

Physical Activity Promotion for Older Adults in Extension through Domestic and International Efforts

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Abstract

The Land-Grant University Cooperative Extension (herein: Extension) system has been an underutilized resource for physical activity programming. With the recent addition of physical activity as a focus of Extension work, efforts are needed improve dissemination and implementation of evidence-based physical activity interventions. Improving implementation requires overcoming limitations including institutional support and perceptions of Extension health educators who could develop, deliver, and evaluate these programs. A participatory approach that includes input at all delivery levels (program participants, delivery agents, and administrators) can aid implementation through considering program acceptability, appropriateness, and feasibility from the beginning. This dissertation includes three manuscripts that explore the Extension's role in promoting physical activity in older adults, both in the United States and abroad. Manuscript 1 detailed a systematic review of community-based older adult physical activity programs that was conducted in order to determine the characteristics of effective older adult physical activity programs and the extent to which programs implemented in Extension systems nationwide employ these characteristics. The results indicated notable differences between peer-reviewed literature and Extension programs as well as presented an opportunity for Extension programs to more effectively use evidence-based program characteristics, including behavioral theories and group dynamics. The results also suggested that Extension programs could more effectively report their findings through peer-reviewed sources so that effective programs can be disseminated to reach a broader population. Manuscript 2 was an exploratory study conducted as a first step in bringing older adult physical activity programming to Ghana through Extension. Results of the mixed-methods study suggested that older adults in Ghana have mostly positive perceptions of physical activity and would be receptive to an in-person physical activity program. In particular, without specific prompting on principles of group dynamics, across all focus groups, participants mentioned aspects of groupness ranging from the need for accountability to the enjoyment of exercising with others. The results also indicated a need for education on Ministry of Health physical activity recommendations and how to meet them. These findings can be used as the first step to adapting and delivering an evidence-based intervention in Ghana through an integrated research-practice partnership. This approach includes community-level decision making to ensure the resultant program is a good fit in the intended delivery system. Manuscript 3 detailed the translation of an evidence-based older adult physical activity program to an Extension system in a rural state (population 585,501). Results suggested that Extension health educators have overall positive perceptions of physical activity programming, but they experience barriers in delivering these programs. While the program has the potential to reach a representative sample of the population, the adoption rate among Extension health educators was low, and system-wide changes may be needed to improve physical activity program adoption rates among educators. Overall, results of the three manuscripts provided evidence and recommendations for Extension professionals to improve physical activity program implementation through using evidence-

based interventions and characteristics, considering perceptions of end users prior to program implementation, and considering system-level changes that promote physical activity program adoption.

General Audience Abstract

The United States Department of Agriculture funds a national Cooperative Extension system. This system brings Land-Grant University evidence to the people. Physical activity was recently added as a focus of Extension programming, but work is needed improve the dissemination and implementation of evidence-based physical activity interventions. To improve implementation, barriers such as institutional support and perceptions of Extension professionals need to be addressed. A shared decision-making approach that includes input from multiple groups (those who participate in programs, teach or organize programs, and make decisions about programs) can help with implementation. This approach considers program acceptability, appropriateness, and feasibility from the beginning. This dissertation includes three manuscripts about promoting physical activity in older adults through Extension. This work takes place both in the United States and abroad. Manuscript 1 was a review of older adult physical activity programs that are based in communities. It identifies traits of programs that are shown to be effective. This is compared to similar programs done through Extension throughout the U.S. Results demonstrated differences between effective programs with published results and programs done through Extension. Extension could be more effective by using program characteristics that are backed up by evidence. This included using theories that explain how people change their behavior and using group strategies. Results also suggested that Extension programs could do better publishing their results so others can learn about them. Manuscript 2 was a study about perceptions of physical activity among older adults in Ghana. Results of the surveys and group interviews suggested that older adults in Ghana have mostly positive perceptions of physical activity and that they would like an in-person physical activity program. Participants were especially interested in a group-based program. In each focus group, participants shared the need for accountability and that they enjoyed being active with friends and family. The results also showed a need for education on government physical activity guidelines and how to meet them. These findings can be used as the first step to adapting and delivering a physical activity program in Ghana through a partnership between researchers and those who will teach or organize the program. This approach includes community-level decision making to make sure the program is a good fit in the intended delivery system. Manuscript 3 was a study about bringing an effective older adult physical activity program to Extension in a rural state (population 585,501). Results suggested that Extension health educators have positive views of physical activity programs, but they perceive barriers in delivering these programs. The program that was studied reached older adults who needed it, but most Extension health educators did not want to deliver the program. Changes to the Extension system may be needed to help more educators deliver physical activity programs. Overall, results of the three manuscripts provided evidence and suggestions for Extension staff to improve physical activity program implementation through using evidence-based programs and characteristics, thinking about the perceptions of end users prior to starting a program, and making system-level changes that promote physical activity program adoption.

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Attributions

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Introduction

Physical Activity Promotion for Older Adults in Extension through Domestic and International Efforts

Background

Staying physically active can help older adults prevent chronic health problems and maintain independence,¹ but most of this population (age 65 and older) does not meet physical activity recommendations.² Community-based interventions are recommended to help Americans begin and continue regular physical activity,³ and the Cooperative Extension system (Extension) is one delivery system for these interventions. Extension, which is associated with each land-grant university of the U.S., has previously been an underutilized resource for physical activity programming. Extension was formed in 1914 to provide education in agriculture and home economics.⁴ Home economics (also called family and consumer science) programs focused on household issues, and have responded to the changing needs of American families throughout the years.⁴ Nutrition education programs have been included in Extension for several decades, initially as a home economics issue and now as a method of promoting a healthy lifestyle.⁴ However, to combat America's current public health concern of obesity and related chronic diseases, physical activity interventions are also needed.^{5,6}

Physical activity has only recently been added as a focus of Extension work. "Physical activity" was added to U.S. Agricultural Act of 2014 (the Farm Bill)⁷ and the 2014-2018 strategic plan of the National Institute of Food and Agriculture⁸ which authorizes and funds Extension, respectively.⁴ However, only 13 state Extension systems have a physical activity objective included in their strategic plans⁹, demonstrating a lack of institutional support for physical activity programming.

While support for physical activity efforts within Extension strategic plans is nascent, Extension professionals are ready to deliver physical activity programming.⁹ However, these Extension professionals also express notable limitations.^{10,11} Challenges relate to perceptions of

Extension educators (also called agents) who work in areas related to health and wellness (nutrition or family and consumer science). These educators serve as key determinants in physical activity program uptake, as they could potentially develop, deliver, and evaluate physical activity programs.¹² However, most of these educators feel that they do not have the training, qualifications, or support to effectively implement physical activity programs.^{10,11} A study in one state's Extension system found that educators also were hesitant to implement these programs as physical activity is not a part of their job descriptions.^{10,11} Aligning with the needs and resources of the educators is imperative for program uptake and sustainability to successfully implement evidence-based physical activity interventions.

One target population for Extension physical activity interventions is older adults. The population of older adults in the U.S. is expected to grow to 88.5 million by 2050,¹³ creating a need for health promotion in this population.¹⁴ Extension has identified adult development and aging as a focus area in order to meet the needs of older adults.¹⁴ Physical activity programs align with this target area, as they promote healthy aging. Staying physically active can help older adults prevent chronic health problems and maintain independence,¹⁵ but only 12% of this population (age 65 and older) meets physical activity recommendations of 150 minutes of aerobic intensity physical activity and two days of muscle- and bone-strengthening activities per week.¹ Community-based interventions are recommended to help Americans begin and continue regular physical activity.³ However, these interventions have not been widely adopted to reach target populations.¹⁶ Broader adoption could lead to a significant reduction in chronic disease and preventable deaths.¹⁶

Extension educators within many state systems are implementing community-based older adult physical activity programs. These programs aim to increase participants' physical activity

levels (L. Washburn, personal communication, February 28, 2017),^{17,18} improve social belonging,¹⁹ and reduce risk of falls and fractures (J. Strommen, personal communication, February 6, 2017),^{18,20-22} ultimately leading to a reduction in chronic disease and higher quality of life. However, it is unknown whether these programs are evidence-based, what setting-specific adaptations have been made, what the impact is on older adult behaviors. There is a need to determine characteristics of evidence-based older adult physical activity programs and the degree to which Extension programs employ these characteristics in order to increase Extension's impact on older adult health. While Extension may seem like a natural fit for integrating physical activity into existing communitywide programming and providing specific physical activity interventions, there are a number of research questions to be addressed.

Overview

This dissertation includes three manuscripts that explore the Cooperative Extension System's role in promoting physical activity in older adults. Manuscript 1 is a systematic review of the literature on community-based older adult physical activity programs conducted to determine characteristics of effective older adult physical activity programs and the extent to which programs implemented in Extension systems nationwide employ these characteristics. Manuscript 2 examines perceptions of physical activity and preferred program characteristics among older adults in Ghana, Africa. This exploratory study was conducted as a first step to adapting and implementing LIFT (Lifelong Improvements in Fitness Together), an evidence-based physical program for this population. Finally, Manuscript 3 explores the implementation of LIFT in University of Wyoming Extension through the RE-AIM (reach, effectiveness, adoption, implementation, and maintenance) framework.

Systematic Review of Older Adult Physical Activity Programs

The systematic review of community-based, open-access older adult physical activity programs was conducted by a county-based Extension health educator acting as a knowledge broker in order to select and implement an evidence-based program. While many different older adult physical activity programs exist throughout Extension nationwide, most do not have results reported in peer-reviewed sources, so their effectiveness and use of evidence-based practices is unknown. The systematic review was conducted by searching both peer-reviewed literature and grey literature (not formally published through academic sources) in order to capture programs implemented through Extension nationwide. The review identifies characteristics of effective programs, such as the use of behavioral theories, individual strategies, and group strategies; the frequency and duration of the program; the types of activities included; and the delivery personnel. These characteristics are compared to the characteristics of current Extension older adult physical activity programs to assess whether these programs are using evidence-based practices. This information can be used to encourage Extension Specialists and Educators nationwide to adopt evidence-based physical activity programs that include the identified characteristics. This can increase Extension's impact on the health of older adults nationwide.

Translating LIFT to Ghana

Ghana is a developing country experiencing a shift in public health issues. As the country becomes more urbanized and work becomes more sedentary, physical activity has decreased and obesity and chronic disease has increased. Older adult rates of inactivity are higher than other age groups, and no policies or programs are currently in place to promote healthy aging. To explore what physical activity programs would be acceptable and appropriate to this population, a mixed-methods study was conducted in three urban areas of Ghana. The results of the study can inform the next step in program adaptation and implementation through an integrated

research-practice partnership. This approach will involve practitioners who may eventually deliver or coordinate the program (e.g., faith community leaders and health care providers) to include local level decision making and ensure that the resultant program is a good fit for the setting.

Translating LIFT to Wyoming

Implementing LIFT in Wyoming has the potential to improve the health of older adults, as increased physical activity levels can prevent chronic disease. In addition, improvements in strength, balance, coordination, and flexibility can help older adults age in place.²³ Implementing LIFT may benefit disadvantaged populations, including older adults living on the Wind River Indian Reservation. This population experiences significant health disparities, including higher rates of cancer, heart disease, diabetes, and accidents compared to white residents of the state.²⁴ The Strong Women, Strong Bones program, a precursor to LIFT, was previously implemented through University of Wyoming Extension; however, the program has not officially been sustained. In order to implement LIFT and ensure that it is maintained within the system, several steps were taken. First, physical activity perceptions of Wyoming Extension Educators were investigated through a concurrent, mixed-methods approach. This assessed RE-AIM dimensions important for implementing LIFT. Due to educator interest, a “live” virtual training on LIFT was offered as a method of intervening to improve program adoption rates. The second portion of the study assessed how the training affected predictors of LIFT implementation, stage of change, and positive intent to deliver LIFT. Following the training, the third portion of the study evaluated the program through the reach, adoption, and maintenance RE-AIM dimensions. Due to low adoption rates, a follow-up survey was also administered to both adopters and non-adopters as

well as Extension administrators. The survey assessed implementation outcomes (acceptability, appropriateness, and feasibility) which may influence program adoption and maintenance.

Overall, these three studies will inform the future of evidence-based older adult physical activity programs implemented in Extension, both domestically and internationally. The results will allow Extension to better disseminate evidence-based interventions to educators. Extension systems will then achieve more behavior change and improve health of their constituents through these interventions.

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Manuscript One

Open-Access Physical Activity Programs for Older Adults: A Pragmatic and Systematic Review

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Abstract

Background and Objectives: Open-access, community-based programs are recommended to assist older adults in meeting physical activity guidelines, but the characteristics, impact, and scalability of these programs is less understood. The Land-Grant University Cooperative Extension System, an organization providing education through county-based educators, functions as a delivery system for these programs. A systematic review was conducted to determine characteristics of effective older adult physical activity programs and the extent to which programs delivered in Extension employ these characteristics.

Research Design and Methods: A systematic review of peer-reviewed and grey literature was conducted from August 2016 to February 2017. The review was limited to open-access (available to all), community-based physical activity interventions for older adults (≥ 65 years of age). The peer-reviewed literature search was conducted in PubMed and EBSCOhost; the grey literature search for Extension interventions was conducted through Extension websites, Land-Grant Impacts, and the Journal of Extension.

Results: Sixteen peer-reviewed studies and 17 grey literature sources met inclusion criteria and were analyzed. Peer-reviewed and Extension programs were similar in their limited use of behavioral theories and group-based strategies. Compared to Extension programs, those in the peer-reviewed literature were more likely to use a combination of physical activity components and be delivered by trained professionals.

Discussion and Implications: The results indicate notable differences between peer-reviewed literature and Extension programs and present an opportunity for Extension programs to more effectively use evidence-based program characteristics, including behavioral theories and group dynamics, a combination of physical activity components, and educator/agent-trained delivery agents.

Background and Objectives

The disease-preventing benefits of physical activity are well established.^{1,2} For older adults in particular, staying physically active leads to a decreased risk of chronic diseases including heart disease, type 2 diabetes, cancer, obesity, hypertension, osteoarthritis, osteoporosis, and depression.¹⁻³ Older adults (age 65 and older) experience high rates of chronic diseases: 37 percent of this population has heart disease,⁴ 25 percent has diabetes,⁵ and 35 percent are obese.⁶ By preventing these chronic diseases and slowing the progression of existing conditions, engaging in regular physical activity can increase both overall life expectancy and active life expectancy, that is, years of life free of significant disease or disability.⁷ Engaging in physical activity can decrease risk of falls,^{3,8} help older adults maintain their independence,⁹ and avoid costly hospital and nursing home stays that can become life threatening.¹⁰

In addition to preventing chronic diseases, physical activity is also beneficial for those who have been diagnosed with a chronic disease. Through engaging in physical activity, those with cardiovascular disease can decrease their risk of cardiac events and premature death, while those with type 2 diabetes can better control their blood sugar levels.² Physical activity has been shown to be safe for these populations as long as individuals follow physicians' guidelines, which may include limiting certain types of activity.⁸ A physical activity plan with both therapeutic (to treat the existing condition) and preventive (to prevent other chronic conditions from developing) activities is recommended, as "virtually all older adults should be physically active."⁸

The Centers for Disease Control and Prevention recommends that older adults engage in 150 minutes of moderate-intensity aerobic activity (or 75 minutes of vigorous-intensity aerobic activity, or an equivalent combination of both) and two sessions of muscle-strengthening

activities (targeting major muscle groups) per week.⁹ However, only 12% of the population fully meet these recommendations,¹¹ indicating a large gap between recommendations and practice. This research to practice gap leads to billions of healthcare dollars spent on preventable treatments for older adults. These costs may continue to rise as the number of Americans who are 65 years of age and older is expected to increase to 88.5 million by 2050.¹² Disseminating and implementing interventions that help older adults meet recommendations is imperative to reduce rates of chronic disease and decrease healthcare costs; particularly through the federally funded Medicare system.

Community-based physical activity interventions are recommended by the Task Force on Community Preventive Services to help Americans increase physical activity levels.^{13,14} Compared to programs implemented in traditional health care settings, community-based programs have greater access and reach¹⁵ as they target individuals in their natural settings (social groups or geographic areas).¹⁶ Community-based programs are especially important for older adults, as they can address the many barriers to physical activity (e.g. fatigue, existing health problems, and lack of motivation) experienced by this population while also addressing concerns of social isolation.^{13,17,18} Finally, as many of these programs are free or low cost, they can reach limited income populations and improve health equity. However, many evidence-based, community-based programs have restrictions based on participant eligibility (e.g., having a chronic disease)^{19,20} or membership requirements (e.g., YMCA).^{19,21} “Open-access” programs go one step beyond “community-based” and is operationalized as unrestricted use and available to all. This distinction is important as not all open-access programs are community-based, nor are all community-based programs open access. The key principle of open-access, community-based

programs is that they are delivered in community settings and any older adult can participate, regardless of membership, residency, race, ethnicity, or chronic disease restrictions.

One delivery system for these open-access, community-based programs is the land-grant university Cooperative Extension System. Extension is a nationwide network of organizations that bring research-based information to residents of each state and territory through informal, community education, reaching millions of people throughout the country.²² Extension has not historically had a focus on physical activity programming, as it historically has roots in agriculture education and home economics. However, physical activity was recently added to the U.S. Agricultural Act of 2014 (the Farm Bill) that authorizes Extension,²³ and is included in the 2014-2018 strategic plan of the National Institute of Food and Agriculture,²⁴ which funds Extension.²³

Extension educators nationwide implement community-based older adult physical activity programs which, in alignment with Extension's mission, are open to the public. These programs aim to reduce chronic disease and improve quality of life by targeting a variety of outcomes, including increasing participants' physical activity levels,^{25,26} improving social belonging,²⁷ and reducing risk of falls and fractures (J. Strommen, personal communication, February 6, 2017).^{26,28-30} The Extension system's work to implement physical activity programs is often done in silos rather than as a nationwide system; see the supplemental reference list (Appendix D) for information on the programs being implemented across the country.

As physical activity is a relatively new programming area for Extension, educators may not have the experience or resources needed to select and adopt evidence-based programs.³¹ It is unknown if programs implemented through Extension are evidence-based, i.e. shown to be effective through at least one peer-reviewed study.³² Adopting evidence-based programs rather

than individually developed programs ensures that programs are effective for the target population and eliminates the time required to develop a new program.^{33,34} Evidence-based programs have the potential to be more cost effective to deliver and can be more accurately evaluated.^{33,34}

These evidence-based physical activity interventions feature certain characteristics that lead to positive behavioral outcomes. Community-based physical activity programs recommended by the Task Force on Community Preventive Services use behavioral strategies including providing support for reaching physical activity goals, monitoring progress and encouraging activity (e.g. through phone calls), goal setting, self-monitoring, creating social support, reinforcing behavior, problem solving, and relapse prevention.¹³ Most of the recommended interventions are also based on constructs from one or more health behavior change theory (e.g. Social Cognitive Theory,³⁵ Transtheoretical Model of Change³⁶).¹³ In addition, several recent reviews of physical activity interventions also found social support, use of behavior change theory, goal setting, and self-monitoring to be essential characteristics for behavior change.³⁷⁻³⁹ Taken together, the use of health behavior theories and constructs to change physical activity behaviors is well established in the literature.

However, implementing and sustaining evidence-based programs in the intended delivery systems remains problematic. Programs are often developed and tested in research trials but never fully adopted by public health practitioners in real world settings.³³ There are numerous reasons for this research to practice gap, including both dissemination (the innovation, communication channels, social systems, and time)⁴⁰ and implementation (acceptability, adoption, appropriateness, costs, feasibility, fidelity, penetration, and sustainability)⁴¹ factors. Furthermore, without packaging that is accessible and user-friendly, practitioners are unlikely to

have the information needed to implement evidence-based programs.⁴² Systematic reviews can synthesize information on interventions for easier translation to practitioner-friendly products⁴² for better dissemination throughout the Extension system.

Several systematic reviews that include characteristics of older adult physical activity interventions exist; however, none focus exclusively on open-access community-based programs. Conn, Minor, Burks, Rantz, and Pomeroy⁴³ and Chase⁴⁴ reviewed physical activity interventions in adults age 65 and up that were not specifically community-based. Other reviews focused on interventions targeting only frail older adults,⁴⁵ were specific to the time around retirement,⁴⁶ or included older adults younger than 65 years old.⁴⁷⁻⁴⁹ Moore, Warburton, O'Halloran, Shields, and Kingsley⁵⁰ did review community-based programs; however, community-based was not defined or used as a search term, so programs were not necessarily open-access. The review was also limited to programs that took place in rural or regional settings. This demonstrates a gap in the literature related to physical activity programs that are community-based, open-access, and target adults age 65 and older.

Therefore, the aim of this study was to systematically review both the peer-reviewed and grey literature (not formally published through academic sources)⁵¹ related to community-based older adult physical activity promotion interventions. This review was conducted to determine the characteristics of effective older adult physical activity programs and the extent to which programs delivered in Extension systems nationwide employ these characteristics in order to increase the impact of Extension programming on older adult health.

Research Design and Methods

Procedure for conducting review

A systematic review was completed by searching the databases PubMed and EBSCOhost for combinations of the search terms physical activity (or fitness or exercise or strength training) and community-based (or community-wide or communitywide). (See Appendix A.) Results were restricted to older adults (age 65 and older). Articles published before August 2016 and available in English were included. Programs were included if met all of the following: 1) had a physical activity, fitness, or exercise outcome (including subjective or objective measures); 2) were community-based/open-access (operationalized below); 3) included only participants age 65 years or older; and 4) the article reported pre and post evaluation data.

The operational definition of community-based/open-access was based on guidelines for Extension programs, which must provide equal access to all to comply with civil rights guidelines (U.S. Department of Agriculture, n.d.-b).⁵² Therefore, program participation could not be restricted based on: membership (to a fitness center, community housing, etc.); clinical affiliation; gender, race, or ethnicity; diagnosis of health conditions (such as programs designed for those with arthritis or who have fallen in the past year). Programs that restricted participants with health conditions for safety reasons (such as those with cardiac conditions or neurological limitations) were included. These eligibility criteria were chosen to increase generalizability of these findings as well as ensure similarity between programs identified by the review and those offered by Extension.

Older adult physical activity programs conducted in state Extension systems were identified through a systematic review of the grey literature through an adaptation of the protocols described by Godin, Stapleton, Kirkpatrick, Hanning, and Leatherdale⁵¹ and Mahood, Van Eerd, and Irvin.⁵³ First, targeted websites (Extension websites for each state and U.S. territory) were searched for any program matching our inclusion criteria by reviewing those

listed in relevant program areas (e.g. Nutrition and Physical Activity, Food and Health, Healthy Living and Families, Family and Consumer Sciences). Second, two Extension-specific grey literature sites were searched. Land-Grant Impacts, a database of published reports on Extension interventions, was searched for impact statements listed under the Nutrition & Health focus area with a Physical Activity tag that contained the search terms physical activity (or fitness or exercise or strength training) and older adult (or senior). The Journal of Extension (JOE), Extension's official refereed journal, was also searched with these search terms. (See Appendix A.)

Grey literature published by August 2016 and available in English were included, and followed similar eligibility criteria as the peer-reviewed literature. Interventions that *targeted* older adults rather than interventions that included *only* participants age 65 years or older were included as Extension interventions cannot discriminate on the basis of age.

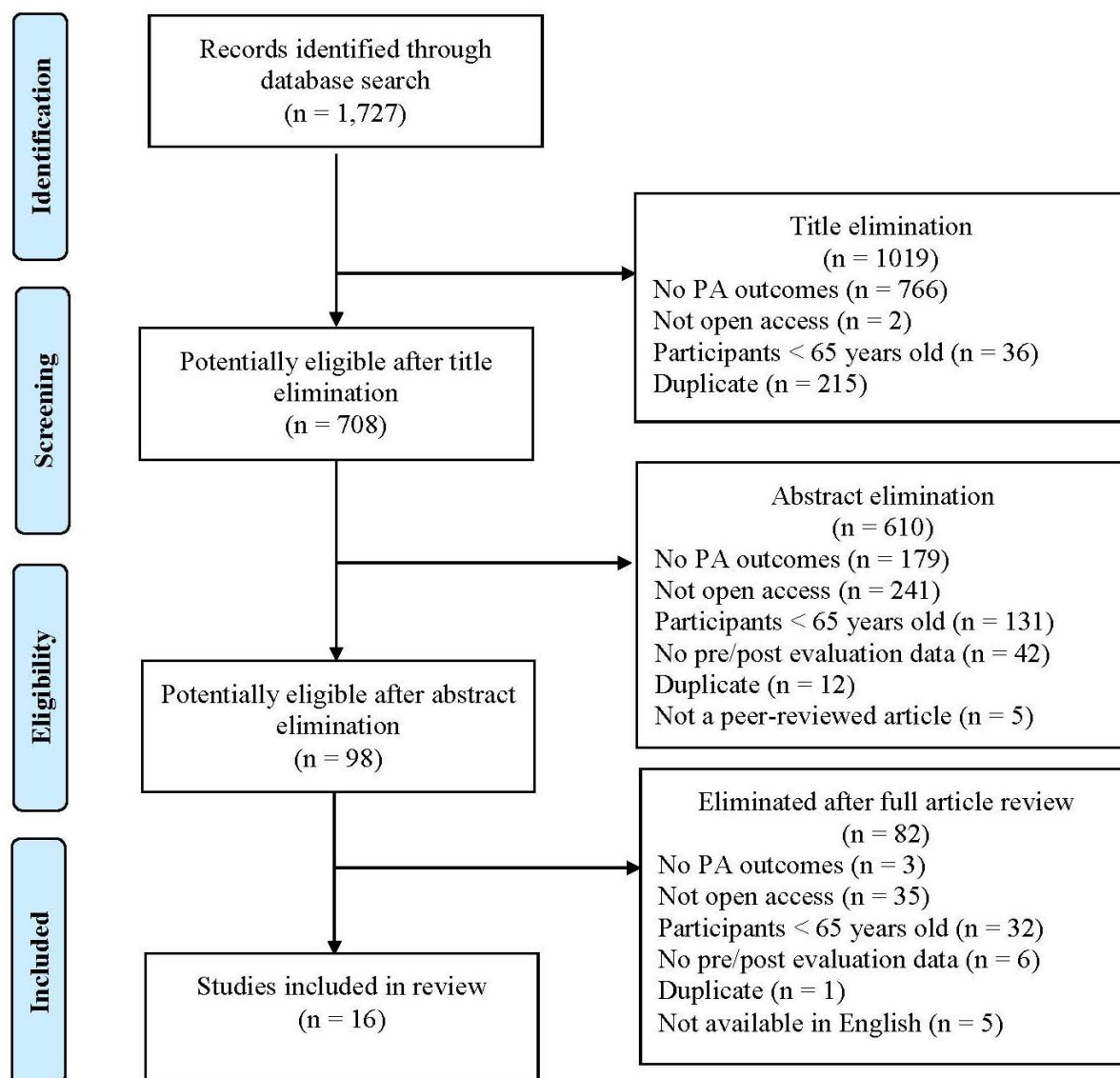
Grey literature sources that did not include pre and post data or the number of participants were further investigated. This systematic procedure was as follows: the lead author emailed the contact person for each intervention to explain the purpose of the study and request information; one follow-up email was sent after seven days without a response. If provided, the pre and post evaluation data or number of participants was included along with the original grey literature source.

Selection of studies for review

The initial search for peer-reviewed articles yielded 1,727 articles. The titles and abstracts of these articles were independently reviewed by two authors and 1,629 were excluded because they did not meet the inclusion criteria or were duplicates. The full text of the remaining 98 articles was assessed by two authors and an additional 82 were excluded because they did not

have a physical activity outcome (n = 3), were not open-access programs (n = 35), included adults younger than 65 years old (n = 32), did not include pre and post evaluation data (n = 6), were not available in English (n = 5), or was a duplicate (n = 1). This left 16 peer-reviewed articles which met inclusion criteria for this review. (See Figure 1.)

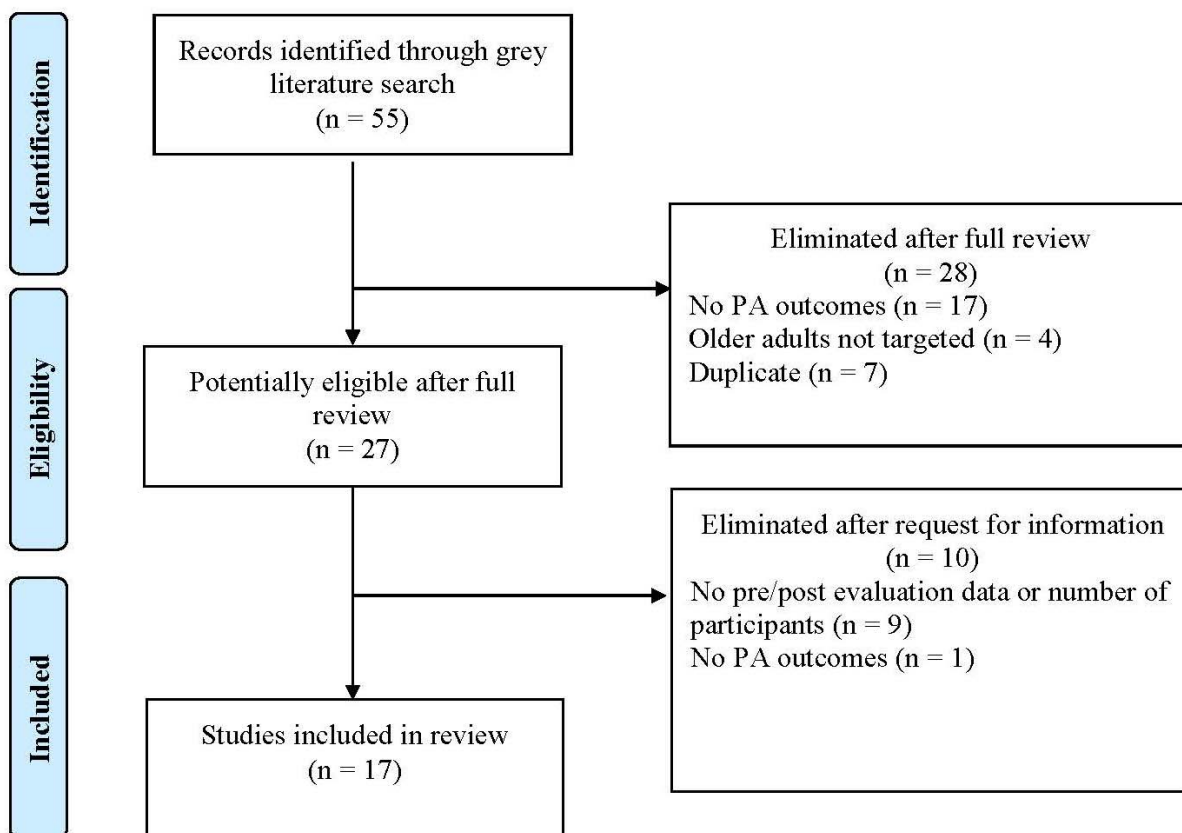
Figure 1. Eligibility and inclusion of peer-reviewed literature for open-access, community-based older adult physical activity programs.



The initial search of grey literature sources yielded 55 programs. The full text of these program websites, impact statements, or JOE articles was assessed by the first author and 28 were excluded because they did not have a physical activity outcome (e.g., a nutrition or aging program that mentioned physical activity but did not target it) ($n = 17$), did not target older adults ($n = 4$), or were duplicates ($n = 7$). Grey literature sources without pre and post evaluation data or number of participants were included until the program contact person could be emailed to request this information. This left 27 sources which potentially met inclusion criteria for the review. After contacting program personnel for additional program data, ten sources were excluded because they did not provide pre and post evaluation data or number of participants ($n = 9$) (see Appendix B for a list of these programs) or it was determined that there was no physical activity outcome ($n = 1$). This left 17 grey literature sources that met inclusion criteria for the review. (See Figure 2.)

Figure 2. Eligibility and inclusion of grey literature for older adult physical activity

Extension programs.



Data extraction and synthesis

A data extraction tool was developed based on Estabrooks, Harden, and Burke's systematic review on group dynamics⁵⁴ and focusing on a balanced understanding of internal and external validity of the program. The extraction tool included characteristics of the study design, intervention, delivery personnel, and sample, as well as research design and analysis features. Program characteristics include the use of behavioral theories or models, individual and group strategies, intervention functions,⁵⁵ the frequency and duration of the program, and the type of physical activity. As for delivery personnel, expertise, training, and personal characteristics were

explored. Sample characteristics included sex, age, body mass index (BMI), race, ethnicity, education level, and income.

The first and senior author coded two articles, then met to discuss and resolve discrepancies. Agreement between authors was 95%. Coding guide definitions were then refined based on items that were deemed unclear. The first four authors then coded three articles to determine inter-rater reliability; agreement between authors was 81%. The remaining studies were each independently coded by two authors. After the adjustments to the coding guide, agreement between authors was 88% across the 109 variables and 11 remaining studies.

Four items were most often discrepant between coders. Discrepancies were related to “contacts delivered face-to-face” because some manuscripts did not report how frequently and how long face-to-face program components were. “Other exercise delivery agent” was also often discrepant. This was due to determining if various delivery agents (such as “researchers and staff,” “physical trainers,” “trained instructors,” and “physical therapists”) should be included in the existing categories or considered “other.” See Appendix C for options from the coding guide. Discrepancies also existed with “physical activity measure type,” as there were differences between coders in determining which measures should be considered primary outcome measures. For example, if a study had functional fitness and self-report physical activity, discrepancies were resolved based on the definition used by the manuscript authors. Finally, “calculated attrition” was also often discrepant. Several articles did not clearly report sample sizes for both baseline and analysis, making it difficult to calculate attrition rates. Any discrepancies between coders were discussed and resolved to determine the final data used; discrepancies were resolved by consulting with the senior author. The grey literature sources

were coded by the first author and verified by the senior author; this procedure was used due to the much smaller amount of information to be extracted.

Results

Sixteen interventions from the peer-reviewed literature were analyzed. (See Table 1). All of the interventions are considered “programs,” as they include direct education. Four of the programs (25%) were conducted in the United States, while the remaining programs were conducted in Japan (31%), Taiwan (19%), Chile (6%), England (6%), Finland (6%), and Korea (6%). Programs ranged in duration from a one-time session to two years, with the average program lasting 25 weeks (± 32) with a total of 64 (± 86) face-to-face contact hours. Five of the programs included additional contact types: brochures ($n = 3$ programs, 19%), multimedia ($n = 1$ program, 6%), and phone calls ($n = 1$ program, 6%). The most common physical activity components were strength training ($n = 15$ programs, 94%), flexibility ($n = 13$ programs, 81%), and balance ($n = 12$ programs, 75%), while 14 of the programs (88%) included a combination of two or three of these components.

Six of the programs (38%) included individual behavioral strategies, while none of the programs included specific group-based strategies. Three of the programs (19%) were based on a behavioral theory or model: Social Ecological Model ($n = 1$ program, 6%), Social Cognitive Theory ($n = 1$ program, 6%), and Cognitive Evaluation ($n = 1$ program, 6%). As for delivery personnel, 14 manuscripts (88%) reported delivery agent type. The most common were exercise professionals ($n = 8$ programs, 50%) and physical therapists ($n = 4$ programs; 25%). None of the programs used lay or community-based educators. Two of the programs (13%) described the training strategy for the delivery personnel: “12 hours of training related to special issues in older adults and EF [EnhanceFitness] procedures and protocols”⁵⁶ and a “training course to be familiar

with the protocol and all the educational contents.”⁵⁷ Eleven of the programs (69%) reported positive outcomes, including increases in strength, balance, and functional mobility, and reductions in falls. The remaining reported no changes (n = 4; 25%) or negative impact (n = 1; 6%) on exercise outcomes.

Results for the grey literature identified 17 interventions in 15 states. These interventions also include direct education and are all considered “programs.” Four of the programs (24%) were based on a behavioral theory or model: Transtheoretical Model (n = 2 programs, 12%), Health Belief Model (n = 1 program, 6%), and Social Cognitive Theory (n = 1 program, 6%). Programs ranged in duration from a one-time session to one year, with the average program lasting 14 weeks (± 14). Five programs (29%) reported total face-to-face contact hours; the average of these was 18 hours (± 21). Five of the programs (29%) included one or more additional contact types: newsletters (n = 2 programs, 12%), handouts (n = 2 programs, 12%), internet (n = 1 program, 6%), and phone calls (n = 1 program, 6%). The most common physical activity components were strength training (n = 10 programs, 59%), balance (n = 4 programs, 24%), and flexibility (n = 3 programs, 18%) while four of the programs (24%) included a combination of two or three of these components.

Two of the programs (12%) included individual behavioral strategies, while one program (6%) included group-based strategies. As for delivery personnel, eight sources (47%) reported delivery agent type. The most common were Extension educators/agents (n = 4 programs, 24%), lay/para health educators (n = 3 programs, 18%), and community leaders (n = 3 programs, 18%). Six of the programs (35%) described the training strategy for the delivery personnel: “Trained through 10 day-long workshops. An “agent trainer” structure was developed, with 16 county FCS agents selected to serve as trainers across the state” (L. Washburn, personal communication,

February 28, 2017), “Completed five online modules at home and attended a 4- hr workshop,”²⁷ “The peer advocate trainer goes through a 1-day train-the-trainers workshop on how to implement Project Healthy Bones,”⁵⁸ “Master Trainers... facilitate at least one class leader training each year” (J. Strommen, personal communication, February 6, 2017), “Extension agents offered local training workshops and prepared... community leaders to teach Taking Charge workshops” (E. Bowen, personal communication, February 9, 2017), and “Strong Women™ Ambassador.... conducted training sessions” (A. Flickinger, personal communication, February 15, 2017). All of the programs reported positive outcomes, including increases in strength, flexibility, and balance, and decreases in fall risk.

Independent-samples t-tests were conducted to compare program duration and face-to-face contact hours in peer-reviewed literature and grey literature programs. There was no significant difference in program duration in effective peer-reviewed (M=28 weeks, SD=39) and grey literature (M=14 weeks, SD=14) programs; $p = 0.136$. There was also no significant difference in face-to-face contact hours in effective peer-reviewed (M=51, SD=51) and grey literature (M=18, SD=21) programs; $p = 0.059$.

Table 1. Older Adult Physical Activity Program Variables from Peer-Reviewed and Grey Literature

Variable	Peer-reviewed literature			Grey literature	Total
	Positive effects (n = 11)	Null results (n = 4)	Negative outcomes (n = 1)	Positive effects (n = 17)	(n = 33)
	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>	<i>M (SD)</i>
Duration	28 weeks (± 39)	25 weeks (± 19)	1 week	14 weeks (± 14)	21 weeks (± 25)
Face-to-face contact hours	55 hours (± 51)	96 hours (± 144)	3 hours	18 hours (± 21)	49 hours (± 75)
	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>	<i>N (%)</i>
Behavioral theory / model					
Social cognitive theory	0 (0)	1 (25)	0 (0)	1 (6)	2 (6)
Transtheoretical model	0 (0)	0 (0)	0 (0)	2 (12)	2 (6)
Health belief model	0 (0)	0 (0)	0 (0)	1 (6)	1 (3)
Social ecological model	1 (9)	0 (0)	0 (0)	0 (0)	1 (3)
Other theory	2 (18)	1 (25)	0 (0)	1 (9)	3 (9)
Combination	2 (18)	1 (25)	0 (0)	2 (12)	5 (15)
No theory	9 (82)	3 (75)	1 (100)	13 (76)	26 (79)
Physical activity components					
Strength	10 (91)	4 (100)	1 (100)	10 (59)	25 (76)
Balance	9 (82)	2 (50)	1 (100)	4 (24)	16 (48)
Flexibility	8 (73)	4 (100)	1 (100)	3 (18)	16 (48)
Walking	3 (27)	2 (50)	0 (0)	0 (0)	5 (15)
General aerobic	2 (18)	1 (25)	0 (0)	1 (6)	3 (9)
Mind-body	1 (9)	1 (25)	0 (0)	0 (0)	2 (6)
Other	1 (9)	0 (0)	1 (100)	4 (24)	6 (18)
Combination	11 (100)	0 (0)	1 (100)	5 (29)	21 (64)
Other contact types					
Brochure	0 (0)	2 (50)	1 (100)	0 (0)	3 (9)
Newsletters	0 (0)	0 (0)	0 (0)	2 (12)	2 (6)
Handouts	0 (0)	0 (0)	0 (0)	2 (12)	2 (6)
Phone calls	0 (0)	0 (0)	1 (100)	1 (6)	2 (6)
Posters	0 (0)	1 (25)	0 (0)	1 (6)	2 (6)

Video	1 (9)	0 (0)	0 (0)	0 (0)	1 (3)
Multimedia	1 (9)	0 (0)	0 (0)	0 (0)	1 (3)
Internet	0 (0)	0 (0)	0 (0)	1 (6)	1 (3)
Other	1 (9)	0 (0)	0 (0)	2 (12)	3 (9)
Combination	1 (9)	1 (25)	1 (100)	2 (6)	5 (15)
No additional contact types	9 (82)	2 (50)	0 (0)	12 (71)	23 (70)
Behavioral strategies					
Individual	3 (27)	2 (50)	1 (100)	2 (12)	8 (24)
Group-based	0 (0)	0 (0)	0 (0)	1 (6)	1 (3)
No behavioral strategies	8 (73)	2 (50)	0 (0)	15 (88)	25 (76)
Delivery personnel					
Exercise professionals	6 (55)	2 (50)	0 (0)	0 (0)	8 (24)
Physical therapists	3 (27)	0 (0)	1 (100)	0 (0)	4 (12)
Extension educators/agents	0 (0)	0 (0)	0 (0)	4 (24)	4 (12)
Lay/para health educators	0 (0)	0 (0)	0 (0)	3 (18)	3 (9)
Community leaders	0 (0)	0 (0)	0 (0)	3 (18)	3 (9)
Other	2 (18)	3 (75)	1 (100)	6 (35)	7 (21)
Multiple types	1 (9)	1 (25)	1 (100)	4 (24)	7 (21)

Discussion and Implications

The purpose of this review was to explore key characteristics of open-access, community-based physical activity programs for older adults. As a summary, the older adult physical activity programs included outcomes of increasing strength, improving balance, decreasing falls/risk of falls, or increasing physical activity levels; were *not* based on behavioral theories and do *not* include behavioral strategies; were conducted over an average of 20 weeks with 40 face-to-face contact hours; included strength training; did *not* include additional contact types (e.g. brochures or multimedia); and were delivered by a variety of personnel (exercise professionals, Extension educators, physical therapists, lay/para health educators, and community leaders). Overall, the results indicate several differences and similarities between effective older adult physical activity programs in peer-reviewed literature and Extension programs identified in the grey literature. The results also lead to recommendations for Extension programs to more effectively use evidence-based characteristics in their programming and to more effectively report their findings. In addition, as no previous systematic reviews of community-based, open-access programs exist, the effective characteristics will be compared to those found in existing reviews of older adult physical activity programs.

Extension programs and peer-reviewed literature programs differed in their duration, face-to-face contact hours, physical activity components, and delivery personnel. Extension programs were shorter duration with fewer face-to-face contact hours than peer-reviewed literature programs. Although the difference was not significant, it is expected that the difference may have been significant with a larger sample. The results suggest that both types of programs can vary widely in their duration and face-to-face contact hours. Previous systematic reviews, while not specific to open-access, community-based interventions, found program duration

varied widely^{43,49,50} and that there was no relationship between duration or contact hours and program effectiveness.^{44,48} This suggests that further research is needed on the minimum program duration required to achieve physical activity outcomes.

Extension programs were also less likely to use a combination of physical activity components (e.g. strength, balance, and flexibility). Previous systematic reviews suggest that multi-component physical activity programs are more effective for preventing falls⁴⁷ and maintaining activities of daily living in frail older adults.⁴⁵ King et al. found that many of the effective programs in their systematic review (of older adults age 50 and over) included combinations of physical activity components; however, they were not combined in a systematic way, and it is difficult to determine the optimal combination of components.⁴⁹

Programs reported in peer-reviewed literature were more likely to use trained professionals such as exercise professionals and physical therapists, while Extension programs were more likely to use Extension educators/agents, lay/para health educators, and community leaders. However, the systematic reviews by Chase and Conn et al. found that effective programs are delivered by a variety of personnel, including both trained professionals (certified exercise trainers and health care providers) and those without professional training (community lay people and graduate students), demonstrating that a variety of delivery agents are capable of delivering interventions.^{43,44}

Extension programs were similar to peer-reviewed literature programs in their limited use of additional contact methods (brochures, newsletters, phone calls, etc.). One previous systematic review found that programs that included mailed materials (newsletters or tracking calendars) or audio-visual materials (CDs or videos of exercise instruction) were more effective than those that did not.⁴⁴ In addition, King et al. found that programs using ongoing telephone supervision of

physical activity in place of face-to-face instruction were just as effective with similar or better adherence rates.⁴⁹ More research into additional contact methods and delivery modes would be useful before recommending that Extension educators/agents supplement in-person delivery with these methods.

Peer-reviewed literature and grey literature programs were also similar in their limited use of behavioral theories and group-based strategies. Three previous systematic reviews found that most effective programs are theory-based^{43,44,59} while one additional review did not mention behavioral theories, but did find that effective programs are based on behavioral or cognitive-behavioral strategies, such as goal setting and self-monitoring.⁴⁹ Interestingly, only one program, Extension's Matter of Balance, reported using a group-based strategy.²⁶ The program used "practical problem solving through group discussion."²⁶ Group-based strategies, such as group goal setting and group problem solving, have been shown to be an effective method of promoting physical activity.⁶⁰

The overall results present an opportunity for Extension to more effectively use evidence-based strategies in their older adult physical activity programs. The average duration of an effective program (20 weeks, 40 total contact hours) may not be feasible for Extension educators or their community partners due to other programming demands, as educators typically offer multiple programs in several subject areas. An alternative option is to implement programs that are shorter in duration but, as recommended in health promotion literature, are based on behavioral theories^{39,61} and include group dynamics.^{54,60,62} Including these components could promote long-term behavior change after completion of the program.^{54,61,62} Interventions should be based on a behavioral theory to explain specifically how behavior change will occur.⁶¹ Group based-strategies have been shown to be more effective than individual behavioral strategies for

older adults,⁶² as they tend to be socially isolated⁶³ and are motivated by the social interaction provided by group-based programs.⁶²

Using trained exercise professionals is not always feasible or sustainable for Extension. However, those delivering physical activity programs may not need to have exercise-specific certifications. Extension educators also deliver nutrition interventions without necessarily having nutrition credentials (e.g., Registered Dietitian), since they are often generalists. An alternative to using trained professionals is to provide training for Extension educators in core physical activity competencies prior to delivering physical activity programs. After receiving training, Extension educators can also train lay/para health educators and community leaders to implement their physical activity programs through train-the-trainer methods, as was described in five of the grey literature sources (E. Bowen, personal communication, February 9, 2017; A. Flickinger, personal communication, February 15, 2017; J. Strommen, personal communication, February 6, 2017; L. Washburn, personal communication, February 28, 2017).⁵⁸ Using Extension educators, lay/para health educators, and community leaders rather than trained exercise professionals to deliver physical activity programs will improve program uptake and sustainability. Finally, it is also recommended that Extension programs include a combination of physical activity components (strength, balance, and flexibility) in order to facilitate positive outcomes in increased strength, improved balance, and decreased fall risk.

Limitations

It is worth noting that all of the Extension programs reported positive effects, compared to only 69% of the peer-reviewed literature programs. This made it difficult to make comparisons between peer-reviewed and Extension programs. This discrepancy in reporting may be due to the less stringent manner in which Extension programs were tested and how outcomes

are reported. Seven of the Extension programs (41%) used a pre-post design, while the remaining programs (59%) either only used a post-test or only reported the number of participants. In comparison, nine of the peer-reviewed literature programs (56%) used a randomized controlled trial design, two (13%) used a quasi-experimental with control design, and five (31%) used a pre-post design.

In addition, six of the Extension programs (35%) reported physical activity outcomes through a peer-reviewed source, Journal of Extension, although it is non-indexed with no impact factor, while the remaining programs results (65%) were reported through sources that are not peer-reviewed (websites and/or impact statements). This presents an opportunity for Extension programs to more effectively report their findings through peer-reviewed sources so that effective programs can be disseminated to reach a broader population. It is also recognized that the results of older adult strength training programs delivered through Extension have been published in peer-reviewed sources that were not captured in our review. For example, studies have been published on the Extension-delivered StrongWomen and Stay Strong, Stay Healthy programs.⁶⁴⁻⁶⁶ These were likely not captured in our peer-reviewed literature search as the specific combinations of search terms and age restriction (65 and older) were not used. In addition, as with other systematic reviews, some publications may have been missed due to not being PubMed indexed.

Conclusion

Open-access, community-based programs are a recommended method for older adults to increase physical activity levels. The results of the review indicate notable differences between peer-reviewed literature and Extension programs and present an opportunity for Extension programs to more effectively use evidence-based program characteristics, including behavioral

theories and group dynamics, a combination of physical activity components, and educator/agent-trained delivery agents. The results also indicate a need for Extension programs to more effectively report their findings through peer-reviewed sources so that effective programs can be disseminated to reach a broader population. Taken together, strategic dissemination and implementation of evidence-based programs may be improved both within and outside of the Cooperative Extension System. These efforts will ensure that Extension programming is evidence-based and that exercise and behavioral scientists inform Extension professionals of their research-generated advancements in physical activity promotion. Future research can investigate a dissemination network that can be used to aid the spread of effective programs through the Extension system.

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Manuscript Two

Older Ghanaian Adults' Perceptions of Physical Activity: An Exploratory, Mixed Methods Study

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BACKGROUND AND OBJECTIVES

Like other developing countries, Ghana is experiencing an epidemiologic shift in public health issues. The four leading causes of death as of 2012 were lower respiratory infections, stroke, malaria, and heart disease, presenting a combination of communicable and non-communicable diseases.¹ In Ghana, the incidence of non-communicable diseases is on the rise, with stroke and heart disease rates increasing since 2000.² Overweight and obesity, a risk factor for stroke and heart disease, is also becoming a growing problem,² with rates higher than the average of African countries.¹

Physical activity rates have also been decreasing, coinciding with urbanization and an increase in sedentary work.³ Older adults, women, those living in urban areas, and those with higher incomes are less active.⁴ As a lack of physical activity contributes to overweight/obesity and non-communicable diseases,^{5,6} promoting physical activity can address Ghana's new public health challenges by preventing non-communicable disease including stroke, heart disease, type 2 diabetes, and obesity.

The Ghanaian Ministry of Health has published physical activity guidelines for older adults, which recommend engaging in 150 minutes of moderate-intensity aerobic activity (or 75 minutes of vigorous-intensity aerobic activity, or an equivalent combination of both) and two sessions of muscle-strengthening activities (targeting major muscle groups) per week.² However, 26% of older adults (age 50 and older) in Ghana have low physical activity levels, with a higher prevalence of low physical activity levels in urban residents.³ Notably, the definition of older adult in African countries varies depending on the source; the World Health Organization's definition of older adults in Africa as age 50 and older and is more consistent with the traditional African definition than the developed world's cutoff of age 65 and older.⁷

Community-based physical activity interventions are an effective method of helping adults to begin and continue regular physical activity.⁸ However, a systematic review of community-based older adult physical activity interventions did not identify any interventions in Ghana.⁹ What is known about this population with regard to physical activity promotion comes from formative work conducted by Tuakli-Wosornu and colleagues.¹⁰ This study explored perceptions of physical activity and activity preferences among Ghanaian urban women. The study determined key physical activity themes through focus groups and in-depth interview with a sub-sample of adult women, fitness professionals, and clergy.¹⁰ The authors then conducted surveys to identify primary physical activity barriers and motivators of women age 40 and older recruited through from a megachurch in Accra.¹⁰

Tuakli-Wosornu and colleagues found that the female participants were primarily motivated to engage in physical activity by weight loss, health concerns, and “energy increases.”¹⁰ The participants’ main barriers to physical activity were time, work/family, and no available facility.¹⁰ Walking, dancing, and group classes at the gym were the preferred types of physical activity.¹⁰ Participants also stated a preference for group-based activities, as the social aspect is important to them. It was also found that women often did not feel comfortable exercising at the gym. Finally, the study found that clergy who participated in focus groups and interviews were interested in faith-based fitness programming.¹⁰ While they expressed an awareness of physical activity benefits and an interest in programming, they also reported uncertainty of what types of physical activity to recommend.¹⁰

Results from Tuakli-Wosornu et al. show motivators and barriers that may affect women’s physical activity participation as well as physical activity preferences, but there were limitations to this work. First, the sample was restricted to women only. Although women over

50 years old were included in the pilot study, they comprised less than half of the participants.¹⁰ Therefore, work is needed to capture perceptions of older adults as well as males. Providing evidence related to the perceptions of aging males and females will assist with developing an open-access program that can be sustained in practice. A final gap in the literature relates to the need for perceptions from a larger and more diverse population than the previous study, which was restricted to church goers in one city of Ghana.¹⁰

While recognizing that physical activity interventions without published results may exist in Ghana, this nevertheless demonstrates a need for evidence-based physical activity programming. In order to speed the translation of evidence-based programming into practice settings, researchers and practitioners should “begin with the end in mind.”¹¹ That is, implementation is often an afterthought of intervention development.¹² This is problematic because although the intervention may have internal validity (effective under tightly controlled conditions), it may not have external validity (generalizable to real-world settings).¹¹

In addition, interventions that are developed and implemented without community-level decision-making may be a poor fit between the intervention and the setting.¹² Including local knowledge and considering local resources will improve the likelihood of a good fit.¹² Using a research-practice partnership can improve the translation of research to practice through collaborating with partner organizations to develop and deliver the intervention.¹³

The U.S. land grant university Cooperative Extension System is uniquely positioned to pilot test an older adult physical activity intervention in Ghana through its research-practice partnership model and internationalization initiative. The United States Department of Agriculture’s National Institute of Food and Agriculture (NIFA), which funds Extension,¹⁴ created an initiative in 2003 to encourage the internationalization of Extension.¹⁵ The goal of the

initiative is to assist state Extension programs with adapting to today's interconnected world and providing leadership in a global society.¹⁵ One initiative area in which Extension can play a role is understanding international health issues.¹⁵ Conducting research on the emerging need of physical activity promotion in developing countries aligns with the goals of NIFA's initiative. It is also an innovative project, as Extension's international work has traditionally focused on agriculture, food security, and community development.¹⁶

Taken together, the first step in adapting a physical activity intervention for the Ghanaian older adult population is determining the population's perceptions of physical activity and the characteristics of a program that would be attractive. Therefore, the aim of this study was to determine older Ghanaian adults' perceptions of physical activity and the characteristics of a physical activity program that would be acceptable to the population. The results of the study will be used to a) select an evidence-based intervention that can be adapted for this population and setting, and b) implement and evaluate the resultant program in Ghana.

While countries worldwide experience similar shifts from communicable to non-communicable disease, Ghana is an ideal country in which to begin promoting physical activity in older adults. Ghana is a leader among African countries; it was the first sub-Saharan African country to achieve independence from a colonial power and is considered the "beacon of hope" of Africa due to its political stability, human rights, and economic growth.^{17,18} Addressing the new challenge of promoting physical activity in old age in Ghana to halt the increases in chronic disease prevalence can set an example for other African countries to follow.

METHODS

Study Design

The study employed a concurrent mixed-methods design¹⁹ implemented through a collaboration with the second author, a physical education teacher who served as a research assistant. Qualitative data were gathered from Ghanaian older adults (potential program participants) (N= 123) through focus groups (N= 10) to determine their perceptions of physical activity and assess acceptability of the potential intervention, including desired instructors and locations. Quantitative data were gathered through a questionnaire administered to focus group participants (N= 121). The University of Wyoming Institutional Review Board approved this study (see Appendix E).

Recruitment

Focus group participants were recruited through adult church groups in three urban areas: Accra, Cape Coast, and Koforidua. These cities represent three of the twelve largest urban areas in Ghana and each represent a different region of the country (Greater Accra, Central, and Eastern). Churches in each area were sent a letter by the second author inviting them to participate. Churches that agreed to participate were then contacted to schedule focus groups and recruit participants. Church leaders used word of mouth and announcements in church to recruit individuals to attend the scheduled focus groups.

Data Collection

Qualitative

Focus groups were conducted at: Presbyterian Church of Ghana - Calvary Congregation in Koforidua (three), Central Assemblies of God in Koforidua (two), Resurrection Methodist Church in Accra (one), and Ebenezer Methodist Church in Cape Coast (two). In addition to the churches, focus groups were also held at the Diabetes and Hypertension Clinic in Koforidua (two). Focus groups included nine to fourteen participants, except for the groups at Church of

Christ, which included 19 participants each. Focus groups were larger than the recommended six to ten participants.^{20,21} This was due to overwhelming interest from the adult church groups as the focus groups were considered a “program” that all church group members typically attend. Focus groups held at the clinic were also large, as all clients attending the clinic that day were interested in participating.

Focus groups were moderated by the second author with the first author serving as an assistant moderator. Community volunteers (e.g., teachers and nurses) also provided assistance during the focus groups, especially by aiding participants with low literacy levels in completing consent forms and questionnaires. At three locations, two focus groups were completed simultaneously to accommodate large numbers of interested participants. In these cases, the second author moderated one focus group and a community volunteer moderated the other with first author as the assistant moderator.

Focus groups lasted two to two and a half hours due to the large sizes of the groups and the time necessary to read the consent form, questionnaire, and focus group questions in both English and Twi. Focus group participants were compensated for their time with 20 Ghana cedis (approximately \$5). Community volunteers were also compensated with 20 Ghana cedis. The main contact at each church and at the clinic who coordinated the focus group(s) was given a gift (water bottle or cutting board) chosen by the second author to thank them for their assistance.

Focus group planning and script development were completed in partnership with the second author. The semi-structured focus group questions were developed based on the Theory of Planned Behavior²² in order to explore attitudes, subjective norms, perceived behavioral controls, and intentions related to physical activity. The Theory of Planned Behavior is a health behavior theory that has been used to explain physical activity behaviors^{23,24} and can

be used to develop, implement, and evaluate interventions based on the identified determinants of these behaviors.²² Strength training perceptions were included in order to fully assess perceptions of the Ministry of Health's recommendations.²

Focus group questions also included exploring characteristics of a physical activity program that would be acceptable to Ghanaian older adults in order to ensure the intervention will meet the needs of the population and be well received.²¹ Questions included the target participants and delivery agents, program location and schedule, delivery methods, and program contents and characteristics. Focus group participants were also asked about the feasibility of delivering a physical activity intervention themselves after going through the program to explore a potential train-the-trainer model.²⁵ Group dynamics items were included, as focus group results from Tuakli-Wosornu and colleagues' study identified a preference for group-based activities among Ghanaian adult women,¹⁰ and evidence shows that these group dynamics-based interventions have successfully increased physical activity levels.²⁶ Finally, intervention acceptability was also included in order to inform future dissemination and implementation. (See Appendix F.)

Quantitative

Focus group participants completed a questionnaire on demographic variables, physical activity levels, health rating, physical activity self-efficacy, and knowledge of physical activity guidelines. Demographic variables included age, sex, ethnic group, education level, employment status, and marital status. Self-reported weight classification was used rather than self-reported height and weight to calculate BMI, as Tuakli- Wosornu and colleagues' study found self-reported weight in this population to be unreliable.¹⁰ Questionnaire items also included how

long it took participants to get to the focus group location, how they traveled to the location, and where they live. The location was either their church or diabetes clinic.

The Global Physical Activity Questionnaire was used to determine physical activity levels over the last week.²⁷ The GPAQ is a valid and reliable instrument that has been tested in nine diverse countries. It is correlated with the International Physical Activity Questionnaire (IPAQ) but has fewer items, includes adults up to 75 years old (rather than up to 65 years old),^{27,28} and was also used in the World Health Organizations' Study on global AGEing and adult health (SAGE) that included data on Ghana.³ The GPAQ is also appropriate for this population as it includes work and travel physical activity.²⁷ (See Appendix G.)

Participants were asked to rate their health compared to others their age on a four-point forced-answer scale of "Extremely healthy" to "Very unhealthy," including a "Don't know" option. To assess self-efficacy for physical activity, participants were asked how confident they are that they can engage in moderate physical activity for 30 minutes for five or more days a week using a five-point Likert scale from "Not at all" to "Completely" confident. They were asked to identify the physical activity recommendations for Ghanaian older adults and to identify the amount of physical activity they engage in compared to the recommendations ("Less than recommended amount," "Meeting recommendations," "More than the recommended amount," "I do not engage in physical activity," and "Unsure").

Analysis

Qualitative

Focus groups were audio-recorded. Notably, portions of the focus groups were conducted in Twi (Ghanaians' native language). As suggested by Chen and Boore,²⁹ the recordings were kept in original language for as long as possible. For this study, this meant that all recordings

were transcribed in English by three of the authors, whereas the Twi portions were transcribed into English by the third and fourth authors, who are bilingual, using Microsoft Word. All coding was conducted by the first and senior author, who do not speak Twi. However, any cases of misunderstanding were checked with the Twi translators and the second author who conducted the focus groups. An inductive, grounded theory approach³⁰ was used to interpret the data. Transcripts were independently coded by the first and senior authors to identify meaning units (i.e. words, phrases, or sentences that contain related content that relays one specific thought or idea).³¹ After all meaning units were identified and categorized, the first author and senior author performed thematic sorting and collapsing of similar meaning units. Each coder reviewed the meaning units and subsequent analysis of the other coder. Frequencies of subthemes and categories were listed by both number of meaning units and number of focus groups to account for the large focus group sizes in which all participants may not have had a chance to speak. Audit trails³² were maintained for all qualitative data, including focus group and interview audio recordings, transcripts, notes, and all coding documents.

Quantitative

Statistical analysis was conducted using SPSS. Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated for the overall sample. As the proportion of focus group participants was much smaller than the proportion of eligible older adults across the three cities in Ghana, descriptive statistics were used to describe the degree of similarity between those completing the focus groups to the overall older adult population of Ghana.

The Global Physical Activity Questionnaire (GPAC) items were used to compute Metabolic Equivalent Task (MET) values and calculate total physical activity. In accordance

with GPAC data interpretation guidelines,³³ MET values were calculate as a combination of the three domains (work, transport, and recreation). Values were then used to estimate mean physical activity through MET-minutes per week and classify the sample population as “active,” “insufficiently active,” or “inactive” according to Ghana Ministry of Health recommendations. GPAC items related to sedentary behavior were used to calculate median values of sedentary minutes per day. Participants with invalid responses to any of the domains or with no valid responses were removed from the data set (N= 60).

RESULTS

Qualitative

The focus groups translated and analyzed thus far (N= 8) generated 1130 meaning units; they were coded into themes of perceptions of physical activity (N= 597 meaning units) and physical activity program characteristics (N= 533 meaning units). Meaning units around Perceptions of Physical Activity were divided into subthemes of A) preferred types of physical activity; B) barriers to physical activity; C) facilitators to physical activity; D) factors that would encourage physical activity participation; E) benefits of physical activity; F) current timing, location, and frequency of physical activity; G) physical activity recommendations; and H) potential negative consequences of physical activity.

Participants preferred dancing (*“I will put on music and dance [that will convince me to do aerobics]”*), walking, and jumping (e.g., jumping rope) for aerobic activities. As for strength training, participants mentioned press-ups, weight lifting, and abdominal exercises. Participants also expressed that they were active through their daily chores such that a participant shared: *“Even sweeping is exercise.”*

Barriers to physical activity included environmental factors (e.g., lack of facilities and equipment) and ill health, while facilitators included determination and making physical activity into a routine. Peer influence and health care providers' recommendations were identified as factors that would encourage physical activity participation. Promoting the physical activity program on TV could also motivate participants to attend, as several participants mentioned televised calls to exercise or exercise programs that motivated them to be active: *“So, when you turn on the TV you see people exercising. And because they recommend that it is something that is good to do so everyone should do it. So, when you see that, it encourages you to also exercise.”*

Benefits of physical activity included chronic disease prevention, such as cardiovascular health and weight management. Most participants preferred to exercise in the mornings inside their homes, with several mentioning that they could exercise in their bedrooms. Participants expressed mainly positive perceptions of the Ministry of Health physical activity recommendations but also expressed concerns about their age appropriateness. Finally, participants also mentioned potential negative consequences of physical activity, including injury, soreness, and undesired weight loss.

Meaning units around the theme of Physical Activity Program Characteristics were divided into subthemes of A) meeting preferences; B) leader preferences; C) need for education; D) need for group-based program; E) incentives; F) delivery method; G) activities; and H) group similarity. Based on the participants' meeting preferences, the program would likely take place at churches and meet once a week for one hour. Most participants preferred meeting on Saturdays due to work commitments during the week and church on Sundays, while activities that take place on Saturdays were also mentioned as a barrier: *“Most of activities occur in the weekend, I*

have to go to funeral, baby naming ceremony, weddings....” Church leaders who participated in the focus groups supported the idea of hosting a physical activity program: “... On behalf of the church, we want to say your program had been a, a, educative, and successfully, it has helped us to know that we have to exercise our bodies. And we promise as a church that we will form a Keep Fit club here. So that every weekend or once in a month, we will be meeting and then exercise our bodies.”

As for who should lead the program, participants desired someone with training in physical activity. However, when asked if they could lead the program after going through it, the participants agreed that they could become peer leaders. Most participants preferred a leader the same age as them (“*We want someone like us...our peer*”), as well as someone who is knowledgeable, organized, and enjoyable.

Participants expressed a need for education on types of physical activity (e.g., what counts as aerobic exercise and strength training). They also conveyed a need for nutrition education, including timing and type of food to eat when participating in a physical activity program as well as general nutrition. Several participants mentioned a need for a dietitian to provide education: “...*if we get somebody, let say a dietitian, who can be coaching us on our diet sometimes, by telling us... you need to eat this, you need to stop eating this, that will help.*”

Participants also voiced a preference for a group-based activity program, mentioning several components of group cohesion, including group norms, distinctiveness, competition, and size²⁶ (“*And if we come and there are enough older people participating, it encourages others to come*”). Overall, participants had positive perceptions of group-based programs and felt that this type of program would increase motivation.

Refreshments were the preferred form of incentives for physical activity program participation, with participants mentioning water, soft drinks, fruit drinks, crackers, bread, fruit, and vegetables. Another desired incentive was financial support, especially to help with transportation. Some participants also suggested paying dues to support each other: *“Maybe you can have some dues that you pay, in case there is a problem with any of the members.”*

As for delivery method, participants expressed a preference for an in-person physical activity program. Some participants had positive perceptions of other delivery methods (e.g., DVD, email, WhatsApp), but also mentioned that it is difficult to determine if information on WhatsApp or other social media comes from a trusted source. It was also noted that access to the delivery method needs to be considered, as internet access can be expensive and participants may not use social media: *“It is possible that someone may not have WhatsApp...”*

As for program activities, participants mentioned interest in active games (e.g., ampe which is a children’s jumping and clapping game), health talks (e.g., talks given by physicians), and health screenings (e.g., blood pressure checks). Finally, as for group similarity, most participants preferred a mixed-gender program.

Table 1. Qualitative Results for Theme: Perceptions of Physical Activity

Subtheme	Category	Example meaning unit
Preferred types of physical activity (N= 130 MU, N= 8 FG)	Dancing (N= 22 MU, N= 8 FG)	Dancing, using dance for exercises...when you dance to music... all of that is exercise.
	Walking (N= 19 MU, N= 7 FG)	I always walk, walking everyday... [inaudible] wherever I'm going I walk.
	Daily chores (N= 19 MU, N= 8 FG)	Sweeping, sweeping in the morning, for exercise.
	Jumping (N= 16 MU, N= 7 FG)	Using the skipping rope [is exercise]...
	Press-ups (N= 13 MU, N= 5 FG)	Yes, even press ups and ... you can strengthen your muscles.
	Lifting weights (N= 10 MU, N= 3 FG)	And then weight lifting [I would do for exercise].
	Jogging (N= 7 MU, N= 5 FG)	The exercise we know in Ghana here is jogging.
	Team sports (N= 7 MU, N= 4 FG)	I do some small volley.
	Abdominal exercises (N= 5 MU, N= 4 FG)	Twisting the waist [you can do for exercise].
	Tennis (N= 3 MU, N= 1 FG)	If you know how to play long tennis [for exercise].
	Stretching (N= 3 MU, N= 2 FG)	I would also want to stretch my arms... stretching my neck.
	Other strength training (N= 3 MU, N= 3 FG)	I do a lot of muscle strengthening activities, but it's not weightlifting.
Other aerobic exercise (N= 3 MU, N= 3 FG)	Swimming too, swimming too.... He wants a swimming pool ... we don't know how to swim, we live here, but we don't know how to swim.	
Barriers to physical activity (N= 115 MU, N= 8 FG)	Environmental factors (N= 37 MU, N= 8 FG)	The environment, here we don't have the means, see the machines we don't have them, so you wouldn't know where [to exercise].
	Ill health (N= 21 MU, N= 7 FG)	Like maybe you are sick [so you cannot do physical activity].
	Laziness (N= 17 MU, N= 7 FG)	One big hindrance [to exercising] will be laziness.
	Lack of time (N= 13 MU, N= 7 FG)	In our setting, for instance, even though we are retired, there are other activities, sometimes you would be required to move, around 5:30, you are going to a family house somewhere, you are traveling, you are doing this, so many other activities, so actually, there would not be the time for you to be doing these things. Except on very few occasions, that you will have time for yourself.

	Poverty (N= 8 MU, N= 3 FG)	You are living in poverty (laughter). In poverty (laughter).
	Transportation (N= 7 MU, N= 3 FG)	Means of transport is also I mean very difficult when the exercise is far. Eh you have to get a means of transportation for the old people because not a lot of time they can come to do the exercise.
	Lack of appropriate programs (N= 5 MU, N= 3 FG)	[We need something specific for older adults] rather than neglect, total neglect.
	Tiredness (N= 4 MU, N= 3 FG)	But after a while me myself I will feel tired.
	Perception of strength training (N= 3 MU, N= 3 FG)	As for me, I don't like muscle training...
Facilitators to physical activity (N= 83 MU, N= 8 FG)	Determination (N= 30 MU, N= 7 FG)	You have to be determine, it's determination that we are talking about, determination, the will power, that is determination. If you have the determination, you have the will power to do it.
	Routine (N= 24 MU, N= 8 FG)	Well, I said that, you know, you've been doing this for a while, and you feel good when you do it, so skipping for a day will make you have a nagging feeling of missing something, because it has become part of you, and so you will ...
	Music (N= 9 MU, N= 6 FG)	Music.... motives me... to exercise, yes, yes.
	Family support (N= 7 MU, N= 4 FG)	If you have children too, then you will let them be part of it. Sometimes they will even prompt you, let's go and do this
	Healthy diet (N= 6 MU, N= 2 FG)	Then, uh, you know, diet has a lot in influence on our body.
	Existing resources (N= 4 MU, N= 3 FG)	So please, know that we have just formed a Keep Fit club in the church. We will meet at least once a month.
	Good health (N= 3 MU, N= 2 FG)	When you are healthy [you can meet physical activity recommendations].
Factors that would encourage physical activity participation (N= 72 MU, N= 8 FG)	Peer influence (N= 19 MU, N= 5 FG)	What will convince me is when I see my age mates engage in these exercises without suffering any adverse effects, such as bodily pains. I believe that will convince me to exercise.
	Health care provider recommendation (N= 16 MU, N= 7 FG)	When I visit the hospital, the doctor can let me know that I need to exercise, so the doctor can convince me to exercise.
	Gradual progress (N= 12 MU, N= 6 FG)	And when you do it [exercise] and you feel it... that is going on well for you, you are motivated to do more.

	Physical appearance (N= 9 MU, N= 4 FG)	Okay...when you see how the body is like, it will convince you [to do muscle strengthening activities]...yeh.
	Focus group information (N= 9 MU, N= 5 FG)	What I want to say is that, in fact, on the whole the program has been educative and very err, errr, very successful. We want to, on behalf of the church, thank you and your colleagues for bringing this program to our doorstep, and we promise as a church, that we are going to start a Keep Fit club in the church, so that every weekend or once in a month we will meet as a church members, exercise our bodies, so that we can grow healthy, and then live long.
	TV programs (N= 7 MU, N= 6 FG)	When you watch the TV, you can see people of the same age as you exercising and that person will be healthy and you sit down and ask yourself why are these people doing it and I am not?
Benefits of physical activity (N= 61 MU, N= 8 FG)	Chronic disease prevention (N= 26 MU, N= 8 FG)	[Exercise] makes your heart good strong. [Exercise] makes your bones strong. Your sugar level also, can can can come down [if you exercise].
	Strength (N= 12 MU, N= 6 FG)	For people who are not strong, it [being physically active] helps strengthen your muscles and makes you stronger.
	Overall health (N= 11 MU, N= 5 FG)	You become healthy, healthier than normal [when you exercise].
	Sweating (N= 6 MU, N= 5 FG)	Well, I think that exercising allows you to sweat.
	Fitness (N= 3 MU, N= 3 FG)	[And if you exercise] it helps you to get fit.
	No negative consequences (N= 3 MU, N= 2 FG)	I don't think there is any negative to exercising.
Current timing, location, and frequency of physical activity (N= 54 MU, N= 7 FG)	Time of day (N= 29 MU, N= 7 FG) Morning (N= 23) Evening (N= 5) Any time (N= 1)	You know, I think it is better in the morning, before you take your bath.
	Location (N= 20 MU, N= 5 FG) Home (N= 15 MU) Gym (N= 3) Streets (N= 1) Church (N= 1 MU)	At times, in my bedroom, or in the hall [I would do aerobic exercise].

	Frequency (N= 5 MU, N= 2 FG) Four days a week (N= 3) Three days a week (N= 1) Daily 1 (N= 1)	[I will do exercise] and will do it four days in the week.
Physical activity recommendations (N= 42 MU, N= 8 FG)	Concern about age appropriateness (N= 19 MU, N= 6 FG)	[I] feel it's [the recommendations] a bit harsh. As elderly as I am, it's harsh. If you are about 90 years.
	Positive perception (N= 16 MU, N= 6 FG)	It's ok. If you are able to do at least 30 minutes even a day, iii is good it's good for the body
	Negative perception (N= 4 MU, N= 2 FG)	You cannot do it [meet physical activity recommendations].
	Neutral perception (N= 3 MU, N= 2 FG)	We, we are saying that [exercise] should be in moderation.
Potential negative consequences of physical activity (N= 40 MU, N= 8 FG)	Injury (N= 14 MU, N= 6 FG)	It [exercise] may even cause them [your joints] to dislocate.
	Soreness (N= 9 MU, N= 6 FG)	Initially, you also feel the pains, the pains [if you exercise].
	Lose weight (N= 7 MU, N= 2 FG)	Your weight...that is if you do exercise you become [too] slim.
	Heart problems (N= 4 MU, N= 3 FG)	Palpitate... some people palpitate [during exercise]...
	Difficulty sleeping (N= 3 MU, N= 1 FG)	Please, I learnt that when you do it [exercise] in the evening, it makes your sleep to be very difficult... that's what I learnt.
	Lack of energy (N= 3 MU, N= 3 FG)	It [physical activity] may not give you enough energy to work.

Table 2. Qualitative Results for Theme: Physical Activity Program Characteristics

Subtheme	Category	Example meaning unit
Meeting preferences (N= 119 MU, N= 8 FG)	Program location (N= 54 MU, N= 8 FG) Church (N= 22) Park (N= 10) Diabetes hospital (N= 4) Field (N= 4) Conference room (N= 3) Gym (N= 2) Spacious place (N= 2)	If you are living around this place, perhaps you can use the Church [for an exercise program].

	<p>Stadium (N= 2) Clubhouse (N= 1) Car park (N= 1) Community center (N= 1) Depends on program (N= 1) Close to home (N= 1)</p>	
	<p>Program frequency (N= 38 MU, N= 8 FG) Once a week (N= 23) Three times a week (N= 7) Twice a week (N= 5) Daily (N= 1) Meet on holidays (N= 1) Once a month (N= 1)</p>	<p>Once a week, you will get the office from Monday to Friday, on Sunday too, you must prepare for church, so Saturday is good for that.</p>
	<p>Program duration (N= 27 MU, N= 7 FG) One hour (N= 14 MU) Two hours or more (N= 5 MU) Thirty minutes (N= 5 MU) Ninety minutes (N= 3 MU)</p>	<p>One, one hour will be okay [for the class].</p>
<p>Leader preferences N= 93 MU N= 8 FG</p>	<p>Qualifications (N= 52 MU, N= 8 FG) Peer leader (N= 21 MU) Trained instructor (N= 20 MU) PE teacher (N= 6 MU) Resource person (N= 4 MU) Health care provider (N= 2 MU)</p>	<p>[I could] teach the exercise or teach the importance of the exercise.</p>
	<p>Age preference (N= 21 MU, N= 7 FG) Same age (N= 10 MU) Younger (N= 6 MU) Any age (N= 5 MU)</p>	<p>One this is if the instructor is below 40 years of age, he will kill us [laughter] yes, it's true [amid laughter] because the young can bend and they will be asking us to bend also you know [laughter].</p>
	<p>Traits (N= 17 MU, N= 6 FG) Knowledgeable (N= 5)</p>	<p>Those who have the knowledge and skill in training people [should teach the class].</p>

	<p>Organized (N= 4) Enjoyable (N= 3) Encouraging (N= 2) Strong (N= 2) Active (N= 1)</p>	
	<p>Gender preference (N= 3 MU, N= 2 FG) Same gender (N= 2) Any gender (N= 1)</p>	...but a man should train a man and a woman should train a woman.
<p>Need for education N= 84 MU N= 8 FG</p>	Nutrition (N= 48 MU, N= 7 FG)	You will need to have someone teach us about what foods are good for us, and what foods are not. So if, we have someone who leads us in this direction, we will become more careful with our eating habits, even help with the supply of foods, such as the fruits that they talk about, that will help us.
	Types of physical activity (N= 19 MU, N= 8 FG)	She is asking if she can lie down and do [aerobic activity in bed].
	Lack of information (N= 8 MU, N= 6 FG)	I don't get any health information from anybody...
	Benefits of physical activity (N= 5 MU, N= 5 FG)	Also, I would like to be told what the negative consequences of not engaging in exercises may be.
	Injury / illness considerations (N= 4 MU, N= 3 FG)	Okay, please, we mentioned several exercises that we could do, and my question is that for someone who may have a problem such as a bad knee and therefore cannot do certain exercises, are you able to provide any recommendations, as to what exercise may be appropriate?
<p>Need for group-based program N= 65 MU N= 8 FG</p>	Motivation (N= 19 MU, N= 7 FG)	It [group physical activity] encourages you to do more.
	Group cohesion (N= 13 MU, N= 4 FG)	You have the same family, what concerns one also concerns you.
	Group norms (N= 9 MU, N= 5 FG)	...I would encourage the members to be punctual, to be punctual, I'll encourage the members to be punctual.
	Positive perception (N= 9 MU, N= 5 FG)	So if you have a group that you can engage in the exercise with, it helps a lot.

	Accountability (N= 7 MU, N= 4 FG)	The group is the best because, if you are lazy to go, they will come and call you hahaha yes. They will come to you, that one also.
	Enjoyment (N= 5 MU, N= 4 FG)	When we work together, it will help us, and we will be happy.
	Distinctiveness (N= 3 MU, N= 3 FG)	Please, I think things such as clothing and shoes that we will wear for the program, that identifies us to all that we are one group involved in exercise, will help.
Incentives N= 51 MU N= 8 FG	Refreshments (N= 30 MU, N= 8 FG) Prefer refreshments (N=28 MU) Refreshments not needed (N= 2 MU)	Oh, maybe [we would have] a fruit juice [as a refreshment].
	Financial support (N= 13 MU, N= 6 FG)	Maybe you can have some dues that you pay, in case there is a problem with any of the members
	Incentive items (N= 5 MU, N= 3 FG)	Motivation, like getting some t-shirt to wear.
	Transportation (N= 3 MU, N= 1 FG)	Transportation [will motivate people to get involved in the program].
Delivery method N= 49 MU N= 8 FG	In person (N= 23 MU, N= 7 FG)	So I wanted to say is that, (crosstalk) if the person is standing before you, you have an advantage and if he is explaining, that will help you to better understand what he is saying. But if the information is on CD, you can't even ask questions. So if the person is before you, that's the best.
	DVD (N= 6 MU, N= 5 FG)	DVD, because with that you can also see the [exercises demonstrated]...
	Email (N= 4 MU, N= 1 FG)	I will prefer information through email.
	WhatsApp or text message (N= 4 MU, N= 3 FG)	That is very good, it helps [to get information via WhatsApp].
	Need trusted sources (N= 3 MU, N= 3 FG)	Know the person...qualification, who is talking to you... Facebook, err, online, on those things you don't know, sometimes they are misleading.
	Consider cost (N= 3 MU, N= 3 FG)	It is useful but it is expensive, it is expensive, even even how to acquire all those things, even even you tube, you can't just go there and be watching all these things... even the DVD, the internet work is expensive...but how to maintain them is expensive but it is good.
	Mass media (N= 3 MU, N= 3 FG)	People do listen to the radio, majority have radio.
	Individual program (N= 3 MU, N= 1 FG)	Well, for me, I don't believe that you have to join a group before you exercise. You should, yourself, engage in mini exercises. So in my

		own home, or I can walk. I can do it according to my own song. I don't look at others to live my life. I do what suits me.
Activities N= 43 MU N= 7 FG	Active games (N= 9 MU, N= 5 FG)	Playing ampe [we would do as a group].
	Health talk (N= 9 MU, N= 4 FG)	Sometimes, sometimes we have to invite a resource person, a resource person, to give us some talks. Someone like a doctor.
	Health screening (N= 8 MU, N= 6 FG)	And it would be advisable that when you are in a group, sometimes you have, you invite medical... err... doctors, to at least see if we fall in the range, that is they can take our BP they can advise what to do...
	Physical activity (N= 7 MU, N= 5 FG)	[We would do] various exercises that will cater for the whole body
	Group events (N= 6 MU, N= 4 FG)	At times we'll also, eat, eating!
	Board games (N= 4 MU, N= 2 FG)	[We would play] ludo, and the draft.
Group similarity N= 29 MU N= 7 FG	Gender similarity (N= 24 MU, N= 7 FG) Mixed-gender (N= 17 MU) Separate gender (N= 7 MU)	Oh no, it doesn't matter, when we are all together it's okay! Men and women, it doesn't matter at all... everybody can do it.
	Separate by age (N= 5 MU, N= 4 FG)	Please, doing it in groups also helps... so like 70 going, their way of exercising, group groups, by age groups.

Quantitative

One hundred twenty-one focus group participants completed questionnaires. These participants had a mean (\pm SD) age of 62.74 (\pm 7.74) years, were predominantly Akan (71%), married (71%), college educated (42%), and currently working (42%). See Table 3 for detailed demographic variables of the participants.

Table 3. Demographic Variables of Focus Group Participants (N= 121)

<i>Demographic variables</i>	<i>N (%)</i>
Age	
50-54	22 (18)
55-59	25 (21)
60-64	27 (22)
65-69	21 (17)
70-74	15 (12)
75-80	11 (9)
Sex	
Male	52 (43)
Female	68 (56)
Not reported	1 (1)
Ethnic Group	
Akan	86 (71)
Ga-Adangbe	13 (11)
More than one ethnicity	9 (7)
Ewe	7 (6)
Guan	5 (4)
Other	1 (1)
Education level	
College	50 (41)
Secondary high school	36 (30)
High school	17 (14)
Primary school	14 (12)
No formal education	3 (2)
Not reported	1 (1)
Employment status	
Currently working	51 (42)
Retired	41 (34)
Not currently working	22 (18)
A homemaker	6 (4)
Disabled/unable to work	1 (1)
Never worked	0 (0)
Marital status	
Married	86 (71)
Widowed	20 (17)
Divorced	8 (7)
Single	4 (3)

<i>Living with partner</i>	2 (2)	
<i>Separated</i>	1 (1)	

Of the 117 participants who responded to the item related to health status, 48% percent of participants self-reported that they were somewhat healthy compared to others their age. Forty two percent reported that they were extremely healthy, nine percent reported that they were not healthy or very unhealthy, and two percent did not know. Of the 120 participants who responded to the item on identifying physical activity recommendations, 43% were able to correctly identify recommendations, 53% were incorrect, and 4% were unsure. Of the 118 participants who responded to the item on meeting physical activity recommendations, 51% reported that they are meeting recommendations, 28% reported that they get less than the recommended amount of physical activity, 9% reported that they get more than the recommended amount, 6% reported that they do not engage in physical activity, and 6% were unsure.

Twenty eight percent of participants were very or completely confident that they could engage in this amount of activity (“moderate physical activities (e.g., not exhausting, light perspiration) for 30 minutes for 5 or more days per week”). Eight percent were not at all confident, 17% were somewhat confident, and 47% were moderately confident.

Thirty seven percent of participants reported that it took then 11-20 minutes to travel to church. Thirty two percent took 10 minutes or less to get to church, 16% took 21-40 minutes, and 14% took over 40 minutes. Fifty six percent of participants traveled to church by car, 38% walked, 3% took the bus, and 3% traveled to church by car and walking. Seventy six percent of participants live in Koforidua or the surrounding area, 16% live in Cape Coast, 7% live in Accra, and 1% live in “other” (not specified).

Out of 61 valid responses to the GPAQ questionnaire items, 82% of participants reported that they are meeting physical activity recommendations (greater than or equal to 600 METs),

while 3% reported being insufficiently active (less than 600 METs) and 16% reported no physical activity. Mean (\pm SD) physical activity level was 7673 (\pm 10307) METs. Mean (\pm SD) sedentary time was 233.9 (\pm 164.4) minutes per day.

DISCUSSION

This exploratory study was developed as a first step to implementing an older adult physical activity program in Ghana to address an emerging need for physical activity promotion and chronic disease prevention. The qualitative and quantitative results of the study provide insight into older Ghanaian adults' health and physical activity status, perceptions of physical activity, and desired physical activity program characteristics. Overall, the results suggest both a need for physical activity programming and interest in a community-based program. These results can inform the selection, adaptation, and delivery of an evidence-based older adult physical activity program by illuminating intervention characteristics that may be a good fit within the intended audience. Considering the perceptions of end users from the onset may speed the translation of programs from research to sustained practice.¹¹

The qualitative results showed that less than half of participants could correctly identify Ministry of Health physical activity recommendations. This was also expressed during the focus groups. Participants were unfamiliar with the recommendations: *"If not today, I never know that Ministry of Health has a policy... I never knew there was a policy on exercising."* While most participants who had valid responses to the GPAQ items indicated that they were meeting physical activity recommendations, the mean physical activity level was equivalent to over 31 hours of moderate intensity physical activity or over 15 hours of vigorous intensity physical activity per week. It is possible that values were over-reported due to a lack of familiarity with types of physical activity and intensity levels.

Indeed, a lack of knowledge of physical activity types was a subtheme in each of the focus groups. Participants were unfamiliar overall with what counted as physical activity (“*So, is dancing a form of exercise?*” and “*I’ll clap my hands vigorously... that is part of it...clapping for long periods of time, it’s part of exercising...*”), types of aerobic activity (“*Stretching [is aerobic]*”), and types of strength training (“*I’ll go jogging..., running, and just swinging my arms [for muscle strengthening]...*”). Daily chores were also mentioned as a type of physical activity participants engage in; this activity would likely be considered light rather than moderate or vigorous intensity. These results suggest respondents may *not* be meeting physical activity recommendations and that there is a need for physical activity promotion and education. The results also suggest that to better understand current physical levels among older adults in Ghana, objective measures may be necessary.

In addition, participants felt that the Ministry of Health should be more involved in promoting physical activity: “*...this will come from Ministry of Health. They have to send someone to educate you, instructors, to encourage you by instructing you do this, do like this.*” A Ministry of Health educational campaign complementing the physical activity program could increase the number of older adults who are aware of and meet physical activity recommendations. The physical activity guidelines (developed based on the World Health Organization’s Global Strategy on Diet, Physical Activity, and Health)² may also need to be adapted to be more culturally appropriate; the example exercises include ballroom dancing and swimming, which were not mentioned as activities the participants currently engage in (except expressing that they did not know how to swim).

Participants reported a preference for an in-person physical activity program, and they were especially interested in one based on group dynamics (i.e. designed to increase group

cohesiveness^{34,35}). While one of the focus group questions asked participants what type of group-based activities would be helpful (with probes for setting group goals, social interactions, and supporting each other), participants provided unsolicited meaning units throughout the focus group related to other components of group dynamics. For example, participants mentioned group norms (*“I would love to see that everybody is taking part. Every member of the group is taking part in all the exercises”*) and group distinctiveness (*“So you just go there and get a shirt, which also helped to easily identify the Church membership exercise group wherever they went”*). This preference for group-based activities is similar to the findings on preferences of women living in Accra and is supported in the literature, as group-dynamics physical activity programs have been shown to result in higher levels of adherence than individual programs, and are especially effective in older adults.^{34,35} A group-based physical activity program could be supplemented by other delivery methods (e.g., DVD, email, or WhatsApp), but the cost of internet access and gaining trust as a credible information source would need to be considered.

While the interviewees shared positive perceptions of physical activity, there are also barriers to overcome to help older adults achieve physical activity recommendations. One barrier related to program delivery was a lack of equipment; in particular, participants mentioned that they do not have access to weight lifting equipment. The physical activity program may need to include an evidence-based strength training routine using only body weight exercises or lower-cost equipment such as resistance bands.

Participants expressed both desire for a trained program leader and the ability to become leaders themselves once they had gone through the program. This indicates that a train-the-trainer model may work well as program participants can receive expert instruction to increase their confidence in becoming leaders. This model has been used successfully with community

health workers and is commonly used in Extension physical activity programs.^{9,25} It can also decrease the cost required to sustain the program.

Finally, a “Keep Fit” club was mentioned by several participants as a current physical activity program in place at churches (“*So please, know that we have just formed a Keep Fit club in the church. We will meet at least once a month.*”). Participants also mentioned intentions to start a Keep Fit club at the conclusion of the focus groups. Given the interest in this existing program, it may be possible to work with Keep Fit clubs to learn about current components of the program and suggest culturally appropriate adaptations to provide a structured program with evidence-based benefits for older adults’ health. In addition to encouraging health care providers to recommend physical activity to their patients, a referral system could be set up (e.g., at diabetes clinics) to refer patients to the physical activity program.

Limitations

The number of participants in six of the focus groups was larger than the recommended six to ten participants^{20,21}, which made the discussions more difficult to facilitate. While the co-moderator captured field notes (e.g., participants’ body language such as nodding in agreement), the large number of participants within each focus group made it difficult to include these field notes in our analysis. For these reasons, frequencies of subthemes and categories were reported across focus groups rather than only by the number of individuals who provided the specific meaning units. There were also language barriers with some of the focus group questions that required clarifications for participants. As for the questionnaire, the GPAQ was developed for face-to-face interviews conducted by trained interviewers; however, we included it as a questionnaire item. Some participants read and completed the questionnaire on their own, while others had the survey read to them by volunteer assistants. The questionnaire did not fully assess

whether participants are meeting Ministry of Health physical activity guidelines, as the GPAQ does not include strength training items. While qualitative results show that participants need clarification on what counts as strength training, some participants did mention engaging in strength training (e.g., press-ups and lifting weight), so we do not know if participants are achieving strength training recommendations. Finally, we recognize that the presence of an American researcher and the compensation for participating in the focus groups may have contributed to the high focus group participation rates. Participation rates may not be as high for a community-based program sustained after the research team leaves.

CONCLUSION

This is the first study, to our knowledge, to address physical activity perceptions and preferences of male and female older adults in urban areas of Ghana. The results presented here suggest that a group-based physical activity program encouraged by health care providers and delivered at churches through a train-the-trainer model would be well received by older adults. In addition, education on physical activity recommendations and types is needed along with better dissemination of the Ministry of Health physical activity guidelines. Understanding older adults' perceptions of physical activity and desired program characteristics can lead to development of a physical activity program that is acceptable, appropriate, and feasible for the target population.

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Manuscript Three

RE-AIM Evaluation of Translating an Evidence-based Older Adult Physical Activity
Intervention to a Rural State

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BACKGROUND AND OBJECTIVES

Older adults face many barriers to meeting physical activity guidelines.^{1,2} Fatigue, health problems, and a lack of motivation can make it difficult for older adults to achieve the recommended 150 minutes of moderate to vigorous intensity aerobic activity and two strength training sessions per week.^{1,2} A number of physical activity promotion programs for older adults exist with outcomes of increased physical activity levels.³ This work has been conducted for three decades, yet only 17% of older adults are meeting physical activity recommendations. Testing interventions in the practice settings that will ultimately deliver them can improve external validity to speed the translation of effective programs into practice.⁴

Community-based efforts can reduce barriers to physical activity by reaching people where they “live, work, and play.”⁵ One practice setting for community-based physical activity interventions is the land-grant university Cooperative Extension system. As Extension professions have to provide equal access, Extension programs are also considered open-access, defined as unrestricted use and available to all. Open-access programs can further reduce barriers to physical activity such as membership fees or clinical affiliation. Extension programs can also reach those in rural communities without access to exercise facilities and safe roads or trails to walk on.⁶

A systematic review of open-access, community based physical activity programs showed notable differences between programs reported in peer-reviewed literature and Extension programs. The review concluded that programs delivered through Extension could more effectively use evidence-based program characteristics such as behavioral theories and group dynamics.³ Extension professionals could also more effectively report their findings through peer-reviewed sources to aid dissemination of effective programs. The review found over 17

unique older adult physical activity promotion programs delivered through Extension nationwide. Therefore, when an Extension professional needs to choose an older adult physical activity intervention to deliver, it is unknown which physical activity program they will choose⁷ and what the potential public health impact will be.

Extension has not historically had a significant focus on physical activity promotion. Extension is funded through the United States Department of Agriculture; however, in 2014 physical activity was linked to health within the Farm Bill and the National Framework for Health and Wellness.^{3,8-14} Concerted effort to improve physical activity participation in this agriculturally-based entity is novel, therefore there is limited information on perceptions of physical activity programming within Extension and a systems-level shift is needed.^{15,16} It is often unclear whether the educators delivering physical activity programs receive adequate training, what physical activity guidelines they follow, and how they evaluate programming materials.⁷ County-based Extension Educators/agents (herein, Extension health educators) have the autonomy to adopt programs of their choice, and evidence suggests many factors related to the adoption decision-making process, including the program's effectiveness, compatibility within the system, reach, and ease of delivery.¹⁷

To link knowledge sharing, adoption-decision making, and program delivery, pragmatic evaluation is needed. This type of evaluation is especially useful in community settings that may not have substantial research funding, and can determine for whom, where, when, why, and how an intervention works as well as what benefits are achieved.¹⁸ This pragmatism does not detract from a robust protocol to identify how and why interventions are chosen and the health outcomes they achieve. There are many lessons from the field not included in peer reviewed literature; however, there are also recent examples of studies that have used a pragmatic approach and

included lessons learned.^{19,20} If we want more evidence-based practice, we need to collect and report on these lessons from the field so we can have more “practice-based evidence”.²¹ Lessons from the field should also include temporality, that is, during which phase of an intervention specific implementation strategies (e.g., delivery agent training) are implemented.^{22,23} Without reporting this information, it is difficult to reproduce the intervention.²²

To systematically capture perceptions, process, and delivery, the RE-AIM framework, designed to enhance the quality, speed, and public health impact of interventions through measuring reach, efficacy, adoption, implementation, and maintenance,²⁴ can be used throughout the planning and evaluation of an intervention. The purpose of this paper is to describe the practice-based perceptions, decision making, and impact of translating an evidence-based physical activity promotion intervention within a rural state’s Extension system.

STUDY 1 – BEFORE THE INTERVENTION

Intervention Setting

Wyoming is a rural state with an economy based on natural resources (coal, natural gas, and oil), agriculture (beef, hay, sugar beets, wheat, barley, and wool), and tourism (e.g., Teton and Yellowstone National Parks).²⁵ It is a politically conservative state with an individualistic and independent culture.²⁶ This culture can impede health promotion efforts, as observed in the tobacco control efforts of the 2000s: “We are independent, we’re rugged, we’ll smoke if we want to, and do not want any government folks trying to tell us how to live healthier and live longer”.²⁶

As the state’s only public university, the University of Wyoming fulfills its land-grant mission through providing Extension programming serving the 585,501 residents of the state. As a leader in community-based, lifelong learning, University of Wyoming Extension (UWE)

provides programming in agriculture and horticulture, range management, 4-H / youth development, nutrition and food safety, and community development. In the Nutrition and Food Safety initiative area, six Extension health educators cover the state's 23 counties. These Educators have a broad reach, interacting with over 40,000 participants per year. Notably, in 2016, there were ten Extension health educators.

Leveraging an Extension Physical Activity Specialist

Within the Extension system, individuals with a terminal degree (PhD, DrPH) are university-based and serve as statewide specialists. In UWE, no individual serves as the health or physical activity specialist. Therefore, when a new county-based Extension health educator with a background in physical activity promotion and research was hired in Wyoming Extension, the educator contacted the Virginia Cooperative Extension Exercise Specialist to inquire about potential research partnerships. This led to several multi-state collaborations, including research on implementation of evidence-based older adult physical activity programs through Extension. In order to address top priorities in health promotion, these two individuals determined existing resources and needs.

Building the Partnership

As part of a translational approach, the county-based nutrition health educator aimed to identify any open-access physical activity programs for older adults. Through this, a systematic review of community-based older adult physical activity programs was conducted. The results showed that Extension systems in 15 states have implemented one or more older adult physical activity programs.³ Existing data, although limited, touted a positive impact of the interventions on strength, flexibility, and balance, and fall risk.³ However, as most of these programs have not

been empirically tested or published in peer-reviewed sources, it is difficult to determine their effect on objectively or subjectively measured physical activity behaviors.³

The systematic review also found that only one of the physical activity programs uses group-based strategies,²⁷ which have been shown to be effective in older adult populations.²⁸ One program that does include group-based strategies is LIFT (Lifelong Improvements through Fitness Together), an eight-week, group dynamics-based physical activity program for older adults with outcomes of improved functional fitness and social belonging. It is an adaptation of two programs: Stay Strong Stay Healthy²⁹ and Activity for the Ages². Stay Strong Stay Healthy is an evidence-based strength training program designed for older adults.²⁹ It has been successfully implemented by Extension professionals in community settings, with participants making improvements in strength, balance, coordination, and flexibility.²⁹ Activity for the Ages is a group dynamics-based older adult physical activity program offered in partnership with congregate meal sites.² The program resulted in participants' increased physical activity levels and was found to fit within the mission, values, and skills of the intended delivery system.²

LIFT combines the evidence-based behavioral strategies (goal setting, self-monitoring, and group dynamics) from Activity for the Ages with the evidence-based strength training protocol from Stay Strong Stay Healthy¹⁶ and Strong Women, Strong Bones (also delivered by Extension professionals).³⁰ The group dynamics approach has been shown to be effective with older adults, as it results in higher participation rates.^{2,15} Group-based interventions also facilitate a shared commitment and common goals among members, which are related to increases in physical activity levels.³¹

Within an integrated research-practice partnership between Extension professionals and academic researchers,¹⁶ a focus on fruit and vegetable consumption was added to LIFT to better

fit the mission, values, and comfort of the health educators and their community needs.

Extension health educators expressed the need for a focus on energy balance particularly as nutrition education is required for educators implementing the program.¹⁴ Research indicates that adding physical activity to a nutrition program does not deter from the impact on nutrition improvements.³² The same may be applicable for adding nutrition to a physical activity program, but this has yet to be empirically tested in Extension.

Considerations

There are unique challenges to translating this community-based physical activity intervention to a large, rural state. Educators have to implement programming across large geographic areas. Fully implementing interventions across an Educator's area requires significant time spent driving to reach distant communities. In addition to state-specific barriers, Extension health educators' personal characteristics also influence physical activity programming uptake; those with higher physical activity levels are more likely to adopt physical activity programs.³³ Academic training may also influence the degree to which educators adopt these programs. However, less is known about the degree to which health educators in Extension are trained in physical activity promotion as a component of chronic disease management and prevention.

Increasing physical activity program adoption rates requires an understanding of health educators' readiness and willingness to adopt physical activity programs, obstacles preventing health educators from adopting physical activity programs, funding opportunities and resource availability, and cross-programming opportunities with other program areas.^{17,33} Such in-depth understanding is necessary to perform successful translation of evidence-based physical activity programs into large-scale interventions delivered by Extension health educators.³⁴ In addition,

RE-AIM can be used to explore factors that may affect physical activity programming adoption, implementation, and system-level maintenance among Extension health educators.

The purpose of Study 1 was to identify 1) Extension health educators' attitudes toward physical activity programs; 2) Extension health educators' current physical activity programming status; and 3) factors that affect physical activity programming adoption, implementation, and system-level maintenance. Findings were obtained via a web survey and focus group interviews and analyzed through the lens of the RE-AIM framework²⁴ with intention to explore ways to increase physical activity programming in UWE.

Methods

Study Design

To explore Extension health educators' perceptions of physical activity programs, a concurrent, transformative mixed-methods approach (i.e., equal emphasis on the quantitative and qualitative findings³⁵) was used. The RE-AIM framework was used to improve generalizability of the findings and maximize informativeness of the results.²⁴ The University of Wyoming Institutional Review Board approved this study (See Appendix H).

Recruitment

A research-practice partnership was formed between one UWE Educator and a dissemination and implementation scientist who serves as the PI of LIFT. The nutrition educator peer-leader has a background in physical activity promotion and was able to act as both a researcher and a knowledge broker. Knowledge brokers function as intermediaries between researchers and stakeholders as they facilitate knowledge transfer between these parties.³⁶ Knowledge brokers' tasks include identifying, engaging, and connecting with stakeholders; facilitating collaboration; identifying and obtaining relevant information; facilitating

development of analytic and interpretive skills; creating tailored knowledge products; coordinating projects; supporting communication and information sharing; developing, maintaining, and facilitating networks; facilitating and evaluating change; and supporting sustainability.³⁶ While findings are inconclusive, a knowledge broker may be able to facilitate changes in knowledge, skills, and practice.³⁶ This unique position can increase the capacity of the statewide team and promote program sustainability, especially with the current lack of a specialist.

The knowledge broker recruited the other Extension health educators to take part in the online survey and semi-structured interviews. An initial email and two follow-ups (sent one and two weeks later) were sent to Nutrition and Food Safety Extension health educators (N=9) inviting them to complete a brief online survey. The final question of the online survey asked participants whether they would be willing to participate in a semi-structured phone interview. Those who were willing were contacted by research assistants to schedule the interview.

Data Collection

Quantitative

The survey contained multiple-choice, rating-scale, and open-ended questions that addressed demographics and health behaviors, current work status, participant physical activity levels, and the RE-AIM dimensions, importance of program characteristic that influence adoption, and interest in LIFT training.

Demographics and health behaviors. In addition to standard demographic items, other questions assessed current health status and self-efficacy relative to engaging in moderate physical activity.

Current work status. Participants were asked to specify the number of years they had worked in Extension, their comfort level delivering physical activity programs to older adults (5-point Likert scale; 1-very uncomfortable, 5- very comfortable), and their intention (based on the transtheoretical model)³⁷ to deliver physical activity programs.

Physical activity. The Godin Leisure Time Physical Activity Questionnaire³⁸ was used for participants to self-report the frequency and duration of strenuous, moderate, and mild exercise they performed within the past seven days.

RE-AIM components. Participants were surveyed regarding time spent with reach (3 items), effectiveness (1 item), adoption (4 items), implementation (4 items), and maintenance (2 items).

Program characteristics. Eleven items assessed program characteristics (RE-AIM dimensions, self-efficacy, diffusions of innovation, expertise, role clarity, and personal physical activity behaviors) that influence the adoption-decision making process (on a 5-point Likert scale; 1- not at all important, 5- very important).

Interest in LIFT training. A description of the LIFT program was provided. One question asked if participants would be interested in receiving training on delivery and evaluation of LIFT; a second question asked if they would be willing to receive the training in person or through a webinar. (See Appendix I).

Qualitative

Two interviews, each approximately 30 minutes in duration, were conducted by a research assistant with interview experience. The interviews were semi-structured with a predefined set of questions (see Appendix J) and recorded on a digital sound recorder. The interviewees were asked for insights on: types of physical activity programming currently

delivered, understanding of physical activity guidelines for youth and adults, physical activity objectives sought after in the current programs, how physical activity objectives can be integrated into the programs currently delivered, barriers for physical activity programming, facilitators and resources for physical activity programming, cross programming opportunities (e.g., resource sharing, participants overlapping), and program evaluations.

Analysis

Quantitative

Surveys were analyzed using SPSS. Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated. For the Godin Leisure Time Physical Activity Questionnaire³⁸ items, the national physical activity guidelines³⁹ were used to convert participants' time spent performing physical activity into the following three categories: active (150 minutes of moderate physical activity per week or 75 minutes of vigorous physical activity or an equivalent combination), insufficiently active (less than 150 minutes of moderate to vigorous physical activity per week, but more than zero minutes), and inactive (zero minutes).

Qualitative

Semi-structured interviews were audio-recorded and transcribed verbatim by a trained research assistant in Microsoft Word. An inductive, grounded theory⁴⁰ approach was used to interpret the data. Transcripts were independently coded for meaning units (i.e. words, phrases, or sentences that contain related content that relays one specific thought or idea)⁴¹ by two trained members of the research team. Researchers then met to resolve any discrepancies and form a set of agreed-upon meaning units. Categories and sub-themes were determined from these meaning units. Inter-rater reliability was established by having each of the researchers code a portion (30

meaning units) of one interview. Initial inter-rater reliability was 93%. After reconciliation and clarification, the remaining meaning units of the interview were coded. Inter-rater reliability was 98%. The remaining interview was then coded. After all meaning units were identified and categorized, the first author and senior author performed thematic sorting and collapsing of similar meaning units. Audit trails⁴² were maintained for all qualitative data, including interview audio recordings, transcripts, notes, and all coding documents.

Results of Study 1

Quantitative

Six out of nine eligible Extension health educators (67%) participated in the online survey. Participants had a mean (\pm SD) age of 50 (\pm 17.8) years, were female (100%), and were predominantly white (83%), married (50%), and had attained a Master's degree (67%). The participants (100%) rated their health between good and excellent. While five participants (83%) were very or completely confident in meeting physical activity recommendations, only two (33%) reported meeting recommendations themselves. As for work-related items, participants had worked in the organization for a mean (\pm SD) of 13.3 (\pm 15.9) years. Four participants (67%) were comfortable or very comfortable delivering physical activity programs to older adults. None of the participants were delivering physical activity programs; three of the participants (50%) were thinking about offering a physical activity program (contemplation phase).³⁷

The items most highly valued when deciding to adopt a program were "This program fits with the mission of UWE," "The program helps people start being more active and 'stick with it' even after the program is over," "The program will receive good public relations opportunities and visibility for me and Extension," and "The program can be maintained/sustained easily for longer than one year without special funding." The only item with a mean rating of less than

three was “I could recruit a strong volunteer base using this program.”

Table 1. Mean Ratings of Value When Deciding to Adopt a Program

Item	Mean (\pmSD) rating
The program fits the mission of UWE.	4.83 (\pm .40)
The program helps people start being more active and "stick with it" even after the program is over.	4.50 (\pm .54)
The program will receive good public relations opportunities and visibility for me and Extension.	4.33 (\pm .51)
The program can be maintained/sustained easily for longer than one year without special funding.	4.17 (\pm .40)
I could easily solicit support from local community organizations.	3.83 (\pm .75)
Other Extension Educators will help implement the program.	3.67 (\pm .51)
The program will attract more residents in my area than other NFS programs.	3.50 (\pm .83)
The program will become a statewide “branded” program.	3.50 (\pm .83)
UWE will provide ongoing financial support for the program.	3.50 (\pm 1.04)
The program would need to be adapted specifically to work within UWE.	3.33 (\pm .81)
I could recruit a strong volunteer base using the program.	2.67 (\pm .81)

Note. UWE = University of Wyoming Extension. NFS = Nutrition and Food Safety.

Regarding task distribution, participants reported spending the most time in an average week (26 hours) with implementation tasks (See Table 2). Participants also reported spending approximately ten hours on reach-related tasks, six hours on maintenance, two hours on effectiveness, and one hour on tasks related to adoption.

Table 2. Average Time per Week Extension Health Educators Spend on Program Tasks

Dimension	Task	Average time/week M (\pm SD) hours
Reach	Recruiting participants	3.6 (\pm 1.94)
	Tailoring program materials for specific groups of people	5.6 (\pm 4.27)

	Determining whether those in most need of intervention were recruited	1.5 (\pm 1.00)
Effectiveness	Evaluating programs	1.8 (\pm 1.78)
Adoption	Attending training sessions for new programs	0.6 (\pm 0.47)
	Attending training sessions for programs previously delivered	0 (\pm 0)
	Training others to deliver programming	0 (\pm 0)
	Traveling related to Extension program training	0.5 (\pm .57)
Implementation	Traveling related to Extension program delivery	4.0 (\pm 3.80)
	Delivering programs	9.4 (\pm 7.70)
	Developing and/or refining program materials	9.8 (\pm 14.18)
	Ensuring that the program is delivered as intended (e.g., completing a checklist at the end of a program session)	3.0 (\pm 1.87)
Maintenance	Maintaining partnerships for program delivery (e.g., attending community forums, networking, attending meetings)	3.4 (\pm 1.94)
	Adapting programs for future iterations	2.2 (\pm 1.64)

Five of the six survey respondents (83%) indicated that they would be interested in receiving training on delivery and evaluation of the LIFT program. Of these five, one was willing to receive the training in person, while the other four were willing to receive the training either in person or through a webinar.

Qualitative

Four volunteered for and two completed the semi-structured phone interviews. Of the two, both were white, married, and the mean (\pm SD) age was 58 (\pm 5.7) years. The thematic coding yielded 349 meaning units. These meaning units provided insight on factors related to program adoption: perceived barriers to delivering physical activity programs, perceived facilitators to delivering physical activity programs, and types of programs delivered.

One hundred fifteen meaning units around perceived barriers to delivering physical activity programs were identified and divided into educator personal factors, organizational structure, program factors, facilities, and weather. Interviewees expressed that their workload was too high to incorporate additional types of program and their focus was on nutrition programming. They also mentioned that delivering the Strong Women, Strong Bones program (which was previously implemented through UWE) was too time consuming. A lack of facilities for physical activity in smaller communities also came up as a barrier.

Meaning units (N = 157) around perceived facilitators to delivering physical activity programs were identified and divided into educator personal factors, organizational factors, physical activity training, community partners, facilities, and program factors. Overall, interviewees had positive perceptions of physical activity recommendations and benefits. The organizational structure of three issue teams, including an “Active Living” team, housed within the Nutrition and Food Safety initiative team was also perceived as positive for delivering physical activity programs. Interviewees had been trained on the Strong Women, Strong Bones program and had enjoyed the training. Community partners were mentioned as a source of physical activity program delivery. While the lack of facilities came up as a barrier, the presence of facilities, including schools, fairgrounds, and walking paths, was also mentioned as a facilitator.

Meaning units (N= 71) around types of programs delivered were identified and divided into physical activity programs delivered, methods of promoting physical activity, program target audience, nutrition / food safety programs delivered, and programs not delivered. Besides the Strong Women, Strong Bones program, other physical activity programs delivered in the past included youth activities through 4-H. Physical activity was also promoted through incorporating

topics such as “sit less, move more” in other programming. Nutrition and food safety programs delivered included food preservation and Dining with Diabetes. The target audiences for all programming areas included older adults, adults, and youth. Finally, interviewees indicated that they were not currently delivering any physical activity programs.

Table 3. Qualitative Results for Theme: Perceived Barriers to Delivering Physical Activity Programs

Subtheme	Category	Example meaning unit
Educator personal factors (51)	Workload (17)	And we never can say oh if I add this I can let that other thing go so pretty soon it's like so much that that you don't do the new stuff [programming].
	Difficulty meeting physical activity recommendations (12)	And so I think again you'd just have to... try to work that [strength training] into your routine every day and I don't.
	Strength training (7)	
	General physical activity (5)	
	Lack of confidence (9)	Because you don't feel as comfortable yet so you stick with the old stuff [programming].
	Lack of communication with colleagues (6)	That I don't know. I don't have any, I guess I don't have any idea on what's going on elsewhere [physical activity programming in other states].
	Out of state colleagues (3)	
	Local colleagues (3)	
	Lack of interest in training (5)	Personally, no [I wouldn't be interested in a training or certification for physical activity].
	Age (1)	Well I think probably my biggest barrier is I'm getting old.
Organizational structure (27)	Lack of training (1)	Not much [training on delivering physical activity program].
	Unfamiliar with facilities (1)	I don't know if it's a very big weight room because I haven't been to that one but they have a few pieces of equipment.
	Job focus area (14)	I have to concentrate a lot on um cooking and nutrition through cooking and that's sort of just where I went.
	Lack of organizational support (6)	So I do know that it finally got you know sort of like well hmm we don't think that's [delivering Strong Bones] quite the best use of our time.
	Area served (5)	So there's five counties [that I'm employed in].
	Single-county programming (3)	But I do a lot of little individual programming within my area too.
	Time required (10)	For that one [Strong Bones] it it's time consuming you know.

Program factors (25)	Heavy weights required (4)	Another thing was we had hand held weights and carrying those little guys around I mean they're heavy.
	Costs (3)	especially if you were going like to other counties [to deliver Strong Bones] because of how much it costs you know for the gas because when we go to other counties the university reimburses us for fuel and that was you know a pretty big commitment the two days a week as far as financial.
	Travel (3)	That's a tough life you know to keep going back and forth.
	Community partners not available to deliver (2)	I just couldn't seem to find a volunteer and the senior center didn't have enough staff to commit to it [delivering Strong Bones].
	Participant recruitment (2)	And so once you kind of do something you have to not do it for a while because probably everyone that was interested did it the first go round so you need to kind of wait and a few years and get a new bunch of people that might be interested.
	Lack of variety (1)	The one thing I know by the end of the 8 weeks the people were getting tired because they were of the same exercises, it was the exact, you know it would be like doing an aerobics class with the exact same routine for 8 weeks. And so with that one you know I don't think we changed.
	Maintenance of physical activity (1)	Whether they stick with it or not is you know is another issue.
Facilities (10)	Lack of facilities (4)	We don't have like a YMCA or a rec center.
	Lack of space (3)	But you know that was when I did it [Strong Bones] ... I had in the building I have we have a conference room so you'd have to move all the tables and chairs and then put them all back.
Weather (2)	Facility operating hours (3)	The weight room we have a great facility it's just such limited hours.
	Winter weather (1)	But I think one of our biggest barriers that we face is um our weather is not conducive to um outdoor stuff. In the winter it's cold and snowy and icy and the wind is blowing. So if you don't have a place to do that inside it makes it really hard. And winter, I mean a lot of times by the first of October till may were in winter, you know.
	General weather (1)	But I think weather is a huge thing for us.

Table 4. Qualitative Results for Theme: Perceived Facilitators to Delivering Physical Activity Programs

Subtheme	Category	Example meaning unit
Educator personal factors (61)	Positive perception of physical activity (22) Aerobic activity recommendation (7) Active lifestyle (5) Belief that older adults need physical activity (4) Need for strength training (2) Strength training (2) Health benefits (1) Ease of meeting recommendations (1)	I've always just believed it's really good for your health.
	Types of activities used to meet physical activity recommendations (8) Walking (5) Exercise bike (2) Gym (1)	Well I just try to set time, five days a week, you know I exercise, um my walking partner has just started going south for the winter, but we would usually do like two days in the gym.
	Positive perception of physical activity programming (7)	We've always felt it's important and if we can speak about it and add a little tidbit here and there that's good so I think we're coming along with having an actually subcommittee that's maybe gonna bring forth some programs or help strengthen that area [physical activity] you know by whichever tactic they take.
	Strategies used to meet physical activity recommendations (6) Fitbit for motivation (3) Habit (1)	I also have like a Garmin, Fitbit whatever you want to call it, so that helpful, reminds me to move, it reminds me to you know how far I have walked, so.

Organizational factors (38)

Working around weather (1) Creativity (1)	
Peer influence (4)	So I think they [younger educators] are all very excited and they're trying to get us older ones on board, so.
Positive perception of Strong Bones program (3) Confidence (2)	Um, You know that little handheld weight program with um, Strong Women was easy. Um I would say, like do you want a rating scale, I'd say fairly confident [in successfully delivering physical activity programming].
Knowledge of physical activity recommendations (1)	I know kids have a different recommendation.
Initiative team (11) Need team buy-in (6) Programs should be chosen as a team (3) Willing to deliver programs chosen by team (2)	Because if you don't, there's so few of us, there's what like 10 if we're fully staffed, and I think we're down to seven maybe or eight now, and so there's so few of us so in order to get the kind of impacts you need to all buy into the same thing.
Issue team (7) New Active Living team (4) Issue team structure (3)	And for the first time we actually have an issue team that deals with physical activity.
Job performance evaluation (6)	But um they [superiors] you know want us to be out teaching and educating.
Organizational support (4)	We have a very progressive person as our nutrition and food safety administrator and I think she would be really behind this, so.
Organizational change (3)	And so whoever takes over my position will be 100% nutrition and food safety.
Role in Extension (2)	I am a nutrition and food safety educator.
Age difference (2)	I think the young ones, we're kind of divided right now, there's three of us that I would consider in the older group, (laughing) and the rest of them are all very young.
Educators value physical activity (2)	You know I think we all [Wyoming Extension health educators] realize physical activity is very important.

	Need for program evaluation (1)	And then you know we'll have our evaluations ready and go from there.
Physical activity training (31)	Past training (16)	[I enjoyed Strong Bones training] cause there were some of the exercises I wasn't sure if I was doing them exactly right or not you know.
	Training components (9)	
	Programs trained on (5)	
	Perceptions of training (2)	
	Desire for training (11)	Maybe having to um do some of the program in front of some of the rest of us. Um hands on as far as that goes.
	Desired training components (5)	
	Belief in importance of training (3)	
	Program type (2)	
	Need for resources (1)	
	Current training methods (4)	So basically what I keep up with is you know if I find a webinar that's interesting.
Community partners (14)	Delivery support (11)	That we could work with someone in our community and get that [physical activity program] delivered.
	Partnerships with local organizations (3)	Yes. Yes, I do [generally have partnerships with the senior center].
Facilities (9)	School (3)	Um, I think that's one thing, our school makes it easy, like, we can use their hallways, and we try to do things sometimes in conjunction with the schools.
	Fairground (2)	And we try to have things here at our fair grounds, for like if we have a 4-H event we have a basketball hoop here and we're gonna install horseshoe ends, and so we are trying to do some things that encourage physical activity.
	Walking path (2)	Having a place to do it um you know we have some bike paths well we have a walking bike path which is good.
	Playground (1)	And we do have really nice playgrounds in town, so it's easy to like have a 4-H activity maybe at the park where the kids can use the equipment that we have.

	Pool (1)	Um, we just got, one thing is we just got a brand new swimming pool so the kids are excited, we have tried to incorporate going to the pool into our 4-H activities.
Program factors (4)	Resources available (2)	And some people would have their own weights and some wouldn't so that's why we always had weights with us that we carried so that if someone didn't have their own we would provide them with some if I can remember them right the weights were from like one or two pounds up to maybe 10 just those little hand held dumbbells.
	Target audience interest (2)	And every year we have to reprint those [walking program] maps for everyone to use cause they like them so much, so that's been kind of a cool thing we did.

Table 5. Qualitative Results for Theme: Types of Programs Delivered

Subtheme	Category	Example meaning unit
Physical activity programs delivered (32)	Past programs delivered (18)	We've [in the past] done things like have a treasure hunt where they [4-H kids] have to follow a treasure map and count their steps and find the treasure.
	Program adaptation (11)	And then probably have to make some adjustments. Because even if it is a program from another state, we like to "Wyomingize" it make it for our clientele so it's successful.
	Needs assessment methods (3)	Um we have a focus group (pause) system of um clientele assessment that we use um we meet in different counties every year and then we get the various county reports plus a statewide summary we use.
Methods of promoting physical activity (17)	Dissemination methods (9)	So I tried to get the word out [on physical activity] versus doing it with them in a class.
	Physical activity topics delivered (8)	I mean with my, I do a variety of projects so for example at the senior center my last topic was sit less move more.
Program target audience (11)	Older adults (4)	Uh elderly I'm guessing they [Strong Bones participants] were oh probably 60 and up.
	Adults (3)	We've had anyone from 20 to probably 75 [in Dining with Diabetes].

Nutrition / food safety programs delivered (6) Programs not delivered (5)	Diabetics and their caretakers (3)	And some of them are like the wife of someone with diabetes.
	All age groups (1)	Um my primary I don't know I do everything from youth through seniors.
	Current programs delivered (3)	Um just trying to think what else we've done recently. I do a lot of food preservation, but there's really no physical activity portion to that.
	Past programs delivered (3)	Um we've done Dining with Diabetes here numerous times here.
	Not currently doing physical activity programs (4)	I think the lack of not having anything real formal since the Strong Women, you know the Body Works program, we haven't really had anything formal since that, it's been quite a few years, maybe even more three years.
Not currently doing physical activity in nutrition programs (1)	Um it you know I do um nothing specific [nutrition programs that include physical activity] at the moment.	

Summary of Study 1

The qualitative results of the study provide insight into Extension health educators' attitudes toward physical activity programs, their current physical activity programming status, and factors that affect physical activity programming adoption, implementation, and system-level maintenance. While the interviewees had positive perceptions of physical activity and physical activity programming, they experienced noteworthy barriers in delivering physical activity programs.

To increase physical activity program *adoption*, several barriers should be addressed. Workload was the most frequently mentioned personal barrier. To encourage educators to adopt a new program area, it may be necessary to reduce other programming areas or job responsibilities. While there are many competing demands on an Extension health educator's time, strategic efforts to de-implement⁴³ programs or educational efforts that are not evidence-based could leave more time for interventions that are evidence-based. For example, the interviewees mentioned addressing physical activity through "getting the word out" via podcasts, radio segments, or newspaper columns rather than implementing actual physical activity program. While the efforts could increase the visibility of Extension work, transferring knowledge of physical activity is not enough to create behavior change; evidence-based strategies and program are needed⁴⁴ (and could also increase visibility).

The results demonstrate a need for structured programming, as interviewees described developing and implementing their own physical activity programs and program components, for example, a 4-H walking map treasure hunt program: "... *the other mapping thing that the 4-H kids did, it took us all summer to actually get the maps made and the steps counted and that kind of thing.*" Encouraging educators to adopt existing evidence-based programs rather than creating

their own can decrease time spent developing programs and increase time available for delivering effective program. Indeed, the quantitative results reflected this distribution of time; educators reported spending more time developing and/or refining program materials than actually delivering programs.

In addition, it may be helpful to explicitly include “physical activity” in Extension health educators’ job descriptions, as they currently refer only to delivering programs in nutrition and food safety; this could better align job duties with the Farm Bill and the National Framework for Health in Wellness. It could be helpful to change Extension health educators’ job titles from “Nutrition and Food Safety” to a broader area, for example, “Health and Nutrition.”

Several barriers specific to the Strong Women, Strong Bones program previously delivered were expressed. The program was considered too time-consuming, as it required in-person delivery twice a week for eight weeks and travel to other communities in the Educators’ large, five-county areas. Moving to a train-the-trainer model with community partners as the eventual delivery agents can alleviate this barrier, while Extension can still house the program through providing training, equipment (weights), and evaluation assistance. Transporting the weights required for the program was another barrier; this could be alleviated by obtaining funding for several sets of weights to be kept on-site at community partner facilities whenever feasible.

Finally, interviewees mentioned a lack of communication with colleagues, both those on their initiative team as well as Educators in neighboring states. An effective dissemination network of Extension state specialists could assist educators in staying informed on evidence-based physical activity promotion efforts taking place nationwide.⁴⁵

To increase physical activity program *implementation* and reduce the adoption-implementation gap (i.e. educators are trained on a program but never deliver it), effective training on physical activity programming is needed.⁴⁶ Interviewees expressed mostly positive perceptions of previous physical activity program trainings, but also stated that they were not interested in additional physical activity training. This seemed to be due to a lack of confidence (*“I’m not sure I could be certified in anything physical activity other than walking”*) and a perception that a training may be too physically demanding (*“So is it real, if it's extremely physically demanding, you know CrossFit um, no I don't have the background and probably don't have the stamina”*). Research has shown that current physical activity program training methods may target health educators who are active themselves and who have high self-efficacy. As such, care should be taken to design trainings for those who are less confident.⁴⁶ Interviewees indicated that they would prefer training with hands-on instruction and teach-back rather than *“just give me a notebook and say here you go,”* which is also supported in the literature as important for implementation.⁴⁶

Finally, to increase physical activity program *maintenance* (at the system level), organizational support is crucial. Interviewees expressed both barriers and facilitators related to organizational support. While the previous administrators may not have been supportive of delivering LIFT due to the time and travel costs required, a current administrator appears to be supportive. The fairly recent organization structure of issue teams housed within each initiative team was identified as a facilitator, as one of the newly created issue teams, Active Living, addresses physical activity programming. Having a team of Educators tasked with determining physical activity programming for the entire initiative team can help with maintenance as these programs are routinely delivered and become the norm.

The quantitative results indicate that Extension health educators are likely to adopt the LIFT program in UWE. Although a majority of educators were inactive or insufficiently active themselves, and therefore may *not* be likely to adopt a physical activity program,³³ five out of six educators indicated interest in adopting LIFT. In addition, most educators indicated comfort delivering older adult physical activity programs and confidence in meeting physical activity recommendations. Given these results, it was decided that a virtual training on the LIFT program would be offered. Based on the values reported by the educators as most important, the training will need to include LIFT's fit with the UWE's mission, its ability to facilitate long-term behavior change, opportunities for public relations and visibility, and potential for sustainability without special funding.

Limitations

Two additional Extension health educators offered to complete the semi-structured phone interviews but were not able to be contacted to be interviewed. In addition, one of the survey respondents had been hired as an Extension health educator but had not yet started in the position. This Educator's responses were included as her perceptions could influence future physical activity program adoption and implementation. However, her responses were not included in the RE-AIM task distribution items, as these reflected task-distribution in her current position rather than as an Extension health educator.

STUDY 2 – DURING PROGRAM ADOPTION

Introduction

Based on the results of Study 1 and the need for a scalable training protocol (e.g., one that was feasible across the entire 97,818 square miles of Wyoming), it was decided that the LIFT training would be offered in a four hour "live" virtual format. The training was developed based

on evidence-based methods on training,^{47,48} learner-centered teaching,⁴⁹ and program adoption rates.⁵⁰ It includes detailed descriptions of program principles and opportunities for experiential learning (practicing and receiving feedback on the exercises and fitness assessments).

The purpose of Study 2 was to determine how the virtual training affects 1) predictors of implementation, 2) stage of change, and 3) positive intent to deliver both the LIFT program and physical activity programming in general.

Methods

Study Design

This study was a pretest-posttest study designed to evaluate the effects of virtual training on implementation of the LIFT program. The Virginia Tech Institutional Review Board approved this study (see Appendix K).

Recruitment

Extension health educators were contacted by the knowledge broker through email and personal contact at a team meeting. Only one other educator (out of six total educators employed at that time) expressed interest in attending training; however, other educators expressed interest in having community partners (e.g., senior center staff) attend the training and deliver LIFT. Following this low initial recruitment, it was decided to make the training and program available to both Extension health educators and community partners. When delivered by community partners, Extension health educators would be responsible for providing equipment and assisting with program evaluation; through this, LIFT would remain an Extension program.

The knowledge broker and other Extension health educators then recruited community partners to attend LIFT training. Partners from senior centers and other health organizations were

contacted via email and follow up phone call with information about the training. Retired educators who have continued to offer Strong Women, Strong Bones were also invited.

Measures

Separate pre- and post-training surveys (see Appendices L and M) were developed and administered to Health educators and community partners (N=13) who attended two virtual LIFT trainings. The pre-training survey assessed: 1) demographic characteristics (i.e., age, gender, race, ethnicity, height, and weight), 2) general health (i.e., chronic disease, sleep, smoking, confidence in meeting physical activity recommendations, and physical activity levels), 3) positive intent to deliver physical activity programming in general and the LIFT program (on a 5-point Likert scale; 1- strongly disagree, 5- strongly agree), and 4) stage of change. In addition, RE-AIM dimensions, self-efficacy, diffusions of innovation, expertise, role clarity, and personal physical activity behaviors were included to determine both 6) program characteristics that influence the adoption-decision making process (on a 5-point Likert scale; 1-not at all important, 5- very important) and, related to LIFT in particular, 7) perceptions of program characteristics that influence the adoption-decision making process (on a 5-point Likert scale; 1-strongly disagree, 5- strongly agree). The post-training survey assessed positive intent to deliver physical activity programming in general and the LIFT program, stage of change, and perceptions of program characteristics that influence the adoption-decision making process as well as training satisfaction.

Analysis

Surveys were analyzed using SPSS. Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated for the overall sample. The Wilcoxon signed-rank test was used to compare pre- to post-test median scores for

intent to deliver physical activity programming, stage of change in physical activity program delivery, and perceptions of LIFT characteristics, as the sample is small and the data ordinal, meaning the analysis should be non-parametric.

Physical activity levels were measured via the International Physical Activity Questionnaire. For these items, the national physical activity guidelines³⁹ were used to convert participants' time spent performing physical activity into the following three categories: high (meeting the additional guideline "for even greater health benefits,"³⁹ i.e. 300 minutes of moderate physical activity per week or 150 minutes of vigorous physical activity or an equivalent combination), moderate (meeting recommendations, i.e. 150 minutes of moderate physical activity per week or 75 minutes of vigorous physical activity or an equivalent combination), and low (not meeting recommendations, i.e. less than 150 minutes of moderate to vigorous physical activity per week, but more than zero minutes). Height and weight were used to calculate Body Mass Index (BMI, kg/m²).

Results of Study 2

Nine participants completed the initial LIFT training in September 2017: the knowledge broker, one Extension health educator, and seven community partners (one of whom is a retired Extension health educator who previously delivered Strong Women, Strong Bones). Following this training, additional community partners expressed interest in the training, and another training was offered in December 2017 to four community partners. Of the thirteen total training participants, nine (69%) completed surveys. Five of the thirteen (38%) completed both the pre- and post-training survey, two completed the pre-training survey only, and two completed the post-training survey only.

The seven participants who completed the pre-training survey had a mean (\pm SD) age of 46 (\pm 15.0) years, were predominantly female (71%), white (71%), had completed some college (57%), and rated their health between good and excellent (71%). Participants had a mean (\pm SD) BMI of 33.4 (\pm 13.4) with four (57%) classified in the obese category,⁵¹ reported a mean (\pm SD) of 7.5 (\pm 1.4) hours of sleep per night, and predominantly were non-smokers or ex-smokers (71%) with no diagnosed chronic diseases (71%). The participants (100%) were very or completely confident in meeting physical activity recommendations; of the six with valid responses to the International Physical Activity Questionnaire items, all (100%) reported high physical activity levels. However, only 57% reported meeting strength training guidelines (two days per week).

Intent to deliver LIFT and physical activity programming in general was high pre-training: mean values were 4.00 (\pm .707) for intent to incorporate physical activity in existing programs, deliver LIFT, and include LIFT in the plan of work and 3.80 (\pm .837) for intent to deliver physical activity programming. Intent to deliver was compared from pre- to post-training; the Wilcoxon signed-rank test showed that the training did not elicit a statistically significant change in: intent to incorporate physical activity into existing programming ($Z = .000$, $p = 1.000$), intent to deliver physical activity programming ($Z = -1.000$, $p = .317$), intent to deliver LIFT ($Z = .000$, $p = 1.000$), or inclusion of LIFT in Plan of Work ($Z = -.447$, $p = .655$). Participants' stage of change related to delivering physical activity programs was also initially high; the mean value was 4.75 (\pm .957), corresponding with the action phase. The Wilcoxon signed-rank test showed that the training did not elicit a statistically significant change in stage of change ($Z = -.447$, $p = .655$).

The program characteristics that influence the adoption-decision making process of highest importance were “The program has been successful when tested in community settings” (mean rating of 4.00 = very important). While the majority of the factors (73%) had a mean rating between 3.00 and 3.99 (moderately important), four factors rated as only “somewhat important”: “I do not feel that the program is part of my job responsibility,” “I do not feel comfortable delivering the program,” “I am not physically active, so do not feel comfortable delivering a physical activity program,” and “I do not have the expertise that is needed to deliver the program.”

Table 6. Program Characteristics that Influence the Adoption-Decision Making Process: Mean Ratings of Value

Item	Mean (\pmSD) rating
The program has been successful when tested in community settings.	4.00 (\pm .57)
I believe I have the knowledge and ability to deliver the program.	3.86 (\pm 1.06)
The program has potential to attract/recruit a group of participants that is representative of the residents of my county/city.	3.71 (\pm 1.25)
The training for the program makes me feel like I could offer this program.	3.71 (\pm .75)
I find it easy to deliver the program.	3.71 (\pm 1.11)
The program has been successful when tested in research settings under optimal conditions.	3.57 (\pm .97)
I can deliver the program according to the guidelines in the program manual.	3.57 (\pm .78)
Compared to other physical activity programs, the program is easy to deliver.	3.29 (\pm .95)
The program has potential to attract/recruit a large number of participants.	3.29 (\pm 1.11)
The program can be maintained/sustained easily for longer than one year without special funding.	3.29 (\pm 1.11)
I do not have the resources (e.g., time, cost, handouts, volunteer) to deliver the program.	3.14 (\pm 1.06)
I feel confident making adaptations to the program that would not detract from its effectiveness.	3.14 (1.34)
The program fits the mission of Cooperative Extension.	3.14 (\pm 1.34)
Other agents/educators recommended this program.	3.00 (\pm 1.41)
The program will receive good public relations opportunities and visibility for me and Extension.	3.00 (\pm 1.15)
I do not feel that the program is part of my job responsibility.	2.86 (\pm 1.21)
I do not feel comfortable delivering the program.	2.57 (\pm 1.27)

I am not physically active, so do not feel comfortable delivering a physical activity program.	2.29 (\pm 1.70)
I do not have the expertise that is needed to deliver the program.	2.17 (\pm .75)

As for perceptions of LIFT characteristics in particular that influence the adoption-decision making process, a Wilcoxon signed-rank test showed that the training did not elicit a statistically significant change from pre- to post-training in any of the program characteristics. Six out of seven post-test participants responded to the training satisfaction questions. Of these six, 100% percent rated the training as good or excellent, 83% were neutral, disagreed, or strongly disagreed that they would have liked to receive more training about delivering LIFT, 67% said the training was useful to a quite large extent or a very large extent, 83% said they met learning outcomes to a quite large extent or a very large extent, and 100% agreed or strongly agreed that they enjoyed the training.

Summary of Study 2

While perceptions of the LIFT training were positive, participating in training did not change attendees' predictors of implementation, stage of change, and positive intent to deliver both the LIFT program and physical activity programming in general. This may be due to the fact that those who attended already planning on delivering LIFT (e.g., intent to incorporate physical activity into existing programming and intent to deliver LIFT both had a mean rating of 4 (agree) both before and after training). Based on these results, it was expected that program implementation rates following training would be high.

Future Directions

Future physical activity program trainings should include opportunities for public relations and visibility; this was identified as a top value for program adoption among Extension health educators but was not part of the original LIFT training. While marketing efforts to

improve public relations and increase visibility are important for Extension, it appears that they have not been included as components of program trainings;⁵² rather, Extension professional may be trained on marketing as a stand-alone topic.⁵³ Increased visibility could also help Extension health educators recruit volunteers for program delivery. Recruiting volunteers was identified as *not* important for program adoption, which may be because volunteers have not traditionally been used for program delivery by Wyoming Extension health educators. However, as time required to deliver physical activity programs was identified as a barrier, exploring a train-the-trainer model with eventual delivery by volunteers could lessen the time required by educators and increase physical activity program adoption rates.

STUDY 3—Post Training, Pre-Implementation

Introduction

Following LIFT training, the final step in this research was to evaluate implementation of LIFT through the RE-AIM framework. The reach, adoption, and (system level) maintenance dimensions were included within the scope of this work. While the benefits of including all RE-AIM dimensions to balance internal and external validity are recognized, fully employing RE-AIM should look different for various phases of research, and it is not always practical to include all RE-AIM dimensions in each study.⁵⁴ As the goal of this study was to determine the impact of translating an evidence-based physical activity promotion intervention within a rural state's Extension system to lead to broader translation of research to practice, reach, adoption, and maintenance were determined to be the most relevant dimensions.

Participants were contacted via phone three weeks after the first LIFT training; none of the participants responded to the calls. All trainees, with the exception of the knowledge broker, were also sent an email two months post-training to assess intent to deliver LIFT. Two participants (the Extension health educator and retired Extension health educator) replied and

indicated that they planned on delivering LIFT, but had not yet scheduled a session. One participant responded that she was interested in training her fitness center staff members; this led to the second training being scheduled.

By February 2018 (five months after the first training and two months after the second), three LIFT programs were being delivered. To assess why the rest of the training participants were not yet delivering LIFT, it was decided to begin iteratively checking in with trainees to assess implementation outcomes (acceptability, appropriateness, and feasibility, which may determine delivery status) as well as current delivery status and barriers. A survey designed to be sent to training participants every three months was created based on valid acceptability, appropriateness, and feasibility items⁵⁵ and the transtheoretical model.³⁷ Collecting iterative responses allow researchers to consider delivery agent perceptions and ensure a good fit between the intervention and the intended delivery setting. The survey was also sent to non-adopters (educators who did not participate in LIFT training) to assess implementation outcomes that may influence adoption rates. To capture perceptions of administrators that may affect adoption rates among educators, a survey was also developed to send to UWE administrators.

Methods

Study Design

This was a cross-sectional study designed to evaluate RE-AIM dimensions (reach, adoption, and system level maintenance) of the LIFT program. There were three levels of respondents: 1) LIFT participants, 2) potential delivery personnel (all Extension health educators and community partners who attended LIFT training as well as Extension health educator who were not trained but eligible), and 3) UWE administrators. Surveying across these three key stakeholder groups facilitates understanding of implementation outcomes to ensure compatibility

within the system. The Virginia Tech Institutional Review Board approved this study. (See Appendices K and N).

Recruitment

LIFT participants were recruited through senior centers (including participants in Strong Bones programs), newspaper articles, flyers, and word of mouth. Extension health educators and community partners who had completed the LIFT training (N=13) were eligible to deliver LIFT; they were contacted via email after training to complete a brief online survey. Extension health educators who had *not* participated in the LIFT training (N=4) and Extension administrators (N=3) were also invited to complete a brief online survey via email. The purpose of surveying those who were eligible but did not attend was to understand their adoption-decision making process, as they may have lower perceptions of LIFT acceptability, appropriateness, and feasibility. The purpose of surveying administrators was to understand their perceptions of LIFT acceptability, appropriateness, and feasibility as well as importance of program characteristics that influence support of LIFT, as their level of support predicts whether the program becomes institutionalized (i.e. the extent to which the program becomes “routine and part of the everyday culture and norms of the organization”²⁴).⁵⁶

Measures

RE-AIM outcomes and implementation outcomes were measured through a cross sectional design. LIFT participants completed surveys at baseline including demographic items used to calculate proportion and representativeness (as well as physical activity levels, social networks, and confidence to engage in physical activity, which were compared to the post-program survey at the conclusion of the program). (See Appendix O). The survey for LIFT training participants as well as Educators who did not attend training assessed: 1) acceptability,

appropriateness, and feasibility of implementing LIFT (on a 5-point Likert scale; 1-completely disagree, 5- completely agree), 2) stage of change, 3) four items related to steps necessary to take to deliver LIFT (recruiting participants, finding a facility, building partnerships, attaining resources; yes or no), and 4) barriers experienced in delivering LIFT (open-ended). (See Appendix P.)

The survey for administrators assessed: 1) acceptability, appropriateness, and feasibility of implementing LIFT (on a 5-point Likert scale; 1-completely disagree, 5- completely agree), 2) importance of program characteristics that influence supporting educators to deliver LIFT (on a 5-point Likert scale; 1-not at all important, 5- very important), and 3) whether they support educators in delivering LIFT (yes or no with reasons why or why not). (See Appendix Q).

Demographic items were not included in the delivery agent or administrator surveys to create a short survey that decreased respondent burden.

Table 7. RE-AIM Dimensions and Measures

Dimension	Current Aims and Outcome Measures
Reach: Number, proportion, and representativeness of LIFT older adult participants	<u>Aim:</u> To monitor and evaluate older adult participation rate <u>Outcome Measure:</u> Number, proportion, and representativeness of LIFT participants
Effectiveness: Impact on primary outcomes, quality of life, and unintended consequences	<i>Outside the scope of this work</i>
Adoption: Number, proportion, and representativeness of settings and staff who deliver the intervention	<u>Aim:</u> To monitor and evaluate Extension health educator and community partner adoption rate <u>Outcome Measure:</u> 1. Number, proportion, and representativeness* of Extension health educators and community partners implementing LIFT 2. Acceptability, appropriateness, and feasibility of LIFT; stage of change and steps taken in delivering LIFT* *Unable to obtain data
Implementation: Degree to which intervention was delivered as intended	<i>Outside the scope of this work</i>

Maintenance (system level):
**Extent to which delivery/
 implementation is sustained
 over time**

Aim: To evaluate administrator support of the intervention
Outcome Measure: Acceptability, appropriateness, and
 feasibility of LIFT; importance of program characteristics that
 influence support of LIFT*
 *Unable to obtain data

Analysis

Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated for the overall sample. Representativeness was calculated by comparing demographics (age, gender, race, ethnicity, education level, and work status) of LIFT participants to all older adults (age 65 and older) in Wyoming (city or county level census data was not available).⁵⁷ As raw data was not available for education level or work status, frequencies were calculated by using census data percentages and totals. Representativeness of BMI was calculated by comparing LIFT participants to the sub-sample of older adults in Wyoming (age 65 and older) who were selected and responded to the Behavioral Risk Factor Surveillance System (BRFSS) survey. A one-sample *t* test was used to compare mean age; Fisher's exact test was used to compare categorical variables due to the small sample size.

Results of Study 3

Reach

Forty-eight participants attended the LIFT classes. However, only 37 individuals agreed to the research portion of this work. Of the 37 who agreed to be research participants, 18 (49%) completed pre-program surveys. These participants who had a mean (\pm SD) age of 67.8 (\pm 4.9) years, were predominantly retired (78%), and were female (100%) and white (100%). Participants had a mean (\pm SD) BMI of 29.9 (\pm 7.0) with seven (39%) classified as obese, seven (39%) classified as overweight, and four (22%) classified as normal weight.⁵¹ Proportion of LIFT participants was calculated as 17 out of 1,480 adults age 65 or older (1%) in Lander, 12 out

of 35 (34%) in Pavillion, and 8 out of 281 (3%) in Guernsey.⁵⁷ There were no significant differences between LIFT participants and older adults in Wyoming in terms of race ($p = 1.000$), ethnicity ($p = 1.000$), employment status ($p = 1.000$), education level ($p = .297$), and BMI ($p = .324$). There was a significant difference between LIFT participants and older adults in Wyoming in age ($t = -4.385$, $p = .000$) and gender ($p = .000$).

Table 8. LIFT Participant Characteristics Compared to Older Adults (Age 65+) in Wyoming

Demographics	LIFT Participants (N= 18)	Older Adults in Wyoming
	<u>Mean (SD)</u>	<u>Mean</u>
Age⁵⁷	67.8 (+4.9)	73
	<u>N (%)</u>	<u>N (%)</u>
Gender⁵⁸		
Female	18 (100)	45,921 (52)
Male	0 (0)	41,891 (48)
Race⁵⁸		
White	18 (100)	84,488 (96)
Other race	0 (0)	3,324 (4)
Ethnicity⁵⁸		
Non-Hispanic	18 (100)	83,649 (95)
Hispanic	0 (0)	4,163 (5)
Education level⁵⁷		
High school graduate or some college	11 (61)	51,814 (64)
Bachelor's degree or higher	7 (39)	19, 854 (25)
Work status⁵⁷		
Not in the labor force (retired, disabled/unable to work, or homemaker)	16 (89)	64,001 (79)
Employed	2 (11)	16,222 (20)
BMI⁵⁹		
Overweight or obese	14 (78)	1,077 (64)
Normal weight	4 (22)	603 (36)

Adoption

Proportion of delivery agents was calculated for both Extension health educators and community partners. Of the six Extension health educators eligible to deliver LIFT who were invited to the training, one delivered LIFT for an adoption rate of 17%. Of the two Extension

health educators who attended training, one delivered LIFT for an adoption rate of 50%. However, the other Extension health educator who attended training indicated through the follow-up email two months post-training that she was planning on delivering LIFT but had not yet scheduled a session; she also recruited community partners to attend the second LIFT training and assisted one of the community partners with completing evaluations when she delivered the program.

Of the eleven community partners who attended training, two delivered LIFT for an adoption rate of 18%. Representativeness of those who delivered LIFT compared to those who attended the training but did not deliver LIFT was not calculated, as demographic data from the pre-training survey was only available for one of the educators who delivered LIFT. One of the 13 training attendees and none of the four Extension health educators who did not attend training completed follow-up surveys. Due to the low response rate, survey results are not included.

Demographics of those invited to attend LIFT training (the six Extension health educators) were compared to the demographics of those who attended LIFT training (both Extension health educators and community partners) and completed the pre-training survey. (See Table 9.) Due to the small sample sizes, representativeness was not calculated.

Table 9. Extension Health Educator Characteristics Compared to LIFT Training Participant Characteristics

Demographics	Extension Health Educators (N= 6)	LIFT Training Participants (N= 7)
	<u>Mean (SD)</u>	<u>Mean (SD)</u>
Age	50 (\pm 17.8)	46 (\pm 15.0)
	<u>N (%)</u>	<u>N (%)</u>
Gender		
Female	6 (100)	5 (71)
Male	0 (0)	2 (29)
Race		
White	5 (83)	5 (71)
Other race	1 (17)	2 (29)
Ethnicity		

Non-Hispanic	4 (67)	7 (100)
Hispanic	0 (0)	0 (0)
Not sure	2 (33)	0 (0)
Education level		
Some college	0 (0)	4 (57)
Bachelor's degree	2 (33)	1 (14)
Graduate degree	4 (67)	2 (29)
Health self-rating		
Excellent	3 (50)	2 (29)
Very good	2 (33)	1 (14)
Good	1 (17)	2 (29)
Fair	0 (0)	2 (29)

Maintenance

One of the three administrators completed the surveys; due to the low response rate, administrator survey results are also not included.

Summary of Study 3

The purpose of this third study was to determine the initial reach, adoption, and system-level maintenance of the LIFT program when translated to Wyoming. Preliminary data indicate initial struggles to translating and evaluating the program in Wyoming, including a lack of compliance with data completion. As previously mentioned, Extension is an open-access entity that values pragmatic outcomes. Therefore, stringent collection of empirical data is more novel to this system. In this study a few preliminary conclusions can be made related to initial reach, adoption, and system-level maintenance, and suggestions for future work in this area.

First, at the *reach* level, LIFT participants were similar to Wyoming residents in terms of work status, race, ethnicity, education level, and body mass index. LIFT participants were younger than the average older adult in Wyoming; however, this is not surprising as LIFT was not restricted to participants age 65 and older (because Extension programs cannot be restricted by age).⁶⁰ LIFT participants were not representative in gender; this is also not surprising as the

Wyoming Extension system had previously delivered Strong Women, Strong Bones. While the program was eventually called “Strong Bones” to be more inclusive, it appears that it was still more attractive to women. One advantage of LIFT is that it is available and promoted to both men and women, similar to the Stay Strong, Stay Healthy program of Extension in Missouri and, more recently, Kansas.^{29,61} Notably to this gender- and age-specific group composition, previous research demonstrated that gender-segregated classes do not produce better adherence or physical activity outcomes when compared to classes of similar age but mixed-gender.⁶² From a practical perspective, there are both mixed feelings as well as mixed data regarding gender composition of older adult group dynamics interventions.⁶² However, programs targeted to older adults (rather than mixed age groups) lead to improved program adherence and enjoyment.⁶²

LIFT also demonstrated strong potential to reach a large proportion of the target audience. In small communities in particular, LIFT may be able to reach a high percentage of older adults, such as the 34% reached in Pavillion (total population 236). LIFT may be especially beneficial to older adults in this type of rural community who do not have access to fitness centers or other physical activity programs.⁶ Community-based, open-access physical activity programs such as LIFT are needed to reach people where they live and reduce barriers to physical activity.⁵

Second, related to *adoption*, the low proportion of Extension health educators attending LIFT training was troublesome. While representativeness of those who adopted LIFT was not calculated, it appears that Extension health educators were similar to LIFT training attendees in terms of age, race, gender, and ethnicity. Extension health educators appeared to have higher levels of education and higher health self-ratings, indicating that these factors were not barriers to adopting LIFT. Extension health educator barriers to adoption may be more related to work

load and job focus area, which were identified as barriers to physical activity program delivery in Study 1.

The proportion of community partner training attendees delivering LIFT after training was also low, indicating an adoption-implementation gap. This gap occurs when delivery agents *adopt* a program (e.g., attend training on the program) but never *implement* the program. The adoption-implementation gap is one of the reasons that translation of evidence-based interventions from development to widespread implementation takes an average of 17 years.⁶³ However, only two months had passed since the second LIFT training, so it is possible that those who attended training will deliver LIFT once they have determined a location, community partners, etc., as intent to deliver LIFT was high post-training. The optimal length of time post-training to assess implementation status is unknown; other studies of Extension-delivery physical activity programs have assessed delivery status after one year⁴⁶ or annually for five years.⁶⁴

Third, while data on system-level *maintenance* was not able to be reported, preliminary observations can be made related to factors needed for LIFT to be sustained: characteristics of the intervention, the inner setting of the organization, and implementation processes.⁵⁶ One intervention characteristic is cost.^{56,65} The startup cost for LIFT is substantial in that each participant should have access to a variety of weights (approximately \$1,200 per 15 participants). However, the equipment cost for LIFT is low once the initial purchase of sets of weights is made.

From a human resource (e.g., time of the educator) perspective, more work is needed on the cost-effectiveness of this program in this setting. Some Extension programs are one-time direct delivery, some are delivered online, and some have multiple sessions over several weeks. As previously mentioned, behavior change and long-term behaviors of the participants are rarely

tracked in Extension; therefore, there is a lack of data on the effect and maintenance of Extension programs on community members' behaviors. This is further related to how Extension educators should and could spend their time: How does Extension value its Educators' time? More work is needed to explore the costs of delivering a program twice a week for 8-weeks that reaches an average of 15 participants per cohort and has outcomes of improved functional fitness¹⁵ versus, for example, a one-time seminar-style intervention that reaches several hundred participants and has minimal to no impacts (e.g., intent to change behavior or satisfaction with the seminars). RE-AIM reach and effectiveness can be used to calculate an individual-level impact index that can be used to compare overall impact of programs, which can then be used by Extension educators, administrators, and stakeholders to guide decision-making.¹⁸

The inner setting includes structural characteristics and culture.⁵⁶ It appears that the components of the organizational structure may support physical activity program delivery, as the focus group participants from Study 1 mentioned the initiative team structure and the newly developed Active Living issue team tasked with determining physical activity programming for the rest of the initiative team. The culture of UWE may reflect the "hands-off" culture of Wyoming; this can be a barrier to implementation and maintenance of any program with health behavior change as an outcome. In addition, physical activity programming is fairly new as an Extension target area and UWE Educators not aware of this change may not support physical activity programming among their colleagues. Finally, as for intervention processes, the presence of program champions and external change agents are related to program maintenance. While both of these individuals were involved with implementing LIFT, opinion leaders and formally appointed internal implementation leaders within the organization also need to buy in to LIFT for implementation and maintenance to be successful.

While Strong Women, Strong Bones was not maintained in the UWE system, it is interesting that two retired Extension health educators continued to deliver the program and a group of community members continued to attend it since 2011. Data on representativeness were not available on Strong Women, Strong Bones in Wyoming; it is possible that the program also had high reach. A group of Strong Women, Strong Bones attendees participated in the Lander LIFT program. Many individuals in the program did not agree to be study participants; some of them were former Strong Women, Strong Bones participants and it is possible they did not feel the need to “register” and complete paperwork for a program similar to one they had been attending for years. Suggestions for future observational protocols may allow Extension professionals to garner representativeness without participant burden. The high LIFT participation rate indicates a need and interest from community members; if adoption and implementation rates can be increased there is potential for high public health impact from the program.

Limitations

Due to low survey response rates, perceptions of LIFT that may influence adoption and system level maintenance were not captured. These data may have offered insight into reasons for LIFT not being adopted and implemented (e.g., low perceived acceptability, appropriateness, or feasibility among community partners, Extension health educators, or UWE administrators) and predicted institutionalization of the program. Future work should consider other methods of collecting data to determine perceptions of LIFT and potentially adapt the program to improve adoption and implementation rates.

DISCUSSION

Three studies were completed through a research-practice partnership in order to investigate perceptions, decision-making, and implementation of translating the LIFT program to

Wyoming. Study 1 results suggest that Extension health educators have overall positive perceptions of physical activity programming, but they experience barriers in delivering these programs. Study 2 results suggest that Extension health educators and community partners who chose to attend training on LIFT were already delivering physical activity programs, had positive intent to deliver LIFT, and had positive perceptions of the training. Finally, Study 3 results suggest that LIFT has the potential to reach a large, representative proportion of the population, but adoption and implementation rates among Extension health educators and community partners were low.

In order to improve physical activity program adoption rates among Extension health educators, system-wide changes may be needed to explicitly include physical activity as a focus area of educators' work. Including "physical activity" in Extension health educators' job descriptions and changing position titles to be more inclusive of physical activity could help educators prioritize physical activity programming and de-implement other work duties that are not evidence-based.⁶⁶ Extension health educators may also need more training on evidence-based programming to encourage them to adopt existing structured, evidence-based programs instead of developing their own programming.⁷

As the time required for program delivery was mentioned as a barrier to Strong Women, Strong Bones (and LIFT requires a similar time commitment), adaptations to the delivery model may encourage adoption. A train-the-trainer delivery model may help Extension health educators to adopt the program and then turn it over to community partners.⁶⁷ Decreasing the time required to deliver the program, such as through replacing a portion of the in-person sessions with virtual classes, could also encourage adoption.

More work is needed to understand the adoption-implementation gap among community partners that occurred following the LIFT training. The training was positively received and intentions to deliver LIFT remained high post-training. Without responses to the follow-up survey, it is difficult to understand perceptions of the program or implementation barriers that may have occurred. Future research on system-level changes to promote physical activity programming through Extension, training on evidence-based programming for Extension health educators, physical activity program delivery methods that decrease educator time commitment, and barriers to community partner program implementation are needed to address low adoption and implementation rates.

Limitations

The sample sizes for each portion of this study were small as we were limited by the organization structure of UWE (i.e., only three administrators and six Extension health educators serving the entire state). However, these Educators have a large reach, as they cover each of the state's 23 counties and are tasked with providing community-based education to all Wyomingites.

CONCLUSION

Older adults face many barriers to physical activity; community-based program can help alleviate many of these barriers. Implementing in-person, community-based programs in rural states can be challenging, given the time required to travel to remote communities and competing demands on Extension health educators' time. The results of this study suggest that system level changes are needed to increase physical activity program adoption rates among Extension health educators and more work is needed to increase program delivery by community partners. This work can inform physical activity programming for older adults through Extension systems

nationwide through suggesting changes needed to improve the adoption, implementation, and system level maintenance of effective physical activity programs.

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General Conclusions

The purpose of this dissertation was to provide insight on the implementation of Extension-delivered physical activity programs, including 1) the characteristics of peer-reviewed community-based older adult physical activity programs compared to these programs delivered through Extension, 2) physical activity perceptions and program preferences among older adults in Ghana as a first step toward physical activity program adaptation and implementation, and 3) the translation of an evidence-based older adult physical activity program to a large, rural state. These lines of inquiry were necessary as Extension has high reach—and the potential for high public health impact—but, as physical activity is a fairly new programming area, work is needed to ensure Extension professionals select and implement evidence-based programs and deliver these programs with high fidelity. Results of the three manuscripts showed that Extension can more effectively implement evidence-based program and use evidence-based program characteristics; there is a need and interest in adapting an evidence-based older adult physical activity program for delivery in a developing country; and there are system-level changes that need to be made to improve physical activity program adoption rates in Extension.

Future directions of this work include improving both dissemination and implementation strategies through Extension. First, Extension professionals can more effectively report their findings through peer-reviewed sources to reach a broader population. As seen in Manuscript One of this dissertation, very few open-access programs for older adults report program evaluation or research evidence. In order to increase the veracity of data collected by Extension professionals as well as the number and quality of Extension peer-reviewed manuscripts, organizational changes may be required for Extension professionals to have protected time for evaluation and dissemination. As an example, there are currently 17 different older adult

physical activity programs implemented across 15 states (and an additional nine programs not included in the systematic review because pre and post evaluation data or the number of participants were not reported). Most of these programs do not report use of evidence-based strategies. To achieve a greater public health impact, Extension professionals could adopt, adapt, and deliver *one* program that includes evidence-based older adult physical activity and behavior change strategies. To assist in these efforts, it is necessary to understand the dissemination pathway and adoption-decision-making of Extension professionals.

Improvements can be also made in training Extension professionals on the need for and use of evidence-based programs as well as the need to implement these programs with high fidelity. As seen in Manuscript Three of this dissertation, Extension health educators reported that they spend a large amount of time developing their own programs. One way to speed translation may be to decrease the time spent developing new programs. This change may require a shift in Extension culture, as “developing programs” is valued as an evaluation metric while implementing “canned programs” is perceived as less valuable. As long as this evaluation metric exists, Extension health educators may be motivated to create programs to receive favorable evaluations. To accomplish this shift, administrators and the infrastructure of the system could encourage Extension professionals to glean evidence from the peer reviewed literature, have training and capacity to make adaptations that do not deviate from the underlying program principles, and respond to community needs.

There are evidence-based approaches to building Extension health educators’ capacities to make informed adaptations such as Putting Public Health Evidence into Action.¹ This ability is paramount to scalability as some practice-based adaptations may enhance program effectiveness (positive deviance) but other adaptations may detract from the core elements

(program drift).² In the Putting Public Health Evidence into Action example, training modules include: 1) discuss what “evidence” means and the evidence behind particular interventions; 2) assess the fit of the organization to the potential interventions; 3) discuss the balance between fidelity and adaptation; 4) describe steps in the adaptation process; 5) discuss important factors or tasks in each phase of implementation (pre-implementation, implementation, maintenance); and 6) know how to use different evaluation methods for evidence-based programs, policies or other strategies.¹ Future work could also include developing core physical activity competencies on which to train Extension health educators. These competencies could progress from reduction of sedentary time to meeting physical activity guidelines to basic principles of exercise science. Training would need to be tailored to those who are less confident in delivering physical activity programs to improve program adoption rates and reduce the adoption-implementation gap.³

Dissemination and implementation strategies can also be used to translate evidence-based physical activity programs to developing countries to address emerging public health issues. The U.S. Extension system can have an impact on physical activity behaviors by collaborating with international Extension partners. Indeed, the national Extension system already has an internationalization initiative; however, most of these efforts have been related to agriculture or community development. The aging population, and physical activity as primary chronic disease prevention, have been overlooked to date. The exploratory work conducted in Ghana (Manuscript Two of this dissertation) developed the foundation to using an integrated research-practice partnership as an implementation strategy to select, adapt, and implement an evidence-based program.⁴ This participatory method equally values the knowledge and preferences of both researchers and the delivery personnel who will eventually implement the program. This approach improves the likelihood of a good fit by considering the culture and resources of the

delivery system from the beginning. Dissemination of physical activity guidelines in Ghana could also be improved; partnering with the Ghanaian Ministry of Health to adapt guidelines (to include more culturally appropriate physical activity examples) and disseminate to improve older adults' knowledge and compliance rates is another future direction.

While physical activity promotion in a developing country through Extension resources is a novel area, this approach is applicable both in the U.S. and worldwide. Promoting health globally supports U.S. national security interests through political stability and economic growth of developing countries.⁵ In addition, non-communicable diseases are global public health problems with similar causes;⁶ lessons learned in Ghana may apply to the U.S. and other countries.

Overall, this work contributes to the body of literature on speeding the translation of evidence-based programs into practice. Taken together, strategic dissemination and implementation of evidence-based programs may be improved within the Cooperative Extension System. These efforts will ensure that Extension programming is evidence-based and that exercise and behavioral scientists inform Extension professionals of their research-generated advancements in physical activity promotion in the U.S. and globally.

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Appendix A

Search specifications used to locate peer-reviewed and grey literature for manuscript 1

Database or Source	Search Terms
Peer-Reviewed Literature	
PubMed	physical activity OR fitness OR exercise OR strength training AND community-based OR community-wide OR communitywide
EBSCOhost	Same as PubMed
Grey Literature	
Extension Websites	reviewed text of relevant program areas
Land-Grant Impacts (Nutrition & Health focus area, Physical Activity tag)	physical activity OR fitness OR exercise OR strength training AND older adult OR senior
Journal of Extension	physical activity OR fitness OR exercise OR strength training AND older adult OR senior

Appendix B

Grey literature interventions excluded due to no reported pre and post evaluation data or number of participants for manuscript 1

Program Name	State	Source(s)
Aging: Healthy, Happy, and Wise Conference	South Dakota	Impact Statement
Arthritis Foundation Exercise Program	Tennessee	State Website
Strong Women, Healthy Hearts	Virginia	State Website
Living Well Alaska	Alaska	Impact Statements
Strong Women Healthy Hearts	Alaska	Impact Statements
Bodywise	District of Columbia	State Website
The Strong Women Program	Mississippi	State Website
Strong Women	Montana	State Website
Mastery of Aging Well	Oregon	State Website

Appendix C

Coding guide for manuscript 1

Study ID number:

Title:

Abstract:

Coder:

Laura Balis (1)
 Thomas Strayer (2)
 Nithya Ramalingam (3)
 Meghan Wilson (4)
 Samantha Harden (5)

Eligibility Full:

Yes (1)
 No (2)

Exclusion Reason:

Not a PA or reduction of sedentary time intervention (1)
 Not open-access (2)
 Not older adults (participants < 65) (3)
 No pre/post evaluation data (4)
 Duplicate (5)
 Not peer reviewed (poster, etc.) (6)
 N/A (0)

Secondary Cite(s): Other papers related to the intervention

Country Conducted: Country name

Theory: Theoretical framework for intervention (list)

Social Cognitive Theory (1)
 Transtheoretical model (2)
 Self-regulation theory (3)
 Theory of Planned Behavior (4)
 Health Beliefs Model (5)
 Group Dynamic Theory (6)
 Social Ecological Model (7)
 Other (specify) (8)
 Atheoretical or not mentioned (999)

Study design:

Randomized Controlled (1)
 Quasi experimental with control (2)
 Pre-post design (3)

Efficacy_Trial: Date of efficacy trial listed

Actual date

Not reported (999)

Duration_Wk: Total duration of program in weeks

Num_Contact: Number of contacts per week

Frequency_contact: Total contacts (weeks x contacts per week)

Description_Program_Dose: Describe program dose if methods are too vague

Measure_Inter_PA: Measurement intervals for PA in weeks

Maintenance_PA: Was maintenance (time without intervention) included for PA?

Yes (duration in weeks)

No (0)

Primary_Outcome: Describe (e.g., functional fitness assessment protocol, self-report PA behaviors)

Positive_Outcomes:

Yes (1)

No (0)

Not reported (999)

Positive_Outcomes_Description

Text if applicable (e.g. significant increase in lower body strength)

Not applicable (999)

Negative_Outcomes:

Yes (1)

No (0)

Not reported (999)

Negative_Outcomes_Description:

Text if applicable (e.g. significant decrease in lower body strength)

Not applicable (999)

No_Change_Outcomes:

Yes (1)

No (0)

Not reported (999)

No_Change_Outcomes_Description:

Text if applicable (e.g. no significant change in lower body strength)

Not applicable (999)

Contact Type Comp: Contacts delivered through computer

Yes (total number)

No (0)

Contact Type PDA: Contacts delivered through hand-held PDAs

Yes (total number)

No (0)

Contact Type Int: Contacts delivered through internet

Yes (total number)

No (0)

Contact Type TV: Contacts delivered through TV

Yes (total number)

No (0)

Contact Type Video: Contacts delivered through video

Yes (total number)

No (0)

Contact Type Face: Contacts delivered face-to-face

Yes (include total: duration of contact x frequency x weeks. e.g.: 1 hour sessions, 3 times a week for 8 weeks = 1440)

No (0)

Contact Type Mass: Contacts delivered through mass media

Yes (total number)

No (0)

Contact Type Mult: Contacts delivered through multimedia

Yes (total number)

No (0)

Contact Type Bro: Contacts delivered through brochures

Yes (total number)

No (0)

Contact Type Mag: Contacts delivered through magazines

Yes (total number)

No (0)

Contact Type News: Contacts delivered through newsletters

Yes (total number)

No (0)

Contact Type Tel: Contacts delivered through telephone

Yes (total number)

No (0)

Contact Type Boost: Contacts delivered through boosters

Yes (total number)

No (0)

Contact Type Other: Contacts delivered through any other methods

Yes (total number)

No (0)

Contact Type Other Descrip: Description of contacts delivered through other methods

Text if applicable

Contact Type None:

No contacts (1)

Contacts (0)

Contact Type Not reported:

Contact type reported (0)

Contact type not reported (999)

Prog Walking: walking included in activity program

Yes (1)

No (0)

Prog Strength: strength training included in activity program

Yes (1)

No (0)

Prog General: general aerobic activity included in activity program

Yes (1)

No (0)

Prog Flex: flexibility included in activity program

Yes (1)

No (0)

Prog Balance: balance included in activity program

Yes (1)

No (0)

Prog Mind: mind-body (Thai Chi, Qigong, yoga) included in activity program

Yes (1)

No (0)

Prog Water: water aerobics included in activity program

Yes (1)

No (0)

Prog Other: any other components included in activity program

Yes (1) - specify

No (0)

Prog Not spec: components of activity program not specified

Specified (0)

Not specified (999)

Individual Strategies Goal: goal setting used as a strategy

Yes (1)

No (0)

Individual Strategies Action: action planning used as a strategy

Yes (1)

No (0)

Individual Strategies Problem: problem solving used as a strategy

Yes (1)

No (0)

Individual Strategies Feedback: feedback used as a strategy

Yes (1)

No (0)

Individual Strategies Tailoring: tailoring used as a strategy

Yes (1)

No (0)

Individual Strategies Self: self-monitoring setting used as a strategy

Yes (1)

No (0)

Group Strategies Goal: goal setting used as a strategy

Yes (1)

No (0)

Group Strategies Action: action planning used as a strategy

Yes (1)

No (0)

Group Strategies Problem: problem solving used as a strategy

Yes (1)

No (0)

Group Strategies Feedback: feedback used as a strategy

Yes (1)

No (0)

Group Strategies Facilitated: facilitated interactions used as a strategy

Yes (1)

No (0)

Intervention Functions Ed: Education (increasing knowledge or understanding) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Pers: Persuasion (using communication to induce positive or negative feelings or stimulate action) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Incent: Incentivisation (creating expectation of reward) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Coercion: Coercion (creating expectation of punishment or cost) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Train: Training (imparting skills) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Restrict: Restriction (using rules to reduce the opportunity to engage in the target behavior) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Environ: Environmental restructuring (changing the physical or social context) used as a behavioral construct

Yes (1)

No (0)

Intervention Functions Model: Modeling (providing an example for people to aspire to or imitate) used as a behavioral construct

Yes (1)

No (0)

Intervention_Functions_Enable: Enablement (increasing means / reducing barriers to increase capability or opportunity) used as a behavioral construct

Yes (1)

No (0)

Delivery_Personnel_TrainedRA: Trained research assistant as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_General: General health professional as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Exercise: Exercise professional as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Community:Community leader as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Lay: Lay/para health educator as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Ext: Extension agent/professional as exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Other: Any other exercise delivery agent

Yes (1)

No (0)

Delivery_Personnel_Not_Spec: Exercise delivery agent not specified

Specified (0)

Not specified (999)

Delivery_Personnel_Other_Spec: Description of other exercise delivery agent

Text if applicable

Delivery_Personnel_Other_Specified

Write out text

Deliv_Pers_Descrip_Trained: Delivery personel trained specifically by research personnel

Yes (1)

No (0)

Deliv_Pers_Descrip_Expertise: Delivery personel expertise characteristics (mediators) e.g.PA behaviors, self efficacy)

Yes (1)

No (0)

Deliv_Pers_Descrip_Personal: Delivery personel personal characteristics (moderators) e.g. age, BMI

Yes (1)

No (0)

Deliv_Pers_Descrip_Participation: Delivery personel participation rate (number eligible and delivered)

Yes (1)

No (0)

Training_Strategy: Language around training strategies/protocol (duration, type, etc.)

Write out text

SampleSize_Total_Baseline: Total sample size at baseline

Actual value

Not specified (999)

SampleSize_Analyses: Total sample size included in analyses (i.e. completed pre and post assessments)

Actual value

Not specified (999)

Sex: Female percentage at baseline (What is reported; If calculated, take to the first decimal)

Actual value

Not specified (999)

Age_M: Mean age at baseline

Actual value

Not specified (999)

Age_SD: Standard deviation age at baseline

Actual value

Not specified (999)

BMI_M: Mean Body Mass Index at baseline

Actual value

Not specified (999)

BMI_SD: Standard deviation Body Mass Index at baseline

Actual value

Not specified (999)

Race_Reported_AA: Percent African American

Actual value

Not specified (999)

Race_Reported_Asian: Percent Asian

Actual value

Not specified (999)

Race_Reported_White: Percent White

Actual value

Not specified (999)

Race_Reported_Other:

Actual value (0)

Not reported (999)

Ethnicity_HL: Percent Hispanic/Latino

Actual value (0)

Not reported (999)

High_school_completed: Percent completed high school / GED

Actual value (0)

Not reported (999)

High_school_college: Percent completed some college or more

Actual value (0)

Not reported (999)

Income: Percent income less than \$40,000

Actual value (0)

Not reported (999)

PA Measure Type:

Objective (1)

Subjective (2)

Both (3)

Attrition_Reported: Reported attrition rate

Actual value

Not reported (999)

Attrition_Calculated: Calculated attrition rate

Actual value
Not reported (999)

ITT: Intent to Treat

Yes (1)
No (0)

ITT_Pro: Imputation procedures included

Yes (1)
No (0)

Med_Analysis: Mediation analyses

Yes (1)
No (0)

Med_Analysis_Factors:

Yes (1)
No (0)

Cost_Categories_Recruit: Recruitment cost reported

Yes (amount)
No (0)

Cost_Categories_Adopt: Adoption (including start-up) cost reported

Yes (amount)
No (0)

Cost_Categories_Implement: Implementation (ongoing) cost reported

Yes (amount)
No (0)

Cost_Categories_Other: Other cost categories reported

Yes (amount)
No (0)

Sequence: Sequence Generation (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Allocation: Allocation concealment (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Blinding: Blinding of participants, personnel, and outcome assessors (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Incomplete Data: Incomplete outcome data (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Selective Reporting: Selective outcome reporting (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Other Bias: Other sources of bias (see cochrane review document)

Low (0)
High (1)
Unclear (2)

Cochrane Review

Domain	Description	Review authors' judgement
Sequence generation.	Describe the method used to generate the allocation sequence in sufficient detail to allow an assessment of whether it should produce comparable groups.	Was the allocation sequence adequately generated?
Allocation concealment.	Describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment.	Was allocation adequately concealed?
Blinding of participants, personnel and outcome assessors <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe all measures used, if any, to blind study participants and personnel from knowledge of which intervention a participant received. Provide any information relating to whether the intended blinding was effective.	Was knowledge of the allocated intervention adequately prevented during the study?
Incomplete outcome data <i>Assessments should be made for each main outcome (or class of outcomes).</i>	Describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. State whether attrition and exclusions were reported, the numbers in each intervention group (compared with total randomized participants), reasons for attrition/exclusions where reported, and any re-inclusions in analyses performed by the review authors.	Were incomplete outcome data adequately addressed?
Selective outcome reporting.	State how the possibility of selective outcome reporting was examined by the review authors, and what was found.	Are reports of the study free of suggestion of selective outcome reporting?
Other sources of bias.	State any important concerns about bias not addressed in the other domains in the tool. If particular questions/entries were pre-specified in the review's protocol, responses should be provided for each question/entry.	Was the study apparently free of other problems that could put it at a high risk of bias?

Appendix D

Supplemental Reference List: All articles and sources included in manuscript 1

Peer-reviewed literature (16 articles):

- Beling, J., & Roller, M. (2009). Multifactorial intervention with balance training as a core component among fall-prone older adults. *Journal of Geriatric Physical Therapy, 32*(3), 125-133. doi:10.1519/00139143-200932030-00008
- Belza, B., Shumway-Cook, A., Phelan, E. A., Williams, B., Snyder, S. J., & LoGerfo, J. P. (2006). The effects of a community-based exercise program on function and health in older adults: The EnhanceFitness program. *Journal of Applied Gerontology, 25*(4), 291-306. doi:10.1177/0733464806290934
- Bunout, D., Barrera, G., Avendaño, M., de la Maza, P., Gattas, V., Leiva, L., & Hirsch, S. (2005). Results of a community-based weight-bearing resistance training programme for healthy Chilean elderly subjects. *Age and Ageing, 34*(1), 80-83. doi:10.1093/ageing/afi005
- Hsu, H., Wang, C., Chen, Y., Chang, M., & Wang, J. (2010). Evaluation of a community-based aging intervention program. *Educational Gerontology, 36*(7), 547-572. doi:10.1080/03601270903237713
- Huang, H. C., Liu, C. Y., Huang, Y. T., & Kernohan, W. G. (2010). Community-based interventions to reduce falls among older adults in Taiwan - long time follow-up randomised controlled study. *Journal of Clinical Nursing, 19*(7-8), 959-968. doi:10.1111/j.1365-2702.2009.02834.x
- Kimura, M., Moriyasu, A., Kumagai, S., Furuna, T., Akita, S., Kimura, S., & Suzuki, T. (2013). Community-based intervention to improve dietary habits and promote physical activity among older adults: a cluster randomized trial. *BMC Geriatrics, 13*(1), 8-8. doi:10.1186/1471-2318-13-8

- Lin, M. R., Hwang, H., Wang, Y., Chang, S., & Wolf, S. L. (2006). Community-based tai chi and its effect on injurious falls, balance, gait, and fear of falling in older people. *Physical Therapy, 86*(9), 1189-1201. doi:10.2522/ptj.20040408
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- Maejima, H., Sunahori, H., Otani, T., Sakamoto, N., Yoshimura, O., & Tobimatsu, Y. (2009). Effect of long-term, community-based daily exercise on the ability to control the dynamic standing balance of Japanese elderly persons in relation to falls. *Nursing & Health Sciences, 11*(2), 128-134. doi:10.1111/j.1442-2018.2009.00453.x
- Ramsbottom, R., Ambler, A., Potter, J., Jordan, B., Nevill, A., & Williams, C. (2004). The effect of 6 months training on leg power, balance, and functional mobility of independently living adults over 70 years old. *Journal of Aging and Physical Activity, 12*(4), 497-510. doi:10.1123/japa.12.4.497
- Robare, J. F., Bayles, C. M., Newman, A. B., Williams, K., Milas, C., Boudreau, R., . . . Kuller, L. H. (2011). The “10 keys” to healthy aging: 24-month follow-up results from an innovative community-based prevention program. *Health Education & Behavior, 38*(4), 379-388. doi:10.1177/1090198110379575
- Hasegawa, R., Islam, M. M., Watanabe, R., Tomiyama, N., & Taaffe, D. (2014). Effects of periodic task-specific test feedback on physical performance in older adults undertaking band-based resistance exercise. *Journal of Aging Research, 1-8*. doi:2014/171694

- Tikkanen, P., Lonroos, E., Sipila, S., Nykanen, I., Sulkava, R., & Hartikainen, S. (2013). Effects of comprehensive health assessment and targeted intervention on chair rise capacity in active and inactive community-dwelling older people. *Gerontology, 59*(4), 324-327. doi:10.1159/000347197
- Won-Jin, K., Moonyoung, C., & Duk-Hyun, A. (2014). Effects of a community-based fall prevention exercise program on activity participation. *Journal of Physical Therapy Science, 26*(5), 651-653. doi:10.1589/jpts.26.651
- Yamada, M., Arai, H., Sonoda, T., & Aoyama, T. (2012). Community-based exercise program is cost-effective by preventing care and disability in Japanese frail older adults. *Journal of the American Medical Directors Association, 13*(6), 507-511. doi:10.1016/j.jamda.2012.04.001
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Grey literature (17 programs, listed by name and state):

Strong women (Alaska)

Carter, D. (2013). *2013 Healthy lifestyles*. Retrieved from Land-Grant Impacts:

<https://landgrantimpacts.tamu.edu/impacts/article/990>

Norris, A. (2015). *2015 Strong Women and living well Alaska promoting health*. Retrieved from

Land-Grant Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/1472>

University of Alaska Fairbanks Cooperative Extension Service. (n.d.). *Healthy living and families*. Retrieved from <http://www.uaf.edu/ces/hhfd/>

Bone Estrogen Strength Training (Arizona)

Houtkooper, L. (n.d.). *Osteoporosis prevention*. Retrieved from

<https://extension.arizona.edu/sites/extension.arizona.edu/files/resources/best.pdf>

Strong Women Strong Men (Arkansas)

Traywick, L., & Washburn, L. (2014). *Extension exercise programs improve health*. Retrieved from Land-Grant Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/686>

Living (well through) Intergenerational Fitness and Exercise (LIFE) (Iowa)

Sowle, A., Francis, S., Margrett, J., & Franke, W. (2016). Utility of the living (well through) intergenerational fitness and exercise program as a county-delivered extension program. *Journal of Extension*, 54(4).

Matter of Balance (Kentucky)

Young, J. (2016). *Matter of balance*. Retrieved from Land-Grant Impacts:

<https://landgrantimpacts.tamu.edu/impacts/article/2145>

Nutrition Education and the Rural Elderly (Maryland)

Frazier, B., Collins, B., & Rhodes, J. (1991). Reaching isolated rural elderly. *Journal of Extension*, 29(3).

Advanced Stay Strong, Stay Healthy (Missouri)

Britt-Rankin, J. (2013a). *Advanced stay strong, stay healthy program*. Retrieved from Land-Grant Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/207>

Britt-Rankin, J. (2015). *Advanced stay strong, stay healthy program - 2015*. Retrieved from Land-Grant Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/1628>

University of Missouri Extension. (2015). *Advanced stay strong, stay healthy*. Retrieved from <http://missourifamilies.org/sssh/advsssh.htm>

Stay Strong, Stay Healthy (Missouri)

Britt-Rankin, J. (2013b). *Stay strong, stay healthy program*. Retrieved from Land-Grant Impacts:

<https://landgrantimpacts.tamu.edu/impacts/article/206>

Britt-Rankin, J. (2015). *Stay strong, stay healthy program - 2015*. Retrieved from Land-Grant

Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/1635>

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Project Healthy Bones (New Jersey)

Klotzback-Shimomura, K. (2001). Project healthy bones: An osteoporosis prevention program

for older adults. *Journal of Extension*, 39(3).

Stepping On (North Dakota)

NDSU Extension Service. (2016). *NDSU Extension family, consumer programs targeted at*

prevention. Retrieved from [https://www.ag.ndsu.edu/news/newsreleases/2016/sept-19-](https://www.ag.ndsu.edu/news/newsreleases/2016/sept-19-2016/ndsu-extension-family-consumer-programs-targeted-at-prevention/view)

[2016/ndsu-extension-family-consumer-programs-targeted-at-prevention/view](https://www.ag.ndsu.edu/news/newsreleases/2016/sept-19-2016/ndsu-extension-family-consumer-programs-targeted-at-prevention/view)

Journey Through Health (Oklahoma)

Jung, S. E., Hermann, J., Parker, S., & Smith, B. (2015). Development and evaluation of an

educational display for older adults: Journey through health. *Journal of Extension*, 53(5).

Better Balance, Better Bones, Better Bodies (Oregon)

Gunter, K., & John, D. (2014). Feasibility of a brief community-based train-the-trainer lesson to

reduce the risk of falls among community dwelling older adults. *Journal of Extension*,

52(1).

Strong Women (Pennsylvania)

Chaudhary, A. K., Van Horn, B., & Corbin, M. (2015). StrongWomen® program evaluation: Effect of strength training exercises on physical fitness of participants. *Journal of Extension, 53*(4).

Penn State College of Agricultural Sciences. (2017). *StrongWomen*. Retrieved from <http://extension.psu.edu/health/strongwomen>

Strong Women, Strong Bones (Virginia)

Virginia Polytechnic Institute and State University. (2017). *Physical activity*. Retrieved from <http://ext.vt.edu/food-health/physical-activity.html>

Active for Life Program (West Virginia)

Erickson, M., Hodgkiss, K., Key, J., Brown, G., Goins, R. T., & Jones, D. (2010). Participants' attitudes, opinions, and beliefs of a physical activity program in West Virginia. *Journal of Extension, 48*(3).

Taking Charge (West Virginia)

Fincham, H., Bowen, E., Davis, K., Kaczor, C., Lester, D., Mowbray, R., & Porter, B. (2011). Use automated phone calls to relay extension educational messages. *Journal of Extension, 49*(4).

West Virginia University. (2017). *Taking charge of your health & safety*. Retrieved from <http://fh.ext.wvu.edu/health/health-for-seniors>

Strong Women (Wisconsin)

Flickinger, A. (2016). *Improving women's health and fitness in Wisconsin: The Strong Women™ program*. Retrieved from Land-Grant Impacts: <https://landgrantimpacts.tamu.edu/impacts/article/1050>

University of Wisconsin-Extension. (n.d.). StrongWomen™ in Wisconsin. Retrieved from
<http://fyi.uwex.edu/strongwomenwisconsin/>

Appendix E

University of Wyoming Institutional Review Board exempt approval for manuscript 2

University of Wyoming
 Vice President for Research & Economic Development
 1000 E. University Avenue, Department 3355 • Room 305/308, Old Main • Laramie, WY 82071
 (307) 766-5353 • (307) 766-5320 • fax (307) 766-2608 • www.uwyo.edu/research

March 28, 2017

Laura Balis
 Extension Educator
 Extension
 University of Wyoming

Samantha Harden
 Assistant Professor and Exercise Specialist
 Human Nutrition
 Virginia Tech

Protocol #20170328LB01536

Re: IRB Proposal “*Older Ghanaian Adults’ Perceptions of Physical Activity: An Exploratory, Qualitative Study*”

Dear Laura and Samantha:

The proposal referenced above qualifies for exempt review and is approved as one that would not involve more than minimal risk to participants. Our exempt review and approval will be reported to the IRB at their next convened meeting April 20th 2017.

Any significant change(s) in the research/project protocol(s) from what was approved should be submitted to the IRB (Protocol Update Form) for review and approval prior to initiating any change. Per recent policy and compliance requirements, any investigator with an active research protocol may be contacted by the recently convened Data Safety Monitoring Board (DSMB) for periodic review. The DSMB’s charge (sections 7.3 and 7.4 of the IRB Policy and Procedures Manual) is to review active human subject(s) projects to assure that the procedures, data management, and protection of human participants follow approved protocols. Further information and the forms referenced above may be accessed at the “Human Subjects” link on the Office of Research and Economic Development website:
<http://www.uwyo.edu/research/human-subjects/index.html>.

You may proceed with the project/research and we wish you luck in the endeavor. Please feel free to call me if you have any questions.

Sincerely,
Esther Seville
 Esther Seville
 IRB Office Associate
 On behalf of the Chairman,
 Institutional Review Board

Appendix F

Focus group script for manuscript 2

Older Ghanaian Adults' Perceptions of Physical Activity Focus Group Script

Thank you for joining us today to participate in the physical activity focus group. A focus group is an interview with multiple persons at once in order to gain a rich understanding of a particular topic. Today we want to discuss your perception of physical activity as well as opinions on the best ways to assist older adults with being more active. There will be approximately 64 participants from Accra, Cape Coast, and Koforidua taking part in focus groups. The length of time you can expect to be in this focus group is 90 minutes.

I am _____, and I am part of the research team. We will start by talking about your role as a participant in this study, obtaining informed consent, and completing a brief questionnaire. Then, I will start the focus group.

We welcome your responses either in Twi or English. For this reason, Laura, who is here to assist me, will be stopping us after each section of the interview to ensure we got to all the questions.

First I will read the consent form, allow time for any related questions, and collect signed consent for those of you who wish to continue with this focus group interview.

(Read consent form, collect signed consent forms. Participants complete questionnaire. Resume [~15 minutes]).

There are no right or wrong answers, so please share your experience and thoughts as we continue. Again, Laura will keep track of time. When she pauses us, it's to check that we have covered all the topics of interest.

I will begin recording now.

Please state the number assigned to you in your packet.

(Allow participants to read their assigned participant number to both test for volume and 'record' voice recognition.)

Thank you for joining.

Our first few questions are related to your perceptions of physical activity (~30 minutes).

Attitude (not read)

- Please tell me about the positive things that may happen if you exercise.
- Please tell me about the negative things that may happen if you exercise.

Subjective Norms (not read)

- The ministry of health recommends engaging in 150 minutes of moderate-intensity aerobic activity (30 minutes most days of the week) and two sessions of muscle-strengthening activities (targeting major muscle groups) per week. Tell me how you feel about this recommendation.
- What would it take for someone to convince you that it is important to do aerobic activity for 30 minutes most days of the week?
 - Probes: who, how, why, health care provider
- What would it take for someone to convince you that it is important to do muscle-strengthening activities two days per week?
 - Probes: who, how, why, health care provider

Behavioral Intention (not read)

- Please describe your intentions to do aerobic activity for 30 minutes most days of the week.
- Please describe your intentions to do muscle-strengthening activities two days per week?

Implementation Intention (not read)

- If you plan to do aerobic activity for 30 minutes most days of the week, how would you do so?
 - Probes: when, where, how
- If you plan to do muscle-strengthening activities two days per week, how would you do so?
 - Probes: when, where, how
- If you already meet these recommendations, how will you maintain these behaviors?

Perceived Behavioral Control (not read)

- What would make it easy to meet physical activity recommendations?
- What would make it hard to meet physical activity recommendations?
- What would you need to help you meet physical activity recommendations?

The next few questions are related to developing a physical activity program for older adults in Ghana (~30 minutes).

We are working to develop an appropriate physical activity program for older adults in Ghana.

- How do you feel about an in-person physical activity program?
 - Probe: What do you want the class to focus on? Have you ever attended a similar class? If so, what was your experience?
- How often should the class meet?
- How long should the class be?
- Where would it be convenient for the classes to meet?
 - Town:
 - Building type:
 - Church:
- What would you do in this class?
- Should separate classes be offered for men and women, or should they participate together?
- Think about who should teach this class. What type of person would be most helpful?
 - Probe: how old, male or female, faith-based, what would s/he do that would be most helpful?
- What program characteristics would you prefer to see in a physical activity program?
 - Probes: tracking, in a group, one-on-one, social support, feedback on goals, diaries.
- What type of group based activities would be helpful?
 - Probes: setting group goals, social interactions, supporting each other
- What should be included to teach you how to eat when participating in a physical activity program?
- How do you feel about health promotional information delivered via:
 - DVD
 - Text
 - Online
 - Email
 - In-person
- What types of incentives would motivate people to get involved in the program?
 - Probe: What type of incentives would help them stay involved?
- What do you think could make it hard for older adults to participate in the program?
 - Probe: What would help them overcome these barriers?

- After going through a program like this, do you think you could teach it yourself?
 - Probe: What would it take for you to feel comfortable teaching the program?

Wrap-Up (~15 minutes)

Is there anything else you would like to share with the research team at this time?

I am going to stop recording now.

Thank you for your participation in this focus group. Members of the research team will transcribe these sessions verbatim (or, word for word). We will then interpret the findings in order to develop a program for older adults in Ghana. If at any time during this process you wish to retract all or part of your statements, you may do so. You have our contact information on your consent form documents.

Appendix G

Focus group questionnaire for manuscript 2

**Older Ghanaian Adults' Perceptions of Physical Activity Focus Group
Questionnaire**

PART A: Tell us about yourself.

- 1) Age _____
- 2) Sex
 - ₁ Male
 - ₂ Female
 - ₃ Prefer not to answer
- 3) My weight status is classified as:
 - ₁ Underweight
 - ₂ Normal weight
 - ₃ Overweight
 - ₄ Obese
 - ₅ Don't know
- 4) Please indicate which of the following best describes you (choose all that apply):
 - ₁ Akan
 - ₂ Ewe
 - ₃ Ga-Adangbe
 - ₄ Gruma
 - ₅ Grusi
 - ₆ Guan
 - ₇ Mande-Busanga
 - ₈ Mole-Dagbon
 - ₉ Other (please specify) _____
- 5) Please mark the highest level of school that you have completed.
 - ₁ No formal education
 - ₂ Primary school
 - ₃ Secondary high school
 - ₄ High school completed
 - ₅ College
- 6) What is your employment status?

<input type="checkbox"/> ₁ Currently working	<input type="checkbox"/> ₄ A homemaker
<input type="checkbox"/> ₂ Never worked	<input type="checkbox"/> ₅ Retired
<input type="checkbox"/> ₃ Not currently working	<input type="checkbox"/> ₆ Disabled/unable to work

7) **What is your marital status?**

- ₁ Single ₂ Married ₃ Widowed
₄ Separated ₅ Divorced ₆ Living with partner

8) **How long did it take you to get to the church today?**

- ₁ <10 minutes
₂ 11-20 minutes
₃ 21-40 minutes
₄ > 40 minutes

9) **How did you travel to church (e.g., walk, bus, car, someone drove you)?**

10) **Where do you live?**

- ₁ Accra
₂ Cape Coast
₃ Koforidua
₄ Other (please specify) _____

Part B. Health1) **In general, compared to other persons your age, how would you rate your health?**

- ₁ Extremely healthy
₂ Somewhat healthy
₃ Not healthy
₄ Very unhealthy
₅ Don't know

2) **How confident are you that you can engage in moderate physical activities (e.g., not exhausting, light perspiration) for 30 minutes for 5 or more days per week?**

- ₁ Not at all ₂ Somewhat ₃ Moderately ₄ Very ₅ Completely

Next I am going to ask you about the time you spend doing different types of physical activity in a typical week. Please answer these questions even if you do not consider yourself to be a physically active person.

Think first about the time you spend doing work. Think of work as the things that you have to do such as paid or unpaid work, study/training, household chores, harvesting food/crops, fishing or hunting for food, seeking employment. In answering the following questions 'vigorous-intensity activities' are activities that require hard physical effort and

cause large increases in breathing or heart rate, 'moderate-intensity activities' are activities that require moderate physical effort and cause small increases in breathing or heart rate.

Work

- 3) Does your work involve vigorous-intensity activity that causes large increases in breathing or heart rate like carrying or lifting heavy loads, digging, or construction work for at least 10 minutes continuously?
- ₁ Yes
₂ No → If no, go to **question 6**
- 4) In a typical week, on how many days do you do vigorous intensity activities as part of your work?
 ___ Days a week
- 5) How much time do you spend doing vigorous-intensity activities at work on a typical day?
 ___ Hours: ___ minutes
- 6) Does your work involve moderate-intensity activity that causes small increases in breathing or heart rate such as brisk walking or carrying light loads for at least 10 minutes continuously?
- ₁ Yes
₂ No → If no, go to **question 9**
- 7) In a typical week, on how many days do you do moderate intensity activities as part of your work?
 ___ Days a week
- 8) How much time do you spend doing moderate-intensity activities at work on a typical day?
 ___ Hours: ___ minutes

Travel to and from places

The next questions exclude the physical activities at work that you have already mentioned. Now I would like to ask you about the usual way you travel to and from places. For example to work, for shopping, to market, to place of worship.

- 9) Do you walk or use a bicycle (pedal cycle) for at least 10 minutes continuously to get to and from places?
- ₁ Yes
₂ No → If no, go to **question 12**
- 10) In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?

___ Days a week

- 11) **How much time do you spend walking or bicycling for travel on a typical day?**

___ Hours: ___ minutes

Recreational activities

The next questions exclude the work and transport activities that you have already mentioned. Now I would like to ask you about sports, fitness and recreational activities (leisure).

- 12) **Do you do any vigorous-intensity sports, fitness or recreational (leisure) activities that cause large increases in breathing or heart rate like running or football for at least 10 minutes continuously?**

₁ Yes

₂ No → If no, go to question 15

- 13) **In a typical week, on how many days do you do vigorous intensity sports, fitness or recreational (leisure) activities?**

___ Days a week

- 14) **How much time do you spend doing vigorous-intensity sports, fitness or recreational activities on a typical day?**

___ Hours: ___ minutes

- 15) **Do you do any moderate-intensity sports, fitness or recreational (leisure) activities that cause a small increase in breathing or heart rate such as brisk walking or volleyball for at least 10 minutes continuously?**

₁ Yes

₂ No → If no, go to question 18

- 16) **In a typical week, on how many days do you do moderate intensity sports, fitness or recreational (leisure) activities?**

___ Days a week

- 17) **How much time do you spend doing moderate-intensity sports, fitness or recreational (leisure) activities on a typical day?**

___ Hours: ___ minutes

Sedentary behavior

The following question is about sitting or reclining at work, at home, getting to and from places, or with friends including time spent sitting at a desk, sitting with friends, traveling in car, bus, train, reading, playing cards or watching television, but do not include time spent sleeping.

- 18) **How much time do you usually spend sitting or reclining on a typical day?**

___ Hours: ___ minutes

- 19) What are the physical activity recommendations for older adults?**
- ₁ 30 minutes of moderate intensity physical activity 5 days a week
 - ₂ 20 minutes of moderate intensity physical activity 3 times per week
 - ₃ 60 minutes of moderate intensity physical activity most days of the week
 - ₄ Unsure
- 20) The amount of physical activity I engage in is:**
- ₁ Less than the recommended amount of physical activity
 - ₂ Meeting physical activity recommendations
 - ₃ More than the physical activity recommendations
 - ₄ I do not engage in physical activity
 - ₅ Unsure

Appendix H

University of Wyoming Institutional Review Board exempt approval for manuscript 3, study 1

University of Wyoming
Vice President for Research & Economic Development
1000 E. University Avenue, Department 3355 • Room 305/308, Old Main • Laramie, WY 82071
(307) 766-5353 • (307) 766-5320 • fax (307) 766-2608 • www.uwyo.edu/research

February 4, 2016

Laura Balis
Extension Educator
Nutrition & Food Safety
University of Wyoming

Protocol #20151214LB01022

Re: IRB Proposal “*Educator Perceptions of Physical Activity Programming in University of Wyoming Extension*”

Dear Laura:

The proposal referenced above qualifies for exempt review with a minor modification and is approved as one that would not involve more than minimal risk to participants. Our exempt review and approval will be reported to the IRB at their next convened meeting February 18, 2016.

Any significant change(s) in the research/project protocol(s) from what was approved should be submitted to the IRB (Protocol Update Form) for review and approval prior to initiating any change. Per recent policy and compliance requirements, any investigator with an active research protocol may be contacted by the recently convened Data Safety Monitoring Board (DSMB) for periodic review. The DSMB’s charge (sections 7.3 and 7.4 of the IRB Policy and Procedures Manual) is to review active human subject(s) projects to assure that the procedures, data management, and protection of human participants follow approved protocols. Further information and the forms referenced above may be accessed at the “Human Subjects” link on the Office of Research and Economic Development website:
<http://www.uwyo.edu/research/human-subjects/index.html>.

You may proceed with the project/research and we wish you luck in the endeavor. Please feel free to call me if you have any questions.

Sincerely,

Colette Kuhfuss

Colette Kuhfuss
IRB Coordinator
On behalf of the Chairman,
Institutional Review Board

Appendix I

Educator survey for manuscript 3

Educator Perceptions of Physical Activity Programming in University of Wyoming Extension

The overall purpose of this study is to examine and inform physical activity programming within University of Wyoming Extension (UWE).

Specifically, the purpose of this survey is to determine 1) current physical activity topics and programming within UWE; 2) level of intent to deliver statewide programs in 2016; and 3) the characteristics of the agents who may ultimately deliver physical activity programming across the state of Wyoming. Related to the third aim, the research team would like to gather information about you as an individual; both demographics as well as information about your own engagement in physical activity.

All of the results will be reported as group data, whereby no individual will be identifiable in the results or any reports of the study findings. Any information you provide will remain anonymous. Please answer each question to the best of your knowledge. *If you choose not to answer any question, just leave it blank and move on to the next question.*

Any questions or concerns about completing this survey can be directed to:

Principal Investigators	Coordinator, Institutional Review Board
Laura Balis Email: lbalis@uwyo.edu Phone: (307) 332-2363 130 Eugene Street Lander, WY 82520 Dr. Samantha Harden Email: harden.samantha@vt.edu Phone: (540) 231-9960 1981 Kraft Dr Room 1009 Blacksburg, VA 24060	Colette Kuhfuss IRB/IACUC Coordinator Email: ckuhfuss@uwyo.edu Phone: 307-766-5322 Office of Research and Economic Development University of Wyoming

PART A: Physical Activity and Nutrition Short Questions

1. How many years have you worked for Extension? _____
2. How many years have you worked at the University of Wyoming Extension? _____
3. What is your highest level of education? _____
4. In what discipline is your Master's degree? _____
5. What is your level of comfort delivering nutrition education programs?

Very Uncomfortable					Very Comfortable
1	2	3	4	5	

6. What nutrition education programs are you currently delivering?
7. What physical activity education programs are you currently delivering?
8. Which of the following best describes your current situation?
 - I am not considering offering a physical activity program in my counties at all.
 - I am thinking about delivering a physical activity program.
 - I am preparing to deliver a physical activity program (e.g. have compiled some resources, looked at possible programs/curricula, etc.) in the next 6 months.
 - I am delivering a physical activity program.
 - I continuously deliver physical activity programs.

PART B:

1. How much time do you spend, on average per week, on the following tasks.

Task	Average Time (per week)
Recruiting participants	
Tailoring program materials for specific groups of people	
Determining if those in most need of intervention were recruited	
In training sessions for new programs	
In training sessions for programs you have previously delivered	
Training others to deliver programming	
Traveling related to Extension program delivery	

Task	Average Time (per week)
Traveling related to Extension program training	
Delivering programs	
Developing and/or refining program materials	
Ensuring the program is delivered as intended (e.g., complete a checklist at the end of a program session)	
Maintaining partnerships for program delivery (e.g., attending community forums, networking, meetings)	
Evaluating the program	
Time spent working on adapting the program for future iterations	
Other (Please specify)	

2. How do you use technology professionally and personally?
(Please check all that apply).

- Smartphone
- Tablet (iPad, Note)
- Laptop
- Desktop
- Social Media
- Electronic Reader
- Other _____

3. Please indicate your level of agreement/disagreement with the following statements where 1 = completely disagree and 5 = completely agree.

When I decide to deliver a program I value whether

	Completely Disagree				Completely Agree
	1	2	3	4	5
1. This program helps people start being more active and "stick with it" even after the program is over.	1	2	3	4	5
2. This program fits the mission of University of Wyoming Extension.	1	2	3	4	5
3. This program will attract more residents in my area than other NFS programs.	1	2	3	4	5

	Completely Disagree			Completely Agree	
	1	2	3	4	5
4. This program would need to be adapted specifically to work within University of Wyoming Extension.	1	2	3	4	5
5. I could recruit a strong volunteer base using this program.	1	2	3	4	5
6. I could easily solicit support from local community organizations.	1	2	3	4	5
7. Other Extension Educators will help implement the program.	1	2	3	4	5
8. The program can be maintained/sustained easily for longer than one year without special funding.	1	2	3	4	5
9. The program will receive good public relations opportunities and visibility for me and Extension.	1	2	3	4	5
10. The program will become a Statewide “branded” program.	1	2	3	4	5
11. UWE will provide ongoing financial support for the program.	1	2	3	4	5

FitEx is an 8-week state-wide walking program based on group dynamics principles of goal setting, distinctiveness, social support, and accountability. In this program, teams of 6 work together to ensure that each member is achieving the physical activity guidelines of 150 minutes of moderate intensity physical activity per week.

Those who engage in the program improve their physical activity and fruit and vegetable consumption. After attending an in-person training, >90% of eligible health educators intended to deliver FitEx.

4. Would you be interested in receiving training on the delivery and evaluation of the FitEx program?

1 Yes 2 No

5. Please select all that apply. Would you be willing to receive this training:

In person

Webinar

6. What is your level of comfort delivering physical activity programs to older adults?

Very

Uncomfortable

Very

Comfortable

1

2

3

4

5

L.I.F.T., Lifelong Improvements through Fitness Together, is an 8-week, team-building, physical activity and nutrition program for older adults. Agents demonstrate exercises to promote balance, flexibility, and strength training that may improve the functional fitness of older adults and their ability to live comfortably, independent longer. The program will meet 2x/week allowing at least a day between sessions. Agents interested in delivering L.I.F.T. within their community will receive training on performing the functional fitness assessment with participants, the 8 full-body exercises completed throughout the program, and a thorough breakdown of the program manual in its entirety. This enables the agents to lead the program with confidence, ease, and familiarity.

7. Would you be interested in training on the delivery and evaluation of LIFT?

1 Yes 2 No

8. Please select all that apply. Would you be willing to receive this training:

In person

Webinar

PART C: Demographic and Health Information

1. Age: _____

2. Sex (check one): 1 Male 2 Female

3. Marital Status:

1 Single

2 Married

3 Widowed

4 Separated

5 Divorced

6 Living common-law or living with partner

4. Please indicate which of the following best describes you (Please Choose One).

1 White

2 Black or African American

3 Asian

4 American Indian/Alaskan Native

5 Native Hawaiian or Other Pacific Islander

6 Not sure

7 Other: _____

5. Please indicate which of the following best describes you (Please Choose One).

1 Hispanic or Latino

2 Not Hispanic or Latino

3 Not sure

6 General Health Status: In general, compared to other persons your age, how would you rate your health?

- 1 Poor 2 Fair 3 Good 4 Very good 5 Excellent

7. How confident are you that you can engage in moderate physical activities for 30 minutes for 5 or more days per week?

- 1 Not at all 2 Somewhat 3 Moderately 4 Very 5 Completely

8. Physical activity over the past week.

Considering the past 7-day period (last week), how many times did you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number). Only count exercise that was done during free time (i.e., not occupation or housework). Note that the main difference between the three categories is the intensity of the exercise. Please write the average frequency on the first line and the average duration on the second line.

Times Per Week Average Duration

a. STRENUOUS EXERCISE
(HEART BEATS RAPIDLY, SWEATING)

(e.g., running, jogging, hockey, soccer, squash, cross country skiing, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)

b. MODERATE EXERCISE
(NOT EXHAUSTING, LIGHT PERSPIRATION)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball badminton, easy swimming, alpine skiing, popular and folk dancing)

c. MILD EXERCISE
(MINIMAL EFFORT, NO PERSPIRATION)

(e.g., easy walking, yoga, bowling)

9. Are you interested in participating in a phone interview that will elaborate on this line of questioning? You will be directed to a separate location to share your contact information.

- a. Yes- taken to new survey to provide contact details.
(Name. Email. Phone number. County.)
- b. No- Thank you for completing this survey.

Appendix J

Educator interview script for manuscript 3

University of Wyoming Extension Educator Key Informant Interviews

Thank you for speaking with me today to participate in the University of Wyoming Extension (UWE) Educator key informant interviews. The purpose of key informant interviews is to collect information from community experts who have first-hand knowledge about the community and can provide insight about a topic. Today we want to discuss physical activity programming in UWE, covering topics ranging from curriculum to evaluation.

I am _____, and I am part of the research team. We will start by talking about your role as a participant in this study and obtaining informed consent. Then, I will start asking questions from my interview guide. My role as an interviewer is to present the topic areas, probe for any follow-up details we may need related to a specific response, and to keep track of time.

First I will read the consent form, allow time for any related questions, and collect signed consent for those of you who wish to continue with this focus group interview.

(Read consent form, collect signed consent forms. Resume [~5 minutes]).

There are no right or wrong answers, so please share your experience and thoughts as we continue.

I will begin recording now.

Please state your role in UWE and the county you are employed in.

(Allow interviewee to read their assigned participant number to both test for volume and 'record' voice recognition)

Thank you.

Physical activity programming (10-15 minutes)

What type of physical activity programming are you currently delivering in your counties?

Probe(s): For how long, to whom?

What types of nutrition programs are you delivering that include a physical activity component?

What are some barriers for physical activity programming?

Probe(s): knowledge, resources [space, equipment], interest from community members?

What are some things that make it easy to include physical activity programming in your counties?

Probe(s): knowledge, resources [space, equipment], interest from community members?

Please describe the training you have as it relates to delivering physical activity programs.

Please describe your perceptions of support from your superiors to deliver physical activity programming.

What is your perception about the degree to which other Extension educators are delivering physical activity programming in UWE? What about other states?

How is your job performance evaluated?

How does physical activity programming relate to your job performance evaluation?

Please describe your thoughts on a "training/certification" for you to become more confident in delivering physical activity.

Personal

Please describe your confidence level that you will be able to successfully deliver physical activity programming.

Probes: What gives you that confidence, how has that changed, previous delivery, what makes unconfident

How prepared are you to deliver physical activity programming?

Probes: why, stages of change, current delivery

How do you determine which programs you deliver?

Probes: evidence, pragmatic vs. research based

As you may know, the national recommendation is for individuals to engage 30 minutes of moderate activity most days of the week.

Tell me how you feel about this recommendation.

Probe: how do you meet (or try to meet) these recommendations, feasibility

As you may know, the national recommendation is for individuals to include 2 or more days of full-body muscle strengthening in their physical activity routine.

Tell me how you feel about this recommendation.

Probe: how do you meet (or try to meet) these recommendations, feasibility

Wrap-Up (Remaining Time)

Is there anything else you would like to share with the research team at this time?

I am going to stop recording now.

Thank you for your participation in this key informant interview. Members of the research team will transcribe these sessions verbatim. We will then interpret the findings in order to conduct physical activity programming in UWE. If at any time during this process you wish to retract all or part of your statements, you may do so.

[Salutations]

Appendix K

Virginia Tech Institutional Review Board approval for manuscript 3, study 2 and 3

Office of Research Compliance
 Institutional Review Board
 North End Center, Suite 4120, Virginia Tech
 300 Turner Street NW
 Blacksburg, Virginia 24061
 540/231-4606 Fax 540/231-0959
 email irb@vt.edu
 website <http://www.irb.vt.edu>

MEMORANDUM

DATE: January 30, 2018

TO: Samantha Marie Harden, NithyaPriya Priya Shivanthi
 Ramalingam, Thomas Edward Strayer III, Meghan Wilson, Laura
 Elizabeth Balis, Stephanie Ann Breig, Elena L Serrano, Judith L
 Midkiff

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires
 January 29, 2021)

PROTOCOL TITLE: Testing a scalable, sustainable approach to training health
 educators

IRB NUMBER: 17-556

Effective January 30, 2018, the Virginia Tech Institution Review Board (IRB) approved the Amendment request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at: <http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As: **Expedited, under 45 CFR 46.110 category(ies) 4,7**
 Protocol Approval Date: **October 9, 2017**
 Protocol Expiration Date: **October 8, 2018**

Continuing Review Due Date*: **September 24, 2018**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

Appendix L

Pre-training survey for manuscript 3

Train S.M.A.R.T. Delivery Personnel Pre-Training Survey

Participation in this survey is voluntary. This survey was developed to contribute to the ongoing research projects in the Physical Activity Research and Community Implementation (PARCI) Laboratory. These research projects relate to delivery personnel's comfort delivering physical activity interventions and other behaviors and practices. All of the results will be reported as group data, whereby no individual will be identifiable in the results or any reports of the study findings. The research may be published. Any information you provide will remain confidential. Please answer each question to the best of your knowledge. If you choose not to answer any question, just leave it blank and move on to the next question.

For questions or concerns about this survey or study, please contact:	Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact:
<p style="text-align: center;">Dr. Samantha Harden, Principal Investigator, Virginia Tech Email: harden.samantha@vt.edu Phone: (540) 231-9960</p>	<p style="text-align: center;">Dr. David M. Moore, Chair, Institutional Review Board Email: moored@vt.edu Phone: (540) 231-4991</p>

By completing this form, I am providing my consent to partake in this research study.

Train S.M.A.R.T. Delivery Personnel Pre Online Training Survey

Personal Identifiers: (For Example: Samantha Harden July 14 is SAMHAR0715)

First 3 letters of your first name: ___ ___ ___

First 3 letters of your last name: ___ ___ ___

Birth Month (numeric July = 07): ___ ___

Day of Birthday (numeric first = 01): ___ ___

TELL US ABOUT YOURSELF:

1. County(ies) where you intend to deliver LIFT:

2. What is your sex? O₁ Male O₂ Female _____
3. What is your age: _____ years
4. About how tall are you without shoes? _____ Feet _____ Inches
5. About how much do you weigh without shoes? _____ pounds
6. Please indicate which of the following best describes you (check all that apply):
O₁ Black/African American O₂ Asian O₃ White
O₄ American Indian/Native Alaskan O₅ Native Hawaiian/Pacific Islander
O₆ Other _____
7. Please indicate which of the following best describes you:
O₁ Hispanic or Latino O₂ Not Hispanic or Latino O₃ Not Sure
8. Please mark the highest grade of school that you have completed:
O₁ Some high school O₂ High School or GED O₃ Some college O₄ College graduate
O₅ Graduate Degree
9. If you attended graduate school, please answer the following
 - a. What is your highest degree:
O₁ Masters of Education O₂ Masters of Science O₃ Master of Public Health
O₄ Other _____
 - b. What program was your degree (e.g., MS of Agriculture, MS of Kinesiology): _____
 - c. Was your degree:
O₁ Non-thesis O₂ Thesis
10. I feel that my training with regard to delivering physical activity programs during my education was:
O₁ Excellent O₂ Good O₃ No Opinion O₄ Fair O₅ Poor
11. In general, compared to others your age, how would you rate your health:
O₁ Excellent O₂ Very Good O₃ Good O₄ Fair O₅ Poor O₆ Don't know

12. What is your current smoking status?

O₁ Currently Smoke O₂ Don't Smoke O₃ Ex-Smoker

13. Has your doctor ever diagnosed you with any of the following (check all that apply)?

O₁ Arthritis O₂ Asthma O₃ Depression O₄ Diabetes
 O₅ Heart Disease O₆ High Blood Pressure O₇ High Blood Cholesterol O₈ Obesity
 O₉ None of the above

14. How many hours of sleep do you usually get in the evening? _____ hours

15. How confident are you that you can engage in moderate physical activities (e.g., not exhausting, light perspiration) for 30 minutes for 5 or more days per week?

O₁ Not at all O₂ Somewhat O₃ Moderately O₄ Very O₅ Completely

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

16. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week**

No vigorous physical activities → Skip to question 18

17. How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

Don't know/Not Sure

Think about all the moderate activities that you did in the last 7 days. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

18. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

No moderate physical activities → Skip to question 20

19. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**
_____ **minutes per day**

Don't know/Not Sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

20. During the **last 7 days**, on how many days did you walk for at least 10 minutes at a time?

_____ **days per week**

No walking activities → Skip to question 22

21. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**
_____ **minutes per day**

Don't know/Not Sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

22. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**
_____ **minutes per day**

Don't know/Not Sure

THE FOLLOWING ITEMS ARE RELATED TO YOUR DECISION MAKING PROCESS.

Please rate <u>how important</u> each of the following factors are when you are deciding whether to adopt a 'new' program in your county(ies)/city.	Very Unimportant	Unimportant	Neutral	Important	Very Important
The program has potential to attract/recruit a large number of participants.	1	2	3	4	5

The program has potential to attract/recruit a group of participants that is representative of the residents of my county/city.	1	2	3	4	5
The program has been successful when tested in research settings under optimal conditions.	1	2	3	4	5
The program has been successful when tested in community settings.	1	2	3	4	5
The on-line training made me feel like I could offer this program.	1	2	3	4	5
Other Extension agents recommended this program.	1	2	3	4	5
I can deliver LIFT according to the guidelines in the program manual.	1	2	3	4	5
I do not have the resources (e.g. time, cost, handouts, volunteers) to conduct LIFT program.	1	2	3	4	5
I feel confident making adaptations to LIFT that would not detract from its effectiveness.	1	2	3	4	5
The program can be maintained/sustained easily for longer than one year without special funding.	1	2	3	4	5
The program will receive good public relations opportunities and visibility for me and Extension.	1	2	3	4	5
I believe I have the knowledge and ability to deliver LIFT.	1	2	3	4	5
I find it easy to deliver LIFT.	1	2	3	4	5
I do not feel comfortable delivering LIFT.	1	2	3	4	5
Compared to other physical activity programs, this program is easy to deliver.	1	2	3	4	5
This program fits the mission of Virginia Cooperative Extension.	1	2	3	4	5
I do not have the expertise that is needed to deliver LIFT	1	2	3	4	5
I do not feel that the program is part of my job responsibility.	1	2	3	4	5
I am not physically active, so do not feel comfortable delivering a physical activity program.	1	2	3	4	5

Which of the following best describes your current situation? (circle one)

I am not considering offering a physical activity program in my county(ies)/city at all.	I am thinking about delivering a physical activity program.	I am preparing to deliver a physical activity program (e.g. have compiled some resources, looked at possible programs/curricula, etc.).	I am planning on delivering a physical activity program in the next 30 days.	I am delivering a physical activity program.	I have been delivering a physical activity program for 6 months or longer.
--	---	---	--	--	--

LIFT is a strength-training program for older, previously sedentary men and women. LIFT participants meet for one hour, 2x/week for 8 weeks and complete an active warm-up, 8-core strength-training exercises, and 3 cool down stretches. Along with strength-training, LIFT incorporates group dynamics behavior change strategies and a nutrition education component. LIFT has shown to be an effective program for maintaining and improving the strength, balance, and flexibility of older adults. Based on existing literature, these improvements may lead to decreased insulin resistance and improved glycemic control, reduction in falls, improved mood and sleep, an increase in overall functional fitness, and ultimately, the ability of older adults to age in place or live independently longer. If you are interested in training on LIFT, please complete the survey items below.

Visit <https://www.parcilab.org/lift-success-stories> for more information

THE FOLLOWING ITEMS ARE RELATED TO YOUR PERCEPTIONS OF LIFT.

Based on your current knowledge and perceptions of LIFT, please indicate your <u>level of agreement/disagreement</u> with the following statements.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
The program has potential to attract/recruit a large number of participants.	1	2	3	4	5
The program has potential to attract/recruit a group of participants that is representative of the residents of my county/city.	1	2	3	4	5
The program has been successful when tested in research settings under optimal conditions.	1	2	3	4	5
The program has been successful when tested in community settings.	1	2	3	4	5
The on-line training made me feel like I could offer this program.	1	2	3	4	5

Other Extension agents recommended this program.	1	2	3	4	5
I can deliver LIFT according to the guidelines in the program manual.	1	2	3	4	5
I do not have the resources (e.g. time, cost, handouts, volunteers) to conduct LIFT program.	1	2	3	4	5
I feel confident making adaptations to LIFT that would not detract from its effectiveness.	1	2	3	4	5
The program can be maintained/sustained easily for longer than one year without special funding.	1	2	3	4	5
The program will receive good public relations opportunities and visibility for me and Extension.	1	2	3	4	5
I believe I have the knowledge and ability to deliver LIFT.	1	2	3	4	5
I find it easy to deliver LIFT.	1	2	3	4	5
I do not feel comfortable delivering LIFT.	1	2	3	4	5
Compared to other physical activity programs, this program is easy to deliver.	1	2	3	4	5
This program fits the mission of Extension.	1	2	3	4	5
I do not have the expertise that is needed to deliver LIFT	1	2	3	4	5
I do not feel that the program is part of my job responsibility.	1	2	3	4	5
I am not physically active, so do not feel comfortable delivering a physical activity program.	1	2	3	4	5

In 2017-2018:	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I intend to incorporate physical activity in my existing programs					
I intend to deliver physical activity programming					
I intend to deliver LIFT					
I will include LIFT in my Plan of Work for 2017-2018					

Appendix M

Post-training survey for manuscript 3

LIFT Delivery Personnel Post- Training Survey

Participation in this survey is voluntary. This survey was developed to contribute to the ongoing research projects in the Physical Activity Research and Community Implementation (PARCI) Laboratory. These research projects relate to delivery personnel's comfort delivering physical activity interventions and other behaviors and practices. All of the results will be reported as group data, whereby no individual will be identifiable in the results or any reports of the study findings. The research may be published. Any information you provide will remain confidential. Please answer each question to the best of your knowledge. If you choose not to answer any question, just leave it blank and move on to the next question.

For questions or concerns about this survey or study, please contact:	Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact:
<p>Dr. Samantha Harden, Principal Investigator, Virginia Tech Email: harden.samantha@vt.edu Phone: (540) 231-9960</p>	<p>Dr. David M. Moore, Chair, Institutional Review Board Email: moored@vt.edu Phone: (540) 231-4991</p>

By completing this form, I am providing my consent to partake in this research study.

LIFT Delivery Personnel Post Training Survey

Personal Identifiers: (For Example: Samantha Harden July 14 is SAMHAR0715)

First 3 letters of your first name: ___ ___ ___

First 3 letters of your last name: ___ ___ ___

Birth Month (numeric July = 07): ___ ___

Day of Birthday (numeric first = 01): ___ ___

THE FOLLOWING ITEMS ARE RELATED TO YOUR PERCEPTIONS OF LIFT.

Based on your current knowledge and perceptions of LIFT, please indicate your level of agreement/disagreement with the following statements.	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
The program has potential to attract/recruit a large number of participants.	1	2	3	4	5
The program has potential to attract/recruit a group of participants that is representative of the residents of my county/city.	1	2	3	4	5
The program has been successful when tested in research settings under optimal conditions.	1	2	3	4	5
The program has been successful when tested in community settings.	1	2	3	4	5
The training made me feel like I could offer this program.	1	2	3	4	5
Other agents/educators recommended this program.	1	2	3	4	5
I can deliver LIFT according to the guidelines in the program manual.	1	2	3	4	5
I do not have the resources (e.g. time, cost, handouts, volunteers) to deliver the LIFT program.	1	2	3	4	5
I feel confident making adaptations to LIFT that would not detract from its effectiveness.	1	2	3	4	5
The program can be maintained/sustained easily for longer than one year without special funding.	1	2	3	4	5
The program will receive good public relations opportunities and visibility for me and Extension.	1	2	3	4	5

I believe I have the knowledge and ability to deliver LIFT.	1	2	3	4	5
I find it easy to deliver LIFT.	1	2	3	4	5
I do not feel comfortable delivering LIFT.	1	2	3	4	5
Compared to other physical activity programs, this program is easy to deliver.	1	2	3	4	5
This program fits the mission of Extension.	1	2	3	4	5
I do not have the expertise that is needed to deliver LIFT.	1	2	3	4	5
I do not feel that the program is part of my job responsibility.	1	2	3	4	5
I am not physically active, so do not feel comfortable delivering a physical activity program.	1	2	3	4	5

Which of the following best describes your current situation? (*circle one*)

I am not considering offering a physical activity program in my county(ies)/city at all.

I am thinking about delivering a physical activity program.

I am preparing to deliver a physical activity program (e.g. have compiled some resources, looked at possible programs/curricula, etc.).

I am planning on delivering a physical activity program in the next 30 days.

I am delivering a physical activity program.

I have been delivering a physical activity program for 6 months or longer.

In 2018:	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I intend to incorporate physical activity in my existing programming					
I intend to deliver physical activity programming					
I intend to deliver LIFT					

I will include LIFT in my Plan of Work for 2018					
---	--	--	--	--	--

This section is meant to inform us about your perceptions of the training.

1. I feel that my training with regard to delivering LIFT was:
O₁ Excellent O₂ Good O₃ No Opinion O₄ Fair O₅ Poor
2. I would have liked to receive more training about delivering LIFT.
O₁ Strongly Agree O₂ Agree O₃ Neutral O₄ Disagree O₅ Strongly Disagree
3. To what extent has this training been useful for your learning in delivering physical activity programming?
O₁ To a very large extent O₂ To a quite large extent O₃ To some extent
O₄ To a small extent O₅ Not at all
4. To what extent did this training contribute to your achievement of the learning outcomes?
O₁ To a very large extent O₂ To a quite large extent O₃ To some extent
O₄ To a small extent O₅ Not at all
5. Overall, I enjoyed the LIFT training.
O₁ Strongly Agree O₂ Agree O₃ Neutral O₄ Disagree O₅ Strongly Disagree
6. What do you consider the most positive aspects of the training?
7. What do you consider the least positive aspects of the training?
8. What changes would you suggest when the training is given the next time?

Please share any other comments about the training below:

Appendix N

Virginia Tech Institutional Review Board approval for manuscript 3, study 3

Office of Research Compliance
 Institutional Review Board
 North End Center, Suite 4120, Virginia Tech
 300 Turner Street NW
 Blacksburg, Virginia 24061
 540/231-4606 Fax 540/231-0959
 email irb@vt.edu
 website <http://www.irb.vt.edu>

MEMORANDUM

DATE: January 20, 2018

TO: Samantha Marie Harden, Meghan Wilson, NithyaPriya Priya
 Shivanthi Ramalingam, Thomas Edward Strayer III, Stephanie
 Ann Breig, Laura Elizabeth Balis

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires
 January 29, 2021)

PROTOCOL TITLE: LIFT: A multi-state older adult strength-training program

IRB NUMBER: 16-032

Effective January 18, 2018, the Virginia Tech Institution Review Board (IRB) approved the Continuing Review request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at: <http://www.irb.vt.edu/pages/responsibilities.htm>

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	Expedited, under 45 CFR 46.110 category(ies) 4,7
Protocol Approval Date:	February 3, 2018
Protocol Expiration Date:	February 2, 2019
Continuing Review Due Date*:	January 19, 2019

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

Appendix O

LIFT pre-program survey for manuscript 3

Pre-Program Survey

LIFT Individual Registration Form Cover Sheet

Thank you for your interest in LIFT!

The following registration form asks several questions about you, your physical activity and what you eat. Your answers are important to us, as they will provide the basis for our evaluation of the *LIFT* program.

You will also be asked to complete the questions again at the end of the program. Your completion of the follow-up survey will help us see if the program helped you to make any lasting changes.

All of the information that you provide will be kept confidential and we will not share your name or personal information with anyone outside of our evaluation group. This group includes Virginia Cooperative Extension and Virginia Tech Faculty as well as some graduate students.

We also want you to know that some of the information you provide could be used for research purposes. However, the data used for investigation will not include your name or any other identifying information.

Thanks again for participating in LIFT and helping to evaluate the program!

By completing this form, I am providing my consent to partake in this research study.

LIFT Pre-Program Survey

First 3 letters of your first name: ___ ___ ___

First 3 letters of your last name: ___ ___ ___

Month and Year of Birth: Month: ___ ___ Year: ___ ___ ___ ___

1. Your Height: _____ Feet _____ Inches

2. Your Weight: _____ pounds

3. Are you? Male Female

4. Do you consider yourself to be Hispanic or Latino? Yes No

5. Please indicate which of the following best describes you (check all that apply):

- 1 White
- 2 Black or African American
- 3 Asian
- 4 American Indian/Alaskan Native
- 5 Native Hawaiian or Other Pacific Islander
- 6 Not sure
- 7 Other: _____

6. Have you participated in an Extension program previously?

- Yes No

7. Did you participate in the *LIFT* program previously?

- Yes No

8. What is your present employment status?

<input type="checkbox"/> 1 Employed for wages	<input type="checkbox"/> 5 A homemaker
<input type="checkbox"/> 2 Self-Employed	<input type="checkbox"/> 6 A student
<input type="checkbox"/> 3 Out of work for more than 1 year	<input type="checkbox"/> 7 Retired
<input type="checkbox"/> 4 Out of work for less than 1 year	<input type="checkbox"/> 8 Disabled/unable to work

9. Please mark the highest grade of school that you have completed.

- 1 Less than High School
- 2 High School Graduate
- 3 Some college
- 4 College graduate
- 5 Post college work

10. In general, compared to other person your age, how would you rate your health?

- 1 Extremely healthy

- 2 Somewhat healthy
- 3 Not healthy
- 4 Very unhealthy
- 5 Don't know

11. On average, how many cups of fruit do you eat each day? _____
12. On average, how many cups of 100% fruit juice do you drink each day? _____
13. On average, how many cups of vegetables do you eat each day? _____
14. On average, how many cups of 100% vegetable juice do you drink each day? _____
15. Would you say your health in general is:
- Excellent
 - Very Good
 - Good
 - Fair
 - Poor
16. How were you recruited to the LIFT program?
- 1 Newspaper
 - 2 Online
 - 3 Flyer
 - 4 Friend
 - 5 Extension Specialist
 - 6 Community Newsletter
 - 7 Family
 - 8 Other _____

Physical Activity

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

17. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ **days per week**
 No vigorous physical activities *Skip to question 20*

18. How much time did you usually spend doing **vigorous** physical activities on one of those days?

_____ **hours per day**
 _____ **minutes per day**

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

19. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

No moderate physical activities *Skip to question 22*

20. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

21. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

No walking *Skip to question 24*

22. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

23. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

_____ **hours per day**

_____ **minutes per day**

Don't know/Not sure

24. How confident are you that you can engage in moderate physical activities (e.g., not exhausting, light perspiration) for 30 minutes for 2 or more days per week?

1 Not at all 2 Somewhat 3 Moderately 4 Very 5 Completely

25. The amount of physical activity I engage in is:

1 Never 2 Rarely 3 Sometimes 4 Often 5 Always

Social Network: Please answer the following questions related to your social network.

Over the last two weeks:

26. How many times have you spoken to relatives on the phone? _____

27. How many times have you spoken to friends on the phone? _____

28. How many times have you seen relatives (not living in home) in person? _____

39. How many times have you seen friends in person? _____

30. How many times have you participated in a group event? _____

31. How many times have you gone to a social gathering? _____

Thank You!

Appendix P

Extension health educator and community partner survey for manuscript 3

LIFT Feedback Survey

Participation in this survey is voluntary. This survey was developed to contribute to the ongoing research projects in the Physical Activity Research and Community Implementation (PARCI) Laboratory. These research projects relate to delivery personnel's comfort delivering physical activity interventions and other behaviors and practices. All of the results will be reported as group data, whereby no individual will be identifiable in the results or any reports of the study findings. The research may be published. Any information you provide will remain confidential. Please answer each question to the best of your knowledge. If you choose not to answer any question, just leave it blank and move on to the next question.

For questions or concerns about this survey or study, please contact:	Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact:
Dr. Samantha Harden, Principal Investigator, Virginia Tech Email: harden.samantha@vt.edu Phone: (540) 231-9960	Virginia Tech Institutional Review Board Email: irb@vt.edu Phone: (540) 231-3732

By completing this form, I am providing my consent to partake in this research study.



LIFT Feedback Survey

Please answer these brief questions regarding LIFT.

We value your feedback and opinions.

LIFT, Lifelong Improvements through Fitness Together, is an eight-week, team-building, physical activity and nutrition program for older adults. Instructors demonstrate exercises to promote balance, flexibility, and strength training that may improve the functional fitness of older adults and their ability to live comfortably and independently longer. The program meets twice a week with at least a day between sessions. Instructors interested in delivering LIFT within their community will receive training on performing the functional fitness assessment with participants, the eight full-body exercises completed throughout the program, and a thorough breakdown of the program manual in its entirety. This enables the instructors to lead the program with confidence, ease, and familiarity.

This section will help us learn more about the acceptability, appropriateness, and feasibility of implementing LIFT through University of Wyoming Extension.

	Completely disagree	Disagree	Neither agree nor disagree	Agree	Completely agree
1. LIFT meets my approval.	①	②	③	④	⑤
2. LIFT is appealing to me.	①	②	③	④	⑤
3. I like LIFT.	①	②	③	④	⑤
4. I welcome LIFT.	①	②	③	④	⑤
5. LIFT seems fitting.	①	②	③	④	⑤
6. LIFT seems suitable.	①	②	③	④	⑤
7. LIFT seems applicable.	①	②	③	④	⑤
8. LIFT seems like a good match.	①	②	③	④	⑤
9. LIFT seems implementable.	①	②	③	④	⑤
10. LIFT seems possible.	①	②	③	④	⑤
11. LIFT seems doable.	①	②	③	④	⑤
12. LIFT seems easy to use.	①	②	③	④	⑤

Which of the following best describes your current situation?

I am not considering offering LIFT in my counties at all.	I am thinking about delivering LIFT.	I am preparing to deliver LIFT (e.g. have compiled resources).	I am planning on delivering LIFT in the next 30 days.	I am delivering LIFT.	I have been delivering LIFT for 6 months or longer.
---	--------------------------------------	--	---	-----------------------	---

Have you recruited participants for LIFT?	Yes	No
Have you found a facility to deliver LIFT?	Yes	No
Have you built partnerships needed to deliver LIFT?	Yes	No
Do you have all the resources you need (e.g. recruitment materials, weights, handouts) to deliver LIFT?	Yes	No
What barriers have you experienced in delivering LIFT?		

Appendix Q
Administrator survey for manuscript 3

LIFT Feedback Survey

Participation in this survey is voluntary. This survey was developed to contribute to the ongoing research projects in the Physical Activity Research and Community Implementation (PARCI) Laboratory. These research projects relate to delivery of physical activity programming, including support from administration. All of the results will be reported as group data, whereby no individual will be identifiable in the results or any reports of the study findings. The research may be published. Any information you provide will remain confidential. Please answer each question to the best of your knowledge. If you choose not to answer any question, just leave it blank and move on to the next question.

For questions or concerns about this survey or study, please contact:	Should you have any questions or concerns about the study's conduct or your rights as a research subject, or need to report a research-related injury or event, you may contact:
Dr. Samantha Harden, Principal Investigator, Virginia Tech Email: harden.samantha@vt.edu Phone: (540) 231-9960	Virginia Tech Institutional Review Board Email: irb@vt.edu Phone: (540) 231-3732

By completing this form, I am providing my consent to partake in this research study.



LIFT Feedback Survey

Please answer these brief questions regarding LIFT.

We value your feedback and opinions.

LIFT, Lifelong Improvements through Fitness Together, is an eight-week, team-building, physical activity and nutrition program for older adults. Instructors demonstrate exercises to promote balance, flexibility, and strength training that may improve the functional fitness of older adults and their ability to live comfortably and independently longer. The program meets twice a week with at least a day between sessions. Instructors interested in delivering LIFT within their community will receive training on performing the functional fitness assessment with participants, the eight full-body exercises completed throughout the program, and a thorough breakdown of the program manual in its entirety. This enables the instructors to lead the program with confidence, ease, and familiarity.

This section will help us learn more about the acceptability, appropriateness, and feasibility of implementing LIFT through University of Wyoming Extension.

	Completely disagree	Disagree	Neither agree nor disagree	Agree	Completely agree
1. LIFT meets my approval.	①	②	③	④	⑤
2. LIFT is appealing to me.	①	②	③	④	⑤
3. I like LIFT.	①	②	③	④	⑤
4. I welcome LIFT.	①	②	③	④	⑤
5. LIFT seems fitting.	①	②	③	④	⑤
6. LIFT seems suitable.	①	②	③	④	⑤
7. LIFT seems applicable.	①	②	③	④	⑤
8. LIFT seems like a good match.	①	②	③	④	⑤
9. LIFT seems implementable.	①	②	③	④	⑤
10. LIFT seems possible.	①	②	③	④	⑤
11. LIFT seems doable.	①	②	③	④	⑤
12. LIFT seems easy to use.	①	②	③	④	⑤

Please rate <u>how important</u> each of the following factors are when you are deciding whether you support county/area educators delivering a program.	Very Unimportant	Unimportant	Neutral	Important	Very Important

The program has potential to attract/recruit a large number of participants.	1	2	3	4	5
The program has potential to attract/recruit a group of participants that is representative of the residents of Wyoming.	1	2	3	4	5
The program has been successful when tested in research settings under optimal conditions.	1	2	3	4	5
The program has been successful when tested in community settings.	1	2	3	4	5
The virtual training will prepare Educators to offer the program.	1	2	3	4	5
Extension Educators recommended this program.	1	2	3	4	5
Educators can deliver the program according to the guidelines in the program manual.	1	2	3	4	5
Educators do not have the resources (e.g. time, cost, handouts, volunteers) to deliver the program.	1	2	3	4	5
Educators feel confident making adaptations to the program that would not detract from its effectiveness.	1	2	3	4	5
The program can be maintained/sustained easily for longer than one year without special funding.	1	2	3	4	5
The program will receive good public relations opportunities and visibility for Extension.	1	2	3	4	5
This program fits the mission of University of Wyoming Extension.	1	2	3	4	5
The program is part of Educators' job responsibilities.	1	2	3	4	5

Do you support educators in delivering LIFT?	Yes	No
Please tell us why you don't support Educators delivering LIFT.		
Please tell us how you support Educators to deliver LIFT.		