Experimental Gerontology 121 (2019) 99–105

Contents lists available at ScienceDirect

Experimental Gerontology

journal homepage: www.elsevier.com/locate/expgero

Association of health empowerment and handgrip strength with intention to participate in physical activity among community-dwelling older adults

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ARTICLE INFO

Section Editor: Emanuele Marzetti

Keywords:
Successful aging
Exercise
Health promotion
Theory of planned behavior

ABSTRACT

Introduction: Health empowerment is an individual's perceived control and competence related to health and health care. The projected increased growth of the older adult population calls for a health-related empowerment movement in health education that targets older adults. Using the theory of planned behavior, the purpose of this study was to investigate the association of health empowerment and handgrip strength with intention to participate in physical activity among older adults.

Methods: The Korean Health Empowerment Scale (K-HES) was used as a measure of health empowerment. Handgrip strength was used as a measure of muscle strength. Intention to participate in physical activity was measured using five items. Participants of this study included 103 community-dwelling older adults (*M*age = 76.45 ± 9.395; Male = 42, Female = 61). Results: Statistical analyses revealed all participants were knowledgeable about the health benefits of exercise and most participated in regular physical activity (n = 84.5%). The majority had normal handgrip strength (n = 60.7%) and most indicated strong intentions to participate in regular physical activity (n = 85%). A stepwise multiple regression revealed health empowerment significantly and positively ($F(1,101) = 30.511$, $p < .001$, $R^2 = 0.232$, $R^2_{Adjusted} = 0.224$) associated intention to participate in physical activity. Health empowerment explained 23.2% of the variance in intentions. There was no significant contribution of muscle strength on intention.

Discussion: Findings suggest overall health empowerment may be affected by a variety of subscales such as problem-solving, obtaining support, motivation, psychosocial coping, and decision making. Conclusion: Future research should explore potential associations between health empowerment and intention to participate in physical activity.

1. Introduction

Participation in regular physical activity provides an avenue for interventions that can assist in alleviating symptoms of disease, as well as in preventing age-related disease among older adults (Jones and Rose, 2005). Jones and Rose (2005) explain that the benefits of physical activity include increased lean muscle mass, improved glucose metabolism, improved balance and cognition, decreased risk of cardiovascular disease, improved blood pressure and blood lipids, and improved mood. Additionally, regular physical activity has been found to be associated with improved quality of life among senior adults (Jones and Rose, 2005; Vagetti et al., 2014).

One of the goals of the *Healthy People 2020* initiative was to increase the quality and years of healthy life among older adults (Office of Disease Prevention and Health Promotion, 2016). Although there are well-established benefits to exercise and its contributions to quality of life, approximately 25% of senior adults ages 65–74 do not participate in regular physical activity (Watson et al., 2016). In adults 75 years and older, > 35% do not participate in regular physical activity (Watson et al., 2016). Contributing factors to the lack of participation in physical activity among senior adults may include an absence of a sense of empowerment, a person's level of muscle strength, and an absence in the intention to participate in physical activity (Fried et al., 2001; Gretebeck et al., 2007; Menon, 2001, 2002).

While there is some research examining health empowerment (Funnell et al., 1992; Gibson, 1991; Menon, 2001, 2002; C. Park and Y. Park, 2013; Shearer, 2007, 2009), handgrip strength, as a measure of muscle strength (Bohannon and Schaubert, 2005; Dudzińska-Griszek et al., 2017; Fried et al., 2001; Syddall et al., 2003), and intention to participate in physical activity among community-dwelling older adults

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https://doi.org/10.1016/j.exger.2019.04.001
Received 28 November 2018; Received in revised form 27 March 2019; Accepted 3 April 2019
Available online 10 April 2019
0531-5565/ Published by Elsevier Inc.

(Barg et al., 2012; Buttery and Martin, 2009; Ghahremani et al., 2012; Gretebeck et al., 2007) as separate variables, there is a paucity of research that examines the relationships between these three variables simultaneously. The purpose of this study was to determine if health empowerment and handgrip strength, as a measure of muscle strength, may serve as predictor variables of intention to participate in regular physical activity among community-dwelling older adults. This study will use the theory of planned behavior (TPB) as a theoretical framework to explain intention to participate in regular physical activity (Ajzen, 1985, 1991, 2006).

1.1. Theoretical framework

The TPB provides a framework for understanding and predicting human behavior (Ajzen, 1985, 1991). The TPB consists of three determinants that guide behavior including (a) behavioral beliefs, (b) normative beliefs, and (c) control beliefs. Ajzen (1985, 1991) explains behavioral beliefs lead to development of attitudes toward the behavior, normative beliefs lead to development of subjective norm, and control beliefs lead to development of perceived behavioral control. Each of these factors contribute to intention to perform the behavior (Ajzen, 1985; Ajzen and Fishbein, 1980). The construct *attitude toward behavior* is personal, reflecting a person's positive or negative appraisal of performing the behavior (Ajzen, 1985, p. 12). The construct *subjective norm*, on the other hand, is related to social influence, affected by an individual's perception of social pressures to carry out the behavior (Ajzen, 1985, p. 12). *Perceived behavioral control* is defined as an individual's perceptions of his/her ability to perform a behavior (Ajzen, 1985; Ajzen and Fishbein, 1980). Together, these factors contribute to intention toward behavior and to the performance of the behavior itself (Ajzen, 2006). Within the TPB, intention is expected to predict behavior, with stronger intention resulting in a greater likelihood the behavior will be performed (Ajzen, 1985, 1991). According to Ajzen (2006), "As a general rule, the more favorable the attitude and subjective norm, and the greater the perceived control, the stronger should be the person's intention to perform the behavior in question" (para. 1). Intention, as an antecedent to behavior, serves as a predictor of the behavior itself (Ajzen, 1985, 1991, 2006).

The TPB has been utilized in multiple research studies to measure intention to participate in physical activity among older adults (Barg et al., 2012; Buttery and Martin, 2009; Ghahremani et al., 2012; Gretebeck et al., 2007). Several research studies indicated self-efficacy as a significant predictor of intention to participate in physical activity (Barg et al., 2012; Ghahremani et al., 2012; Gretebeck et al., 2007).

Barg et al. (2012) investigated the relationship between physical activity, risk perceptions, outcome expectancies, action self-efficacy, and intentions in 175 sedentary middle-aged women between 40 and 65 years old. Results showed action self-efficacy and outcome expectancies significantly ($p < .05$) predicted intention to participate in physical activity. Action self-efficacy was the greater predictor of intention, indicating belief in the ability to perform the activity was one of the greatest components in the determination of whether or not the intention was established (Barg et al., 2012).

Ghahremani et al. (2012) examined intention to participate in physical activity among elderly male nursing home residents between 60 and 85 years of age ($n = 120$). Results indicated affective attitude toward physical activity was the greatest predictor ($\beta = 0.0113$, $p < .0001$) of intention. Self-efficacy was also found to be a significant predictor ($\beta = 0.071$, $p < .027$) of intention to participate in physical activity (Ghahremani et al., 2012).

Gretebeck et al. (2007) examined the relationships between the constructs of TPB, physical activity, and functional ability in senior adults. Attitude toward physical activity behavior, subjective norm, perceived behavioral control, functional ability, physical activity, and intentions to participate in physical activity were measured ($n = 1104$, M age = 75.5, $SD = 6.7$). According to Gretebeck et al. (2007), perceived behavioral control had the greatest significant effect on intention ($\beta = 0.82$, $p < .05$); standardized effect on intention was also significant for functional ability ($\beta = 0.56$, $p < .05$), and attitude ($\beta = 0.36$, $p < .05$). The TPB explained 72% of the variance in intention, while the addition of functional ability explained 74% of the variance in intention. Attitude and perceived behavioral control significantly ($p < .05$) predicted intention to participate in physical activity. Additionally, Gretebeck et al. (2007) found subjects reporting low functional ability indicated strong intention ($p < .05$) to participate in physical activity (Gretebeck et al., 2007).

The literature indicates there are varying factors that may serve as influences on intention to participate in physical activity behavior. While these factors can contribute to, or can attenuate, intention to perform behavior, Ajzen (1985) explains, "It is possible to predict behavior with a great deal of accuracy on the basis of intentions to perform the behavior in question" (p. 143).

1.2. Health empowerment

In the United States, empowerment has become an important element of radical social transformation, allowing marginalized groups to mobilize in pursuit of their perceived human rights (Luttrell et al., 2009). The remarkable growth forecasted among the older adult population, and the projected increases in the burden on the healthcare system due to this population growth, call for a health-related empowerment movement in health education that targets older adults (Centers for Disease Control and Prevention, 2013a, b). Menon (2002) defines health empowerment as, "A cognitive state characterized by perceptions of control regarding one's own health and health care; perceptions of competence regarding one's ability to maintain good health and manage interactions with the health care system; and internalization of health ideas and goals at the individual and societal level. (p. 34). Although Menon (2002) proclaims "people cannot be coerced to participate in healthy habits" (p. 30), older adults often do not recognize the necessity of empowerment as related to addressing their health needs (Shearer, 2009). Shearer (2009) explains older adults can experience limitations in recognizing, obtaining, and participating in resources designed to improve health due to increased complications of health needs as they age.

Health educators can serve as the intermediaries for assisting older adults in their progression toward health empowerment (Gibson, 1991). Gibson (1991) explains, "Health care professionals cannot empower people, people can only empower themselves. However, nurses can help them develop, secure and use resources that will promote or foster a sense of control and self-efficacy" (p. 357). Thus, health-related empowerment among senior adults may contribute to health status among the older adult population (Funnell et al., 1992; Gibson, 1991).

Empowerment influences individuals' participation in health behaviors and can improve overall health status (Funnell et al., 1992). There are multiple possible components of empowerment related to health including a sense of control over health, the ability to solve problems and to use health care resources, and self-efficacy (Bandura, 1977; C. Park and Y. Park, 2013; Shearer, 2009). Katula et al. (2006) explain empowerment as the motivation and desire to take action, the sense of personal competence, and the relationship of these components to perceived self-efficacy. C. Park and Y. Park (2013) further expound, "Control, problem solving, decision making, self-motivation, psychosocial coping, resource-utilization and self-efficacy could be key attributes of empowerment" (p. 143).

C. Park and Y. Park (2013) created the K-HES to measure health empowerment among Korean elderly ($n = 175$). Developed from the Diabetes Empowerment Scale-Short Form (Anderson et al., 2003), the K-HES was modified to an overall health empowerment scale and exhibited acceptable validity and reliability (C. Park and Y. Park, 2013). The K-HES consists of seven subscales that measure seven key attributes of health empowerment including control, problem solving, decision

making, self-motivation, psychosocial coping, resource utilization, and self-efficacy. Through the use of the K-HES, the authors measured the health empowerment of senior adult subjects. This measurement was intended to provide insight into the health empowerment of senior adults, indicating the senior adults' perceptions of control over their health and their abilities to participate in self-care (C. Park and Y. Park, 2013). Through the recognition and promotion of health empowerment among older adults, health educators may assist senior adults in utilizing personal and social resources designed to improve health (Shearer, 2009).

1.3. Handgrip strength

While no one definition of frailty exists, researchers generally agree frailty results from the decline of multiple physiological systems (Clegg and Young, 2011). Declines in these systems can result in loss of function and increased risks for falls (Clegg and Young, 2011). Frailty has been defined by Fried et al. (2001) and Clegg and Young (2011) in the physical domain as weakness. Handgrip strength has been deemed as a marker of frailty and muscle strength, and as a method for measuring weakness, with lower handgrip strength found to be associated with loss of muscle mass and muscle strength, both of which are indicators of frailty (Dudzińska-Griszek et al., 2017; Syddall et al., 2003). Handgrip strength has been used in multiple studies as a component to measure frailty (Chang et al., 2011; Fried et al., 2001; Rantanen et al., 2003; Sasaki et al., 2007). Fried et al. (2001) used handgrip strength as one of five indicators of frailty. According to the authors, handgrip strength in the lowest 20% by sex and body mass index (BMI) indicates weakness (Fried et al., 2001). Like Fried et al. (2001), Cesari et al. (2006) also used handgrip strength as a marker of frailty. In a study of 923 older adults ages 65 and over, the investigators determined weakness of subjects based upon handgrip strength, sex and BMI, with low handgrip strength classified as $\leq$20th percentile. (Cesari et al., 2006).

In their study to construct and operationalize a phenotype for frailty, Fried et al. (2001) established unintentional weight loss, weakness, exhaustion, slowness, and low activity levels as the five characteristics of frailty. The authors operationalized weakness as it relates to frailty by providing cut-points for handgrip strength (Fried et al., 2001). According to the authors, weakness is indicated by the lowest 20%, which is adjusted for sex and body mass index.

In a study by Alley et al. (2014) to determine handgrip strength cut-points, which classify weakness related to mobility impairments, the authors examined data from 20,847 subjects (males = 9897; females = 10,950) participating in various studies on aging. The authors reported most studies used the Jamar dynamometer for handgrip strength assessments and utilized the maximum strength recorded for either hand for analysis (Alley et al., 2014). Additionally, most studies reviewed incorporated three measures for each hand in handgrip strength protocols (Alley et al., 2014). Alley et al. (2014) identified three cut-points for handgrip strength for men and women, establishing them at normal (males $\geq$32 kg; females $\geq$20 kg), intermediate (males < 32 kg; females < 20 kg), and weak (males < 26 kg; females < 16 kg). The authors found that cut-points that established subjects as weak were related to mobility impairment. These associations were based upon age, body mass index, height, and disease status and were found across subgroups (Alley et al., 2014).

Handgrip strength is a simple, reliable measure of muscle strength. Handgrip strength has served as a predictor of functional limitations and disability (Fujita et al., 1995; Ishizaki et al., 2000; Kuh et al., 2005, 2006; Rantanen et al., 1999, 2000; Sasaki et al., 2007). Although more research is required to establish handgrip strength as a single marker of frailty, the use of handgrip strength to determine weakness may assist health educators in identifying subjects at risk for loss of strength and mobility (Alley et al., 2014; Syddall et al., 2003). Since research indicates that muscle strength, as measured by handgrip strength, can be directly related to functional capabilities, a person's handgrip strength may be associated with health empowerment and intention to participate in physical activity (Gretebeck et al., 2007; Morley et al., 2002).

1.4. Relationship between the variables

Intention to participate in physical activity may be influenced by health empowerment and muscle strength. The K-HES is a measure of health empowerment and includes measures self-efficacy and self-control that are evaluated through five subscales including problem solving, obtaining support, decision making, motivation, and psychosocial coping (C. Park and Y. Park, 2013). The tenets of control and self-efficacy encompass the five subscales of the K-HES. Problem solving, decision making, obtaining support, motivation, and psychosocial coping are health behaviors representing behavioral, normative, and control beliefs necessary for an overall sense of perceived control and self-efficacy related to health (Ajzen, 1991; Bandura, 1977; Katula et al., 2006; Menon, 2001, 2002; Shearer, 2007, 2009). Fulfillment of each subscale within the individual transforms health empowerment from a process to an outcome, which may result in improved health status and self-care (Anderson et al., 2003; Menon, 2001, 2002; Shearer et al., 2012).

Health empowerment is multidimensional and includes self-efficacy, self-control, and the relationships of individuals between healthcare providers, healthcare systems, and healthcare services (Funnell et al., 1992; Menon, 2001, 2002; C. Park and Y. Park, 2013). Intention to perform a behavior is also multidimensional and may be influenced by multiple factors including attitude, subjective norm, and perceived behavioral control. Thus, it is logical to conclude the multidimensional concept of health empowerment, which incorporates the key behaviors necessary to achieve self-control and self-efficacy, may influence the multidimensional construct of intention to participate in physical activity.

Handgrip strength, as a measure of muscle strength, may also influence intention to exercise because of the functional limitations that often accompany weakness (Fried et al., 2001; Xue et al., 2008). Ajzen (1985) provides the following explanation: “Prediction of behavior from intention at the aggregate level is often remarkably accurate,” with one exception (p. 48). This exception includes the effect of an external factor or event, which, according to Ajzen (1985), may reduce intention to perform a behavior. Thus, handgrip strength may serve as an external factor that influences intention to participate in physical activity.

2. Methods

2.1. Sample participants

Participants in this study were recruited from a local independent living facility and local senior center organizations. Two respondents' surveys contained had missing data resulting in exclusion from the study. Thus, this study had a sample of 103 participants.

2.2. Instrumentation

This study included three types of self-report instrumentation including demographics, the K-HES (C. Park and Y. Park, 2013), and intention to participate in regular physical activity (Fishbein and Ajzen, 2010). Handgrip strength, as a measure of muscle strength, consisted of a physical assessment. Demographics included the following: age, sex, marital status, ethnicity, education, types of chronic disease, and current level of participation in physical activity.

Permission was obtained from the original authors to utilize the K-HES to measure health empowerment among community-dwelling older adults (C. Park and Y. Park, 2013). The authors provided the Korean version of the K-HES and their English translation of the

instrument. The K-HES consists of eight Likert-type scale items ranging as follows: 5 = strongly agree; 4 = agree; 3 = neither agree nor disagree; 2 = disagree; 1 = strongly disagree.

Intention to participate in regular physical activity was measured by a 5-item Likert-type probability scale ranging as follows: 5 = extremely likely; 4 = likely; 3 = neither likely nor unlikely; 2 = unlikely; 1 = extremely unlikely (Ajzen, 2006; Ajzen and Fishbein, 1980; Vallance et al., 2012). According to Ajzen and Fishbein (1980), intentions are more stable predictors of behavior when measured in short periods of time. For the purpose of this study, intention to participate in regular exercise was given the time frame 'within the next two months'. The two-month time period was utilized effectively in a previous study examining functional ability and intention to participate in physical activity by Gretebeck et al. (2007). Each intention statement was developed according to guidelines established by Ajzen and Fishbein (1980) and Fishbein and Ajzen (2010).

Handgrip strength was measured using the JAMAR adjustable hydraulic hand dynamometer, model J00105 (Lafayette Instrument Company, USA). This study assessed both hands, alternating hands for each trial. The measurements were recorded in kilograms of force. Administrators of the assessment noted the dominant hand. Alley et al. (2014) established handgrip strength cut points for males and females, classifying cut points as normal (males > 32 kg; females > 20 kg), intermediate (males < 32 kg; females < 20 kg), and weak (males < 26 kg; females < 16 kg).

2.3. Data analysis

All data for this study was analyzed using IBM SPSS statistical software. Initial data analysis included screening for missing data, outliers, and straight lining (Warner, 2008). Demographic variables were reported using descriptive statistics. Stepwise multiple regression analysis was used to evaluate the association of health empowerment and muscle strength on intention to participate in regular physical activity. Data were screened for outliers and no assumptions were violated. Since using stepwise multiple regression allows for the determination of the level of contribution for each independent variable, this methodology was used for this study (Warner, 2008).

Approval was obtained from the Institutional Review Board before the implementation of the study. Participants signed a written Informed Consent outlining the purpose of this research and the potential risks associated with participation.

3. Results

Results of study participants' responses to the requested information involving demographic characteristics and medical conditions are delineated in Tables 1 and 2, respectively.

3.1. Descriptive statistics for the sample and participation in physical activity

The sample for this study included community-dwelling older adults (Age ≥ 60; Male = 42; Female = 61). The majority of participants in this study (84.5%) reported participation in regular physical activity as defined by the World Health Organization (2015) and the CDC (2014).

3.2. Descriptive statistics for the K-HES

The K-HES is an 8-item Likert-type instrument used to determine level of health empowerment. Mean and standard deviation was calculated for each item of the K-HES and are depicted in Table 3. The total mean K-HES score was 4.19 (*SD* = 0.579). Participant responses to K-HES items ranged from 4.04 to 4.30 (*SD* ± 0.579–0.853, respectively).

Table 1
Demographic characteristics of participants.

Characteristics	*n*	%
Age (yr)		
60–69	30	29.1
70–79	27	26.2
80–89	36	35.0
≥90	10	9.7
Sex		
Male	42	40.8
Female	61	59.2
Marital Status		
Married	62	60.2
Single	4	3.9
Divorced	10	9.7
Widowed	26	25.2
Ethnicity		
White not Hispanic	101	98.1
Asian or Pacific Islander	1	1.0
Other	1	1.0
Education		
High School/GED	20	19.4
Associates Degree/Some College	15	14.6
Bachelor's Degree	38	36.9
Master's Degree	13	12.6
Advanced Graduate Study: Ph.D., M.D., etc.	16	15.5
Other	1	1.0

Note. $N = 103$; M age = 76.45 ± 9.395.

Table 2
Medical conditions reported by participants.

Characteristics	*n*	%
Heart Attack	4	3.9
Transient Ischemic Attack	5	4.9
High Blood Pressure	48	46.6
Stroke	3	2.9
Neuropathies	13	12.6
Parkinson's Disease	1	1.0
Multiple Sclerosis	0	0.0
Polio/Post-polio Syndrome	0	0.0
Epilepsy	0	0.0
Other Neurological Conditions	4	3.9
Osteoporosis	27	26.2
Rheumatoid Arthritis	8	7.8
Other Arthritic Conditions	37	35.9
Cancer	38	36.9
Respiratory Disease	12	11.7
Diabetes	11	10.7
Heart Disease	17	16.5
Other Chronic Condition	17	16.5

Note. $N = 103$; M age = 76.45 ± 9.395.

3.3. Descriptive statistics for handgrip strength

Handgrip strength is a continuous scale measure and was utilized in this study to measure level of frailty among participants. Handgrip strength was measured for each hand, with the highest recorded score used for analysis. Participant handgrip strength scores ranged from 11 to 60 kg. More specifically, male handgrip strength ranged from 22 to 60 kg. Female handgrip strength ranged from 11 kg to 36 kg.

Participants demonstrating normal strength consisted of 26 (61.9%) males and 33 (54.1%) females. Study participants exhibiting intermediate strength included 15 (35.7%) males and 22 (36.1) females. Participants classified as demonstrating weak handgrip strength included 1 (2.4%) males and 6 (9.8%) females.

3.4. Descriptive statistics for intention to participate in physical activity

Intention to participate in physical activity was measured utilizing a 5-item Likert-type scale ranging from *extremely unlikely* to *extremely*

Table 3
Descriptive statistics for Korean Health Empowerment Scale.
Adapted from "Validity and Reliability of Korean Version of Health Empowerment Scale (K-HES) for older adults," by C. Park and Y. Park, 2013, Asian Nursing Research, 7(3), pp. 142–148.

Item Content	Mean ± SD
In general, I believe that I know what part(s) of taking care of my health that I am dissatisfied with.	4.04 ± 0.827
I can set up a plan to achieve health care goals.	4.20 ± 0.784
I can try out various ways to overcome hurdles to my health care goals.	4.22 ± 0.726
I have some health problems but can find ways to be positive.	4.31 ± 0.817
I know a positive method to cope with stress related to my health care.	4.07 ± 0.832
I can ask for support for taking care of my health when I need it.	4.30 ± 0.826
I know what helps me stay motivated to take care of my health.	4.17 ± 0.853
As I am well aware of myself, I can select a health care method suitable for me.	4.24 ± 0.734
Total	4.19 ± 0.579

Note. $N = 103$.

likely. The scale exhibited a high level of internal consistency, as indicated by a Cronbach's alpha of 0.903. A majority of the study participants indicated an extremely strong likelihood to participate in physical activity with scores ranging from 50.5% to 71.8% in the *extremely likely* category for all five items. The mean score for all items was 4.43 ± 0.888.

3.5. Inferential data analysis

A stepwise multiple regression was performed to examine the potential for determining an association of health empowerment and muscle strength, as measured by handgrip strength, on intention to participate in physical activity among older adults. Means and standard deviations for variable responses were calculated in aggregate for each variable. Health empowerment was measured using the K-HES, an eight-item Likert-type scale with potential scores ranging from eight to 40 points. Average scores for the K-HES are represented by a range from 22.24 to 25.40. Participants' mean score for the K-HES was 33.55 ($SD = 10.66$), indicating a majority of participants reported above-average levels of health empowerment. Handgrip was used to determine muscle strength. The mean handgrip strength score was 28.99 ($SD = 10.66$). Intention to participate in physical activity was measured using a five-item Likert-type scale. The mean participant response to intention to participate in physical activity was 21.72 ($SD = 4.44$). This score indicates a majority of participants intended to participate in physical activity.

Findings indicated health empowerment explained a significant ($p < .001$) amount of the variance in the intention to participate in regular physical activity ($F(1,101) = 30.511$, $p < .001$, $R^2 = 0.232$, $R^2_{Adjusted} = 0.224$). Thus, health empowerment significantly ($\beta = 0.482$, $t(100) = 5.524$, $p < .001$) correlated with intention to participate in regular physical activity among community-dwelling older adults participating in this study (Table 4).

Results indicated a significant and positive association ($\beta = 0.482$, $t(100) = 5.524$, $p < .001$) between health empowerment and intention to participate in regular physical activity among community-dwelling older adults. The positive slope for health empowerment as a predictor of intention to participate in regular physical activity indicated that there was approximately a 0.5-point increase in intention to participate in regular physical activity for each 1-point increase in health empowerment (Table 4).

Results of the analysis indicated that handgrip strength, as a measure of muscle strength, did not significantly ($p = .340$) predict intention to participate in regular physical activity among community-dwelling older adults ($\beta = 0.084$, $t(100) = 0.96$). Thus, handgrip strength did not associate with intention to participate in regular physical activity among participants in this study.

4. Discussion

Utilizing the theory of planned behavior as a theoretical framework (Ajzen, 1985, 1991), the purpose of this study was to examine the potential association of health empowerment and handgrip strength, as a measure of muscle strength, on intention to participate in regular physical activity among community-dwelling older adults. Participants were mostly white; most reported having at least a bachelor's degree, and most reported being married. The majority of participants in this study reported participating in regular physical activity. There were three self-report instruments utilized in this study including demographics, the K-HES, and intention to participate in physical activity. Trained administrators assessed handgrip strength, as a measure of muscle strength.

The overall mean K-HES score for participants was above average, suggesting that participants felt capable of taking care of their health care needs. This above average mean was also true for all subscales of the K-HES, including self-control, self-efficacy, problem solving, decision making, psychosocial coping, obtaining support, and motivation (C. Park and Y. Park, 2013). Participants in this study, however, indicated a high level of education, which is often associated with better health, and thus, results should be interpreted with caution (Rhodes et al., 1999).

The findings indicated health empowerment was significantly and positively associated with intention to participate in physical activity. Health empowerment explained 23.2% of the variance on intention to participate in physical activity. Handgrip strength, as a measure of muscle strength, however, did not significantly associate with intention to participate in physical activity. Despite the lack of significance for handgrip strength on intention to participate in physical activity, the model was supported as a result of the significance found for health empowerment and intention to participate in physical activity (Fishbein and Ajzen, 2010).

4.1. Future directions and limitations

Since the K-HES is a relatively new instrument, there have been no prior studies examining health empowerment using the K-HES (C. Park

Table 4
Stepwise multiple regression summary of model coefficients and analysis for health empowerment and intention to participate in physical activity among community-dwelling older adults.

Predictor Variable	Cumulative R^2	Adjusted R^2	F	β	SE	Beta	p
Intercept				6.23	2.82		
Health Empowerment[a]	0.232	0.224	30.511	0.461	0.224	0.482	0.000*

Note. Dependent variable is intention to participate in physical activity. β = unstandardized regression coefficient; SE = standard error of the coefficient; Beta = standardized coefficient.
[a] $N = 103$.
* $p < .05$.

and Y. Park, 2013). The subscales the K-HES measures, however, appear to align with the tenets of the TPB, which include behavioral beliefs, normative beliefs, and control beliefs (Ajzen, 1985, 1991, 2006). Previous research has found associations between the constructs of the TPB, self-efficacy, and intention to participate in physical activity (Barg et al., 2012; Ghahremani et al., 2012; Gretebeck et al., 2007). The positive association between health empowerment and intention to participate in physical activity suggests fulfillment of the subscales of the K-HES potentially contributes to positive health behaviors. Future research should examine the potential associations between all tenets of the TPB and the subscales measured by the K-HES.

There was no significance found in this study for the association of handgrip strength, as a measure of muscle strength, on intention to participate in physical activity. There is limited research on this topic and findings related to such vary. Additionally, populations examined in previous research investigating older adults and intention to participate in physical activity consisted of frail participants or post-acute hospital patients, while a majority of participants in the present study were not frail (Benjamin et al., 2005; Buttery and Martin, 2009). Future research should examine handgrip strength and intention to participate in physical activity using a larger sample more representative of the general population of older adults. In addition, weak older adults exhibiting low muscle strength in the present study reported lower health empowerment scores than their peers that were deemed not weak. A majority of weak participants also reported participating in regular physical activity. Future research should explore these results and replicate this research to determine what types of interventions may be developed to assist older adults in preventing and reversing muscle weakness.

A limitation may be that health empowerment serves as a mediating variable to intention to participate in regular physical activity. While the data analysis allowed for the determination of associations between variables, we are unable to prove causality and thus, further research exploring this possibility is required.

Limitations to this study included the sample population, which was mostly white, highly educated, and married. Three of the instruments used in this study were self-reported, relying on participant interpretation and honesty in completing the items. Trained administrators assessed handgrip strength, as a measure of muscle strength, and thus, there was the potential for human error. Future research should include study replication with a larger sample size representing the older adult general population. The K-HES should continue to be utilized and applied in the American culture. Lastly, Ajzen (1985, 1991, 2006) explains that intention is the antecedent to actual performance of behavior. Future research should examine the relationships between health empowerment, handgrip strength, intention to participate in physical activity, and actual participation in regular physical activity.

5. Conclusions

The present study's findings reflect the potential of the K-HES to measure health empowerment among the older adult American population. The K-HES as a measure of health empowerment provides health educators with the means to examine health empowerment among individuals as a whole, including the tenets of self-control and self-efficacy, and through specific subscales, including problem solving, decision-making, obtaining support, psychosocial coping, and motivation. Determination of low scores in any one subscale may indicate the need for an intervention addressing that specific subscale in hopes of improving health empowerment scores and resulting in overall positive health behavior outcomes.

Author contributions

K.A. Caillouet planned the study, analyzed the data, and wrote the paper. L. Cosio Lima assisted with planning the study and revising the manuscript.

Acknowledgements

The authors would like to thank Dr. F. Stephen Bridges, Dr. Carla Thompson, and Dr. Rodney Guttmann for their assistance in the development, implementation, and completion of this project.

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