adults, are included here.

In the entire adult population, including those with low general and health literacy [57, 78], electronic methods that have experimentally delivered health education [78] and have been shown to increase ease of electronics use [78] and comprehension [57, 78, 142] include:

- Videotape [78]
- Videotape accompanying written instructions [57]
- Videotape accompanying spoken education [57]
- Touchscreens [78]
- Virtual reality [142]

Within the LTCF population specifically, the following methods have demonstrated increased patient involvement [20] and self-empowerment [143], and decreased chance of falls [103], though were not tested in regards to patient health education:

- Robotic devices [20]
- Programs on electronic tablets [143]
- Exergames [103]

In addition to electronic methods with experimental outcomes, geriatric patients have stated their preferences for the following types of technology to receive health education [141]:

- Telephonic health counseling and training [141]
- Web-based health counseling and training [141]
- Educational webpage [141]
- Educational online video [141]

Due to the developing and evolving nature of electronic HE delivery methods, there are less specific and numerous implementation recommendations available for the geriatric LTCF population. In addition to studying techniques for executing electronic health education, future research should include the effectiveness and patient preference in using technology to increase their health literacy.

Section Summary

Health literacy levels influence a patient's ability to participate in and make decisions regarding their own health, including physical therapy programs and regular physical activity. At each level of the Social-Ecological Model from Intrapersonal to Community, there are several interventions worth pursuing in long-term care physical therapy, to increase patient's health literacy and program adherence. Specific recommendations are available for the design and implementation of both written and electronic health education materials. Nevertheless, there remains a dearth of validated interventions in the field of institutionalized geriatric health literacy and program adherence, with future research required to ameliorate this deficit.

Chapter 5 – Conclusions

The institutionalized elderly population is expected to significantly increase in the near future, though the current population has low exercise initiation and adherence rates. Within this paper, health literacy has been presented as a mediating factor on the activity adherence rates of the LTCF elderly population. Currently, there are a number of peer-reviewed studies on the barriers and motivators to exercise in elderly patients [12, 19], though a considerably lower number of publications concentrated on long-term care subjects [12]. There is a noted paucity of information on LTCF exercise rates [144], as well as therapeutic adherence interventions for the LTCF elderly population. Overwhelmingly, existing papers on exercise programs in the elderly cite a need to improve not only the uptake of PA, but maintenance of PA beyond the active experimental intervention phase [4, 87, 116, 117, 145, 146]. In this instance, health literacy stands as a potential intervention to increase institutionalized patient's physical therapy program adherence and maintenance. To this author's knowledge this is the first English-written research paper specifically focused on recommending methods to increase health literacy in elderly LTCF patients as a method of increasing physical therapy adherence.

Four Intrapersonal recommendations were produced in this manuscript to increase patient's health literacy and consequent adherence: providing customizable patient journals, providing illustrated exercises, providing concise educational materials and giving patients the opportunity to confirm their newfound knowledge. The substantiating evidence ratings for the four main Intrapersonal recommendations are relatively high: *Ib* [115, 117, 119], *Iia* [118], and *Iib* [72]. Three of the five references reported on institutionalized populations [72, 118, 119], and three of the five directly studied activity adherence [117-119]. Improving patients' self-efficacy is an overarching theme within the Intrapersonal level, as increased belief in their ability to succeed in exercise is thought to increase a patient's chances in maintaining an exercise routine [86]. Future necessary research at the Intrapersonal level includes strengthening the associated relationship between health education and adherence and undertaking experimental interventions in institutional settings.

One Interpersonal recommendation to increase patient health literacy and adherence was produced in this manuscript: health discussions between the resident and physical therapist, including the resident's immediate friends and family if possible. With respect to patient

adherence, a reciprocating relationship between patients and PTs has high prominence in the Interpersonal level [128]. A practitioner's support of elderly exercise can repudiate the belief that decreased activity levels are protective to older people [86]. The single piece of central substantiating evidence for the Interpersonal level studied a community-dwelling population and their motivation to be physically active when exposed to SEM factors [87]. McMahon et al. received a *Ib* evidence rating, indicating good quality. There are several pieces of supporting evidence within the Interpersonal recommendation section that support its chance for success when utilized in the clinic. However, McMahon et al. did not directly examine adherence, and the content of the study was adapted by this author to hypothetically fit the environment of an LTCF. As such, the recommendation certainly requires further study and evidence validation to determine its efficacy in institutionalized populations.

Two Organization recommendations were produced in this manuscript to increase patient health literacy and adherence: organize peer-led education and activity, and facilitate health literacy materials focus groups. The recommendations in this level were supported by five main substantiating references. Only two of these references performed data collection in a long-term care facility environment [121, 122], and the sample populations of all five references included subjects under the age of 65 years. The references received varied evidence ratings of *Ia* [120], *IId* [121], *III* [83], *IV* [122], and *V* [81]. The focus of the substantiating evidence in the Organization level was on improving health literacy and health education, although Burton et al. did study the effects of peer instruction on exercise adherence. Benefits of interventions at this level include the increased opportunity for social interaction as well as increased health education, which can consequently increase adherence. Though it is a valid level from which to base adherence recommendations, the Organization level is almost universally omitted from SEM analyses of elderly activity and adherence behaviors. Therefore, the Organization level requires further work to normalize its use in the literature and in clinical situations.

Three Community recommendations were produced in this manuscript to increase patient health literacy and adherence: host group education and exercise classes, display examples of physically active counterparts throughout the LTCF and rehabilitation clinic, and display educational posters throughout the LTCF and rehabilitation clinic. The Community recommendations were supported by six main substantiating references. The evidence ratings for the Community level are *Ib* [115, 123, 125], *IV* [124, 126], *V* [20]. The majority of references

focused on physical activity and exercise outcomes, as Martin Ginis et al. was the only main Community reference with a focus on health education. Three of the six references were based in long-term care [20, 124, 125], and five of the six had sample populations over 65 years of age (with the de Souto Barreto et al. producing recommendations for non-specified “older adults”). Four references reported on activity adherence or activity rates [123-126]. The Community SEM level appeared to have the most relevant references to the ideal sample population of this paper.

The purpose of this paper was to establish the potency of the relationship between health literacy and program adherence, and present recommendations for facility physical therapists to efficaciously implement health literacy interventions in elderly long-term care residents. As noted by Baert et al., physical therapists are able to most effectively use physical activity to treat institutionalized patients, compared to other healthcare providers within the facility [97]. Furthermore, LTCF physical therapists have stated their belief that LTCF residents have decreased physical states as well as increased disease burden, and as such require distinct PA recommendations [97]. However, several limitations presented themselves in the research analysis portion of this paper. The field of experimental HL interventions applied to the elderly LTCF population is still developing, numerous experimental health literacy studies have small sample sizes [81], and authors have noted that the currently published research on certain health literacy intervention types and their association to adherent behaviors (for all adult age groups) are unclear in their conclusions [57], and thus require further study. Due to the small number of valid, peer-reviewed health literacy interventions in this paper’s specified target population, findings within this manuscript often had to be extrapolated from populations related to, but not meeting the guidelines of, the ideal target population. As seen in Table 4, recommendations were drawn from sample populations that were community-dwelling, younger than this paper’s established elderly age threshold of ≥ 65 years of age, and from studies examining physical activity and exercise interventions instead of physical therapy. Additionally, nine out of sixteen main references, contributing to eight out of ten recommendations, were based on one experimental component of a larger intervention or one suggested clinical application out of a longer list of proposed guidelines [20, 72, 81, 83, 87, 115, 117-119]. Finally, three main references used to substantiate three of the recommendations were cited from study protocols or general recommendations, but were not cited (by this author) from peer-reviewed research or review [81, 124, 126]. Generalization such as this clearly affects the ability to apply those experimental intervention’s results with the predicted

adherence of recommendation recipients. Furthermore, though the author's original intent to explore the Intrapersonal, Interpersonal, Organization and Community levels of the Social-Ecological Model was technically achieved, acute difficulty was noted in distinguishing the Organization and Community levels from one another. Traditional examples of the Organization SEM level include the subject's place of employment and institutions of higher learning [111], which LTCF residents are not technically members of, while the SEM Community level refers to the entirety of the environment and communal groups the subject lives and interacts within [111], which constitutes the entire LTCF for long-term care residents. In a unique population such as long-term care, the facility's size determines whether Organizational and Community SEM levels are separate (with multiple distinct smaller social groups within the larger facility) or can be combined (if the facility is small enough to promote only one overall community). Due to this indistinct boundary, interventions in the LTCF population could be considered part of the Organization or Community level depending on the population's size and resident familiarity level. Additionally, a notable majority of this paper's recommendations were categorized into the Intrapersonal, Organization and Community SEM levels, with both decreased quantity of recommendations and less main substantiating evidence within the Interpersonal SEM level recommendation. The uneven distribution is hypothesized by this author to be due to individual interventions (Intrapersonal level) being more convenient to apply in experimental trials, and interventions on large groups (Organization and Community level) presenting the greatest potential positive outcome for the most residents possible. Concurrently, McArthur et al. noted that experimental PT interventions targeting residents prevail over broader facility and system levels [8], though research at these higher SEM levels can contribute to collaborative study across different long-term care facility cohorts [8]. Finally, though the recommendations of this paper were organized within the SEM to include the effect of the unique LTCF environment on the patient, components of several different behavioral change theories were included in the recommendations. While the relationship of health literacy and adherence clearly requires further peer-reviewed validation by performing research on institutionalized elderly, the tentative recommendations produced within this paper could likely be implemented now without risk of serious harm to patients.

Due to the emergent nature of this area of research, there are several directions in which future research could be performed. In the population of long-term care physical therapists, the

therapy utilization rate, health literacy intervention rate, and health literacy intervention strategies could all benefit from further study and validation. Furthermore, the population of LTCF elderly is vastly under investigated, and peer-reviewed studies into current health literacy statistics, health literacy's relationship to patient demographics (including terminal education levels and socioeconomic status) and successful health literacy interventions are needed to move the field forward. Long-term care patients are a small subset of the research performed on the elderly population, and a smaller amount still of research performed on health literacy or health education within LTCF elderly. In order to efficaciously and accurately determine the outcomes of individual behavioral change methodologies, each intervention should be tested independently of one another, instead of combined into one large behavioral change trial [87]. Additionally, health education or health literacy interventions should be performed as an experimental intervention, rather than as a control treatment in exercise and physical activity trials. Finally, the term adherence is used broadly throughout the literature, and can be applied to attendance rates [130], active participation in therapy, completion rate of home exercises [130], completion of the entire therapeutic treatment plan [130], and more. Applying the term adherence to one specific measure would make reviewing and summarizing research results in this field much more efficient.

The recommendations produced within this paper aim to target the health literacy and program adherence of institutionalized elderly physical therapy patients. Organized within the Social-Ecological Model to encapsulate the effects of the long-term care facility on the residents, these recommendations require further experimental validation before they can be implemented in a clinical setting. Though promising work has been done in this field, much remains to be accomplished in advancing this important theoretical work into clinical practice.

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