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Association Between Components of a Self-management Theory and Falls Among Older Adults

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ASSOCIATION BETWEEN COMPONENTS OF A SELF-MANAGEMENT THEORY AND FALLS AMONG OLDER ADULTS

by

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ABSTRACT

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by

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Under the Supervision of Professor Dr. Murad H. Taani

Objectives: The purpose of this study was to examine self-management process factors, proximal outcomes, and distal outcomes of fall prevention utilizing the Individual Family and Self-Management Theory (IFSMT) in older adults residing in CCRC's in a Midwest community.

Design: This descriptive study was a secondary data analysis of a cross-sectional correlational study.

Setting: Completed in six Continuing Care Retirement Communities in a Midwest state.

Participants: Ninety-nine participants ranged in age from 70-99 years of age.

Measurement: The data for self-efficacy, goal congruence, social support, aging expectation, protein intake, vitamin D intake, and total number of falls was obtained through questionnaires. The data for physical activity was retrieved from an Actigraph GT3X+ which the older adult wore for 7 days. Both logistic and multivariant statistics were used to analyze the data. Multicollinearity was assessed for each model.

Results: Those participants with higher self-efficacy for physical activity exhibited more steps per day. Higher expectations regarding aging demonstrated a reduced likelihood of meeting daily protein intake. Meeting vitamin D intake was not associated with any of the variables. Falls were not associated with any of the process variables (self-efficacy, goal congruence, social support, and aging expectations). Further research is needed to better understand the results of this study,

and to develop interventions to prevent falls as well as the negative health outcomes associated with falls in older adults.

Conclusion: Further research is needed to determine what impacts these relationships and what interventions can prevent falls in older adults residing in continuing care retirement communities. There may be factors that affect older adults residing in CCRC's that may not pertain to older adults living within the community. Self-management interventions that prevent falls in older adults has the potential to impact not only those who have fallen but those who have not yet experienced a fall. Further research is needed to develop and implement interventions to prevent falls as well as the negative health outcomes associated with falls in older adults.

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Chapter 1

This chapter describes falls in older adults as a continuing public health concern, particularly among older adults living in continuing care retirement communities (CCRC). This chapter comprises an overview of falls among older adults, including background, prevalence, significance, specific risk factors, and the gap in knowledge. The purpose of this dissertation study and research questions are discussed. Description of the study variables and structure of the dissertation are provided.

Introduction

One in four older adults in the United States experiences at least one fall every year. Falls lead to negative outcomes including significant injury, disability, decreased quality of life, and increased mortality rates (CDC, 2021). Falls in older adults are a concern worldwide, with other countries reporting similar statistics to the United States. Unintentional falls are the seventh leading cause of death in those aged 65 and older in the United States (CDC, 2019). Falls are preventable and not part of the normal aging process (Ambrose et al., 2013; Horton et al., 2018; NCOA, 2016). Understanding the contributing factors of falls among older adults in different living settings lay the foundation to design and implement interventions to decrease both the rate and risk of falling among older adults.

Background

Falls in older adults are a significant problem in the United States and associated with negative health consequences, including injuries, fractures, functional decline, loss of independence, and increased health care expenditure (CDC, 2019; Florence et al., 2018; Horton et al., 2018; National Council on Aging, 2016). Falls also contribute to a decreased quality of life

and increased mortality among older adults (McQuaid-Bascon et al., 2018; Xu & Rivera Drew, 2017). Wisconsin has the highest mortality rate in the nation associated with falls in older adults (CDC, 2018). The United States' mortality rate ranges from 24.4 to 142.7 per 100,000 (CDC, 2018), and the one-year mortality rate of an older adult who falls and fractures a hip is approximately 20% (NCOA, 2016). As the older adult population is projected to increase, fall rates and health care spending are projected to rise.

Current census data revealed that there were 47.8 million older adults in the United States (U. S. Census Bureau, 2018), and that 10,000 people turn 65 years of age every day (CDC, 2016). Currently, older adults represent 14.9% of the total U. S. population, and the expectation is that the percentage of older adults will rise to 24% of the total population by 2060 (Pincus et al., 2017). As the percentage of older adults in the U.S. increases, the older adult's life expectancy is predicted to increase. Estimated predictions suggest that males will live to about 80.7 years, and women will live to about 85.2 years (Gelbard et al., 2014). As the population of older adults increase, the total number of falls is also expected to increase.

The literature showed that some health care providers and policymakers believe that falls in older adults are unavoidable and occur because of the normal aging process (Grealish & Chaboyer, 2014; Horton et al., 2018; Pitchai et al., 2019). Older adults have also reported that falling is a part of everyday life (Gustavsson et al., 2018). However, organizations such as the Total Joint Commission, Center for Medicare and Medicaid Services, and Agency for Healthcare Research and Quality deem falls in older adults as never events and preventable (Quigley & White, 2013). The literature emphasized the importance of designing and implementing interventions that prevent falls through the early identification of its risk factors.

Prevalence and Significance

Falls among older adults are a significant public health problem around the world that is associated with negative health outcomes including fractures, injuries, and reduced quality of life (CDC, 2018; Florence et al., 2018; Grealish & Chaboyer, 2015). Evidence also showed that falls are the second leading cause of unintentional injury death worldwide after motor vehicle accidents (WHO, 2019). Older adults who are 65 years of age and older also have a higher mortality rate than other age groups after experiencing a fall (Gelbard et al., 2014). In addition, there is a disproportionate cost to treating an older adult after a fall (Bai et al., 2018). In the United States, the cost of treating non-fatal injuries in older adults who fell has been estimated to be $50 billion, in addition to $754 million that was spent on treating injuries that resulted in fatalities (CDC, 2017). Medicare and Medicaid incurred 75% of the health care costs resulting from older adult falls (CDC, 2017). The cost of treating falls in older adults is expected to rise as the number of older adults in the population increases. Thus, it is imperative to gain a better understanding of the risk factors for falls among older adults in different settings.

Self-management has been used as a strategy to manage and control chronic conditions. Self-management can be also extended to the area of prevention as a key factor in preventing illnesses among the asymptomatic as well as promoting health and well-being. Older adults who are at risk for falling are among the "asymptomatic" and the self-management approach can be used to prevent falls. Fall prevention self-management has been defined as "actions individuals take or behaviors they perform to prevent themselves from falling" (Schnock et al., 2019). Adequate self-management has the potential to decrease the risk of falls among older adults, promote recovery after falling, and enhance the effectiveness of the provided fall-related healthcare services (Bongoers et al., 2016). However, according to the Individual and Family

Self-Management Theory (IFSMT), there are events, conditions, or self-management processes that influence the occurrence of self-management (Ryan & Sawin, 2009). Improving self-management behaviors by targeting the self-management processes may help decrease both the rate and risk of falling among older adults.

The Individual and Family Self-management Theory

The IFSMT can be used to study potential factors that could lead to falls among older adults (Ryan & Sawin, 2009). The IFSMT identifies four dimensions: context, process, proximal outcomes, and distal outcomes (see figure 1). The context dimension includes risk or protective factors and incorporates condition-specific, environment, and individual and family factors that influence self-management behaviors (Ryan & Sawin, 2009). The process dimension focuses on the factors that influence self-management behaviors, such as self-regulation, self-efficacy, goal congruence, and social support (Ryan & Sawin, 2009). The context and process dimensions influence proximal and distal outcomes. Proximal outcomes include self-management behaviors. Distal outcomes contain the cost of health care services and quality of life (Ryan & Sawin, 2009). Proximal and distal outcomes are measured by various tools depending on the outcomes being examined. The IFSMT can provide greater insight into older adults' self-management behaviors to prevent falls and provide a framework for assessing, planning, and implementing a theory-based approach to prevent falls among older adults.

The IFSMT model has been used to explain the self-management behavior in adolescents with type 1 diabetes mellitus (Verchota & Sawin, 2016), described older adults with reduced muscle outcomes (Taani et al., 2018), studied post-partum sleep interventions (Doering & Dogan, 2018), identified factors that influence medication adherence in African American women,(Ellis 2019) developed a self-management theory-guided discharge intervention for

parents of hospitalized children (Sawin et al., 2017), and recognized the process of behavior change in middle-aged women (Ryan et al., 2019). However, the IFSMT model has not been used to study the potential risk factors for falls in older adults living in CCRCs. The IFSMT has been modified to provide the foundational concepts for this research and focus on potential risk factors for falls in older adults.

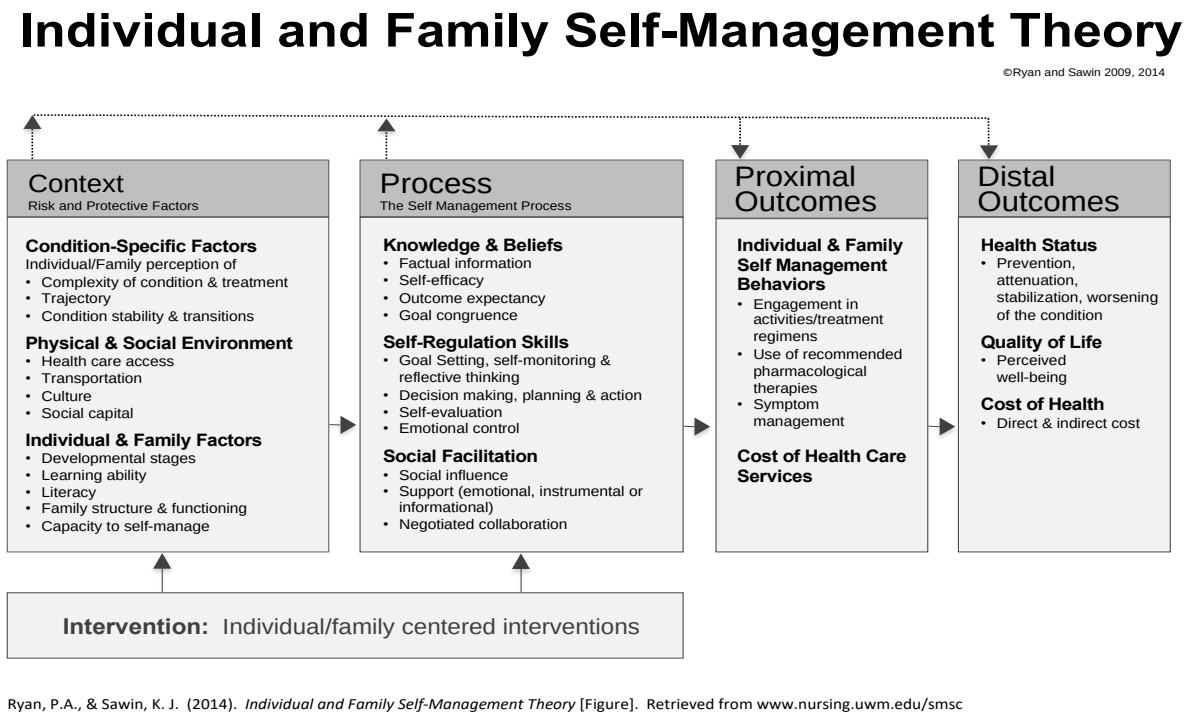

Figure 1 The Individual and Family Self-Management Theory

Risk Factors and IFSMT

Ryan and Sawin (2013) suggested that contextual and process factors influence individual and family engagement in self-management, and these factors are antecedent to proximal and distal outcomes. When considering the IFSMT, factors associated with falls in older adults align within these dimensions to add meaning and clarify this phenomenon. Contextual factors include gender and age. Process factors are influenced by concepts that affect

individuals' knowledge and beliefs, including self-efficacy, aging expectations, goal congruence for protein intake-vitamin D intake-physical activity, and social support. The self-management behaviors are designated as proximal outcomes and include protein intake, vitamin D intake, and physical activity. These are actions taken by the older adult that will produce a result. Distal outcomes include the total number of falls. Although the relationship between some of these variables and falls has been studied in community-dwelling older adults, limited research has been conducted among older adults living in CCRCs. A better understanding of the relationship between the proposed variables and falls is needed to improve the prevention of falls and their adverse health outcomes.

Age

As people age, physiological changes occur in the human body, referred to as part of the normal aging processes (Ambrose et al., 2013). As the body begins to slow down, reflexes slow, muscles become weaker, and balance beings to decline (Ambrose et al., 2013). The older adult has a decreased sense of thirst and reduced appetite, which play a role in nutritional status and muscle weakness (Ambrose et al., 2013). Those over the age of 85 have a significantly greater risk of falling than those between the ages of 65 and 74 (Ambrose et al., 2013).

Gender

Gender is defined as "the attitudes, feelings, and behaviors" that are associated with a person's biological sex (APA, 2020, p. 138). There are differences in falls based on gender. Women have a slightly higher life expectancy than men and have more falls than men (Ambrose et al., 2013; Gale et al., 2016). Women also experienced more non-fatal injuries after falling, while men had more fatalities after falling (Ambrose et al., 2013).

Self-Efficacy for Physical Activity

Self-efficacy, or confidence in oneself, can either motivate or negatively affect a person's behaviors. Older adults can be encouraged by their certainty that there are benefits to physical activity. A lack of confidence deters older adults from participating in physical activity due to the belief that it doesn't make a difference (Yao, 2019). An older adults' self-assurance about their ability to perform specific tasks influences whether they will or will not engage in physical activities (Belka & DeBeliso, 2019; Yao, 2019). Fears about performance impact their participation in healthy life choices, including health promotion checkups and physical activity (Belka & DeBeliso, 2019). When older adults have higher self-efficacy, they report greater satisfaction with life and less depression leading to greater physical and mental capacity (Yao, 2019). Higher self-efficacy was also shown to improve commitment to a physical activity program (Yao, 2019). Increased self-efficacy leads to increased physical activity resulting in improved muscle function and decreased falls.

Aging Expectations

Aging expectations impact whether an older adult will participate in health promotion activities (Sarkisian et al., 2002). The definition of normal aging has evolved over the past 40 years. A landmark paper by Rowe and Kahn pointed out that many of the changes often associated with normal aging are, in fact, preventable (Sarkisian et al., 2002). However, older adults may believe that falling is an expected result of normal aging (Gustavsson et al., 2018). In one qualitative study, older adults reported that falling was a normal part of everyday life (Gustavsson et al., 2018). When falls are seen as an expectation of aging, fall prevention is not seen as a priority.

Older adults desire and believe that they are aging well (Reichstadt et al., 2010). Aging well can take on different meanings for different people. Still, just like self-efficacy, older adults

can either be motivated or negatively influenced by their perceived expectations of growing older (Yao, 2019). When they are motivated by their expectations, the older adult participates in health-promoting activities such as physical activity. When the older adult has negative expectations of aging, they often do not seek regular care for manageable health conditions, or participate in health-promoting activities (Yao, 2019). The lack of health promotion and preventive care behaviors places the older adult at risk for many things, including falls.

Goal Congruence for Physical Activity, Protein and Vitamin D Intake

Knowledge and beliefs impact whether an older adult is willing to perform specific tasks (Sawin & Ryan, 2009). Goal congruence involves the older adult's ability to resolve conflicting information and manage multiple demands to engage in healthy behaviors (Ryan & Sawin, 2009). Knowledge includes knowing which foods contain protein and vitamin D and how much activity is beneficial. Older adults must understand how to incorporate these foods and physical activity into their daily routines and recognize how much they will pay for them. What an older adult believes about physical activity, protein, and vitamin D will affect their behaviors. If the older adult does not believe that these factors will improve muscle strength or reduce falls, they will not engage in those behaviors. There are also competing demands and barriers that impact an older adult's food intake and amount of physical activity. All these factors lead to decreased intake of protein and vitamin D as well as decreased physical activity levels. The consequences of these behaviors are poor muscle function and falls in older adults (Meehan & Penckofer, 2014).

Social Support

Social support provides needed resources and encouragement to older adults as they age (Geller, 2019; White et al., 2009). Research has identified different forms of social support, such

as social networks and functional resources (White et al., 2009). Social support can be either positive or negative (Chogahara, 1999). Positive social support motivates older adults to endure when things are difficult (Geller, 2019). When exercises are hard to perform or when muscles become sore due to the exercise, positive social support can inspire the older adult to main their focus on improved muscle function and lower risk for falls. As people age, social support, especially from family members, encourages older adults to remain active and engaged in physical activity (Smith et al., 2017). Increased activity and engagement will lead to heathy behaviors and better self-management. Negative social support can result in the opposite response by discouraging physical activity and other health behaviors (White et al, 2009). Older adults with high levels of social support are more likely to choose healthy behaviors such as increasing protein intake, vitamin D intake, and physical activity (Geller, 2019; Smith et al., 2017). The result of sustained healthy behaviors will be improved muscle outcomes and decreased falls.

Protein Intake

Protein intake is needed to maintain optimal physical functioning in older adults (Bauer et al., 2013). In the past, there was much discussion regarding the association between chronic diseases and diet, and it was believed that chronic diseases were the result of what a person ate (Caan et al., 1999; Miller, 2019). However, age-related changes also affect nutritional intake and include a decreased appetite, decreased thirst sensation, slower gastrointestinal motility, decreased senses of taste and smell, and a reduced ability to purchase and make meals (Miller, 2019). These have been categorized into the following: "inadequate protein intake, reduced ability to use available proteins and greater need for protein" (Bauer et al., 2013). Each of these factors contributes to a reduction in total protein intake. Researcher’s recommendations for

protein intake in older adults is 1.0 to 1.5 g/kg of body weight per day (Bauer et al., 2013). One study that examined protein intake in older women found that increased protein intake reduced the risk of frailty (Beasley et al., 2010). Decreased protein consumption affects muscle quality and strength, placing an older adult at risk for falling (Miller, 2019). Finding ways to increase protein intake by older adults is a challenge that faces society.

Vitamin D Intake

Vitamin D offers a protective factor for older adults in the prevention of osteoporosis and fractures. Vitamin D benefits include improving muscle movement, balance, gait, and physical performance and reduces falls in older adults (Meehan & Penckofer, 2014). Older adults have decreased Vitamin D levels related to reduced intake, reduced sun exposure, and reduced kidney function. The Institute of Medicine (IOM) released recommendations for Vitamin D intake in older adults (greater than 70) of 800 international units daily (Meehan & Penckofer, 2014). There is not enough information available about what constitutes inadequate Vitamin D intake. Some research studies suggest that Vitamin D supplementation is not effective in reducing falls if a deficiency is not present (Cameron et al., 2012). More research is needed concerning how much Vitamin D is necessary for older adults to prevent falls.

Physical Activity

Health benefits of physical activity include reduced number of chronic diseases, decreased risk of premature death, positive mental health, and improved muscle function, strength, and balance (Bauman et al., 2016; CDC, 2019; Silvia et al., 2019). Despite these health benefits, many older adults remain inactive (CDC, 2019). Several factors addressed some of the barriers that prevent older adults from participating in physical activity, such as safe environments (Bauman et al., 2016). A systematic review found that when social support was

provided, especially by family members, the older adult was more likely to engage in physical activity (Smith et al., 2017).

Falls Definition

Falls are defined in this study as an unplanned descent to the floor by an older adult.

Knowledge Gap

The self-management processes (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) and self-management behaviors (protein and vitamin D intake, physical activity-steps per day) and their associations with falls among older adults living in CCRCs are understudied. Although the relationship between some of these variables such as physical activity and vitamin D intake have been studied in older adults, other factors such as goal congruence and aging expectations have not been studied. Moreover, limited research is available on the relationships between the previously discussed factors and falls among older adults living in CCRCs. It is not clear whether the results of the existing research can be generalized to older adults living in CCRCs (Beasley et al., 2010; Cameron et al. 2012; Geller, 2019; Gustavsson et al., 2018; Meehan & Penckofer, 2014; Yao, 2019). To the best of the author's knowledge, there are no nursing studies that have examined the relationship between the self-management process factors, self-management behaviors, and falls among older adults living in CCRCs.

Purpose, Research Questions and Hypotheses

Purpose

A better understanding of how self-management process factors and self-management behaviors influence the distal outcome of the total number of falls in older adults is necessary to design interventions to prevent falls in older adults. The purpose of this study was three-fold:

1. To examine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the proximal outcomes (self-management behaviors: physical activity, protein, and vitamin D intake) in older adults residing in CCRCs.

2. To determine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the distal outcomes (falls) in older adults residing in CCRCs,

3. To evaluate the relationship between the self-management behaviors (physical activity, protein, and vitamin D intake) and distal outcomes (falls) in older adults residing in CCRCs.

Questions and Hypotheses

The following list includes the research questions that were reviewed and their corresponding hypothesis.

1. What is the relationship between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) and the proximal outcome (physical activity- steps/day, protein and vitamin D intake) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with physical activity, protein, and vitamin D intake in older adults residing in CCRCs.

2. What is the relationship between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the distal outcomes (falls) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with falls in older adults residing in CCRCs.

3. What is the relationship between the self-management behaviors (physical activity, protein, and vitamin D intake) and distal outcomes (falls) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, physical activity, protein, and vitamin D intake are associated with falls in older adults residing in CCRCs.

Contributions to Nursing and Innovation

This study will contribute to nursing knowledge by examining process and self-management behaviors and their potential associations with falls among older adults living in CCRCs. This study included factors that have not been evaluated in older adults living in CCRCs and will contribute to the body of knowledge in this area of inquiry. Better understanding of the risk factors and self-management behaviors associated with falls will lay the foundation for designing and implementing interventions to prevent falls and their negative consequences among older adults living in CCRCs.

Summary

Fall prevention in older adults remains a concern throughout the world. Multiple risk factors contribute to older adult falls, which has led to the continued high number of falls in older adults over the years. Questions remain regarding how risk factors affect the total number of fall occurrences in older adults. This study reviewed the relationship between self-management process factors (self-efficacy for physical activity, goal congruence for protein intake-vitamin D intake-physical activity, aging expectations, and social support), self-management behaviors

(protein intake, vitamin D intake, and physical activity) to the number of falls in older adults residing in CCRCs.

Structure of Dissertation

The structure of this dissertation followed the following format. Chapter one introduced the problem of falls in older adults, briefly discussed the Individual and Family Self-Management Theory, outlined factors that have been shown to impact falls in older adults and provided a brief discussion about gaps in knowledge. The focus of Chapter two was a systematic literature review on the self-management process factors and self-management behaviors that influenced falls in older adults. Chapter two also included an integrative review of the IFSMT. Chapter three discussed the methods of this secondary analysis of a cross-sectional correlational study evaluating physical activity and dietary self-management in older adults. Chapter four was a discussion of the results of this study. Chapter five focused on how these results can be applied.

Chapter 2

This chapter includes a manuscript reviewing current knowledge about factors leading to older adults' falls from a self-management lens. In addition, a review of the Individual and Family Self-Management Theory (IFSMT) and contemporary literature regarding the factors affecting falls was examined.

Introduction

Approximately 3 million emergency room visits are a result of older adult falls every year (CDC, 2017). Falls occur when older adults experience an unplanned descent to the floor or ground (Cozart & Cesario, 2009). The leading cause of injury-related deaths in older adults is unintentional falls (Gelbard et al., 2014; National Council on Aging, 2016). The effects of falls include minimal injuries such as bruising and soreness. Falls can also lead to significant injury, disability, and death (Burns & Kakara, 2019; Chang & Do, 2015; Gale et al., 2018; National Council on Aging, 2016). Significant injuries involve fractured hips, long bone fractures, and traumatic brain injury (Ambrose et al., 2013; Stevens & Sogolow, 2005). Fall-related injuries can cause temporary or permanent disability when older adults have decreased mobility, independence, and functional abilities. In addition, older adults who have pre-existing medical conditions and experience a fall have worse clinical outcomes (Gelbard et al., 2014).

Consequences of falls in older adults living in the community include hospitalizations, rehabilitation, or admission to long-term care faculties (Ambrose et al., 2013; Stevens & Sogolow, 2005). After experiencing a fall, the daily lives of older adults are impacted by a loss of independence, confidence, and mobility which can lead to a fear of falling (Ambrose et al., 2013). Fear of falling is an independent risk factor for experiencing a subsequent fall (Young & Williams, 2015).

Falls in older adults are a worldwide concern. Prevention of falls is one of the goals of research focusing on older adults. In the United States, statistics regarding falls in older adults show that falls are not decreasing (Burns & Kakara, 2019). There was a 31% increase in older adults' mortality rates due to falling from 2007 to 2016 (Burns & Kakara, 2019). During this time, 30 states reported a substantial increase in fall rates, and another 11 described no change in fall rates for older adults (Burns & Kakara, 2019). As the number of older adults increases and the number of reported falls increases, medical costs are expected to increase.

Organizations such as the Centers for Disease Control and Prevention (CDC), the National Council on Aging (NCOA), and the World Health Organization (WHO) developed policies aimed to reduce falls in older adults. For example, the National Falls Free Initiative focuses on physical mobility, medication management, home safety, and environmental safety in the community (NCOA, n. d.). The NCOA encouraged states to develop State Coalitions so that interventions targeting the risk factors identified as impacting their communities could be established (Schneider et al., 2016). The Stopping Elderly Accidents, Deaths & Injuries (STEADI) is another program developed by the CDC providing resources to health care providers as well as patients and family members (Horton et al., 2018).

Strategies utilized to impact fall prevention include the use of self-management theories (Schnock et al., 2019). Identification of those at risk for falling is key to preventing older adults from experience a fall and/or injuries related to falling (Bongoers et al., 2016). Self-management interventions promote autonomy and engagement in completion of daily activities.

The purpose of this paper was to review common risk factors associated with falls in community-dwelling older adults based on current research that can be impacted by self-management processes and behaviors. The IFSMT concepts such as context, process, proximal

and distal outcomes was applied to these common risk factors including a discussion about interventional research. Gaps in the literature were also be identified.

Methods

The databases used for this study included CINAHL, PubMed, and Web of Science. The keywords comprised self-efficacy for physical activity, goal congruence, aging expectations, social support, vitamin D intake, protein intake, physical activity, and "accidental falls AND 65andolder NOT screen". In addition, the search included peer-reviewed English language papers published between 2015 and 2020 and relevant to community-dwelling older adults. The initial search identified 560 articles, and after examining the abstract and removing duplicates, 58 articles remained. This was further reduced by removing systematic evaluations, umbrella reviews, and interventional research studies. This left 20 articles that met the inclusion criteria. (See Appendix A)

Results

Self-Efficacy for Physical Activity

Self-efficacy for physical activity is a person's confidence in their ability to execute actions needed for specific movements (LaPier et al., 2009). Instruments to measure self-efficacy in fall prevention research include self-efficacy for physical activity and self-efficacy for falls (Chivers Seymour et al., 2019; Eckert et al., 2020; Ellmers et al., 2018; Huang et al., 2018; Kamide et al., 2018; Kollen et al., 2017; LaPier et al., 2009; Pau et al., 2017; Pauelsen et al., 2018). Self-efficacy for falls looks at concerns that older adults have about falling, while self-efficacy for physical activity looks at confidence in performing physical activity inside the home, outside the home and at social event (LaPier et al., 2009). Previous performance, individual achievements, and successful past experiences with exercise influence confidence when

engaging in physical activity; therefore, researchers should consider this instrument when adding physical activity as an intervention (LaPier et al., 2009). There is also a consideration for adherence to exercise and physical activity which is imperative to improve muscle strength (LaPier et al., 2009). Identifying barriers to self-efficacy for physical activity and creating interventions that minimize these barriers can promote engagement, and adherence to physical activity; thereby, supporting fall prevention in older adults.

Recent studies have focused on how fear of falling and social isolation impact self-efficacy for physical activity (Ponzano et al., 2021; Robins et al., 2018). There was a negative association between having a fear of falling and exercise self-efficacy (Ponzano et al., 2021). When older adult women are afraid of falling, they have less confidence in their ability to exercise, and therefore limit their physical activity (Ponzano et al., 2021). Limiting physical activity leads to muscle weakness and increased risk for falling. This study was limited to older adult women with vertebral fractures.

The second study examined the impact of social isolation on physical activity in community-dwelling older adults (Robins et al., 2018). While the physical activity level did have an association with reduced social isolation, self-efficacy for physical activity (physical capacity) did not have an association with social isolation (Robins et al., 2018). Since this was a secondary analysis, a direct relationship between physical activity and self-efficacy for physical activity could not be determined (Robins et al., 2018).

Aging Expectations

The focus of aging expectations in research has been to examine if positive aging beliefs influence engagement in health promotion activities (Andrews et al., 2017). One assumption is that aging expectations may influence intention to engage in physical activity and behavioral

outcomes (Dogra et al., 2015). When aging expectations are positive, older adults are more social with others and take part in health promotion activities, such as physical activity and health care services (Andrews et al., 2017; Breda & Watts, 2017; Dogra et al., 2015). One longitudinal study found that women were more likely to be engaged in physical activity when their overall expectations regarding aging was higher (Andrews et al., 2017). The implications of this study acknowledged that interventions to improve aging expectations may benefit older adults and encourage them to be more active (Andrews et al., 2017). Research studies identified that positive expectations led to increased physical activity, and interventions to increase positive aging expectations encouraged physical activity (Andrews et al., 2017; Breda & Watts, 2017). An implication of this result included a potential to inspire improved health outcomes such as physical function (Breda & Watts, 2017).

However, an inverse association exists between negative aging expectations and lower participation in physical activity (Andrews et al., 2017). Negative aging expectations may be a barrier to participation in physical activity (Andrews et al., 2017). Negative beliefs about the aging process may become ingrained affecting engagement in physical activity (Andrews et al., 2017). The belief that deterioration is due to getting old leads to the assumption that nothing can be done to prevent this decline.

Goal Congruence for Physical Activity, Protein and Vitamin D Intake

Knowing the degree to which older adults believe they can meet goals concerning physical activity, protein intake, and vitamin D intake is essential to understand the self-management behaviors they demonstrate. A measure has been developed for this, and it has been termed goal congruence (Ryan & Sawin, 2009). Goal congruence involves the older adult's ability to analyze conflicting information and negotiate multiple demands to engage in healthy

behaviors (Ryan & Sawin, 2009). Specifically, goal congruence identifies the degree to which the person believes goals can be met (Ellis et al., 2018). The quote by Henry Ford, "If you think you can or you think you can't, you're right" seems to apply here.

Two studies embraced goal congruence to measure the specific topic being studied (Ellis et al., 2018; Ryan et al., 2013). One of the studies examined vitamin D intake in middle-aged women and demonstrated reliability with a Cronbach alpha of 0.94 (Ryan et al., 2013). Goal congruence for vitamin D intake improved over time, indicating an increasing belief that vitamin D nutritional goals could be attained (Ryan et al., 2013). The second study examined goal congruence with medication self-management in African American older women (Ellis et al., 2018). The Cronbach alpha for this study was 0.89, indicating the appropriateness of this measure with older adults (Ellis et al., 2018). However, no studies were found that included the relationship between goal congruence and falls in older adults.

Social Support

Social support is believed to strengthen the well-being of individuals both physically and mentally (White et al., 2009). As people age, social support provides a protective aspect that promotes active aging (Dierking et al., 2016). The lack of social support has been linked to increased stress, decreased resilience, and adverse health outcomes (Trevisan et al., 2019). With the increase in the older adult population, it is necessary to promote active aging and increase physical activity. Finding ways to promote active aging is especially important considering the statistics on falls, the poor health outcomes associated with falls, and the cost of treating an older adult who experiences a fall.

Social support is seen as a facilitator for improving physical activity in older adults (Whipple et al., 2019). Older adults reported that social support provides motivation and

socialization, which encourages physical activity (Whipple et al., 2019). Exercising with others who are also trying to increase their daily physical activity promotes faithfulness and frequency of daily exercise (Whipple et al., 2015). Social support can have positive and negative influences on older adults. Older adults who receive positive support engage in physical activity, while those who receive negative support tend to remain sedentary. While most research tends to demonstrate support for the use of social support to increase physical activity in older adults, one research study did not find a link between social support and physical activity in older adults (Durbin et al., 2016). This study was a secondary analysis study that used variables not intended initially to measure social support, and this was listed as a limitation of the study (Durbin et al., 2016).

Protein Intake

Protein intake has been considered a modifiable risk factor in fall prevention for older adults (Smith et al., 2020). The RDA for protein intake is 0.8g/kg of body weight for adults (Bauer et al., 2013; Deer & Volpi, 2015). Researchers have stated that the RDA may not support optimum health for older adults, and their recommendations for protein intake in older adults is 1.0 to 1.5 g/kg of body weight per day (Bauer et al., 2013; Paproski et al., 2019). Increased protein intake is believed to improve muscle mass, strength, and function, while decreased protein intake contributes to muscle atrophy, muscle weakness, and falling (Deer & Volpi, 2016, Paproski et al., 2019). However, there have been inconsistent findings in recent research studies.

The Framingham Study included a Food Frequency Questionnaire that demonstrated no association between increased protein intake and falls except for participants with an unintentional weight loss (Sandoval-Insausti et al., 2019). Researchers stated that there might have been a protective factor with adequate protein intake, but the statistical significance was

only borderline (Zoltick et al., 2011). A limitation of this study included missing data regarding falls outcomes for nonparticipants who had lower protein intake (Zoltick et al., 2011). Another study supported this conviction, also showing no association with protein intake and fall prevention apart from participants who inadvertently lost weight (Sandoval-Insausti et al., 2019). In this study, diet was self-reported and recall bias may have impacted the overall results (Sandoval-Insausti et al., 2019). Another study showed no association between protein and vitamin D intake and falls (Larocque et al., 2015). This was a secondary analysis of data obtained between 1997-1998 and was limited to Caucasian women (Larocque et al., 2015). The Food Frequency Questionnaire was used in this study and is dependent on memory recall which may have led to recall bias.

Vitamin D Intake

Vitamin D influences muscle function through the vitamin D receptors located on the muscle tissue (Dhaliwal & Aloia, 2017). Due to its action, vitamin D has been recommended as an intervention to reduce the occurrence of falls in older adults (Russell et al., 2017). However, discussion has resulted from research showing inconsistent findings regarding how much influence vitamin D has in preventing falls in older adults. Current research is not finding a relationship between older adults with normal vitamin D levels and the occurrence of falls (Aspell et al., 2019). Although, a consistent pattern has been noted between older adults with a severe vitamin D deficiency and falls (Aspell et al., 2019; Dretakis & Igoumenou, 2019). Older adults with severe vitamin D deficiency exhibit muscle weakness and decreased muscle function (Aspell et al., 2019). The question remained about how much vitamin D was needed to show improvements in muscle function and strength.

Physical Activity

Physical activity maintains functional capacity in older adults, while sedentary behavior leads to frailty and falls (Aranyavalai et al., 2020; Maula et al., 2019). In addition, increased physical activity leads to a reduction in the risk of falling by improving muscle strength (Aranyavalai et al., 2020; Haider et al., 2016;). Many fall prevention programs include some type of physical activity that may be individualized based on the needs of the person or completed with multiple persons at the same time (Maula et al., 2019). When physical activities are conducted in groups, this promotes long-term adherence to the program through socialization and motivation (Maula, et al., 2019).

Recently, researchers have reviewed walking, and exercise programs in the prevention of falls in older adults (Aranyavalai et al., 2020). The objective for this study was to determine what and how much exercise could reduce the risk of falls in older adults. Recommendations have included walking ≥5000 steps per day, and physical activity of moderate intensity for 150 min/week (Aranyavalai et al., 2020).

Walking was associated with the prevention of falls in older adults (Aranyavalai et al., 2020). Although this study only examined older adults who were at a low risk of falling, (Aranyavalai et al., 2020). Low sample size was a limitation in three other studies; therefore, generalizability is not possible (Aranyavalai et al., 2020; Duck et al., 2019; Sawa et al., 2020). Another study examined the effects of physical activity on balance and found no correlation between light to moderate physical activity as a predictor for falls (Duck et al., 2019).

Fear of falling appears to impede the older adult's performance of physical activity and reduction of fall risk (Sawa et al., 2020). One study found that older adults with increased fear of falling were more sedentary, leading to an increased risk for falls and frailty (Sawa et al., 2020).

This same study identified that the greater the fear of falling the more sedentary the older adult was. (Sawa et al., 2020). Physical activity is also mediated by other factors such as age, nutritional status, and vitamin d levels (Aranyavalai et al., 2020).

Total Number of Falls

Total number of falls is a metric that has been used in fall prevention research. Reducing or eliminating falls in older adults is necessary to prevent injuries and death as well as to reduce the costs associated with treating the older adult (Aspell et al. 2020). Of the studies included in this literature review, six studies included number of falls in their data (Aranyavalai et al., 2020; Aspell et al., 2019; Dretakis & Igoumenou, 2019; Duck et al., 2019; Sandoval-Insausti et al., 2019; Uusi-Rasi et al., 2017). In all these studies, falls was self-reported by the older adult. Recall bias is a concern when collected data in this manner, and it is often listed as a limitation of the study. Falls were reported based on one fall, multiple falls or fall requiring medical attention, and as a mean (Aranyavalai et al., 2020; Aspell et al., 2019; Dretakis & Igoumenou, 2019; Duck et al., 2019; Sandoval-Insausti et al., 2019; Uusi-Rasi et al., 2017).

Individual and Family Self-Management Theory (IFSMT)

Self-management theories identify factors that influence individual behaviors. These factors can increase or decrease the likelihood that a specific behavior will occur. The theory chosen for this study is the Individual and Family Self-Management Theory (IFSMT) (Ryan & Sawin, 2009).

The lack of agreement regarding components within current self-management theories resulted in the creation of the IFSMT (Ryan & Sawin, 2009). The IFSMT includes individual and family factors and is a mid-range descriptive theory that identifies four interactive constructs that impact self-management (Ryan & Sawin, 2009). The constructs of this theory are context,

process, proximal outcomes, and distal outcomes (see Figure 2). The goal of self-management involves maintaining or changing health behaviors to optimize health outcomes. Within the constructs of the IFSMT are multiple factors that affect individuals and families trying to navigate the world of health (Ryan & Sawin, 2009). The responsibility for health and maintaining a healthy lifestyle often falls on the individual or the family unit (Ryan & Sawin, 2009). Therefore, factors that affect the success or demise of self-management must be included in planning.

As stated above, these constructs are not independent of each other but are interactive. These factors influence each other and build to affect the ability of the individual or family to self-manage. For example, the complexity of the health condition can affect the self-efficacy of the individual or family. Thus, a relationship exists between self-efficacy, self-management behaviors, and overall health status. Knowledge about the constructs clarifies this interaction.

The context construct looks at the health condition, the environment, and individual or family characteristics (Ryan & Sawin, 2009). Context factors either place the individual and family at risk for harm or strengthen them to improve outcomes (Ryan & Sawin, 2009). Thus, the context factors set the stage for the process constructs.

The process construct focuses on knowledge, beliefs, self-regulation skills and abilities, and social influences (Ryan & Sawin, 2009). These factors are integral to self-management, and they are affected by individual and family characteristics. For example, information processing dramatically affects the ability to set goals or monitor behavior.

The next construct is proximal outcomes. Proximal outcomes are a new consideration for a self-management theory and can motivate continued self-management behaviors. Achievement

of short-term goals can influence the individual or family to continue striving for the final objective. Often it takes time and diligence to continue to strive for goals when dealing with a

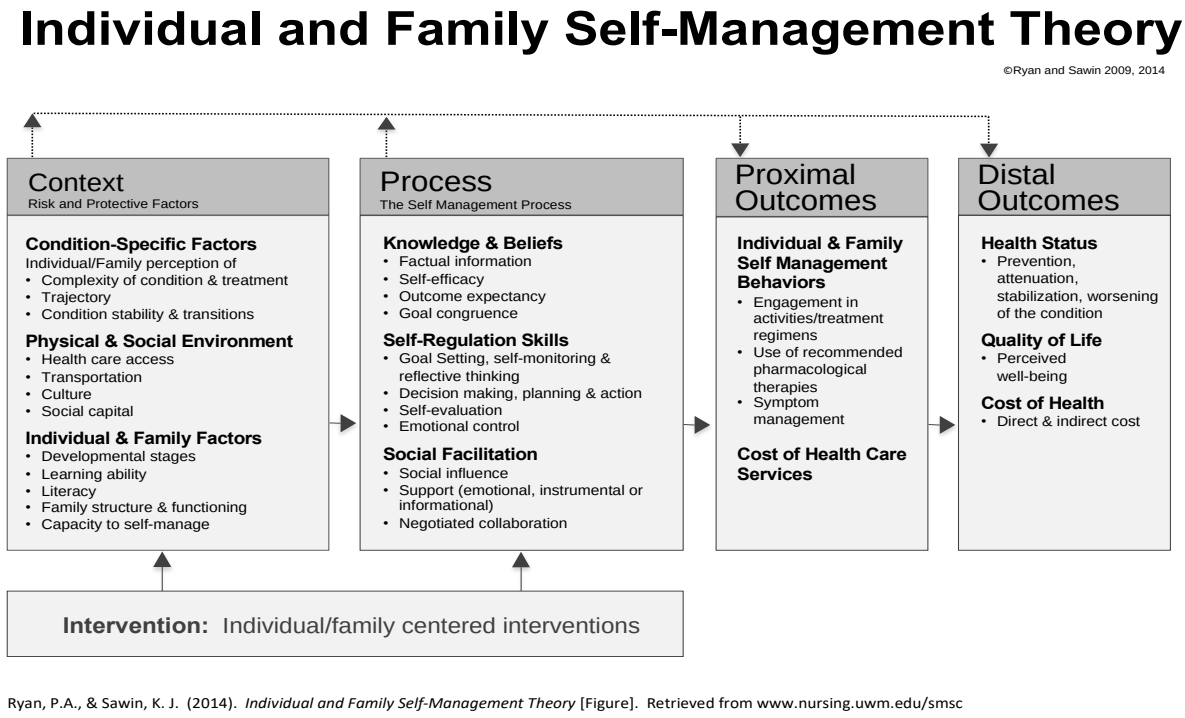

Figure 2 The Individual and Family Self-Management Theory

chronic medical condition. The researchers identified that proximal goals could be harder to measure due to the lack of sensitive outcomes (Ryan & Sawin, 2009).

The final construct is distal outcomes. Distal outcomes are the goal of self-management and include health status, perceived quality of life, and cost of health (Ryan & Sawin, 2009). These long-term goals are related to the proximal outcomes, but distal outcomes allow the individual or family to realize the maximum potential for navigating their world of health.

IFSMT and Research on Falls Prevention in the Older Adult

Many factors can affect the self-management of older adults and fall prevention (Ambrose et al., 2013; Bain, 2011; Gordon, 1982; Jung et al., 2016; Lawlor et al., 2003; Sehested

& Severin-Nielsen, 1977; Spar et al., 1987). The IFSMT provides a solid foundation from which to explore multiple variables that affect falls in older adults. The IFSMT began as a theory to guide descriptive studies. The IFSMT has been used to describe the numerous variables that affect chronic diseases (Verchota & Sawin, 2016), and more recently, it has been used to explore health-promoting interventions (Doering & Dogan, 2018). The IFSMT guides research on fall prevention in older adults through the lens of the self-management process. This theory identifies the relationship between the factors included in each of the three dimensions. The variables affecting fall prevention are described further in the following paragraphs based on the dimension of the IFSMT (see Figure 3).

The context dimension incorporates condition-specific factors and individual and family factors. These include age ≥65 years and gender. These context factors do not include all factors that affect falls in older adults; however, the factors listed may impact an older adult's ability regarding the self-management process.

The process dimension includes knowledge and beliefs as well as social facilitation. Specific factors may consist of self-efficacy, expectations regarding the aging process, goal congruence for physical activity-protein intake-vitamin D intake, and social support. In addition, process factors are directly related to self-management behaviors (Ryan & Sawin, 2009). These factors allow the individual to utilize knowledge regarding their conditions and barriers to facilitate choices that positively impact decision-making and outcomes.

Proximal outcomes include self-management behaviors (Ryan & Sawin, 2009). Specific factors related to fall prevention include protein intake, vitamin D intake, and physical activity. Each of these behaviors has the potential to influence distal outcomes. For example, increased protein intake can result in stronger muscles. These behaviors can be measured to determine if

there have been short-term or long-term gains. Short-term gains, such as completing 2,000 steps per day, can motivate the individual and or family to stay the course. The proximal outcomes build toward distal outcomes, such as completing 10,000 steps per day.

Distal outcomes reflect overall health status (Ryan & Sawin, 2009). The goal for the distal outcome is the prevention of falls in older adults. Prevention of falls will result in continued independence, improved health, and a better quality of life. However, this is affected by maintaining health behaviors such as protein intake, vitamin D intake, and physical activity. Each of these factors can impact the occurrence of falls in older adults.

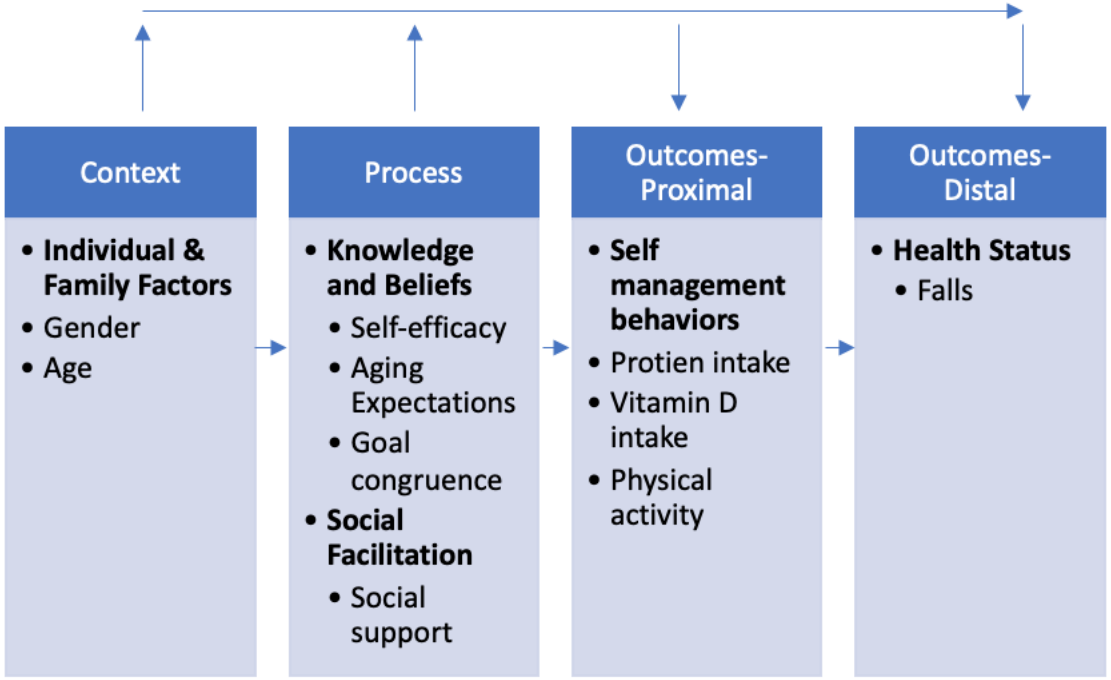

Figure 3 IFSMT and Occurrence of Falls in the Older adults

Critique of the Literature

The literature regarding fall prevention focuses on the risk factors contributing to falls in community-dwelling older adults. The age range of the participants varied from 60 and older to 65 and older (Aranyavalai et al., 2020; Takatori et al., 2019). The age considered to be an older

adult can impact the results of the studies since younger older adults may be more active and have a more positive approach to maintaining their health. These younger older adults may also be healthier than older adults, which can skew the overall results.

Some of the studies identified the low rates of participation, and one study determined that the participants were not a representative sample of the larger population (Maula et al., 2019; Sawa et al., 2020). Low rates of participation and having a sample that does not represent the overall population makes generalization of the results concerning. To better understand the population and interventions that can positively impact fall prevention, it is necessary to have a sample that appropriately powers the study. Finding ways to encourage older adults' participation and prevent attrition will help ensure results can be generalized. Recruiting older adults is not an easy task. Identifying people from the community, such as social workers or nurses, to help identify older adult participants is beneficial. There is also a trend where older adults want to be included in the planning portion of the research study (Worum et al., 2019). These older adults do not wish to participate in research studies that will not benefit them, and they feel that researchers are out of touch with what works. Including older adults in the development of a research study may result in greater participation.

Many of the studies did not include a theory that guided the study. The absence of a theory may have been due to restrictions imposed by the journal, or maybe the researcher did not use a particular theory (Aranyavalai et al., 2020; Larocque, et al., 2015). Since research theories guide the study, knowing this information is beneficial for the reader to understand the study's foundation better. Without a guiding theory, research can start with a weak foundation leading to incorrect conclusions.

Finally, another concern is the use of a variety of instruments to measure the same variable. For example, physical activity is measured in steps/day, average minutes in activity, and minutes/day (Aranyavalia et al., 2020; Duck et al., 2019; Maula et al., 2019; Sawa et al., 2020). Are these tools measuring the same thing? In addition, the use of multiple instruments leads to heterogeneity in results, making it challenging to apply the results to future studies (Cameron et al., 2013).

Concerns were raised about research designs related to vitamin D results. Heterogeneity has been identified as a limitation when attempting to complete a systematic evaluation of the literature (Dhaliwal & Aloia, 2017). Specific concerns addressed included participant characteristics, study designs, assessment tools, and falls vs. fallers (Dhaliwal & Aloia, 2017). Until more uniformity of research is completed, the suggestion was made to follow the Institute of Medicine recommendations of 800 IU of vitamin D per day in adults older than 70 (Conley et al., 2019; Dhaliwal & Aloia, 2017).

Discussion

Risk Factors

The risk factors identified in this study do not address all the potential risk factors that affect fall prevention in older adults. However, the risk factors described above have been identified as those commonly affecting community-dwelling older adults (Perez-Ros et al., 2018).

Context Factors

Context factors such as age and gender influence falls. For example, increased age demonstrates an increase in risk for falling. Age-related changes such as slower reflexes and vision changes impact the risk of falls in older adults. Gender effects have been seen with

females falling more than males, yet when males fall, the morbidity is higher due to the type of falls they experience. One consideration that needs to be discussed regarding gender is that there are an increased number of older adult women than older adult males in the US population. (Administration on Aging, 2020). This discrepancy has the potential to skew the data regarding falls. For example, the higher number of older women can potentially make it seem as if older women fall more than older men, which may not be accurate.

Process Factors

The process factors of self-efficacy for physical activity, goal congruence for physical activity-protein intake-vitamin D intake, social support, and aging expectations have been included in research on sarcopenia, physical activity, geriatric syndromes, coping, muscle strength, and fall prevention. (Da Silva et al., 2019; Deer et al., 2016; Haider et al., 2016; Loft et al., 2018; Taani et al., 2018). Many of these factors seem to have common elements such as their effects on muscle strength and sedentary behavior (da Silva et al., 2019; Deer et al., 2016; Haider et al., 2016; Loft et al., 2018; Taani et al., 2018) One example involves when an older adult believes they can accomplish something, they are more willing to try it. When an older adult believes they cannot do something, they will often avoid that activity. Activity avoidance can lead to a downward spiral. For example, when an older adult does not believe they can participate in physical activity, they will remain sedentary leading to continued muscle weakness, sarcopenia, potential geriatric syndromes, and risk for falling. Social support by family and friends may promote engagement of the older adult for whatever the task may be, such as participation in physical activity. (Smith et al., 2017).

Proximal Outcomes

As confidence grows or is encouraged, there should be an effect on the older adult's behavior. The proximal outcome or self-management behavior (increased vitamin D intake, increased protein intake, and increased physical activity) is likely to increase as confidence in the ability to accomplish this behavior increases (Ryan & Sawin, 2009). Each of these factors can influence the success of the self-management process, yet these factors have not been examined together regarding the prevention of older adult falls. What is the combined effect of these factors on the behaviors of older adults?

Distal Outcome

There is a need to address how these process factors can influence the distal outcome (total number of falls). As stated above, these psychosocial factors are important determinants of behaviors (Ryan & Sawin, 2009). As these factors influence the direct actions of the older adult, there should be evidence of this, such as a decrease in the number of falls the older adult is experiencing. When there is no reduction in the total number of falls, the older adult may either lack confidence or something else is producing the falls. Many research studies often look at other outcomes such as muscle strength instead of the total number of falls. The assumption is that if muscle strength increases, this will reduce the number of falls since muscle weakness leads to an increased risk of falling (de Silva et al., 2019; Dipietro et al., 2019; Maula et al., 2019; Valdes-Badilla et al., 2019). Since the number of falls in older adults is not decreasing despite having increased muscle strength, should researchers consider evaluating the total number of falls in older adults? The number of falls is usually a self-report by the older adult leading some researchers to contemplate if the older adult may be underreporting or forgetting how many falls they have experienced. Reporting accuracy is needed to ensure the validity of the results.

Self-Management Behaviors and Distal Outcomes

In addition to process factors, proximal outcomes are the short-term goals that occur before the distal outcome can be met (Ryan & Sawin, 2009). The accomplishment of short-term goals motivates the older adult to continue with the interventions to meet the distal outcome (Ryan & Sawin, 2009). In this study, the self-management behaviors are intake of protein, intake of vitamin D, and physical activity (steps per day) with the distal outcome of total number of falls.

IFSMT

The research studies that have used the IFSMT concur that this is a theory that can be used to explore factors that affect self-management behaviors and interventions related to self-management (Casida et al., 2018; Crowley et al., 2020; Doering & Dogan, 2018; Ellis et al., 2019; Everhart et al., 2018; Odom-Forren et al., 2017; Qu et al., 2019; Ryan et al., 2020; Sawin et al., 2017; Taani et al., 2018; Wilson et al., 2018; Young et al., 2019; Yun & Kim, 2017). The IFSMT incorporates multiple self-management factors, including context, process, and outcomes (proximal and distal). Since fall prevention is multifactorial, using a theory that includes numerous factors will positively affect the outcomes. Once the factors contributing to poor self-management are recognized, interventions targeting the problem can be developed. Factors involved in self-management may be similar for various phenomena.

One of the research studies that utilized the IFSMT looked at factors that affected sarcopenia in older adults. This study emphasized the psychosocial factors that influence sarcopenia, such as self-efficacy, depressive symptoms, and social support (Taani et al., 2018). These psychosocial factors were examined through the variables of muscle mass, muscle strength, and muscle function (Taani et al., 2018). While the goal of this study was not to prevent

the occurrence of falls, these same factors also influence falls and are included in the model for fall prevention listed above (Ambrose et al., 2013; Bain, 2011; Gordon, 1982; Jung et al., 2016; Lawlor et al., 2003; Sehested & Severin-Nielsen, 1977; Spar et al., 1987). Research on physiological processes may be intertwined, thus resulting in similar factors. While many factors can be identified in the research studies, there may be a limit to the number of interventions that should be executed at one time.

A qualitative study found that using comprehensive interventions was prohibitive to the individual (Ryan et al., 2020). This study focused on self-management behaviors in health promotion activities. In this study, participants selected the interventions that had greater meaning for them and then implemented those (Ryan et al., 2020). In doing so, the participants personalized their behavior change. Findings suggested that personalizing interventions may lead to adaptations and behavior change (Ryan et al., 2020). The researchers stated that there was concern regarding altering the interventions as this could affect outcomes (Ryan et al., 2020). However, researchers also acknowledged that some changes might be better than none (Ryan et al., 2020). When individuals reduced their activity levels to 1/3 of the suggested recommendation, disabilities and limitations related to immobility were reduced (Ryan et al., 2020). This finding has the potential to influence fall prevention measures, as well.

Older adults have difficulty adapting if too much change occurs at once. While the IFSMT is comprehensive and considers multiple factors, it may be beneficial to include the client and family when choosing which interventions are most meaningful to work on first. As suggested in the qualitative study above, self-management is a process that takes time to develop (Ryan et al., 2020). Time is also required to adjust to changing health status. If factors affecting falls in older adults can be identified, researchers can individualize interventions. Individualized

interventions may increase motivation for further changes and result in an overall improvement in self-management behaviors. Further research is needed to determine how personalizing interventions can contribute to the development of self-management behaviors.

Gaps in Knowledge

Various factors may influence the outcome of many different physiological processes. Understanding how these factors can influence fall prevention and self-management behaviors may provide insight into promoting healthy behaviors in older adults. The risk factors affecting fall prevention in older adults have been discussed in the literature, and research has included some of these factors in relation to falls prevention. However, these factors have not been reviewed from a self-management lens. Research is needed to examine factors that have not been evaluated in older adults living in CCRCs, therefore, laying the foundation for designing and implementing interventions to prevent falls and their negative health outcomes among older adults living in CCRCs.

Summary

The IFSMT framework included the individual as well as the family as factors that can impact self-management behaviors. Proximal outcomes were added so that short-term achievements could be recognized on the path to completing the overall goal. The IFSMT is a recent theory, but empirical evidence has supported this mid-range theory. Self-management skills are needed to promote lifestyles that allow the individual and family to navigate through the world of health. Tailored interventions allow the needs of the individual and family to be met. Personalizing the interventions will increase motivation and willingness to continue health-promoting behaviors. Further research is needed to support this theory.

Chapter 3 Methods

Falls in older adults are a significant problem in the United States. The older adult population is expected to increase from 14.6% to 24% of the total population by 2060 (CDC, 2017); therefore, the number of falls in older adults is also expected to increase. Falls are associated with negative health outcomes including injuries, disability, and death (CDC, 2017). Other negative outcomes include hospitalizations, long-term nursing home placement, and increased healthcare costs. Better understanding of the risk factors associated with falls is an essential step towards the development of effective interventions to prevent falls among older adults residing in Continuing Care Retirement Communities (CCRC).

The Individual and Family Self-Management Theory (IFSMT)

The Individual Family Self-Management Theory (IFSMT) was used to guide this study (Ryan & Sawin, 2009) (see Figure 4). This theory provides a framework to explain the potential relationships between context factors, self-management process factors, proximal (self-management behaviors) and distal outcomes (falls) in older adults residing in CCRCs. According to the IFSMT, context factors impact the self-management process dimension. The factors that fall into the context dimension as individual factors include age and gender. Age and gender provide a perspective regarding the older adult that may influence self-management processes (Ryan & Sawin, 2009). The self-management process factors of self -efficacy, goal congruence for physical activity, protein intake, and vitamin D intake, aging expectations, and social support may influence the self-management behaviors of physical activity, protein intake, and vitamin D intake. These factors impact self-management behaviors through confidence levels, personal beliefs regarding performance of physical activity, and improving support to accomplish goals or overcome barriers (Yao, 2019). People are more likely to engage in healthy behaviors when their

beliefs and social support encourage and facilitate them to do so (Ryan & Sawin, 2009). The self-management behaviors of physical activity, protein intake, and vitamin D intake have been associated with better muscle outcomes including muscle strength and function, which have the potential to decrease the risk of falls among older adults (Ambrose et al., 2013; Bauer et al., 2013). These factors have not been studied in CCRCs. More information is needed about how self-management processes and self-management behaviors affect falls among older adults residing in CCRCs. A better understanding of the relationships between these factors lays the foundation to design interventions to reduce risk of fall among older adults residing in CCRCs.

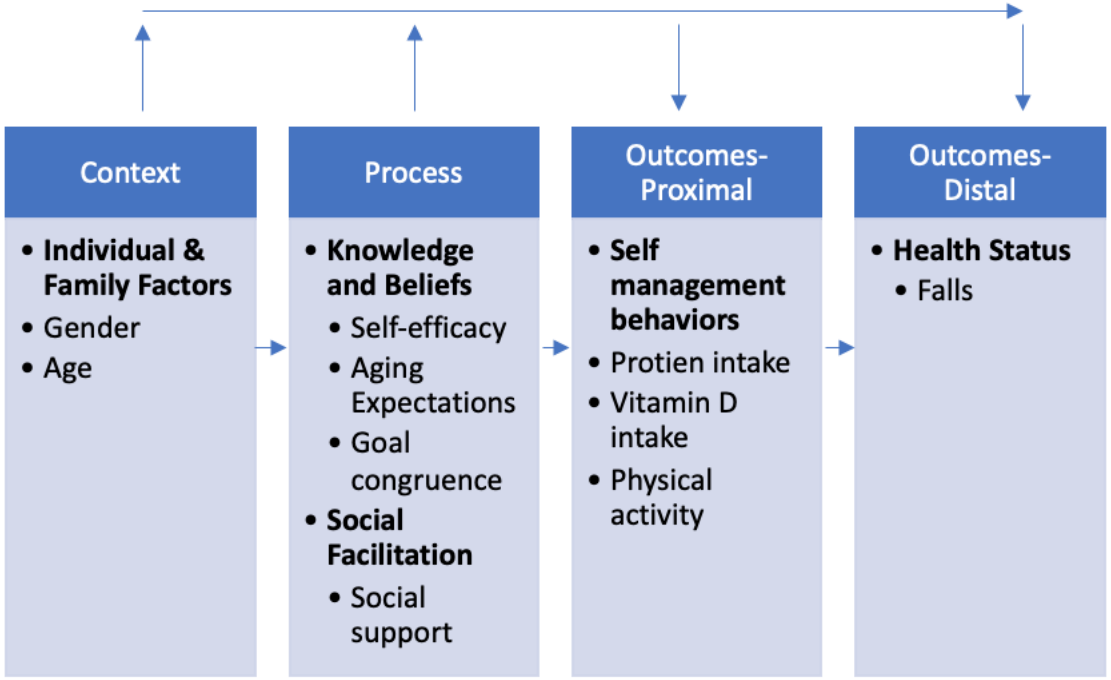

Figure 4 Individual and Family Self-Management Theory and Falls Model

Purpose

The purpose of this study was three-fold:

1. To examine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social

support, and aging expectations) to the proximal outcomes (self-management behaviors: physical activity, protein, and vitamin D intake) in older adults residing in CCRCs.

2. To determine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the distal outcomes (falls) in older adults residing in CCRCs,

3. To evaluate the relationship between the self-management behaviors (physical activity, protein and vitamin D intake) and distal outcomes (falls) in older adults residing in CCRCs.

Research Questions and Hypotheses

The research questions and hypotheses were as follows:

1. What is the relationship between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) and the proximal outcome (physical activity- steps/day, protein, and vitamin D intake) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with physical activity, protein and vitamin D intake in older adults residing in CCRCs.

2. What is the relationship between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the distal outcomes (falls) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with falls in older adults residing in CCRCs.

3. What is the relationship between the self-management behaviors (physical activity, protein, and vitamin D intake) and distal outcomes (falls) in older adults residing in CCRCs?

Hypothesis: Controlling for age and sex, physical activity, protein, and vitamin D intake are associated with falls in older adults residing in CCRCs.

Methods

This research study is a secondary analysis of a cross-sectional correlational study evaluating physical activity and dietary self-management in older adults. The primary research was conducted in a Midwest city in the United States and used a convenience sample of older adults living in six continuing care retirement communities (CCRC). Data from the primary research was used to answer the research questions of this study. The available dataset provides access to vulnerable and hard-to-reach population. The author of this study worked on the primary research as a research assistant under the supervision of the principal investigator. Research assistants for this study facilitated recruitment and data collection.

Sample and Setting

The sample for the primary study included 105 older adults (age 70 years or older) living in six CCRCs in a Midwest city. Inclusion criteria for the study included the following: English speaking, age 70 years and older, have a score > 26 on the Montreal Cognitive Assessment (MoCA) (Milani et al., 2018), and have a score < 11 on the 15-item Geriatric Depression Scale (GDS) (Miller, 2019). Participants were excluded based on the following exclusion criteria: unable to stand without assistance of a person (the use of a can or walker was allowed) and those with end-stage organ disease.

Instruments

This section of the paper provides a description of the measurements used in the original study to measure the dependent and independent variables of this study.

Independent Variables

Self-Efficacy for Physical Activity

Self-efficacy for physical activity was assessed using Physical Activity Assessment Inventory (Hass & Northam, 2010). The scale consists of 13 questions. Each question was rated from 0-100 with 0 being cannot do, and 100 being certain can do (Hass & Northam, 2010). The older adult rated themselves in 10-point increments. Each question reflected the older adult's ability to perform physical activity under various circumstances such a when tired or busy (Hass & Northam, 2010). The total score for this inventory was 0-1300. A higher score indicates confidence in performing physical activities. Researchers assessing psychometrics of this tool found evidence of internal consistency with an alpha of 0.92 and R squared between 0.38-0.76 in older adults (Resnick & Jenkins, 2000).

Aging Expectations

Aging expectations was completed with the Expectations Regarding Aging-38 (ERA-38) survey (Sarkinsian, et. al, 2002). The ERA-38 is comprised of 38 questions that assess how older adults perceive the aging process. The questions in this survey were answered with definitely true, somewhat true, somewhat false, and definitely false. Examples of questions included: I expect that as I get older, I will enjoy my life; and I expect that as I get older, I will have more aches and pain. The total score for this instrument was 152. Lower scores indicate a decline in health and functional abilities. Researchers have reported Cronbach coefficient alpha of 0.94 (Sarkinsian, et al., 2002).

Goal Congruence for Physical Activity, Protein and Vitamin D intake

Goal congruence was measured using an instrument created by and adapted with the permission of the developers (Ryan, et al., 2013). The original tool focused on physical activity and calcium intake. For the primary study, the tool was modified to focus on physical activity and protein and vitamin D intake. The instrument has 27 questions with a Likert scale from 1 (no problem) to 5 (significant struggle or problem), with a score range of 27 to 135. The prefaces to all questions on the goal congruence instrument were "How much of a problem would it be for you to…." Topics in the instrument included such issues as "Figure out how to increase your protein intake" and "Feel safe when you engage in physical activity." The response categories rate "how much of a problem" achieving each goal is; accordingly, high scores indicate more problems and less congruence.

Social Support

The Social Influence Scale was used to measure social support (Chogahara, 1999). The scale measures the amount of support that participants received from their families, friends, and health and fitness experts over the previous 12 months. The scale consists of two subscales: positive and negative social influences. Responses were based on a Likert scale with 0=never, 1=rarely, 2=occasionally, 3=often, and 4=very often. The total score for positive social support was 60. The 15 questions on positive support were summed up and divided by 15 to give the total score, and a higher score indicates greater social support. There were 12 questions regarding negative social support. The total score for negative social support was 48. The 12 questions on negative support were summed up and divided by 12 to give the total score, and a higher score indicates lower social support. Cronbach alphas were reported between 0.917 to 0.924 for the positive questions. (Chogahara, 1999).

Protein and Vitamin D Intake

Protein and vitamin D intake were assessed using 70-item Block Brief 2000 food frequency questionnaires (FFQ) (Block et al., 1990). The questionnaire focused on how much and what kinds of food the older adult consumed over the past year (Caan et al., 1999). Participants responded to how often (never to every day), and how much per serving (either numeric or based on measurement such as ¼ cup, etc.). The questionnaires were sent out for analysis to NutritionQuest (Berkeley, CA). Daily intake of protein adjusted for body weight was calculated, and a dichotomous variable characterizing protein intake was set as either meets recommendation or does not meet recommendation (Bauer et al., 2013). Daily intake of vitamin D was calculated, and a dichotomous variable characterizing vitamin D intake was created as follows: 1 = meets recommendation; 0 = does not meet recommendation according to the Dietary Reference Intakes for Calcium and Vitamin D (Nieves, 2003). Current daily dietary recommendations for older adults are 1-1.2 gm of protein/kg, and 800 IU of vitamin D (Dodd, 2020).

Physical Activity

Physical activity as steps per day was measured using Actigraph GT3X+ (Actigraph Inc., Florida, US). The Actigraph was attached to an elastic belt that had a plastic buckle. The participants wore an Actigraph wGT3X-BT accelerometer from the time they woke up until they went to bed at night. Participants removed the device only for bathing or swimming. The accelerometer was worn at the level of the hip for a period of 7 consecutive day. The data was recorded in seconds, and standardized quality procedures were used to ensure the validity of the data (Choi et al., 2011; Troiano et al., 2008). The data was valid when the Actigraph showed more than 600 minutes of wear time each day. Participants were requested to wear the Actigraph when they were awake; however, the recorded data revealed that some of the participants did not

wear the Actigraph as instructed. Participants were only included in the final analysis if the Actigraph included four days of data greater than 600 minutes (Troiano et al., 2008).

Falls

The total number of falls was self-reported for the past one year before the study.

Other Variables

Demographics data were collected including age, gender, race marital status, and education level.

Research Procedures

This section describes the data collection procedures conducted in the original study. Flyers were posted in all facilities and handed out to potential participants. CCRCs staff were asked to talk to potential participants and asked them if they could be contacted for possible participation. The study primary investigator (PI) and/or research assistants (RA) also gave short talks to residents and set up an information table in each setting to enhance recruitment and answer any questions or concerns regarding participation. If an individual was interested in participating, consent was obtained using teach-back technique. Following consent, screening form was administered including MoCA and GDS. If the individual was found to be eligible, two visits were scheduled for one and half hours each. The two visits were seven days apart and took place at the facility. Guidelines for participation included that the participant needed to wear the accelerometer for 7 days, and this information was provided to the participants. If potential participants did not meet inclusion criteria, a protocol was used to refer for further evaluation. If the GDS score was less than 11, they were positive for depressive symptoms and referred to their primary care provider. If they were positive for cognitive impairment, they were told that they should contact their primary care provider for further cognitive evaluation.

During the first visit, demographics, Physical Activity Assessment Inventory, goal congruence surveys, Social Influence Scale, and FFQ were administered in an interview format with the study PI or RA. An accelerometer was applied to waist and participants were asked to wear it for 7 consecutive days. Instructions and written materials on how to use the accelerometer were given including how to make sure the watch face is positioned correctly and reposition if it has moved to the bony sides of the waist. The PI or RA and participants demonstrated how to wear and take off the accelerometer. Participant were contacted via phone at day 1, 2, 4, and 6 after the first visit to determine if they were experiencing any discomfort related to wearing the accelerometer. Participants were also asked to contact the PI or RA if they had any questions during the research study. In the second visit, accelerometers were collected, and SIS and ERA-38 questionnaires were administered.

Data Analysis

The most current version of SPSS was used to analyze the data. Descriptive statistics were used to describe the sample.

For Question 1: Multiple regression analysis was used to examine the relationship between self-efficacy, goal congruence, social support, aging expectations, and steps per day. Logistic regression was used to examine the relationships between self-efficacy, goal congruence, social support, and aging expectations and protein and vitamin D intake. These models were adjusted for age and sex.

For Question 2: Multiple regression analysis was used to examine the relationship between self-efficacy, goal congruence, social support, and aging expectations and falls. This model was adjusted for age and sex.

For Question 3: Multiple regression analysis was used to examine the relationship between steps per day, protein and vitamin D intake and falls. This model was adjusted for age and sex.

All statistical assumptions were checked, and multicollinearity was evaluated using the tolerance and variance inflation factor (VIF). The overall fit of the model was checked using the F-value. The R squared and odd ratios were reported Any cases with missing data was not included in the analysis.

Limitations

One of the limitations for this study relates to the fact that is a secondary analysis. Data analysis was limited by the data that was collected during the initial study. Due to the secondary analysis, there was no opportunity to collect information on additional variables they may have impacted falls in older adults. Although all the regression models were adjusted for age and sex, all the potential confounding variables could not be controlled for, which may affect the results. The analysis was also limited by the participants who volunteered to take part in this study. The original study also excluded individuals with cognitive impairment, end-stage organ disease, and those who were unable to stand without assistance. Thus, the participants may not be a good representation of the overall population. This limits generalizability of the information to those who participated in the study. Thus, findings will need to be viewed with caution. The study is also limited by the ability of the participants to recall information. Some of the data was based on self-report and the inability to recall information could potentially affect the results.

Summary

The IFSMT was used to guide this secondary data analysis to better understand the factors associated with falls in older adults residing in CCRCs. The relationships between the

self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein intake and vitamin D intake, social support, and aging expectations), self-management behaviors (protein intake, vitamin D intake, and physical activity), and distal outcomes (falls) was examined. This chapter provided an overview of the methods including design, sample, setting, instruments, procedure, and data analysis plan. This chapter also discussed the limitations.

Chapter 4: Results

Introduction

Falls among older adults is highly prevalent and considered a major public health problem. The CDC reported that there were 36 million falls resulting in 8 million injuries in 2018 (CDC, 2021). One in five falls in older adults leads to serious injury (CDC, 2021). The injuries associated with falling include broken extremities, fractured hips, and closed head trauma. The injuries accompanying falls have resulted in disability and death. There were 34,000 deaths due to injuries resulting from falls in older adults in 2019 (CDC, 2021). Falls are also associated with higher healthcare costs including $50 billion spent annually (CDC, 2021). While there has been a slight improvement in falls reduction, falls in older adults continues to be a public health concern.

Falls have been associated with several risk factors including muscle strength, balance, malnutrition, chronic diseases, polypharmacy, use of alcohol, and environmental factors (CDC, 2021; Miller, 2019). However, other risk factors for falls have not been studied among older adults including the self-management process and dietary and physical activity self-management behaviors (Taani, et al., 2022). While risk factors for falls have been studied among hospitalized older adults, community dwelling older adults, and long-term care residents, the relationship between self-management processes and dietary and physical activity self-management behaviors and falls among older adults residing in continuing care retirement communities (CCRCs) have not been well understood (Taani et al., 2022). CCRCs provide residences for older adults who are independent in their cares, older adults who may need assistance (assisted living), and older adults who need more nursing care (long-term care) (Senior Living, 2022). The idea behind CCRCs is that as the health needs of the older adult increases, the facility could meet

those needs without transferring the older adult to more restricted living environments such as nursing homes. CCRCs provide a unique opportunity to identify older adults at risk for falling and utilize self-management to reduce or eliminate this risk.

Theoretical Framework

Self-Management has been used to promote independence and autonomy in older adults with chronic conditions (Ryan & Sawin, 2009). However, self-management can also be used in fall prevention. The definition of fall prevention self-management is "actions individuals take or behaviors they perform to prevent themselves from falling" (Schnock et al., 2019). The literature from the Total Joint Commission, The Centers for Medicare and Medicaid, and the Agency for Health Care Research and Quality emphasize the importance of designing and implementing interventions that prevent falls through the early identification of its risk factors (Quigley & White, 2013). Identifying older adults who are at risk for falling but remain symptom free has the potential to reduce fall risk, promote recovery after a fall, and enhance fall related health care services (Bongoers et al., 2016).

The Individual Family and Self-Management Theory (IFSMT) acknowledges that there are events, conditions, or self-management processes that impact the occurrence of self-management (Ryan & Sawin, 2009). Promoting self-management behaviors by targeting self-management processes has the potential to decrease both the rate and risk of falling among older adults.

The IFSMT has four dimensions which include context, process, proximal outcomes, and distal outcomes (Ryan & Sawin, 2009). Each of these dimensions are impacted by the factors within them as well as the factors between them. Context factors are those within the person, family or environment that influence their ability for self-management (Ryan & Sawin, 2009).

For fall prevention these include age and gender. Process factors include knowledge and social facilitation (Ryan & Sawin, 2009) such as self-efficacy for physical activity, aging expectations, goal congruence and social support (see Figure 5). Proximal outcomes are the short-term goals that allow the long-term goals to be met (Ryan & Sawin, 2009). For fall prevention these include physical activity, protein intake, and vitamin D intake. The long-term goals are the distal outcomes which include health status (Ryan & Sawin, 2009). For fall prevention the total number of falls is considered a distal outcome.

Each of these dimensions are made up of factors that influence falls. For example, in the context dimension, older age and being a woman are associated with an increased risk of falling (Ambrose et al., 2013). In the process dimension, self-efficacy for physical activity is the individual's belief in their ability to complete a certain task or execute behaviors necessary to attain a valued goal (Yao, 2019). Increased self-efficacy for physical activity is associated with increased participation in physical activity and a decrease in falls (Yao, 2019). Aging expectations is another process factor, and it is defined as the beliefs an older adult has regarding the aging process (Andrews et al., 2017). Low aging expectations is associated with a decrease in participation in health promotion activities such as physical activity, which might impact muscle outcomes and increase the risk of falling (Yao, 2019). Goal congruence may also be associated with falls among older adults. Goal congruence involves the older adult's ability to resolve conflicting information and manage multiple demands to engage in healthy behaviors (Ryan & Sawin, 2009). When goal congruence is low, older adults may not complete a task such as meeting daily protein and vitamin D intake or meeting daily physical activity leading to an increased risk of falling (Meehan & Penckofer, 2014). Another important potential process factor

is social support. When social support is positive, older adults participate in health promotion activities such as physical activity and have a decreased risk of falling (White, et al., 2019).

According to the IFSMT, consuming the daily recommended protein and vitamin D and participating in physical activity are proximal outcomes and might reduce the risk of falling in community dwelling older adults (Meehan & Penckofer, 2014; Miller, 2019). Finally, the number of falls among older adults is considered distal outcome. Each of these dimensions affect each other as well as the overall goal of fall prevention. For example, older age influences self-efficacy which influences whether the older adult participates in physical activity and that influences the risk for falls. However, potential risk factors for falls based on self-management processes and self-management behaviors have not been well-studied in older adults residing in CCRCs.

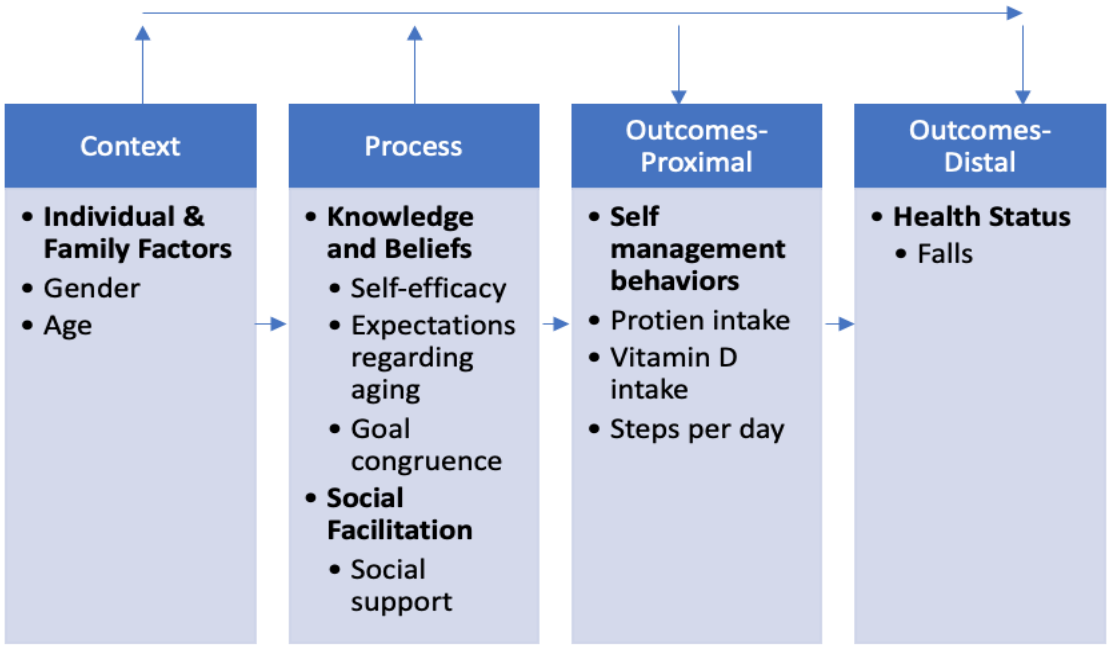

Figure 5 Individual and Family Self-Management Theory Applied to Physical Activity and Dietary Self-Management and Falls in Older Adults. Adapted with permission from Ryan and Sawin (2009).

The purpose of this study was three-fold:

1. To examine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the proximal outcomes (self-management behaviors: physical activity, protein and vitamin D intake) in older adults residing in CCRCs.

   Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with physical activity, protein, and vitamin D intake in older adults residing in CCRCs.

2. To determine the relationship of the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations) to the distal outcomes (falls) in older adults residing in CCRCs.

   Hypothesis: Controlling for age and sex, self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations are associated with falls in older adults residing in CCRCs.

3. To evaluate the relationship between the self-management behaviors (physical activity, protein, and vitamin D intake) and distal outcomes (falls) in older adults residing in CCRCs.

   Hypothesis: Controlling for age and sex, physical activity, protein, and vitamin D intake are associated with falls in older adults residing in CCRCs.

Methods

Design, Setting, and Sample

This descriptive study is a secondary data analysis of a cross-sectional correlational study that examined the predominance and relationships between self-management process factors and behaviors related to sarcopenia among older adults living in CCRCs in a Midwest state (Taani et al., 2022). Inclusion criteria consisted of the following: aged 70 or older, English speaking, Montreal Cognitive Assessment (MoCA) $\geq$ 26, and Geriatric Depression Scale (GDS) <11. Exclusion criteria consisted of the following: unable to stand without assistance, and end-stage organ disease. The primary study was managed in accordance with the Declaration of Helsinki, and the protocol was approved by the institutional review board of the University of Wisconsin Milwaukee (IRB#: 19.059).

Measurement

This section describes the measurement tools used in the primary study to measure the study variables.

Independent variables

Self-Efficacy

Self-efficacy for physical activity was assessed using Physical Activity Assessment Inventory (Hass & Northam, 2010). The scale consists of 13 questions. Each question is rated from 0-100 with 0 being cannot do and 100 being certain can do (Hass & Northam, 2010). The participant would rate themselves in 10-point increments. Each question reflected the older adult's ability to perform physical activity under various circumstances such a when tired or busy (Hass & Northam, 2010). The total score for this inventory was 0-1300. A higher score indicates confidence in performing physical activities. This tool demonstrated good internal consistency with a Cronbach's alpha of 0.92 in older adults (Resnick & Jenkins, 2000).

Goal Congruence

Goal congruence was measured using a scale created by and adapted with the permission of the developers (Ryan et al., 2013). The original tool focused on physical activity and calcium intake. For the primary study, the tool was modified to focus on physical activity and protein and vitamin D intake. The instrument has 27 questions with a Likert scale from 1 (no problem) to 5 (significant struggle or problem), with a score range of 27 to 135. The prefaces to all questions on the goal congruence instrument were "How much of a problem would it be for you to…." Topics in the instrument included such issues as "Figure out how to increase your protein intake" and "Feel safe when you engage in physical activity." The response categories rate "how much of a problem" achieving each goal is; accordingly, high scores indicate more problems and less congruence.

Aging Expectations

Aging expectations was completed with the Expectations Regarding Aging-38 (ERA-38) survey (Sarkinsian, et. al, 2002). The ERA-38 is comprised of 38 questions that assess how older adults perceive the aging process. The questions in this survey were answered with definitely true, somewhat true, somewhat false, and definitely false. Examples of questions included: I expect that as I get older I will enjoy my life, and I expect that as I get older I will have more aches and pain. The total score for this instrument is 152. Lower scores (negative aging expectations) indicate a decline in health and functional abilities. Researchers have reported Cronbach's coefficient alpha of 0.94 (Sarkinsian, et al, 2002).

Social Support

The social influence scale (SIS) was used to measure social support (Chogahara, 1999). The scale measures the amount of support that participants received from their families, friends,

and health and fitness experts over the previous 12 months. The scale consists of two subscales: positive and negative social influences. Responses were based on a Likert scale with 0=never, 1=rarely, 2=occasionally, 3=often, and 4=very often. The total score for positive social support was 60. The 15 questions on positive support were summed up and divided by 15 to give the total score, and a higher score indicates greater social support. There were 12 questions regarding negative social support. The total score for negative social support was 48. The 12 questions on negative support were summed up and divided by 12 to give the total score, and a higher score indicates lower social support. Cronbach's alphas were reported between 0.917 to 0.924 for the positive questions, and 0.847-0.865 for negative questions (Chogahara, 1999).

Physical Activity

Physical activity as steps per day was measured using Actigraph GT3X+ (Actigraph Inc., Florida, US). The Actigraph was attached to an elastic belt that had a plastic buckle. The participants wore an Actigraph wGT3X-BT accelerometer from the time they woke up until they went to bed at night. Participants removed the device only for bathing or swimming. The accelerometer was worn at the level of the hip for a period of 7 consecutive day. The data was recorded in seconds, and standardized quality procedures were used to ensure the validity of the data (Choi, et al., 2011; Troiano, et al., 2008). The data was valid when the Actigraph showed more than 600 minutes of wear time each day. Participants were requested to wear the Actigraph when they were awake. Participants were only included in the final analysis if the Actigraph included four days of data greater than 600 minutes (Troiano, et al., 2008).

Protein and Vitamin D Intake

Protein and vitamin D intake were assessed using 70-item Block Brief 2000 food frequency questionnaires (FFQ) (Block, et al., 1990). The questionnaire focused on how much

and what kinds of food the older adult consumed over the past year (Caan, et al., 1999). Participants responded to how often (never to every day), and how much per serving (either numeric or based on measurement such as ¼ cup, etc.). The questionnaires were sent out for analysis to NutritionQuest (Berkeley, CA). Daily intake of protein adjusted for body weight was calculated, and a dichotomous variable characterizing protein intake was set as either meets recommendation or does not meet recommendation (Bauer, et al., 2013). Daily intake of vitamin D was calculated, and a dichotomous variable characterizing vitamin D intake was created as follows: 1 = meets recommendation; 0 = does not meet recommendation according to the Dietary Reference Intakes for Calcium and Vitamin D (Nieves, 2003). Current daily dietary recommendations for older adults are 0.8 gm of protein/kg, and 800 IU of vitamin D (Dodd, 2020).

Outcome Variable

Falls are defined in this study as an unplanned descent to the floor by an older adult. The total number of falls was self-reported for the past one year before the study.

Other Variables

Demographics data were collected including age, gender, race, education level and marital status.

Data Analysis

The data was analyzed using SPSS version 28. Descriptive statistics were generated to gain an understanding of the participants included in this study. Multiple regression was used to analyze the relationship for question 1a between the process variables and the total number of falls. Logistic regression was used for questions 1b, 1c, 2, and 3 to analyze the relationship between the process variables, the self-management behaviors (meeting or not meeting the daily

requirement for protein and vitamin D) and the dependent variable (falls). Statistical assumptions were checked, and multicollinearity was evaluated using the tolerance and variance inflation factor (VIF). The overall fit of the model was checked using the F-value. The R squared and odd ratios were determined. Statistical significance was defined as $p<0.05$. Any cases with missing data were not include in the analysis. All models were adjusted based on age and gender.

Results

Participant Characteristics

The primary study recruited 105 participants. However, only 99 participants had complete information and those with missing data were excluded from analyses. Participants ranged in age from 70-99 years of age with approximately 82% being female. Participant race included: Caucasian (82.9%), African American (15.2%), Hispanic (3.8%), and American Indian/Alaskan native (1.9%). The majority of the participates were widowed (52%), while 21% were married, 17.1% were divorces, and 6.1% were either separated or never married (see Table 1).

Relationship between the Self-management Process Variables and Self-Management Behaviors (Physical Activity, Protein and Vitamin D Intake)

The multiple regression analysis adjusted for age and sex demonstrated a positive association between self-efficacy for physical activity and steps per day. Participants with higher self-efficacy for physical activity demonstrated more steps per day (see Table 2). The multiple regression analysis demonstrated no association between the process variables (positive social support, negative social support, goal congruence, and aging expectations) and steps per day (Table 2).

Table 1

Demographics

Characteristic	Mean (S. D.)	N (%)	Range
Age	82.39 (7.4)		70-99
Gender: Male		19	
Female		81	
Race White		82.90	
African American		15.2	
Hispanic or Latino		3.9	
American Indian or Alaskan Native		1.9	
Marital Status			
Never married		5.7	
Married		21	
Divorced		17.1	
Separated		1	
Widowed		55.2	
Education Level			
7-9th grade		4.8	
10-12th grade		13.3	
High school graduate		9.5	
Some college		24.8	
College graduate		47.6	
Self-efficacy	915.46 (256.60)		220-1300
Goal congruence	1.8165 (0.55)		19-78
Aging expectations	40.3003 (15.23)		2.60-93.90
Social support: Positive	3.35 (2.60)		0-11.60
Negative	0.63 (1.20)		0-6.33
Physical activity	2432.50 (1858.70)		282.20-13292.40
Met daily protein Yes		43	
No		57	
Met daily vitamin D intake		94	
		6	
Fallers		46	
Non-fallers		54	

Data is expressed in means for age, self-efficacy, goal congruence, aging expectations, social support**,** and physical activity. Data is expressed in percentage for gender, education, race, marital status, protein intake, vitamin D intake, and fallers vs non-fallers. Range is provided for age, self-efficacy, goal congruence, social support, and physical activity.

The logistic regression analysis adjusted for age and sex demonstrated that high aging expectations (OR = 0.949; 95% CI: 0.912-0.988) is associated with reduced likelihood of meeting daily protein intake. Positive social support, negative social support, goal congruence, or self-efficacy were not associated with protein intake (see Table 3). Vitamin D intake was not associated with any of the variables: positive social support, negative social support, goal congruence, self-efficacy for physical activity, or expectations regarding aging (see Table 4).

Relationship Between Self-Management Process Variables and Falls

Falls were not associated with any of the process variables: positive social support, negative social support, goal congruence, self-efficacy, or expectations regarding aging (see Table 5).

Table 2

Multiple Regression Predicting the Relationship Between SM Process Variables and Steps per Day

				95% CI		
Predictors	Beta	SE	OR	LL	UL	P
Age	-0.253	0.34	1.030	0.965	1.101	0.020
Sex	-0.099	0.678	4.708	1.246	17.787	0.359
Positive Social Support	0.013	0.091	1.037	0.867	1.239	0.905
Negative Social Support	-0.009	0.222	1.327	0.859	2.052	0.940
Goal Congruence	-0.075	0.547	0.432	0.148	1.264	0.500
Self-Efficacy	0.380	0.001	1.000	0.998	1.002	0.003
Expectations Regarding Aging	-0.062	0.020	0.949	0.912	0.988	0.608
R-Square = 0.180						
F = 2.813; p = 0.011						

Table 3

Logistic Regression Predicting the Relationship Between SM Process Variables and Protein Intake

				95% CI		
Predictors	EST	SE	OR	LL	UL	P
Age	0.030	0.034	1.030	0.965	1.101	0.373
Sex	1.549	0.678	4.708	1.246	17.787	0.022
Positive Social Support	0.036	0.091	1.037	0.867	1.239	0.694
Negative Social Support	0.283	0.222	1.327	0.859	2.052	0.203
Goal Congruence	-0.839	0.547	0.432	0.148	1.264	0.126
Self-Efficacy	0.000	0.001	1.000	0.998	1.002	0.995
Expectations Regarding Aging	-0.052	0.020	0.949	0.912	0.988	0.010
F-value = 23.1; $p < .001$						
R-squared = 0.627						

Table 4

Logistic Regression Predicting the Relationship Between SM Process and Vitamin D

				95% CI		
Variables	EST	SE	OR	LL	UL	P
Age	0.107	0.089	1.113	0.935	1.325	0.227
Sex	-19.679	8468.497	0.000	0.00	0.00	0.998
Positive Social Support	0.400	0.245	1.492	0.924	2.411	0.102
Negative Social Support	-0.380	0.530	0.684	0.242	1.934	0.474
Goal Congruence	0.092	1.049	1.097	0.140	8.573	0.930
Self-Efficacy	-0.005	0.003	0.995	0.989	1.001	0.820
Expectations Regarding Aging	0.064	0.044	1.066	0.988	1.162	0.146
F-value = 21.00; $p < .001$						
R-squared = 0.61						

Table 5

Logistic Regression Predicting the Relationship Between SM Process Variables and Falls

				95% CI		
Variables	EST	SE	OR	LL	UL	P
Age	0.061	0.032	1.063	0.998	1.133	0.056
Sex	-0.805	0.616	0.447	0.134	1.493	0.191
Positive Social Support	0.004	0.090	1.004	0.841	1.198	0.969
Negative Social Support	0.114	0.223	1.121	0.725	1.734	0.608
Goal Congruence	-0.207	0.457	0.813	0.332	1.990	0.650
Self-Efficacy	-0.002	0.001	0.998	0.996	1.000	0.055
Expectations Regarding Aging	0.007	0.017	1.007	0.974	1.041	0.689
F-value = 0.574, p = .775						
R-squared = 0.04						

Table 6

Logistic Regression Predicting the Relationship Between SM Behaviors and Falls

				95% CI		
Predictors	EST	SE	OR	LL	UL	P
Age	0.035	0.029	1.036	0.978	1.097	0.228
Sex	-0.539	0.554	0.583	0.197	1.727	0.331
Vitamin D intake	20.72	17904.854	999835918	0.000	0.00	0.999
Protein intake	0.352	0.442	1.422	0.59	3.38	0.426
Physical Activity	0.00	0.00	1.000	1.00	1.00	0.990
F-value = 2.284; p = .053						
R-squared = 0.109						

Relationship Between Self-Management Behaviors and Falls

Falls were not associated with steps per day, protein intake, or vitamin D intake (see Table 6).

Discussion

This secondary data analysis was guided by the IFSMT to examine the relationship between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations), the proximal outcomes (self-management behaviors: physical activity, protein and vitamin D intake), and the distal outcome (falls) among older adults residing in CCRCs. The results demonstrated a positive association between self-efficacy for physical activity and steps per day. When self-efficacy is higher, older adults have more confidence that they can perform certain physical activities, and thus their activity level is higher. This finding is consistent with the existing literature that supports the importance of optimal physical activity, muscle strength and balance to prevent falls (Belka & DeBeliso, 2019; Yao, 2019). One study reported that higher physical activity is associated with higher muscle strength and better balance, which reduces falls among older adults (Yao, 2019).

Furthermore, one study evaluated the effects of psychosocial factors on muscle function and found individuals with higher self-efficacy for physical activity had better muscle outcome than those with lower self-efficacy (Taani et al., 2018). Increased muscle mass, strength and function might have a protective effect against falls in older adults (Taani et al., 2022). This finding demonstrates the importance of considering self-efficacy when designing interventions to improve muscle strength and function and reduce the risk of falling among older adults. Another study showed a negative correlation between the fear of falling and self-efficacy for physical

activity (Ponzano et al., 2021). Older adults with a higher fear of falling had a lower self-efficacy score (Ponzano et al., 2021). When confidence in performing physical activity is low, the older adult will exhibit more sedentary behaviors, which negatively impacts muscle outcome and might increase the risk of falling. Including scales that assess fear of falling will help in understanding other factors that may impact both self-efficacy for physical activity as well as falls in older adults.

One unexpected finding of this study was that increased aging expectations (positive aging expectations) to be associated with a reduced likelihood of meeting daily protein intake. This finding is contradictory to the findings of other investigations that reported older adults who expected fewer age-related health problems (i.e., had higher ERA or positive aging expectations) engaged in more routine self-management behaviors (Andrews et al., 2017; Ellis et al., 2019; Ryan et al., 2013; Warren-Findlow Seymour, & Huber, 2021). Other studies reported that positive aging expectations are associated with an increased participation in health promotion activities, such as increasing protein intake and physical activity (Dogra et al., 2015; Yao, 2019). Negative aging expectations has been identified as a barrier to participation in physical activity as well as other health promotion activities (Andrews et al., 2017). Interventions to promote aging expectations may have the potential to increase participation in health promotion activities such as meeting the daily requirements for protein intake. However, one study demonstrated that older adults who had negative/lower aging expectations did not engage in healthy behaviors such as eating a heathy diet (Taani et al., 2021). There may have been other factors not addressed in this study that impacted the older adults aging expectations. Further research is needed to determine potential mediating factors between the study variables.

The current study showed no relationship between the process variables (self-efficacy for physical activity, aging expectations, goal congruence, and social support) and vitamin D intake (Taani et al., 2021). However, several studies have examined these process variables and their relationships to various healthy behaviors such as calcium and vitamin D intake, medication self-management, and self-care (Ellis et al., 2019; Ryan et al., 2013; Warren-Findlow Seymour, & Huber, 2021). One study examined calcium and vitamin D intake in women to prevent osteoporosis and found both self-efficacy and goal congruence to be significant predictors (Ryan et al., 2013). Another study found that more confidence the African women had, the more empowered they felt in managing their hypertension (Warren-Findlow et al., 2021). In addition, self-efficacy and goal congruence were found to be predictors of medication self-management in African American older women (Ellis et al., 2019). Another study showed that strong social support had had greater muscle mass and strength than those who lacked social support (Taani et al., 2018). When older adults lack social support or receive negative social support, there is a decline in health promotion activities. Negative social support is when the family member/friend discourages the older adult due to fears the family member/friend has about the older adult either falling or injuring themselves. Further research is necessary to better understand these variables and their role in adopting healthy behaviors such as vitamin D intake.

Falls were not associated with any of the process variables for this study (self-efficacy for physical activity, aging expectations, goal congruence for protein intake-vitamin D intake-physical activity, and social support). While this is the first study that examined the relationships of these process variables and falls, there have been other studies that examined the relationships between some of these process and other factors related to falls such as fear of falling and physical activity. Some of these studies showed relationships between self-efficacy for physical

activity and fear of falling and adherence to health promotion activities such as physical activity, which might result in a better muscle outcome and decreased the risk of falling (Ponzano et al., 2021). Other studies showed relationships between aging expectations and physical activity (Andrews et al., 2017; Breda & Watts, 2017; Dogra et al., 2012; Yao, 2019) and between goal congruence and vitamin D intake, medication adherence, and sedentary behavior (Ellis et al 2019; Ryan et al., 2013; Taani et al., 2022). In another study, social support was associated with better muscle mass and function (Taani, 2013). While these variables were not directly associated with falls, they might have indirect relationship to falls and could be considered when designing interventions to prevent falls among older adults living in CCRCs. However, further research is needed to determine which factors have the greatest impact on fall prevention for this population.

In the current study, meeting daily protein and vitamin D intake were not associated with falls among CCRC residents. Previous research found no association between protein and vitamin D intake and falls in older adults except those who inadvertently lost weight (Dretakis & Igoumenou, 2019; Larocque et al., 2015). Both studies were secondary data analyses one from the ENRICA study conducted in Spain (2008-2010 with follow-up in 2012), and the second one was from the Study of Osteoporotic Fracture conducted in the US (1997-1998). The ENRICA study examined only protein intake, while the Study of Osteoporotic Fracture assessed both protein and vitamin D intake. Both studies used a food questionnaire that asked about types of foods they consumed over the previous year. Falls was assessed for both studies using a self-report. One study reported BMI while the second study asked the participant if they lost weight. Self-report was listed as a limitation in both studies.

Another study showed that protein intake may be a protective factor in relationship for falls; however, it did not appear to decrease fall rate (Zolick et al., 2011). It has been reported that protein is essential for better muscle health resulting in a decrease in falls; however, recent research has not included falls as an outcome measure (Bauer et al., 2013). Other studies have suggested that older adults need more than the current recommendation of 0.8 g/kg per day, and that timing of protein intake may also be important (Bauer et al., 2013; Deer & Volpi, 2015). The relationship between meeting protein and vitamin D intake and falls needs further longitudinal research to explain these relationships. There is also a need to research much of these nutrients that are required to maintain optimal health and decrease both the rate and risk of falls in older adults.

There were several limitations to this study. This study is a secondary analysis, and the data analysis was limited by the data that was collected during the primary study. Due to the secondary analysis, there was no opportunity to collect information on additional variables they may have impacted falls in older adults. Although all the regression models were adjusted for age and sex, other potential confounding variables could not be controlled for, which may affect the results. The analyses were also limited by the participants who volunteered to take part in this study. The primary study also excluded individuals with cognitive impairment, end-stage organ disease, and those who were unable to stand without assistance. Thus, the participants may not be a good representation of the overall population which limits generalizability of the findings to those who participated in the study and all findings should be viewed with caution. The study is also limited by the ability of the participants to recall information. Some of the data was based on self-report and the inability to recall information could potentially affect the results. Self-report of falls may also have been under reported due to concern the older adult may have had about

being placed in a more restrictive environment (long-term care facility) thus limiting their independence and autonomy.

Conclusion

The aims of this study were to examine the relationships based on the IFSMT between the self-management process variables (self-efficacy for physical activity, goal congruence for physical activity, protein and vitamin D intake, social support, and aging expectations), the proximal outcomes (self-management behaviors: physical activity, protein and vitamin D intake), and falls among older adults residing in CCRCs. The study showed an association between self-efficacy for physical activity and steps per day as well as between aging expectations and protein intake. More research is needed to determine what impacts these relationships and what interventions can prevent falls in older adults residing in CCRCs. Moreover, self-efficacy for physical activity and aging expectations should be taken into consideration when designing future self-management interventions to prevent falls among older adults living in CCRCs. Such interventions have the potential to prevent injuries and improve quality of life among CCRCs residents and decrease healthcare costs.

Chapter 5

Introduction

This chapter is focused on reviewing the findings of the study. A discussion of the self-management processes and self-management behaviors associated with falls and how specific findings are consistent with previous research will be presented. Implications for nursing education, clinical practice, and health policy are also discussed. Limitations of the study, recommendations for future research, and a concluding statement are presented.

Background

Falls among older adults are a continuing public health concern globally. Research has identified risk factors and evidence-based interventions to reduce the occurrence of falls. Yet, health care providers may not be aware of or know how to use research to support their clients. As a result, a gap exists between research and practice environments (Curtis, et al., 2016; Titler, 2018). Each researcher needs to disseminate their findings, but there is also a need to translate their results so that health care professionals can improve the care of older adults. Health care professionals are aware that implementing evidence-based interventions promotes optimal improvement in health outcomes (Curtis, et al., 2016; Titler, 2018). However, there is a lag between the research that is being conducted and the application of the interventions that were identified in research studies (Curtis, et al., 2016). One research team has identified the term "knowledge translation" as the movement of knowledge from the place where it was identified to a location where knowledge can influence clinical practice (Worum, et al., 2019). Another definition of knowledge translation is the process through which research knowledge is generated, distributed, and implemented into clinical practice (Curtis, et al., 2016). Others have identified "translational research" as the deciphering of research for use in clinical practice

(Curtis, et al., 2016). The World Health Organization (WHO) stated that it is unethical to conduct human research and not publicize the findings for clinicians to use (Curtis, et al., 2016).

One research team is questioning if all research can be translated for use in practice (Curtis, et al., 2016). Some research designs such as descriptive studies cannot be used to determine causation; however, they do play an integral role in understanding the phenomena being studied. Research in fall prevention has come under scrutiny due to the heterogeneity of research designs, making it difficult to synthesize findings of multiple interventional studies. (Cameron et al., 2013). Yet, other researchers are making attempts to integrate research findings to add to the body of knowledge and understand the impact that interventions may have to reduce falls in older adults.

Prevention of falls is needed to improve health outcomes for older adults. Older adults who fall are at a greater risk for temporary or permanent injuries leading to a decrease in their abilities to perform activities of daily living (Gelbard et al., 2014). After falling, an older adult may develop a fear of falling which can further limit their physical capacity (Ambrose et al., 2013). When this occurs, the recovery time may be prolonged or prevented from occurring at all.

Risk factors can help to predict older adults with an increased likelihood of falling. Risk factors include but are not limited to muscle strength, balance, nutrition, medications, use of alcohol, physical activity, previous fall, presence of a chronic medical condition, presence of depression, confusion, and fear of falling (Gordon, 1982; Jung, et al., 2016; Lawlor, Patel, & Ebrahim, 2003; Sehested & Severin-Nielsen, 1977; Spar, La Rue, Hewes, & Fairbanks, 1987). Early identification of risk factors has the potential to allow interventions to be developed which will help to prevent falls and promote health outcomes.

Self-management has been used to promote independence, autonomy, and health outcomes in older adults with chronic conditions, and to prevent falls among older adults (Ryan & Sawin, 2009). Fall prevention self-management is the "actions individuals take and behaviors they perform to prevent themselves from falling" (Schnock et al., 2019). The Individual and Family Self-Management Theory (IFSMT) identities events, conditions, and self-management processes that impact the occurrence of self-management (Ryan & Sawin, 2009). Improving self-management behaviors by targeting self-management processes may reduce both the rate and risk of falling among older adults.

The IFSMT consists of four dimensions. These dimensions are context, process, proximal outcomes, and distal outcomes (Ryan & Sawin, 2009). The context dimension includes risk and protective factors, condition specific factors, environmental factors, individual factors, and family factors (Ryan & Sawin, 2009). The factors identified for the fall prevention model for this dimension included age and gender. The process dimension includes knowledge and beliefs, self-regulation, and social facilitation (Ryan & Sawin, 2009). The factors identified for the fall prevention model for this dimension included self-efficacy for physical activity, aging expectations, goal congruence for physical activity-protein and vitamin D intake, and social support. Proximal outcomes are unique to this theory and includes self-management behaviors (Ryan & Sawin, 2009). The factors identified for the fall prevention model included physical activity, protein intake, and vitamin D intake. Proximal outcomes are the short-term goals that lead to the attainment of the distal outcomes. Distal outcomes are the long-term goals and include cost of health care services, quality of life, and health status (Ryan & Sawin, 2009). The factor identified for the fall prevention model for this dimension included falls.

Each of these dimensions are influenced by the factors within them as well as the factors between them. The IFSMT can provide greater insight into older adults' self-management behaviors to prevent falls in older adults and provide a framework for assessing, planning, and implementing a theory-based approach to prevent falls among older adults.

Synthesis of Findings

In this current study, the Individual and Family Self-Management Theory provided the lens to observe self-management process factors, behaviors, and the impact these have on falls (Ryan & Sawin, 2009). One observation was that self-efficacy was associated with an increase in number of steps per day. When older adults believe they can successfully complete physical activity, older adults will have a higher activity level (Belka & DeBeliso, 2019; Kinney et al., 2009). The results of higher activity levels are increased or maintained muscle strength and function and a decrease in the number of falls (Yao, 2019). Interventions that support higher self-efficacy such as providing positive social support and encouragement may contribute to fall prevention (Ponzano et al., 2021). Reducing barriers to higher self-efficacy such as a fear of falling can also improve activity level (Kinney et al., 2009; Ponzano et. al., 2021). This can be accomplished by providing the older adult with activities in which they can be successful; thereby, increasing their confidence (i.e., self-efficacy). To improve self-efficacy, the older adult will need activities that encourage independent exercise (Kinney et al., 2009). Research has demonstrated that when structured activity is not highly supervised there is an association with improved self-efficacy (Kinney et al., 2009). The study accomplished this through a gradual transition from supervised exercise to independent exercise (Kinney et al., 2009).

This current study also found a negative association between increased aging expectations and meeting daily protein intake. This means that when the participant met daily

protein intake, aging expectations were lower, which is an unexpected finding. Aging expectations are the beliefs the older adult has about the aging process. When aging expectations are positive, the older adult is more active and social with others (Breda & Watts, 2017). This leads to participation in health promotion activities such as exercise and healthy nutrition (Breda & Watts, 2017; Yao, 2019). Negative aging expectations are believed to be a barrier to participation in physical activity and healthy eating behaviors (Yao, 2019). Yet, older adults in this study had lower aging expectations and still met their daily protein intake. There may have been factors outside the scope of this study that impacted these results. More research is needed to determine what if any factors influence both meeting daily protein intake as well as aging expectations and the relationship between them.

Another finding of this current study was that meeting daily vitamin D intake was not associated with any of the process variables (self-efficacy, goal congruence, positive social support, negative social support, and aging expectations). In this current study, 89.5% of the non-fallers and 100% of the fallers met the daily requirement for vitamin D intake. Process factors are believed to influence self-management behaviors by improving knowledge and beliefs, self-regulation, and social facilitation (Ryan & Sawin, 2009). When the older adult feels they have the knowledge, and support to complete a task, the older adult will make more of an effort to be successful in completing the self-management behavior (Ryan & Sawin, 2009). The fact that this study did not show a relationship meeting daily vitamin D intake and the process variables leads to questions. Potential questions include were the process factors chosen appropriate for the expected behaviors, did another factor that was not evaluated impede the expected results, and were the results insignificant since most participants met the daily vitamin D recommendation?

More research is needed to evaluate how and what process factors influence self-management behaviors including vitamin D intake.

Falls were not associated with any of the process variables. Process variables for this study included self-efficacy for physical activity, goal congruence, positive/negative social support, and aging expectations. These variables can impact self-management behaviors (such as physical activity and protein and vitamin d intake) which ultimately impact the distal outcome (falls). Falls is the distal outcome and may not show a direct relationship to the process factors, or it may need longitudinal studies to determine any associations between these variables (Ryan & Sawin, 2009). Interventional studies have shown support for these variables in relation to improved participation in physical activity and improved muscle function (Bauer et al., 2013; Ryan et al., 2019; Smith et al., 2017; Taani et al., 2022; Yao, 2019). These variables place a key role regarding the older adult's ability to improve the process of self-management (Sawin & Ryan, 2009). More research is needed using the IFSMT to guide future studies to determine support for these factors.

In this current study, meeting daily protein intake was not associated with falls. However, protein intake is believed to increase muscle strength making exercise and completing activities of daily living possible (Smith et al, 2020). While other secondary data analyses have not shown an association between protein intake and fall prevention, there might be limitations such as recall bias that may have affected these results (Larocque et al., 2015; Sandoval-Insausti et al., 2019, US Preventative Task Force, 2018). Although research findings did not show a relationship between protein intake and falls, it has been reported adequate protein intake is crucial to maintain musculoskeletal health (Larocque et al., 2015). Further research is needed to delineate the relationship between protein intake and falls.

Implications for Education

Geriatric nursing education should be a major component of nursing curriculum. Geriatric education is needed due to the increasing numbers of the older adult population and the prevalence of falls among older adults. Comprehensive geriatric education is crucial to improve health outcomes, prevent adverse health outcomes, and deliver clinically competent nursing care (AACN, 2022; Yan et al., 2022). Research assessing clinical competence of geriatric nursing care revealed a need for advancement in education of comorbidities, medication management, cognitive impairment, nursing measures and documentation (Yan et al., 2022). One of the strategies to increase knowledge in geriatric care and improve the quality of care among older adults is integrating geriatric training and content in nursing curriculum (Yan et al., 2022).

This dissertation study has implications for nursing education focusing on the assessment and identifying self-management process factors and self-management behaviors associated with falls among older adults living in CCRCs. Although this study was a secondar data analysis, findings suggest that some self-management processes and behaviors may impact falls among older adults and there is a need for a more comprehensive assessment of risk factors associated with falls incorporated into nursing curriculum and documentation requirements. Educating the nursing students on the risk factors associated with falls is needed and might help in providing better care and reducing number of falls among older adults including CCRC residents (AACN, 2022).

Providing nursing students opportunities to apply geriatric knowledge is imperative to ensure competence. Development of geriatric simulation scenarios that include interdisciplinary teams promotes critical thinking and clinical judgement while building therapeutic communication skills.

Furthermore, assessment is one of the initial steps to prevent falls among olde adults, which is the first step in the nursing process. Nursing instructors should identify tools available to help nursing students screen older adults such as the Morse Fall Scale or the Hendrich Fall Scale (Miller, 2019). Early identification of older adults at risk of falling will provide an opportunity to design and implement interventions that will reduce the risk of the fall from occurring. Nursing students should also look for ways to reduce fall risk by helping the older adult increase their self-efficacy for physical activity, which in turn will enhance physical activity levels and improve muscle outcomes (LaPier, 2009). The more the older adult participates in physical activity, the greater the chance of improvement in muscle strength and function (Taani et al., 2022). The improved nursing knowledge can lead to a reduction in both the rate and risk of falling for older adults as the fall risk is identified and interventions are designed to meet older adults needs (AACN, 2022).

Implications for Clinical Practice

As nursing education focuses on the risks of falling for older adults, nurses will have the information they need to teach older adults within various health care settings (AACN, 2022). The older adults included in this research study lived in CCRCs. However, those factors that place an older adult at risk for falling are similar within all settings. Nurses in the clinical setting can evaluate the older adult's risks for falling and teach them how to reduce those risks (Miller, 2019). Nurses can also screen older adults regarding self-efficacy for physical activity, teach them about the need to be physically active and to eat a nutritious diet that includes adequate protein and vitamin D, and find appropriate interventions to improve such behaviors. Nurses can help identify barriers that prevent the older adult from participating in fall prevention

interventions and identify resources to improve utilization of fall prevention measures (CDC, 2017).

Health care providers can make recommendations to increase physical activity levels, adopt healthy eating habits, and place referrals to a physical therapist. For example, participation in physical activity will increase when the older adult believes he/she can safely accomplish the activity without falling, and this starts by building the confidence of the older adult. Health care providers should be encouraged to work together with other community partners to create a fall prevention program designed for their community (NCOA, 2021). Tool kits are available from the National Council on Aging (NCOA) and the Centers for Disease Control and Prevention (CDC) to help health care providers and community members develop a fall prevention program as well as to monitor the results of their interventions (CDC, 2017; NCOA, 2021).

Implications for Policy

Prevention of falls among community dwelling older adults and those in CCRCs and long-term care facilities requires policy solutions, strategies, and actions from both the public and private organizations. These solutions, strategies, and actions must include deliberate and intentional interventions and require long term commitment to decrease falls and fall related deaths. Unless this is completed, falls will continue to escalate, and health care costs will continue to rise. Using results from this study and other research on falls is an important step to prevent falls and improve health outcomes among all older adults. Organizations such as the CDC, NCOA, and Centers for Medicare and Medicaid have worked on strategies to prevent falls among older adults (CDC, 2017; NCOA, 2021). While the most effective approach to preventing falls is proper assessment and management of factors contributing to falls, each of these organizations utilized risk factors identified in research studies to develop programs to prevent

falls in older adults (Schneider et al., 2016). The NCOA developed the Falls Free Initiative which focuses on four risk factors: physical mobility, medication management, home safety, and environmental safety (Schneider et al., 2016). Out of the Falls Free Initiative grew the establishment of state coalitions. State coalitions include multiple stakeholders within communities who identify gaps and implement recommendations within the Falls Free Initiative.

While there are many factors that contribute to falls in older adults, multiple stakeholders working together is critical to reduce falls in older adults (Schneider et al., 2016). Policy needs to focus on building public awareness about fall prevention, maximizing local resources, and preventing duplication of efforts (NCOA, 2021). Increasing public awareness about fall prevention must start with education about risk factors such as low physical activity. Older adults must be included in this process.

Public policy must focus on identifying resources and increase its accessibility to older adults and health care providers without barriers. The Silver Sneaker Initiative provides older adults with access to physical fitness equipment and online home fitness classes; however, this is limited to certain Medicare plans (Silver Sneakers, 2022). This needs to be accessible to all Medicare beneficiaries (Horton et al., 2018).

To ensure fiscal responsibility, duplication of services must be eliminated. Fiscal responsibility must also include determining the return on investment (ROI) for fall prevention interventions such as fall programs. Accountability and responsibility for expenditures necessitates that all programs follow quality standards and reporting demonstrating the impact the program had on fall prevention goals (NCOA, 2021).

Funding of fall prevention services is also often a barrier to continuation of these services. Policy makers must support funding for these services to prevent falls from occurring

and prevent fall related deaths in older adults (Horton et al., 2018). Funding includes reimbursement to health care providers, grants, and private donations that are allocated to fall prevention programs (Schneider et al., 2016). Investment in fall prevention services is imperative for long-term successes to be realized. New Zealand provides an exemplar by allocating priority funding to reduce falls in older adults (Barry & Kaye, 2016). Funding for preventative measures is essential to promote improved balance and muscle function before falls occur.

Policy must encourage active aging by designing communities which allow older adults to safely engage in physical activity by designing safe walking trails. CCRC's allow older adults to maintain their independence and provide a variety of activities and services that can change as the needs of the older adult ages (AARP, 2022). Active aging policies improve self-management behaviors by providing needed resources and support that older adults need to maintain autonomy and independence. Policy makers support of self-management behaviors in older adults is essential and includes funding of physical activity and healthy nutrition programs. Strategies must include planning for a culture change. Current strategies are not working; therefore, policy makers must look to other fall prevention programs with significant success rates in reducing falls among older adults. Two countries have created policy and programs that demand attention. These include Canada and New Zealand (Barry & Kaye, 2016; Tiessen et al., 2010). New Zealand has instituted self-referral to physical therapy which eliminated barriers to needed support. Self-referral to professional care promotes self-management allowing older adults to identify problems and engage in healthy behaviors which will promote muscle health and balance; thereby, reducing falls and fall related injuries. Canada has created a culture change with the focus on respect and autonomy of older adults in the creation of a culture of safety (Tiessen et al., 2010). The model of falls management supports older adults' choices while

creating an environment of safety, and this has resulted in a rate of falls that is lower than the industry average (Tiessen et al., 2010).

Policy must apply to all older adults demonstrating equity to all. Collaboration between stakeholders is needed to ensure resources are equally accessible to older adults without barriers. For this to occur, policy support for fall prevention must be ongoing and intentional ensuring that fall prevention is a priority. Policy that supports fall prevention programs will improve health outcomes and reduce disabilities in older adults (Horton et al., 2018; Schneider et al., 2016).

Limitations

There were several limitations to this study. This is a secondary data analysis and causality cannot be inferred. Data analysis was limited by the data that was collected during the primary study. Due to the secondary analysis, there was no opportunity to collect information on additional variables they may have impacted falls in older adults. Although all the regression models were adjusted for age and sex, all the potential confounding variables could not be controlled for, which may affect the results. The analysis was also limited by the participants who volunteered to take part in this study. The original study also excluded individuals with cognitive impairment, end-stage organ disease, and those who were unable to stand without assistance. Thus, the participants may not be a good representation of the overall population. This limits generalizability of the information to those who participated in the study. Thus, findings will need to be viewed with caution. The study is also limited by the ability of the participants to recall information. Some of the data was based on self-report and the inability to recall information could potentially affect the results. Older adult's self-report may have been influenced by a fear of being placed into a more restrictive environment such as a long-term care facility. The potential loss of independence and autonomy may have limited their disclosure.

Recommendations for Future Research

Our findings suggest there is a need to further investigate the risk factors of falls including self-management processes and behaviors in older adults. Further study is needed to validate whether changes in self-management processes and behaviors are related to falls. Self-management process variables (self-efficacy, goal congruence, aging expectations, and social support) could affect self-management behaviors (physical activity and protein and vitamin D intake), and self-management behaviors could also mediate self-management process variables; further analysis is needed. The role and impact of self-management behaviors (physical activity and protein and vitamin D intake) on falls is also an important research consideration. Further research is needed on how older adults can most optimally be involved in self-management behaviors to decrease risk of and prevent falls.

Fall prevention programs for older adults should also prioritize to address modifiable factors of fall including self-management processes and behaviors across health and functioning statuses. Findings from this preliminary work would indicate that there is a need to develop interventions for older adults addressing how to prevent falls and enhance crucial self-management process variables to foster effective self-management behaviors. The Individual and Family Self-Management Theory can serve as a cogent theory for understanding and further substantiate the details of the relationships between key concepts, processes, and outcomes essential to self-management and fall prevention in older adults.

Conclusion

Identifying older adults at risk for falling allows interventions to be identified and implemented to reduce the risk of falling, improve health outcomes, and reduce health care expenditures. Descriptive studies allow relationships to be examined and create a better

understanding of how these relationships influence fall prevention in older adults. The findings from this study provide useful insight that can be used to guide future research. Further research should be guided by questions and hypotheses that arise from the findings of this research study.

Summary

Fall prevention is a continued public health concern leading to poor health outcomes and increased health care expenditure. Descriptive studies play an integral role in understanding the phenomena being studied. Researchers should translate the results of their study so that health care providers can identify and implement interventions to prevent falls in older adults. This study showed that self-efficacy for physical activity was associated with an increased number of steps per day. Interventions to promote self-efficacy before and after a fall can encourage participation in physical activity. Increased participation in physical activity can improve muscle strength and function; thereby, reducing both the rate and risk of falling in older adults. Other findings of this study were not expected, and further research is needed to understand potential factors that may have influenced these results.

There are implications for nursing education, clinical practice, future research based on these findings. Nursing students can impact the care of older adults by learning about risk factors and assessment tools for fall prevention. Health care providers can implement plans of care and fall prevention programs based on evidence to reduce falls in older adults. Researchers can promote nursing practice by adding to the body of knowledge and assisting in the translation of their findings. This will aid health care providers as they design and implement interventions to promote fall prevention self-management of older adults. Examining conflicting findings will strengthen relationships, promote health outcomes, and contain health care costs.

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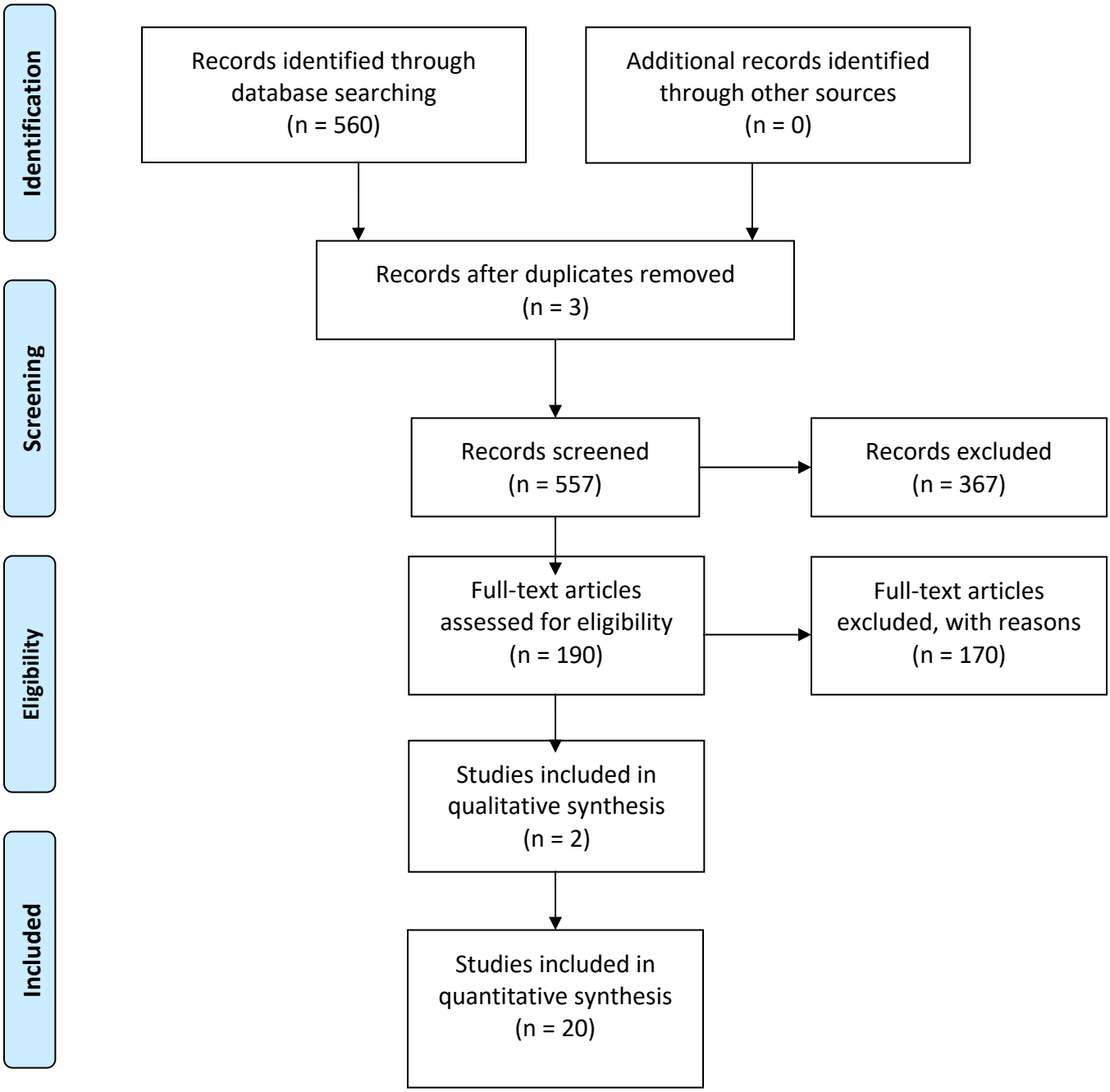
Appendix A

PRISMA 2009 Flow Diagram



Appendix B

Evidence Table

Author/Year	Purpose/Question	Design/Sample	Data Collection	Analysis	Findings	Strengths and limitations
Self-efficacy for physical activity (exercise)						
Ponzano et al, 2021	Explore fear of falling and its relationship with exercise self-efficacy in women aged 65 years and older with history of vertebral fractures	Secondary analysis of a cross-sectional study; community-dwelling women aged 65 years and older	Questionnaires	Descriptive statistics, bivariate ordinal regression analysis, multivariate analysis	Negative association between fear of falling and exercise self-efficacy.	Strengths: Large sample size Limitations: Not generalizable or representative of all persons with vertebral fractures, self-report measure used for physical activity.
Robins et al., 2018	Determine whether there is a relationship between physical activity and social isolation in older community-dwelling adults.	Secondary analysis of a cross-sectional study; older adults 70+ years, living in the community	Telephone survey	Univariate analysis, logistic regression, backwards elimination multiple ordered logistic regression	Factors associated with reduced social isolation include living with a spouse/partner, better health, higher levels of physical activity, less depression. Physical capacity (self-efficacy for physical activity) did not have an association with social isolation.	Limitations: limited to English speakers, possible over-sampling of those with chronic medical conditions, self-reported measures have potential for recall bias, and model fit was low-may not describe the data accurately.

Aging Expectations						
Andrews et al., 2017	Understand how expectation regarding aging are longitudinally associated with physical activities in older adults in a sociodemographically disadvantaged sample	Secondary analysis of a randomized control trial/ 446 participants with median age of 67 years Volunteers at elementary schools	Interviews at baseline, and one follow up visit at 12 months or 24 months.	Linear mixed effects models	Higher expectations regarding aging are associated with higher engagement in moderate to high intensity physical activity over a two-year time frame- only in women	Limitations: Not able to examine low intensity physical activity Self-reported responses to questionnaire Possibility that selection or other biasing effects affected our findings
Breda & Watts, 2017	Examined how expectations regarding aging (ERA) influence physical activity participation and physical function	Cross sectional design/ 148 participants who ranged in age from 61 to 96 years old	Series of questionnaires	Means and standard deviations Independent samples t test and ANOVA Multiple linear regression	Significant associations between aging expectations and social functioning, energy/vitality, mental health, self-rated health, and physical activity	Limitations: Cross-sectional design, limited generalizability due to large number of Caucasian females, and convenience sampling
Dogra et al., 2015	Determine whether aging expectations (AE) are associated with physical activity participation and health among older adults of low socioeconomic status (SES).	Cross sectional design/ 170 older adults (mean age 70.9 years)	Study materials sent in the mail	Adjusted linear regression models	Positive expectations were associated with more physical activity, and better physical function. Physical activity mediated ERA and physical function.	Limitations: Study was cross-sectional in nature; thus reverse-causality cannot be ruled out Self-selection bias since the participants elected themselves to participate in the study.
Goal Congruence for physical activity, vitamin D and						

protein intake						
Ellis et al., 2019	Examined the direct association among caregiver role strain, medical mistrust, the medication regimen	Correlational and cross-sectional study African American, female, age ≥50 years, diagnosed with two or more chronic diseases, and taking prescription medication	30-60 min in person interview; structured questions	Ordinary least square regression model	Goal congruence and self-efficacy were not found to act as mediators Self-efficacy, and age predicted 30% of the variance in MSMB	Limitations: Convenience sample Self-report bias Measurement error and response-set biases
Ryan et al., 2013	Evaluate the impact of a theory-based, tailored, computerized intervention on women's intake of calcium and vitamin D.	Repeated measures experimental study	Computer-based intervention or usual care group Follow-up questionnaires at 8, 14 weeks and 6 months	Linear modeling using Generalized Estimating Equations with autoregressive working correlation structure	Self-efficacy predicted calcium intake. Intervention group had higher calcium intake at 14 weeks.	Limitations: Intervention that required two types of computer technology Unexpected high rates of attrition Limited focus on nutrition
Social Support						
Dierking et al., 2016	Determine predictors of fear of falling in older Mexican Americans over time	Secondary analysis of Longitudinal Study: Community-dwelling Mexican Americans aged 72 and older	In person or proxy surveys	Mantel-Haenszel Chi-square test, ANOVA, time hazard models with logistic regression	The predictors of reporting fear of falling included female sex, frequent familial interaction, depression, chronic health conditions, IADL limitations, higher MMSE score, and three or more falls in the last 12 months. Predictors of severe fear of	Strengths: 10 years' worth of data, the population is understudied and is growing Limitations: attrition bias, limited to Mexican Americans

					falling included older age, female sex, married, depressive symptoms, chronic health conditions, IADL limitations, higher MMSE score, and fall history. Protective factors included frequent friend interaction and higher levels of education.	
Durbin et al., 2016	Evaluates the relationship between social support and falls among a community-dwelling population of older adults	Secondary Data analysis of a cross-sectional study: residents aged 65 and older, living in the community.	Telephone interviews.	Multivariable logistic regression	The relationship between social contact and perceived availability of social support and falls among older adults, neither relationship was significant.	Limitations: unable to establish a temporal order between fall events and the social support constructs, self-reported data, and the use of a dichotomous falls' variables.
Trevisan et al., 2019	Examined the impact of social connections and social support on the risk of injurious fall and on fall-related functional decline and mortality.	Secondary analysis of a Prospective Study with 6 yr. follow-up: older adults aged 60 and older	Face to face interviews, physical function tests	Cox regression analysis, multinomial logistic regressions, demographic analysis	Social network can influence the risk and prognosis of injurious falls in older people. Limited social connections increase the risk of injurious falls, and	Strengths: comprehensive assessment of social network and a large cohort, sensitivity analyses supported the independent role of social network on fall risk and prognosis.

					those with poor social connections have a higher risk of developing disabilities and mortality in association with severe injuries or multiple falls.	Limitations: only considered falls that required medical attention, those excluded were likely to be older and have worse health status, functional status measured at baseline and 6 years only.
Whipple et al., 2019	Investigate the unique experiences of older adults with PAD and diabetes related to physical activity.	Mixed methods study: aged 65 years or older	Semi-structured interviews, questionnaires, physical function tests	Thematic analysis, Descriptive statistics, Integrated analysis	The barriers most identified by participants were lack of accessibility, lack of enjoyment of activity, lack of motivation, and pain and physical health. Social support and accessibility and convenience were particularly important, providing possible targets for future interventions to promote physical activity.	Strengths: mixed method design, objective measurement of physical activity (accelerometer). Limitations: limited scope and sample size, may not have reached saturation with respect to interview themes or full range of experiences, did not collect additional data on other comorbid health conditions, unable to examine potential temporal relationships between activity levels, changes in function, and

						barriers and facilitators to exercise.
Protein intake						
Larocque et al., 2015	Evaluate the relationship between protein and vitamin D intake with the occurrence of falls in older women	Secondary analysis of an Observational Study; Caucasian women older than 65 years	Questionnaires	Descriptive statistics, ANOVA, Chi-Square, Quadratic Regression, forward stepwise regression	No significant association between protein and vitamin D intake and falls.	Strengths: large sample size and comprehensive set of fall risk factors. Limitations: not able to determine injurious vs noninjurious falls, findings may not apply to non-white or men, data is older
Sandoval-Insausti et al., 2019	Association between protein intake and falls in a Spanish community-dwelling cohort.	Secondary analysis of ENRICA study; noninstitutionalized individuals 60 years and older in Spain	Computer assisted telephone interview, home visits	Logistic models	Statistically significant interaction with unintentional weight loss was observed for the association between protein intake and fall risk No protective association was found between protein intake and the risk of falling in older adults.	Strengths: prospective design, study results did not change across many sensitivity analyses. Limitations: diet was self-reported, underreporting of falls is possible because of recall bias, survival bias could be present because hip fracture increases mortality, and participants lost to follow-up.
Vitamin D intake						
Aspell et al., 2019	Determine the association between impaired muscle function and serum	Secondary analysis of the English Longitudinal Study of	Biological data, muscle function tests,	Descriptive statistics, multiple logistic regression,	Participants with the lowest serum 25(OH)D	Strengths: large well-defined population, comprehensiv

	vitamin D status in community-dwelling older adults. Falls were explored as a secondary aim.	Ageing; adults aged ≥60 years		multivariate analysis of variance, variance inflation factors tests, stepwise regression	(<30 nmol/L) had the highest prevalence of impaired muscle strength and performance compared with participants with levels ≥50 nmol/L. Vitamin D deficiency (<30 nmol/L) was a significant determinant of low HGS and poor physical performance. Older adults partaking in regular moderate physical activity had significantly lower odds of impaired muscle strength and physical function. Single or multiple falls were not associated with vitamin D status.	e assessments, and measures. Limitations: findings cannot demonstrate cause and effect, serum 25(OH)D in the ELSA cohort was assessed by immunoassay (DiaSorin), while the gold standard is considered LC-MS/MS.
Dretakis & Igoumenou, 2019	Investigate whether differences exist by hip fracture type with respect to serum 25(OH)D (vitamin D) and parathyroid hormone (PTH) levels	Correlational Study; 48 men and 68 women; mean age 80.8 ± 8.5 (range 62-94) years-community dwelling	Biological data, questionnaire	Kolmogorov-Smirnov test, independent samples T test, Chi Square test, Pearson correlation, logistic	Older age, recurrent falls, serum levels of PTH > 65 pg/ml, and severe vitamin D deficiency were found to be	Limitation: The small sample size was a limitation. The follow-up visits occurred in spring and early summer which may

				regressions analysis	associated with trochanteric fractures. Additionally, older age, female gender, PTH > 65 pg/ml, and severe vitamin D deficiency were related to recurrent falls. Patients with absence of PTH response to low vitamin D levels, were not repeated fallers and suffered mostly from sub capital fractures.	have affected the Vit D levels.
Russell et al., 2017	Measure awareness of, and adherence to, six national fall prevention recommendations among community-dwelling older adults in Ottawa.	Descriptive Design; Community-dwelling older adults 65-85 and older.	Questionnaire	Descriptive statistics, Pearson's chi-squared tests, Bonferroni correction	High awareness that home modifications and physical activity can prevent falls. Lower awareness of annual medication review, eye exam, physical exam and daily vitamin D could reduce fall risk.	Limitations: Low response rate, response bias may be present, not all questions in the survey were assessed for validity and reliability in this population, and data is limited to older adults living in their home.
Physical Activity (steps per day)						

Aranyavalai et al., 2020	Investigate the association between all possible risk factors including physical performance, physical activity and fall incidence over the six-month in community-dwelling older people who had low-risk of falling and to identify walking threshold (steps/day) for reducing risk of fall.	Prospective observational study/ The older people who aged ≥60 years	Physical activity evaluation, questionnaires, accelerometer, fall calendar	Descriptive statistical analysis, independent t test, Cox's proportional hazard model	Significant association between fall incidence and behavioral risk factors including PASE scores, walking, and moderate to vigorous intensity of PA.	Limitations: Low number of participants who met the PA recommendation of MVPA≥150 min/week (n = 22)
Duck et. al., 2019	Identify the types of physical activity; and determine the relationship between amount of physical activity and postural balance among rural community dwelling older adults	Cross-sectional, prospective, descriptive, correlational design/ rural community dwelling older adults	Questionnaires and physical function testing	Descriptive statistics, independent t-tests, one-way analysis of variance, Pearson correlation coefficients, linear regression models, and stepwise hierarchical blocks	Age and sex were the strongest predictors of Berg Balance Scale. Berg Balance Scale scores positively correlated with average minutes of light and moderate physical activity.	Limitations: Convenience sample, generally healthier and active group of individuals, Hawthorne effect, and self-report may have led to recall bias.
Maula et al., 2019	Aimed to provide a better understanding of PA maintenance behaviours in older people	Qualitative Study: community dwelling adults aged ≥65 years	Semi-structured face-to-face Interviews	Thematic analysis	Important themes identified were physical, social, psychological, and environmental facilitators and barriers.	Strengths: large number of interviews which allowed for thematic saturation. Interview shadowing helped ensure consistency in technique. Limitations: Not all invitees

						participated and may have differed from those who participated. Potential for recall bias, and social desirability bias. Minorities not well represented.
Sawa et al., 2020	Explore the associations between FoF and step count, light-intensity physical activity (LPA), and moderate/vigorous-intensity physical activity (MVPA) in community-dwelling older adults.	Cross-sectional study; older adults living independently in the community	Survey, physical function tests.	Descriptive statistics, Multivariate regression analysis	Step count and physical activity intensity showed significant linear trends across FoF severity. High FoF showed decreased stop count by approximately 2,000 steps/day. High FoF was significantly associated with short durations of both LPA and MVPA. Moderate FoF was associated with decreased LPA duration.	Limitations: small sample size, sample was well-functioning older adults, and causation could not be determined between FoF and physical inactivity. Addition factors that may affect FoF were not collected.