

Exploration of training as an implementation strategy to promote physical activity within
community settings: research, theory, and practice

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Exploration of training as an implementation strategy to promote physical activity within
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SCIENTIFIC ABSTRACT

The prevalence of inactivity remains high, with more than 80 percent of adults failing to meet physical activity guidelines. Numerous evidence-based interventions for physical activity promotion have been developed and tested to address this need, but are typically not scaled-up and sustained in the intended practice setting. Many of these physical activity promotion programs suggest community-based delivery, often requiring researchers to train delivery personnel on intervention components. However, there is a paucity of detail on training mechanism, structures, or components in the literature.

The purpose of this research is to evaluate trainings to promote physical activity within community settings through an exploration of differential training outcomes, theoretical underpinnings, and training implementation in practice. The first study was a mixed-methods exploration of delivery personnel characteristics and perceived implementation barriers and facilitators before and after program delivery or non-delivery. The second study was a systematic review of physical activity trainings for community-based delivery personnel to determine the characteristics of those who were trained, the structural and mechanistic components of said trainings, and the effectiveness of these trainings. The third study was a case-study of training in practice to assess training processes that are likely to be successful in the real world and to evaluate the feasibility of an observational tool for physical activity trainings.

The results of this dissertation show that delivery personnel characteristics and skillset may impact the acceptability, appropriateness, and effectiveness of training. They also provide

preliminary support for the inclusion and importance of peer support within physical activity trainings to increase training reach and increase delivery personnel comfort. Further, descriptions of training for in-person physical activity programs in community settings are vague and inadequate for replication, evaluation, or generalizability. Taken together, these studies provide a foundation and call to action for larger, more controlled studies that prioritize both efficacy and replicability, to develop an evidence-base for training mechanisms.

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PUBLIC ABSTRACT

The prevalence of inactivity remains high, with more than 80 percent of adults failing to meet physical activity guidelines. Numerous evidence-based interventions for physical activity promotion have been developed and tested to address this need, but are typically not scaled-up and sustained in the intended practice setting. Many of these physical activity promotion programs suggest community-based delivery, often requiring researchers to train delivery personnel on intervention components. However, there is a paucity of detail on for whom, under what conditions, and how training mechanism are effective in practice.

The purpose of this research was to explore the questions related to the research, theory, and practice of training. For research, a mixed-methods exploration of delivery personnel characteristics and perceived barriers and facilitators before and after program delivery or non-delivery was conducted. For theory, a systematic review of physical activity trainings for community-based delivery personnel was conducted in the literature to determine the characteristics of those who were trained, the structural and mechanistic components of said trainings, and the effectiveness of these trainings. For practice, a case-study of existing training in a community based setting was conducted to determine training processes that are likely to be successful in the real world and to evaluate the feasibility of an observational tool for physical activity trainings.

The results of this dissertation show that delivery personnel characteristics and skillset may impact the acceptability, appropriateness, and effectiveness of training. They also provide preliminary support for the inclusion and importance of peer support within physical activity

trainings to increase the number and representativeness of people trained and increase comfort with the training material. Further, descriptions of training for in-person physical activity programs in community settings are vague and inadequate making them difficult to replicate. Taken together, these studies provide avenues for future research and practice to develop an evidence-base for training mechanisms.

DEDICATION

In memory of P.S. Pillai, who instilled in me the values of education and service as avenues for a
fufilling life

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ATTRIBUTIONS

Manuscript 1:

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Manuscript 2:

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Manuscript 3:

Samantha M. Harden is the developer of LIFT and led the trainings evaluated in this manuscript. She assisted in the conceptualization, data management, data interpretation, and editing of this manuscript.

TABLE OF CONTENTS

Scientific Abstract.....	ii
Public Abstract.....	iv
Dedication.....	vi
Acknowledgements.....	vii
Attributions.....	viii
Table of Contents.....	ix
List of Appendices.....	xi
List of Tables and Figures.....	x
Chapter 1: Introduction.....	1
References.....	12
Chapter 2: Manuscript 1: From training to delivery: a mixed methods exploration of the adoption to implementation gap of a community-based intervention.....	20
Abstract.....	21
Background.....	23
Methods.....	25
Results.....	27
Discussion.....	37
Conclusion.....	41
Tables and Figures.....	42
References.....	44
Chapter 3: Manuscript 2: How are community based practitioners trained on physical activity interventions? A systematic review.....	52
Abstract.....	53
Background.....	55
Methods.....	60

Results.....	61
Discussion.....	66
Conclusion.....	70
Tables and Figures.....	71
References.....	74
Chapter 4: Manuscript 3: Training as an implementation strategy: A mixed methods exploration of what is typically done in practice to promote physical activity in community settings.....	81
Abstract.....	82
Background.....	83
Methods.....	84
Results.....	92
Discussion.....	95
Conclusion.....	99
Tables and Figures.....	101
References.....	108
Chapter 5: Conclusions.....	114
References.....	119

LIST OF APPENDECIES

Appendix A-Pre-training survey (Manuscript 1)	121
Appendix B- Post-training survey (Manuscript 1)	132
Appendix C- Semi-structured interview guide (Manuscript 1)	142
Appendix D- Coding sheet (Manuscript 2)	145
Appendix E- Pre-training survey (Manuscript 3)	158
Appendix F- Post-training survey (Manuscript 3)	165
Appendix G- LIFT training agenda (Manuscript 3)	170
Appendix H- Trainer Observational Checklist (Manuscript 3)	173
Appendix I- Delivery Personnel Observational Checklist (Manuscript 3)	180
Appendix J- IRB memorandum (Manuscript 1)	185
Appendix K- IRB memorandum (Manuscript 2.....	188

LIST OF TABLES AND FIGURES

Table 1.1 Physical activity promotion in Virginia Cooperative Extension.....	11
Table 2.1 Virginia cooperative extension county and health educator distribution in 2015.....	42
Table 2.2 Characteristics of implementers vs. non-implementers in 2015.....	43
Figure 3.1 Eligibility of peer-reviewed literature for training for community-based physical activity programs.	71
Table 3.1 Summary of publications included in the review.....	72
Table 3.2 Summary of outcomes as reported in publications.....	73
Table 4.1 LIFT events in Virginia Cooperative Extension prior to the case study.....	101
Table 4.2 Virginia cooperative extension county and health educator distribution in 2017.....	102
Table 4.3 Training characteristics in 2017 versus 2015.....	103
Table 4.4 Trainee sample characteristics in 2017.....	104
Figure 4.1 Pre-training ratings of trainees perception of predictors of implementation, ranked and standardized to a z-distribution.....	106
Figure 4.2 Post-training ratings of trainees perception of predictors of implementation, ranked and standardized to a z-distribution.....	106
Figure 4.3 Pre-training rating of trainees perception of outcome expectations according to RE-AIM, ranked and standardized to a z-distribution.....	106
Figure 4.4 Pre-training rating of trainees perception of outcome expectations according to RE-AIM, ranked and standardized to a z-distribution.....	106
Table 4.5 Health educator self-reported training satisfaction.....	107

CHAPTER 1: INTRODUCTION

There is strong evidence that physical inactivity leads to increased risk and incidence of many major health concerns including cardiovascular disease, type II diabetes, and various cancers (Centers for Disease Control, 2003; Haskell et al., 2007; Lee et al., 2012) as well as decreased quality of life, (Bize, Johnson, & Plotnikoff, 2007; Brown et al., 2003; Buchner, 1997) and increased health care costs and utilization (Carlson, Fulton, Pratt, Yang, & Adams, 2015; Colditz, 1999). However, physical inactivity is one of the top modifiable health behaviors (World Health Organization, 2005) and there is a large body of evidence regarding behavioral change strategies and interventions that improve physical activity behaviors (Heath et al., 2012; Kahn et al., 2002; Michie, Van Stralen, & West, 2011). While this evidence-base for physical activity promotion interventions continues to grow, these interventions are not often being translated into typical, sustained community practice (Dzewaltowski, Estabrooks, & Glasgow, 2004; Estabrooks & Glasgow, 2006; Estabrooks et al., 2011; Glasgow, Lichtenstein, & Marcus, 2003).

One reason for the disconnect between research and practice is that many researchers either explicitly or implicitly assume that tools and interventions deemed efficacious within clinical or community-based trials would be readily transmitted to the field (Westfall, Mold, & Fagnan, 2007; Zoellner, Van Horn, Gleason, & Boushey, 2015). However, compelling evidence suggests that this has not been the case (Glasgow & Emmons, 2007; Green, Glasgow, Atkins, & Stange, 2009; Westfall et al., 2007; Zoellner et al., 2015). In fact, when research aims to move beyond efficacy trials into effectiveness trials (i.e., tested “real world” settings), next steps for full-scale dissemination and implementation have remained outside the scope of these trials. For example, in an effectiveness trial, information, tools, and interventions have been tested in pragmatic settings, such as clinics, YMCAs, and worksites. Yet, the cost and financing of the

intervention, providing training for delivery personnel, availability of resources, monitoring the quality of intervention delivery is not developed, tested, or evaluated (Chambers & Norton, 2016). Furthermore, the assumption of a static, linear model of translation –and that dissemination and implementation are final steps in this pipeline (Glasgow & Chambers, 2012) –overlooks the complexities of practice-settings (Damschroder et al., 2009; Westfall et al., 2007). In these complex settings, characteristics of delivery personnel and the settings in which they work need to be considered. The mission, values, and resources of a setting or staff within that setting may have competing interests, lack of resources, and limited training to support intervention delivery. This may result in low fidelity to intervention core elements (or research tested underlying principles) (Leeman et al., 2015). Low quality intervention delivery can lead to type 3 error—a belief that the intervention has no effect when, in reality, fidelity to the underlying intervention evidence-base was low, resulting in null effects (Rychetnik, Hawe, Waters, Barratt, & Frommer, 2004; Tones, 2000).

One emergent response to these translational challenges is the growth of the field of Implementation Science, which aims to study the “methods to promote the adoption and integration of evidence-based practices, interventions and policies into routine health care and public health settings (Eccles & Mittman, 2006, Implementation Science section, para. 2).” Implementation science has been described as trans-discipline (i.e., crosscutting disciplines rather than being situated in one content area). Commonly, implementation research is conducted within a given context, with the intent of studying mechanisms of success in “real-world” settings. Dimensions of implementation research include investigations of major obstacles (e.g., social, behavioral, economic, management) that impede effective implementation, identification of likely facilitators (e.g., leaders, open climate, incentives, frequent public data sharing) that

promote effective implementation, and testing of new approaches to improve health care delivery, as well as to maximize preventive and promotive interventions.

Early implementation science was experience-driven and not grounded in theory. Eccles, Grimshaw, Walker, Johnston and Pitts (2005) suggested that early implementation science was an expensive version of trial and error, with only 10% of the studies identified providing an explicit rationale for their strategies (Davies, Walker, & Grimshaw, 2003). Indeed, mixed results of implementing evidence-based practices in various settings is often attributed to a limited theoretical basis (Bhattacharyya, Reeves, Garfinkel, & Zwarenstein, 2006; Colquhoun et al., 2013; Davies, Walker, & Grimshaw, 2010; Eccles, et al., 2009; Foy et al., 2011; Mitchie, Fixsen, Grimshaw, & Eccles, 2009; Pinnock et al., 2016; Powell et al. 2015). Lack of theory makes it difficult to understand and explain how and why implementation succeeds or fails, thus limiting opportunities to identify factors that predict the likelihood of implementation. Implementation studies borrowed theories from disciplines such as psychology, sociology and organizational theory as well as theories, models and frameworks that have emerged from within implementation science. This led to, in 2018, the recognition of at least 87 research and practice-based Implementation Science models and frameworks (Rabin & Brownson, 2017; Tabak, Khoong, Chambers, Brownson, 2012).

One prominent framework is the RE-AIM framework for planning and evaluation (Glasgow, Vogt, & Boles, 1999; Kessler et al., 2013). This framework emphasizes whether the intervention 1) reaches the most individuals, particularly those most in need (representativeness); 2) achieves a robust effect on program outcomes; 3) is adopted by delivery personnel and settings; 4) is implemented throughout the settings with fidelity; 5) and maintained in a practice-based setting, beyond the life of the intervention. This framework was developed to evaluate and

report real-world adaptations, improve generalizability, and speed the translation of interventions into sustained practice (Glasgow et al., 1999). While moving beyond effectiveness is important when establishing generalizability of a program's success, it is also imperative to consider the reasons why the program has low or differential adoption or implementation. The Consolidated Framework for Implementation Research (CFIR) offers an overarching scaffold, systematically categorizing constructs within the practice context, delivery agent characteristics, interventions characteristics, and the process of implementation that may assist in explaining differential adoption and implementation (Damschroder et al., 2009). The CFIR highlights the importance of the economic, political, and social context within which an organization resides, the structural, political, and cultural features of the system itself, and the knowledge, beliefs, and capacity of the delivery personnel within the organization. That is, even when interventions are developed with scalability or "beginning with the end in mind," (Chambers & Norton, 2016; Klesges, Estabrooks, Dzewaltowski, Bull, & Glasgow, 2005) the intervention may or may not align with the available resources in the delivery system, the organizational values, or the delivery system's mission.

Another barrier to the scalability of evidence-based physical activity interventions in pragmatic settings is that practitioners are often unfamiliar with how to find, use, or evaluate evidence-based practices and commonly rely on best practices from the field or the status quo of the system (Leeman et al., 2017). Training is frequently cited as a solution to increase practitioner capacity and improve real-world practice thereby improving patient centered outcomes (Powell et al., 2015; Ramalingam & Harden, 2016; Whitehead, Ramalingam, Carter, Katz, & Harden, 2016). A recent systematic review of capacity building strategies for community-based practitioners identified training as one of six strategies, with 27 of 29

identified studies including training (Leeman et al., 2015). Within this review, training is articulated as “pre-planned educational and/or skill building sessions typically provided within group settings” (Leeman et al., 2015, p.3). Similarly, a recent review of 73 implementation strategies (Powell et al., 2015), identified three strategies involving training: 1) Provid[ing] ongoing training; 2) Make training dynamic and 3) Provide clinical supervision. However, these recommendations did not further describe who, what, where, when, why, or how training should be implemented. These vague articulations of training and the increased calls to action for specification and reporting of implementation strategies (Pinnock et al., 2015; Proctor, Powell, & McMillen, 2013) indicate the need to problematize our understanding of the structure, content, modality, and evaluation of training.

Taken together, there is a sizeable need for robust evaluation of training strategies. This evaluation should include feasibility, acceptability, and appropriateness of training strategies as well as identification of frequency, duration, modality, mechanisms, or underlying models and processes of training strategies. To address this need, this dissertation includes a series of manuscripts focused on the research, theory, and practice of training. The work presented in this dissertation exists at the T3 level of the translational spectrum, investigating methods of adopting and integrating evidence-based practice, policies, and interventions into sustained use, with the ultimate goal to move to the T4 level and improve public health outcomes (Zerhouni, 2005). Therefore, very little data about intervention participant health behaviors will be presented as the manuscripts presented here focus on the characteristics and the challenges faced by those who are delivering health promotion programs.

Cooperative Extension Service (Herein: Extension) is one such system in which physical activity promotion programs are delivered. Extension exists within every US state and territory

through land grant university. Although there may be nuanced differences between the state systems, fundamentally, each system is similar with the ultimate goal of connecting research conducted at the land grant institutions with community residents through county-based health educators (Grumbach & Mold, 2009). Predominately United States Department of Agriculture (USDA) funded, the priorities of Extension have historically been agriculturally focused. In 2014, ‘physical activity’ was added as a priority area through the Farm Bill and the Cooperative Extension National Framework for Health and Wellness was developed (Braun, et al. 2017). While these two events indicate an administrative shift within Extension towards health-centric programming, health programming has already been delivered at the county-level by extension professional. In fact, specific to physical activity, in 2012, Pena-Purcell, et al. reported that, “Nearly all respondents (96%; n=101) said they discussed physical activity, and half (51%; n=54) led physical activities as part of their current programming...However, it is unclear if Extension faculty doing physical activity programming are being trained appropriately, what guidelines they are following, and what criteria they use to evaluate physical education materials.” Aligning with this, physical activity promotion was initiated within the Virginia Cooperative Extension system by Dr. Estabrooks, an assistant professor in the department of Human Nutrition, Foods, and Exercise at Virginia Tech. Although not having an official appointment *within* the Extension system, Dr. Estabrooks became a knowledge broker sharing previous research and expertise from other State Extension systems (Estabrooks, Bradshaw, Dzewaltowski, Smith-Ray, 2008) and establishing the need for participatory approaches (Estabrooks & Glasgow, 2006; Harden, Johnson, Almeida, Estabrooks, 2016).

In 2014, and in response to both implementation challenges at large and the physical activity specific implementation challenges within the Extension, the first physical activity

specialist (i.e., Dr. Harden) was hired to serve Virginia Cooperative Extension. As part of her appointment *with* the Extension system Dr. Harden led a needs assessment to evaluate health educators' perceptions on delivering physical activity interventions. Barriers to delivering physical activity intervention included lack of 1) training to deliver physical activity interventions, 2) explicit language supporting physical activity as part of the health educator's job description, (Harden, Lindsay, Everette, & Gunter, 2016) 3) validated and simple-to-administer evaluation tools and 4) knowledge of available curricula. (Balis et al., unpublished.) To address these barriers to physical activity intervention delivery, a collaborative partnership—defined as one in which researchers and community stakeholders work together on projects designed, initiated, and managed by the research team (Brownson, Colditz, & Proctor, 2012)—was developed to train, support, and evaluate physical activity efforts in the state of Virginia. Interventions that are adaptable and fit the needs, mission, and resources of the intended delivery system are more likely to be adopted and sustained. (Chambers & Norton, 2016; Estabrooks & Glasgow, 2006; Harden, Johnson, Almeida, & Estabrooks, 2016).

Dr. Harden presented a number of Extension-delivered physical activity programs for older adults (Stay Strong, Stay Healthy (Ball, et al., 2013); Eat Smart, Live Strong (Dunn, et al., 2011; Hersey, et al., 2015); and Better Bones and Balance (McNamara & Gunter, 2012; McNamara, Pavol, & Gunter, 2013) to health educators of the partnership. The Stay Strong, Stay Healthy program was selected and adapted for statewide delivery. This program was adapted by Virginia extension personnel to fit the values, mission, and resources of Virginia Extension. This adapted program was branded as Lifelong Improvements through Fitness Together (LIFT) and includes nutrition education and behavior change strategies in addition to the full body exercises from Stay Strong, Stay Healthy. LIFT was introduced to Virginia Extension in 2015 at a

statewide in-service training. Briefly, the adaptations include behavior change components of Active Living for the Ages (Estabrooks, et al., 2011) such as goal setting, relapse prevention, and social connectedness. Our confidence in this adapted program comes from a) the 20 years of exercise behind the initial program “Strong Women, Strong Bones” developed by Dr. Merrium Nelson (2006) at Tufts University that was then translated to Extension as Stay Strong, Stay Healthy in 2003 by Dr. Steven Ball in Missouri (Ball, et al. 2003), b) the extensive group dynamics literature for older adults (Estabrooks, 2006) , and c) the initial efficacy trials of LIFT (Wilson, Strayer, Davis, & Harden, 2018a; Wilson, Strayer, Davis, & Harden, 2018b). Table 1.1 provides further details on the events surrounding physical activity promotion within Virginia Extension.

This dissertation seeks to fill the gap that exists in the literature and practice between training and delivery specifically for community based physical activity programs. Overall, through this work, we sought to answer questions related to the factors contributing to the gap from training to delivery, the mechanistic underpinnings of trainings as reported in the literatures, and the training processes that are likely to be successful in the real-world. In Manuscript 1, operationalized as the “research” manuscript, we sought to identify and characterize the reasons community health workers chose to deliver (or not deliver) an evidence-based physical activity program in practice following the 2015 state-wide training. For theory, Manuscript 2 represents a scoping review that was conducted to understand the current practices (e.g., dose, mechanisms, delivery mode) for training community health workers in physical activity delivery that may make up the theoretically underpinnings of training as an implementation strategy as reported in the literature. Finally, Manuscript 3 entails a mixed-methods case study that was conducted to report on what training looks like in practice and

evaluate the feasibility for a training-specific observational tool. The training as reported in manuscript 3 was conducted in 2017 and was adapted from the results of Manuscript 1. The long-term goal of these efforts is to improve and adapt training structures to meet the mission, values, and resources of delivery personnel and systems and ultimately, improve health behaviors of participants.

Table 1.1. Physical activity promotion in Virginia Cooperative Extension

Date	Event	Data collection	Research team members involved	Extension personnel involved
<i>Fall 2014</i>	Physical activity needs assessment	Surveys, focus groups	Principal investigator	74 VCE professionals from across the state
<i>Winter 2015</i>	Establishment of Physical Activity Leadership Team	-	Principal investigator	2 VCE county-based representatives from each of the four districts
<i>June 2015</i>	Introduction and selection of older adult strength training program, Stay Strong, Stay Healthy (SSSH)	-	Principal investigator	Physical Activity Leadership Team (PALT)
<i>June 17, 2015</i>	Scheduled training for SSSH	-	Principal investigator, Steve Ball	-
<i>August 2015</i>	SSSH training in Missouri	-	Principal investigator	Program Champion from the Northern District
<i>August-October 2015</i>	Development of LIFT: adapting SSSH to fit the needs of stakeholders (Wilson et al., 2018a)	-	Principal investigator, program manager	Program champion from the Northern district, PALT
<i>October 2015</i>	In-service training	Pre and post-training surveys	Principal investigator, 2 program managers, 1 research assistant	26 VCE county-based health educators, 13 eligible to deliver LIFT
<i>Spring-Summer 2016</i>	Establishing the effectiveness of LIFT	Reach and Effectiveness trial	Principal investigator, Program manager	6 VCE county-based health educators
<i>Fall 2016</i>	Evaluating barriers to LIFT adoption and implementation (Manuscript 1)	Qualitative interviews	Graduate student Training manager	6 VCE county-based health educators
<i>Spring 2017</i>	Participatory development of training for 2017 (including need for district-based trainings)	-	Principal investigator, Training manager	PALT
<i>Summer 2017</i>	District-level trainings and feasibility tests of observational protocols (Manuscript 3)	Pre and post-training surveys, observations	Principal investigator, Training manager, Program manager, 2 research assistants	7 VCE county-based health educators, 9 master food volunteers and community volunteers

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CHAPTER 2

Mansucript 1: From training to delivery: a mixed methods exploration of the adoption to implementation gap of a community-based intervention

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ABSTRACT

Background: Many delivery personnel who are trained on a given intervention do not ultimately deliver it in practice, yet reasons for this limited delivery are not well understood. This study sought to fill this gap through a mixed-methods exploration of health educator characteristics and health educator perceived implementation barriers and facilitators before and after program delivery or non-delivery.

Methods: Health educators attended training on a physical activity intervention. Pre- and post-training surveys assessed demographics, intervention perceptions, predictors of implementation, positive intent to deliver, and training satisfaction. One-on-one interviews were conducted with those who implemented the intervention (n=5) within one year of the training and randomly selected non-implementers (n=4, 40% of non-implementers).

Results: Quantitatively, non-implementers were significantly more likely to report low capacity and self-efficacy for delivery of physical activity interventions compared to implementers. Implementers were less likely to be overweight or obese and were more likely to be physically active than their non-implementer counter parts. Qualitatively, both implementers and non-implementers reported high training satisfaction, the need for structured peer support, and a desire for ongoing training. Frequently reported barriers to implementation included the complexity of the intervention, cost of equipment, and low self-efficacy related to physical activity intervention delivery. Frequently reported facilitators to implementation included assistance from outside personnel to reduce delivery burden, positive perceptions of the pragmatic fit of the intervention, and positive perceptions of the effectiveness of the intervention.

Conclusions: The results of this study provide evidence that current training methods may target those health educators who are already behaviorally and psychologically prepared to deliver programming. Further, they offer preliminary support for the addition of peer support to current training methods to increase health educator comfort. Further research is needed to determine the association of these factors with effective training strategies and generalizability across other contexts.

Background

Traditionally, research-developed health promotion interventions are designed and tested in a particular community or setting with the explicit or implicit intention to generalize to the broader population or setting from which the intervention was originally tested (Westfall, Mold, & Fagnan, 2007; Zoellner, Van Horn, Gleason, & Boushey, 2015). This research often assumes that tools and interventions deemed efficacious within clinical or community-based trials would be readily transmitted to the new populations or settings; however, evidence suggests that this has not been the case (Aarons, Sklar, Mustanski, Benbow, & Brown, 2017; Glasgow & Emmons, 2007; Green, Glasgow, Atkins, & Stange, 2009; Westfall et al., 2007; Zoellner et al., 2015). When translating evidence-based interventions from research to practice settings there are a number of challenges. For example, healthcare professionals (who ultimately deliver the intervention in practice) may perceive that the intervention does not align with the available resources in the delivery system, the delivery system values, or the mission of the delivery system (Damschroder et al., 2009; Helfrich et al., 2010). Therefore, it is the responsibility of researchers or practitioners who train healthcare professionals on an evidence-based intervention to clearly express intervention and setting characteristics that may speed translation into practice, such as compatibility or complexity (Damschroder et al., 2009; Rogers, 2010). Furthermore, there are characteristics of the healthcare professionals themselves that may influence perceptions of the intervention. These characteristics have been articulated in the meta-theory of the Consolidated Framework for Implementation Research (CFIR) as 1) knowledge and beliefs about the intervention, 2) self-efficacy for intervention delivery, 3) stage of change for intervention adoption, 3) identification with the organization (e.g., organizational citizenship,

connectivity, burnout, security), and 4) other personal attributes including motivations, values, and learning style (Damschroder et al., 2009).

The latter is one of the key facets to the study reported in this manuscript. Health professionals are often asked to deliver an intervention after a single didactic training session (or no training) (Beidas, Koerner, Weingardt, & Kendall, 2011; Cervero & Gaines, 2015). However, limited or no changes in practice occur (Cervero & Gaines, 2015; Davis et al., 1999; Marinopoulos et al., 2007) if trainings do not include interactive, on-going training structures, or are irrelevant to delivery personnel priorities (Cervero & Gaines, 2015; Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012). The intent of training is to engage healthcare professionals in an adoption-decision-making process (Downey, Wages, Jackson, & Estabrooks, 2012; Johnson, Harden, & Estabrooks, 2016) that moves them from training (adoption) to real-world delivery (implementation) over time (sustainability). However, many delivery personnel who are trained on a given intervention do not deliver it in practice; reasons for this adoption to implementation gap are not well understood (Proctor, Powell, & McMillen, 2013). This adoption-to-implementation gap has public health implications, (Grol & Grimshaw, 2003; McGlynn et al., 2003; Schuster, McGlynn, & Brook, 2005; Westfall et al., 2007) with low system penetration (Rychetnik, Hawe, Waters, Barratt, & Frommer, 2004) resulting in lost costs in both evidence-based intervention development and the training and capacity building among healthcare professionals (Tinkle, Kimball, Haozous, Shuster, & Meize-Grochowski, 2013).

Previous methodological approaches (e.g., tools employed, questions asked, constraints of traditional research paradigms) have hindered the understanding of the degree to which evidence-based interventions are adopted and ultimately implemented within a system (Glasgow & Chambers, 2012). As part of a larger trial examining the implementation of an older adult

strength training intervention, this study examines health educators' perceptions of training and intervention implementation. This study sought to measure and understand the adoption-implementation gap within a state- and nation-wide system that serves county residents through an examination of health educator characteristics and health educator perceived implementation barriers and facilitators before and after delivery or non-delivery.

Methods

Setting

Healthcare professionals within the national Cooperative Extension System (Herein: Extension) are called health educators, agents, and/or county specialists (Ramussen, 2002). In this manuscript, they will be referred to as health educators. Extension health educators bring research-evidence from land-grant universities to improve local community health behaviors. 'Physical activity' has recently been added as a priority area for Extension, (Agriculture Act of 2014, 2014) providing an opportunity to explore the adoption and implementation process as it happens. The reach of Extension as a delivery system provides an opportunity to achieve a broad public health impact; in Virginia alone, 1.8 million people engaged in at least one Extension intervention in the last year ("About Virginia Cooperative Extension", 2018). Extension has recently (Gallaway & Hongu, 2015) initiated educating health educators on the types of physical activity necessary to achieve health benefits as well as what those benefits are (e.g., reduced risk of cardiovascular disease, (Thompson et al., 2003) hypertension, (Arroll & Beaglehole, 1992) and all-cause mortality (Nocon et al., 2008)). As a result, health educator comfort and familiarity with physical activity interventions varies widely. This heterogeneity makes it difficult to determine Extension readiness and capacity for physical activity interventions. Collectively, these factors underscore the need for research to determine facilitators of interventions that align

more closely with the evidence base as well as health educator barriers for evidence-based intervention delivery.

Design

This study was a sequential, transformative mixed-methods approach (Creswell, 2013) based on the Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009). The addition of qualitative data can augment intervention research by gathering exploratory data that may explain outcomes and inform future adaptations (Harris et al., 2009). Consent was implied with the submission of confidential surveys and verbal consent was obtained from health educators prior to the start of the interviews. The Virginia Tech Institutional Review Board approved this study and consent to participant was obtained by all participants.

Participants

Family and Consumer Science health educators within Virginia Extension (N=52) were invited to attend a two-day training on two evidence-based physical activity interventions (an older adult strength training intervention and a state-wide walking intervention). The data presented in this paper examines the adoption and implementation of the older adult strength training intervention (Lifelong Improvements through Fitness Together; LIFT) specifically (Wilson, Strayer III, Davis, & Harden, 2018; Wilson, Strayer III, Davis, & Harden, 2018). Training was evidence-informed and consisted of instruction on intervention components, small group discussion, and experiential learning of the assessments and exercises (Kolb, 2014; Salas et al., 2012). Health educators were tracked for a year following the in-person training to determine implementers and non-implementers of the older adult strength training intervention. Separate pre- and post-training surveys were developed and administered to health educators

who attended training. Those who implemented the intervention (n=5) and randomly selected non-implementers (n=4, 40% of the non-implementers) were invited to participate in one-on-one semi-structured interviews to assess the adoption-implementation gap.

Measures

Health educators (N=15) who attended training were invited to complete surveys assessing 1) demographic characteristics (i.e., age, gender, race, ethnicity, height, weight, and physical activity levels) (Gates & Cooke, 2011); 2) predictors of implementation (i.e., self-efficacy, diffusions of innovation, stage of change); 3) positive intent to deliver (on a 5-point Likert scale 1- strongly disagree; 5- strongly agree); and 4) training satisfaction (Tello, Moscoso, García, & Chaves, 2006). Body Mass Index (BMI) was calculated from self-reported height and weight. Penetration was operationalized as those who were trained and ultimately delivered the intervention. Adoption was operationalized as those who attended the training and implementation was defined as those who delivered the intervention within 12 months. The semi-structured interviews contained two parts: 1) teach-back of the five essential intervention components (i.e., group dynamics-based, strength training exercise program, older adult target audience, twice weekly frequency, and eight-week intervention duration) and 2) health educator's perceptions of intervention characteristics, their own personal characteristics, and the implementation process as guided by constructs of CFIR.

Data Analysis

Quantitative

Statistical analyses were conducted using statistical analysis software (SPSS v. 23.0 for Windows, SPSS Inc., Chicago, Illinois). Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated for the samples overall, as

well as according to delivery status (1 = implemented, 0 = did not implement). Independent sample one-tailed *t*-tests and Chi squared tests were used, based on variable type, to determine significant differences between delivery status (i.e., non-implementer vs. implementer) in their survey responses (i.e., intent to deliver, desire for more training on delivering physical activity interventions, fit of physical activity interventions within job responsibility, comfort in delivering a physical activity intervention, and preparation of delivery of a physical activity intervention).

Qualitative

Trained research assistants transcribed the health educator interview audio-recordings verbatim in Microsoft Word. The transcriptions were de-identified by replacing each participant's name with a code number for anonymity. Participants were informed they could choose to have their responses excluded from the study once the interview was complete. No participants requested to be removed from the study. Participants' responses were reduced to meaning units (i.e., singular pieces of datum that represented one concept or idea) (Creswell, 2013). Each transcript was independently reduced to identify meaning units by two members of the research team. To establish initial inter-rater reliability, each member (NR, LB, TS, MW) of the research team independently identified meaning units across two pages of a participant transcript. The group met to resolve any discrepancies in meaning unit identification and establish a group consensus on what constituted as a meaning unit. Inter-rater reliability among the four coders was greater than 85% ($\kappa = 0.69$) for this first iteration; therefore, the lead author and one other investigator were paired for the remaining transcripts.

A codebook informed by the CFIR conceptual framework was used to describe the emerging themes and subthemes within the meaning units. Two team members independently

collapsed the meaning units into emergent categories, subthemes, and themes. The team members compared their coding and reconciled coding discrepancies through discussion until consensus was reached. To establish inter-rater reliability of how meaning unit would be coded, each member (NR, LB, TS, MW) of the research team independently coded 50 meaning units within one interview, the group met to resolve discrepancies in coding and provide clarification. After this first round, inter-rater reliability among the four coders was greater than 80%. The research team then independently coded the remainder of the interview (i.e., 50 additional meaning units) to ensure that inter-rater reliability was maintained. After this second round, inter-rater reliability among the four coders was greater than 88% ($\kappa = 0.71$). To ensure coding consistency among all the meaning units, the first author coded all of the meaning units, the second author coded half, and the third and fourth author each coded the remaining quarters.

Results

Of the 52 eligible health educators within Virginia, 15 (29%) attended the training. Trained health educators represented all four districts within Virginia, with the majority from Northern (40%, $n=6$), Central (27%, $n=4$), and Southwest (27%, $n=4$) districts. Overall, 40% of Northern health educators, 36% of Central health educators, 6% of Southeast health educators, and 40% of Southwest health educators attended the training with 66% ($n=4$) of Northern, 100% ($n=1$) of Southeast and 50% ($n=1$) of Southwest attendees ultimately delivering the intervention. Of these 15 trained health educators, six (~12% of total eligible) ultimately delivered the intervention to 113 participants (See Table 1). Health educators recruited cohorts of 10-15 older adults and delivered in-person strength training two times a week for eight weeks (Wilson et al., 2018).

Descriptive statistics of health educators' characteristics are reported for the total sample, as well as for groups categorized by implementation status (See Table 2). Health educators who attended the training represented 51% of the Virginia counties and were, on average, 44.73 (± 13.65) years of age, predominately Caucasian (86.7%), female (86.7%), and overweight ($M_{BMI} = 29.33 \pm 6.97$) kg/m²). Implementers and non-implementers did not differ significantly in age, race, or gender; however, implementers had a significantly lower BMI than non-implementers ($p = .02$).

Penetration of the intervention was 33%, with no significant difference between implementers and non-implementers regarding intent to deliver ($M = 3.77 \pm 1.09$). Implementers and non-implementers reported high training satisfaction with objectives and content, methods and training context, and the usefulness and overall rating (51.85 out of 60) immediately post training. Post training, non-implementers were significantly more likely to want more training on delivering physical activity interventions ($p = .045$), to feel that the physical activity interventions are not part of their job responsibility ($p = .037$), and to report that they “are not physically active, so do not feel comfortable delivering a physical activity intervention” ($p = .001$). Implementers were significantly more likely ($p = .024$) to be preparing to deliver a physical activity intervention than their non-implementer counterparts.

Qualitative Results

Overall, both implementers and non-implementers reported high training satisfaction, the need for structured peer support, and a desire for ongoing training. Frequently reported barriers to implementation included the complexity of the intervention, cost of equipment, and low self-efficacy related to physical activity and physical activity delivery. Frequently reported facilitators to adoption included assistance from the research team and other cooperative

extension personnel to reduce delivery burden, positive perceptions of pragmatic fit of the intervention, and positive perceptions of the effectiveness of the intervention. Non-implementers were more likely to report barriers than facilitators while implementers reported both barriers and facilitators within the three domains.

Intervention Teach-back

Implementers had a higher understanding of the integral intervention components, with all implementers specifying at least four of the five components correctly. In contrast, non-implementers, on average, were only able to specify two of the five components correctly. Additionally, non-implementers frequently reported misinformation about the intervention (e.g., incorrect duration or frequency). Non-implementers were more likely to say that they could not remember specific details about the intervention or to express surprise when given the intervention details.

“You know I honestly don’t remember. I don’t know if it was a 12-week program or an 8-week program. I can’t remember. I know a lot of people use this programs for older adults but I don’t know if it’s specifically designed just for older adults or if it can be used on a general adult population.” (Participant 6, non-implementer)

Intervention Characteristics

Both implementers and non-implementers expressed concerns about the degree to which the intervention could be adapted or tailored for the needs of their participants (negative perceptions of adaptability). Specifically, they desired variability within the intervention and the inclusion of more nutrition resources. This is unsurprising as interventions for these health

educators are typically not as regimented and have traditionally contained a higher proportion of nutrition education.

“From what I gather, the program [LIFT], the exercises stay the same... there really isn't a whole lot of variety.” (Participant 6, non-implementer)

“It gets a little repetitive when you have them doing the variations of the, like sometimes it says to do the eight exercises while you're doing the warm up and they're gonna do those during the class anyways, so we usually do something else.” (Participant 1, implementer)

Implementers were more likely to feel that the intervention was structurally similar to other physical activity interventions available for delivery and that there was a lack of other options for strength training specifically (positive relative advantage). In contrast, non-implementers felt that the potential reach of the intervention was low and that other existing physical activity interventions offered within Extension were simpler and easier to implement (negative relative advantage). Both implementers and non-implementers had negative perception of time needed to implement as compared to other interventions (negative relative advantage); however, implementers were more likely to express that while time was an issue, it was not a major barrier to delivery of the interventions.

“Well, normally I wouldn't have a program that went on for eight weeks. Generally, the longest I have is a nutrition series that is six weeks and it's one time a week. So it's a pretty big time commitment. It's not at all hard to do and everything is thought out for

you, but it just kind of ties up a couple hours two days a week...But, um, I had program assistants that helped me a couple times when I had a conflict and I wasn't able to go.”
(Participant 7, implementer)

Cost of equipment and lack of funding were noted as barriers for both implementers and non-implementers, with many non-implementers expressing that the cost to initiate and implement the intervention was prohibitive (negative cost). Both implementers and non-implementers noted that the interventions they currently were delivering were dependent on grant funding available to them. Implementers frequently reported creating partnerships or applying for local grants as a method to fund the intervention.

The quality and design of the resources and materials available was only mentioned by implementers; although they expressed that the materials were high quality and user friendly, the method of access (i.e., a flash drive) did not fit within their needs in the field. Implementers desired easier access to materials, both electronic and hard copy versions, and offered adaptations made in the field that facilitated the delivery of the intervention. Examples of these adaptations included checklists and changing the format and layout for increased participant usability. Intervention source, evidence strength and quality, and trialability were not considered important to either implementers or non-implementers with zero meaning units fitting into those categories.

Characteristics of Individuals

Implementers saw strength training and physical activity as a need within their communities and were likely to report that the intervention had high pragmatic fit (positive knowledge and beliefs about the intervention). Non-implementers were worried about lack of

credentials as a fitness professional and the repercussions and liability if an intervention participant was to get injured during a session (negative knowledge and beliefs about the intervention).

Echoing the quantitative results, non-implementers also expressed concerns about being less physically active themselves (negative self-efficacy) and therefore not comfortable leading a physical activity class whereas the majority of implementers stated that they were physically active themselves, had personal experience with strength training, or had led physical activity classes in the past (positive self-efficacy).

“And since I’m not in[to] physical activity... I’m not the person who...goes to gym, so they [people who go to the gym] are very familiar with all of the things you do at the gym. I’m not that kind of person to do that. But I think that if I knew those kinds of things [physical activity], right off in the beginning, I would have been more likely to really jump on board to get that done [deliver LIFT].” (Participant 5, non-implementer)

“I think the fact that I’m in relatively good shape and do weight lifting myself makes it easier for me to be a confident instructor. Um, I think if it were more difficult for me to do some of the exercises and some of the weights then nah, it might not inspire as much confidence as an instructor... So I think that, that’s something that makes it easier for me, probably.” (Participant 1, implementer)

Implementation process

Both implementers and non-implementers indicated positive perceptions about the quality of the in-service trainings (positive planning). Implementers followed up these positive perceptions with suggestions for improvement informed by their experiences delivering the intervention. Non-implementers, on the other hand, generally did not volunteer information on negative aspects of the trainings or suggestions for improvements until asked directly.

“It [training] was good. I really enjoyed it. I think maybe it would have been nice actually to have assigned, um, maybe groups or individuals teach one of the lessons, one of the sessions...Um, because even though we went through all eight exercises, uh, still need a facilitator or to probably like talk about being a facilitator and how to get the group to engage? Because right now I’m dealing with a very large group and it’s a little hard.” (Participant 4, implementer)

“It’s definitely something that in the four-and-a-half years that’s the first time something like that was offered. Um, and I think it (in-service) was a good opportunity.” (Participant 3, non-implementer)

Both implementers and non-implementers reported a desire for more extensive and personal training, with a preference for experiential and mentored training activities. Implementers were more likely to suggest concrete or discrete solutions such as health educators taking turns running through the exercises during training or shadowing health educators in the field who have already delivered the intervention.

When asked about their experiences delivering the intervention, implementers reported utilizing personnel within extension (e.g., program assistants, interns, other health educators) and within the research team (e.g., intervention manager, extension specialist) to help alleviate barriers related to time or lack of expertise.

“[After the in-service training] I thought I could teach the program with some help...going over the exercises again and talking to other health educators who are offering it or who had taught similar classes. (light laughter) And there was always the graduate student program manager or the extension specialist who could answer questions.” (Participant 2, implementer)

“They [summer interns] helped advertise and, uh, distribute materials, and they helped me set up the rooms, flip tables over, you know, get rid of chairs and carry the weights. So they've [summer interns] been instrumental. It's uh certainly been helpful to have help for sure, in the set-up and take down and delivery of the class.” (Participant 1, implementer)

Implementers reported activities that reflected championing the intervention to other health educators who were either unaware or not delivering the intervention (positive champion). Non-implementers reported lack of access to an intervention champion and desired more information on how to initiate and implement the intervention from people who had previously delivered it (negative champion).

“We had a district planning meeting a couple months ago and I took the notebook [Intervention curriculum] and I told them about it and said this is a very easy to implement program. Well, you know, and I passed the notebook around for people to look at...I think I was probably the only one that brought a curriculum to look at.”

(Participant 7, implementer)

“I think maybe like some of the seasoned health educators who have done this, maybe just sharing, just starting from the get-go, like what did they do to get this program up and running? ...did they reach out to senior centers? Did they just recruit in the community through some sort of marketing, or something like that? Just kind of how did they get the program going...” (Participant 6, non-implementer)

Discussion

Work related to faster and higher quality health care delivery is gaining momentum. Theory and practice suggest that organizational context (Légaré, Ratté, Gravel, & Graham, 2008; Mendel, Meredith, Schoenbaum, Sherbourne, & Wells, 2008; Rycroft - Malone et al., 2004) and characteristics of the individuals (Godin, Bélanger-Gravel, Eccles, & Grimshaw, 2008; Lukas et al., 2008) delivering the intervention play a critical role in enabling—and hindering—the implementation process (Weiner, Amick, & Lee, 2008; Weiner, 2009). As dissemination and implementation science is a relatively new field, there is a dearth of reporting on the characteristics and factors leading to better implementation (Proctor et al., 2013). This mixed-methods study was developed to identify implementers and non-implementers perceptions of intervention barriers and facilitators, with the goal of improving and adapting training structures to meet the mission, values, and resources of delivery personnel and systems and ultimately,

improve health behaviors of participants. Data were also collected to describe health educators' personal characteristics and perceptions on training and the strength training intervention.

From this work, there are three primary implications. First, the results from this study suggest that current training methods may target those health educators who are already behaviorally and psychologically prepared to deliver the intervention. Considerable exploratory studies have been done (Kirk et al., 2016) involving constructs within the CFIR, but limited hypotheses on the relationships between these factors and implementation outcomes exist (Damschroder et al., 2017). Health educators who delivered the intervention tended to already be physically active themselves, were preparing to deliver physical activity interventions, and expressed higher self-efficacy related to physical activity and physical activity delivery. While unsurprising, this aligns with previous findings (Estabrooks, Bradshaw, Fox, Berg, & Dzewaltowski, 2004) that physically active health educators are more likely to deliver physical activity interventions.

Second, the results of this study also provide preliminary support for the addition of social support and experiential learning to current training methods to increase health educator comfort. Many of the health educators used outside help (e.g., intervention manager, other health educators, extension personnel) to develop comfort in intervention delivery. Both implementers and non-implementers expressed the need for more practice with the exercises, aligning with the need to engage the three different learning styles (visual, auditory, and tactile) (Kolb, 2014; Salas et al., 2012). This also fits within delivery system resources and values; a major priority of Extension is to build local relationships and collaborative partnerships to help people put scientific knowledge to work. Additionally, within Extension, oral culture is predominant and health educators share resources with each other (Grumbach & Mold, 2009;

Ramussen, 2002). Further, prior to delivery of the intervention, health educators were unaware of the intervention components they needed more training on. This is evidenced by high training satisfaction and lower desire for further training immediately post-training, but a high desire for increased experiential learning activities and more personalized intensive training as reported in the one-on-one interviews following intervention delivery. Increased integration of social support and peer networking within training could harness the tacit knowledge of the current and former deliverers to increase the likelihood of delivery.

Third, the results of this study emphasize the need to incorporate tacit knowledge of delivery personnel when developing and reporting on implementation strategies and outcomes. As previously mentioned, research-developed health promotion interventions are typically tested in a particular community or setting with the intent of generalizing to the broader population or setting. The most popular example of this concept is the many iterations of the Diabetes Prevention Program (Diabetes Prevention Program Group, 2002) from adapting to Spanish-speaking audiences (Ockene et al., 2012) to community-based delivery at YMCAs (Ackermann, Finch, Brizendine, Zhou, & Marrero, 2008) to delivery within the Veterans Health Affairs (Moin et al., 2017). Perhaps less prominent but similar in concept, Strong Women, Strong Bones (Nelson, 2006) has been adapted for male participants and Extension service setting (Ball et al., 2013), for dissemination and implementation trials (Seguin et al., 2008), and to include aerobic activity (Folta et al., 2015). These interventions reflect the new concept of ‘scaling out’ – introduced by Aarons and colleagues—where interventions with strong effectiveness data are scaled to 1) fixed delivery systems, different population, 2) different delivery systems, fixed population, or 3) different delivery systems, different population (Aarons et al., 2017). In fact, the proportion of funding allocated to dissemination and implementation (Neta et al., 2015;

Purtle, Peters, & Brownson, 2016; Tinkle et al., 2013) is increasing as the evidence base for what could work in practice settings grows but these interventions are rarely brought to scale (Riley, 2017). However, there exists a dearth of reporting on the effectiveness, characteristics, dose, and evaluation of implementation and training strategies, (Proctor et al., 2013) limiting the ability to replicate or scale out implementation. Even when added information, tools, and interventions have been tested within real-world effectiveness studies, the development of knowledge to support broader dissemination and implementation (e.g. cost and financing of the intervention, provider training, availability of resources) has often remained outside the scope (Chambers & Norton, 2016). Furthermore, the assumption that dissemination and implementation are final steps in a static, linear translational pipeline (Glasgow & Chambers, 2012) overlooks the complexities of practice-settings (Westfall et al., 2007). This often leads to poor implementation quality, and, ultimately, the potential of type 3 error in which the intervention is deemed ineffective when, in reality, the poor implementation has not been fully evaluated. In this study, implementers had tacit knowledge on how to implement the intervention that the non-implementers lacked, perhaps because they are more behaviorally and psychologically prepared to deliver physical activity interventions to begin with. This pragmatic knowledge from the field may increase the quality of implementation in the field by using the extant skillset, mission, and resources of the intended delivery systems and delivery personnel.

Limitations exist within this study. This study was part of a comparative effectiveness trial wherein funding was provided to health educators to initiate intervention implementation, and it is possible that some of the educators may not have implemented the intervention if funding was not provided. However, health educators were encouraged, and did, to procure their own funding to increase the likelihood of intervention sustainability. Further, this study had a

small sample size with participants solely from Virginia Extension. This may limit the transferability of the results to other settings. However, this exploratory study provides preliminary evidence and support for adaptations necessary to increase training effectiveness. Finally, inter-rater reliability for the qualitative data was not assessed throughout the meaning unit coding process. However, the first author coded all meaning units to ensure consistency among coding pairs.

Conclusion

Interventions may be implemented following a single training session (or no training) leading to differential implementation. This study emphasizes the importance of delivery personnel characteristics, skillset, and knowledge when considering training modalities and components as well as raises important questions about necessary adaptations for training effectiveness. Larger scale studies—including those targeting health educators in a variety of practice settings—will be important to testing mechanisms of training effectiveness for certain populations and settings.

Table 2.1. Virginia Cooperative Extension county and health educator distribution.

	Total	Northern	Central	Southeast	Southwest
N (%) of counties	112	29(26)	26(23)	36(32)	21(19)
n (%) of counties without health educators	32 (29)	1(3)	15(47)	10(31)	6(19)
M (sd) Range counties per health educator	1.6(1.52) R= 1-10	2.21(1.38) R= 1-5	1 R = 1	1.62(2.2) R=1-10	1.37(.5) R=1-2
N (%) of health educators as of January 2015	52	15(29)	11 (21)	16(31)	10(19)
n (% of trained) trained 2015	15(29)	6(40)	4(27)	1(7)	4(27)
n (% of trained) delivered LIFT 2015-16	6(40)	4(67)	0(0)	1(-)*	1(25)
n (% of trained) interviewed	9 (70)	5(83)	2(50)	1(100)*	1(25)

* Implementer was part of the PALT and did not attend the in-service training

Table 2.2. Characteristics of implementers vs. non-implementers

Characteristics	Total Sample (n=15)	Implementers (n=5)	Non-implementers (n=10)
Age, years (m,sd)	44.73 (13.65)	45.40(15.14)	44.40 (13.66)
Race	86.7% Caucasian	100% Caucasian	80% Caucasian
Gender	86.7% Female	80% Female	90% Female
BMI (m,sd)	29.33 (6.97)	25.23(5.6)*	31.38 (6.90)
Intent to deliver (m, sd)	3.77 (1.092)	3.40(1.52)	4.00(.76)
Preparing to deliver physical activity interventions (m, sd)	3.65 (1.02)	4.50(.58)*	3.22(1.48)
Comfort in delivering a physical activity intervention (m, sd) (r)	1.95 (.45)	1.00(.00)**	2.43(.79)
Physical activity as part of job responsibility (m, sd) (r)	1.64 (.56)	1.20(.45)*	1.86(.69)
Desire for more training (m, sd)	3.02 (1.2)	2.20(1.10)*	3.44(1.33)
Training Satisfaction out of 60 (m,sd)	51.85 (5.1)	50.75(4.86)	52.00(5.3)

* $p < .05$ and ** $p < .001$, m = mean, sd = standard deviations, r = reverse coded

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CHAPTER 3

Mansucrypt 2: How are community health workers trained to deliver physical activity? A scoping review.

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ABSTRACT

Background: Community-based physical activity interventions are recommended due to increased reach and public health impact. However, little is known about the training and recruitment of the community health workers (CHWs) who deliver these interventions. The purpose of this study was to determine the characteristics of CHWs who were trained to deliver in-person physical activity programs, the structural and mechanistic components of physical activity trainings, and the effectiveness of these trainings.

Methods: A systematic review of peer-reviewed literature was conducted from November 2017-January 2017. The review was limited to community health worker training on adult physical activity delivery that reported on training descriptors (e.g., reach of training, effect of training, fidelity to intervention post-training). The peer-reviewed literature search was conducted in PubMed and EBSCOhost and included any articles published from 1995 (coinciding with the release of the national physical activity guidelines) to December 2017.

Results: 6651 peer-reviewed studies were identified, 205 full manuscripts were evaluated, and seven papers met inclusion criteria and were analyzed. All studies reported the initial sample size of CHWs trained, however, limited information was provided on their characteristics. The majority of studies reported on training modality (e.g., in person or online) and dosage which varied widely across studies. Four studies reported on training outcomes including fidelity to intervention delivery, CHW implementation of the intervention, changes in CHWs physical activity behaviors, CHW perceptions of training (n=1), and intervention participants perception of physical activity classes.

Conclusions: The results indicate that there is inconsistent reporting on training across the literature, making comparisons between studies difficult and conclusions regarding training

effectiveness difficult to discern. Further research is needed to understand the mechanistic underpinnings to understand for whom, under what conditions, and why physical activity trainings strategies are working in the community.

Background

Nearly 90% of adults in the U.S. are not meeting physical activity guidelines which include both strength and aerobic activity recommendations (Haskell et al., 2007; Tucker, Welk, & Beyler, 2011). Physical inactivity is one of the top four modifiable risk factors in the development and exacerbation of chronic diseases, such as cardiovascular disease, diabetes mellitus, cancer, hypertension, anxiety and depression (Lee et al., 2012; Mammen & Faulkner, 2013; Warburton, Nicol, & Bredin, 2006). Beyond chronic disease, physical inactivity is also associated with decreased quality of life and other negative impacts including, but not limited to, inability to complete daily tasks of living, increased absenteeism from work, and reduced aging in place (Amlani & Munir, 2014; Buchner, 1997; Lahti, Laaksonen, Lahelma, & Rahkonen, 2010). These morbidity and mortality effects based on levels of physical activity have also been linked to increased health care utilization and costs (Carlson, Fulton, Pratt, Yang, & Adams, 2015). Contributing factors to low levels of physical activity include lack of awareness of physical activity recommendations and self-perceptions of low physical competence or confidence (Bauman et al., 2012). To improve awareness, increase self-efficacy, and promote ongoing participation in physical activity behaviors, community-based physical activity interventions are recommended (Kahn et al., 2002). It is further recommended that these community-based programs include mastery or vicarious experiences in combination with behavior change strategies such as social support, self-monitoring, or goal setting (Ashford, Edmunds, & French, 2010; Olander et al., 2013).

One approach to connecting adults to these community-based physical activity interventions in the “Exercise is Medicine Initiative.” This approach involves the integration of clinician-conducted physical activity behavior assessment, prescription, and referral to evidence-

based community resources (Lobelo, Stoutenberg, & Hutber, 2014). Currently, the Exercise is Medicine Initiative focuses on referral of patients to American College of Sports Medicine-certified health professionals as the main avenue for physical activity intervention in the community. However, access to these services and trained personnel is an issue, particularly for patients from health disparate populations such as rural residents and individuals from low income households (Gordon-Larsen, Nelson, Page, & Popkin, 2006). In addition, the relationship between these vulnerable patients and researchers or clinicians is often contentious. This contention is linked to mistrust, a lack of cultural sensitivity, and power dynamics (Wallerstein & Duran, 2010).

One approach to increasing community trust, and ultimately buy-in, is to utilize community health workers (CHWs), defined as a community member or frontline public health worker who is a trusted member of and/or has a close understanding of the community served (Witmer, Seifer, Finocchio, Leslie, & O'Neil, 1995). These CHWs serve as knowledge brokers between health and social services and community members. CHWs facilitate access to services and improve the quality and cultural competence of service delivery. Additionally, they seek to build individual and community capacity by increasing health knowledge and self-sufficiency of community members to engage in health behaviors through a range of activities such as outreach, community education, and advocacy (“Community Health Workers,” APHA, 2018). CHWs encompass a broad range of individuals and are well positioned to act as leaders for community-based health promotion interventions. Indeed, many evidence-based interventions reported in the literature rely on the CHWs to lead and deliver the programming, and community-based approaches to physical activity promotion are strongly recommended (Kahn et al., 2002). Although these interventions typically rely on CHWs to lead and deliver the

programming, there is a lack of detail about recruitment and training. There are also a number of reported barriers hindering the public health impact that CHWs may have on physical activity rates. These barriers include CHWs lack of confidence or capacity to lead physical activity mastery experiences, a lack of clear work protocols, high turnover and variable performance of CHWs, and a history of not knowing how to identify high-quality evidence (O'Brien, Squires, Bixby & Larson, 2009; Witmer et al., 1997).

While CHWs may represent a feasible option to improve access to and buy-in of community-based physical activity intervention, there remains a gap in understanding how and what *exercises* CHW are proficient to instruct. As with other community-based programs, CHW may make practice-based adaptations to respond to participant needs. However, the degree to which they have the knowledge and skills to effectively and safely adapt an exercise is less understood. To date, there is no review of the literature regarding what specific exercises are being delivered by CHW to an adult population. For example, it may be that CHW are facilitating behavior change strategies and encouraging participants to be active elsewhere or providing materials (flyers, DVDs) to assist with exercise, but not instructing exercise itself. Some certifications exist such as the American College of Exercise group fitness certification, however there are large costs associated with certification (and ongoing continued education), which may make sustainability of credentials a challenge in community settings (Washburn, Cornell, Phillips, Felix, and Traywick, 2014) . Scalable (i.e., reaching many CHW with low, incremental costs) training is needed.

Training is frequently cited as a solution to increase capacity to deliver programming and improve real-world practice. A recent review of 73 implementation strategies (Powell et al., 2015), referred to three strategies: 1) provid[ing] ongoing training articulated as “plan for and

conduct training in the clinical innovation in an ongoing way;” 2) make training dynamic, articulated as “vary[ing] the information delivery methods to cater to different learning styles and work contexts, and shape the training in the innovation to be interactive;” and 3) provide clinical supervision articulated as “provid[ing] training for clinical supervisors who will supervise clinicians who provide the innovation. Unfortunately, these vague articulations of training do not provide enough detail for replication, evaluation, or generalizability. While there has been increased effort and calls to action for specification and reporting of implementation strategies, the extant literature remains largely devoid of details (Pinnock et al., 2015; Proctor, Powell, & McMillen, 2013). There are no guidelines, protocols, or strategies that specify necessary frequency, duration, modality, mechanisms, or underlying models and processes of implementation strategies for delivery personnel to ensure the uptake of interventions. This is especially lacking for implementation strategies dedicated to community-based practitioners. Leeman et al. (2015) conducted a systematic review specific to building practitioners capacity for community-based interventions; however, only three of the twenty-nine studies reported on physical activity training and the review did not capture any details on the frequency, duration, modality, mechanisms of the capacity building strategies used within the training protocols.

Therefore, this lack of transparency and detail has become a recent high need exploration in public health. Numerous trainings to increase the number of professionals qualified to implement community interventions grounded in evidence-based practices and conduct physical activity and public health research exist (e.g., Physical Activity and Public Health course for Researchers and Practitioners (Brown, 2001), Move More Scholars Institute (Schneider, 2007)). While this is an important gap in physical activity promotion at large, the focus remains on planning, translating, and evaluation of physical activity promotion rather than increasing

confidence or capacity of those delivering the interventions (e.g., CHWs leading physical activity mastery experiences). One of the most prominently used curriculums for training CHWs in the delivery of evidence-based programs is the Putting Public Health Evidence into Action Training workshop curriculum, supported by Cancer Prevention and Control Research Network and based upon the National Cancer Institute Putting Evidence into Action (Fernández et al., 2014). In a recent evaluation of that training protocol, it was found that the interactions with peer and trainers, usable tools within the activities, and the comprehensive content of the training were noted as the most helpful features in facilitating capacity building for evidence-based public health delivery (Mainor et al., 2017). While this curriculum provides a good schedule of frequency, dose, and content, these facets have not been yet established specifically for how CHWs can promote physical activity.

Therefore, the aim of this study was to review the peer-reviewed literature related to community health worker training on physical activity delivery and establish the nature and extent of research evidence. This review was conducted to answer the following questions:

1. What are the characteristics of those who are trained to deliver in-person physical activity programs in community settings?
2. What are the structural and mechanistic components of physical activity trainings (e.g. frequency, duration, modality, mechanisms, or underlying models and processes, objectives)?
3. How is effectiveness of these trainings measured and reported in the literature?

The data presented here will begin to build an evidence base for community-based physical activity trainings and inform recommendations for what still needs to be known about physical activity trainings for CHWs.

Methods

Procedure for conducting review

A scoping review (Levac, Colquhoun, & O'Brien, 2010) was completed through searching the databases PubMed and EBSCOhost for combinations of the search terms training (or curricula or competency or education or learning or module) and physical activity and community (or public health). (See Table 1.) Articles published from January 1995 (i.e., when the CDC first released recommendations on physical activity behaviors) (Pate et al., 1995) to December 2017 and available in English were included. Articles title and abstracts were reviewed and were included for full article review if they met all of the following: 1) had an eligible study design (i.e., research studies including experimental, quasi-experimental, and nonexperimental designs); 2) included adult physical activity delivery (operationalized below); and 3) included training descriptors (e.g., reach of training, dose, training objectives). These eligible articles were reviewed in full by the first author and senior author to ensure they met the above criteria and 1) reported on pre/post evaluation data (e.g., reach of training, effect of training, fidelity to intervention post-training) and 2) were trainings for CHWs.

This review was focused on adult in-person physical activity, specifically. Adult physical activity delivery was operationalized as 1) targeting participants >18 years of age and 2) direct physical activity participation; specifically teaching people the skills to change their behavior and providing social support for doing so (e.g., walking groups, aerobics class, strength training classes). For the purpose of this review, articles that examined the physiological effects of exercise and the management of health problems (i.e., biological or physiological outcomes) were excluded as the main outcome of those trials was not increasing physical activity levels.

Data extraction and synthesis

A data extraction tool was developed based on Estabrooks, Harden, and Burke's systematic review on group dynamics (2012) and focused on a balanced understanding of internal and external validity of the trainings examined within this review. The extraction tool was adapted to include characteristics of training, the intervention trained on, sample of those trained, and outcomes reported, as well as research design and analysis features. Training characteristics include the use of theories or frameworks, dose, frequency, mode, and capacity building strategies and were based on components from the the recently conducted systematic review by Leeman, et al. (2015). Intervention characteristics include the use of behavioral theories or models, inclusion of behavior change strategies, and the type of physical activity. Sample characteristics included sex, age, body mass index (BMI), race, ethnicity, education level, income, and job title. Outcome characteristics included method of data collection (i.e., quantitative, qualitative, or both), scale used, and reported results as well as whether any mediation analyses were performed, cost data was collected or if fidelity was measured. Two reviewers independently abstracted the above data for each publication, compared their abstractions, and resolved discrepancies by consensus.

Results

The initial search for peer-reviewed articles yielded 6651 articles. The titles and abstracts of these articles were independently assessed by the two members of the research team (NR, TS, SB) and 6446 were excluded because they did not meet the inclusion criteria or were duplicates. The full text of the remaining 205 articles was reviewed by first author and the senior author and an additional 144 were excluded because they did not have adult physical activity promotion (n = 54), were not for community health workers (n = 68), did not include evaluation data (n = 43), no training was described (n=11), were an ineligible design (n=19) or was a duplicate (n = 7). Seven

peer-reviewed articles met inclusion criteria for this review. (See Figure 3.1) A number of the articles (n= 42) were excluded after full review due to the fact that the CHW did not engage in physical activity with participants or lead them in any instruction. For example, one study (Comellas, 2010) had information on pilot testing the training which built the CHW capacity to lead discussions. Another (Taylor, Everson-Hock, & Ussher, 2010) had trained physical activity instructors lead indoor cycling while CHW led the discussion. Additionally, one (McEwen, Pasvogel, Gallegos, & Barrera, 2010) had relevant outcomes, but were not physical activity specific, including: “1. Recruitment and retention of two promotoras for the duration of the intervention, 2. Completion of the six 4-hr training sessions, 3. Achievement of a score of 90% on the Diabetes Knowledge Questionnaire, and in response to the case studies, 4. Identification of 95% of the diabetes-related problems, 5. Demonstration of three types of social support, and 6. Individual tailoring of the intervention.” While these studies were not eligible for inclusion within this systematic review, it is notable that the training exists, but training on how CHW can *lead* physical activity interventions is less prominent (i.e., only 7 eligible articles).

Table 3.1 provides an overview of the included studies. All seven studies were conducted in the U.S. with the earliest included study published in 2007. The authors used a variety of study designs; however, these designs often were at the intervention level (i.e., randomization or evaluation of intervention participants) as opposed to at the training level. The studies were conducted in a range of settings with two (Haughton, Ayala, Burke, Elder, Montañez, & Arrendondo, 2015; Wilcox, et al. 2007) being church-based and three (Ayala, 2011; Seguin, Economos, Hyatt, Palombo, Reed, & Nelson et al., 2008; Zoellner et al., 2007) being community based. All of the studies included interventions with either a walking (Wilcox, et al. 2007; Zoellner et al., 2007) or strength (Muramatsu, Yin, & Lin, 2017; Ory, Smith, Wade, Mounce,

Wilson, Parrish, 2010) component, with three of the interventions including both (Ayala, 2011; Haughton et al., 2015; Seguin et al., 2008;. About half of the interventions were based in theory, citing either the transtheoretical model (n=1) (Muramatsu et al., 2017) and the socioecological model (n=1) (Haughton et al., 2015), or a combination of theories (n=2) (Wilcox, et al. 2007; Zoellner et al., 2007). Interventions in five of the studies included the delivery of behavior change strategies (e.g., self-monitoring, goal setting, feedback) in addition to physical activity delivery. The number of CHW trained depended on the scope of the study, from statewide or multi-state trainings with hundreds of trainees (n=3) (Ory et al., 2010; Seguin et al., 2008; Wilcox, et al. 2007), to smaller scale, single site trials (n=4) (Ayala, 2011; Haughton et al., 2015; Muramatsu et al., 2017; Zoellner et al., 2007). About half of the studies described how many CHW delivered the intervention, with the majority of those reporting a ~70% attrition rate from training to delivery.

What are the characteristics of those who are trained to deliver in-person physical activity programs in community settings?

All studies included in the review stated the initial trainee sample size, as reported in Table 3.1, with four studies (Haughton et al., 2015; Ory et al., 2010; Seguin et al., 2008; Wilcox et al., 2007) indicating how many of the trainees ultimately delivered the physical activity intervention. Three of the studies (Ory et al., 2010; Seguin et al., 2008; Wilcox et al., 2007) did not report any characteristics of the trainees. In the other four studies, those trained were predominately female (>90% across all studies). One of those studies (Haughton et al., 2015) did not report the racial or ethnic demographics of the trainees; in the remaining three studies, the CHWs had similar racial or ethnic demographics of the target population of the underlying physical activity intervention with the trainees being 100% African-American or Black (Zoellner

et al., 2007), or 98% African-American or Black (Muramatsu et al., 2017), or 100% Latina or Hispanic (Ayala, 2011). Education levels of the CHW trained varied, with three studies describing the majority of the CHWs as completing high school. Trainees were middle aged, with two studies including average age and one including percentages across age brackets. Only one study (Haughton et al., 2015) reported on income levels of the CHWs with 27% of CHWs trained stating that they earned less than \$2000 per month in household income. No studies reported on BMI of the trainees. One study (Seguin et al., 2008) conducted a sub-analysis survey of people who had been trained as of 2004. Of the 142 CHW trained, 139 (98%) were women. Of the 139 women, 31 (22%) were from urban areas, 55 (40%) were from suburban areas, and 53 (38%) were from rural areas. No other demographic information was reported for the sub-analysis within the Seguin et al. (2008) manuscript.

What are the structural and mechanistic components of physical activity trainings?

The way that the physical activity trainings were structured varied widely with regard to frequency, duration, modality, mechanisms, or underlying models and processes. In six of the studies, authors provided information on the modality, with all six trainings conducted in-person. Descriptions of dose varied, with the majority of studies describing the number of trainings and their duration (e.g., one half day session). Average duration of trainings sessions across the four studies that included training length was 6 hours. Didactic training (n=4), skill building workshops (n=3), tools (n=4) were used most often to build CHW capacity to deliver physical activity programming, with consultation (n=2) and assessment and feedback (n=1) being used less often. Tools provided during the training took the form of written manuals detailing the contents of training, walking path maps, pictorial guides of exercises, and lists of community resources for free and low-cost PA resources. While four studies reported on capacity building

strategies included in training, none of the included studies provided any details on the theoretical basis behind training structure. Only one of the studies (Ayala et al., 2011) explicitly described training objectives, specifically: “1) what it means to be a promotor, 2) how to effect behavior change, 3) and how to organize and lead physical activity groups.”

How is effectiveness of physical activity trainings measured and reported in the literature?

Most studies (n=4) did not include training as the primary outcome measure, of these four studies, only one included any training outcomes as seen in Table 3.2. Training outcomes reported across studies included fidelity to intervention delivery (n=2), implementation of the intervention (n=2), changes in CHWs physical activity behaviors (n=2), CHW perceptions of training (n=1), and intervention participants perception of physical activity classes (n=1). Outcomes were assessed via surveys (n=4), interviews or focus groups (n=3), observations (n=2), or administrative data (n=1).

Two studies (Muramatsu et al., 2017; Wilcox et al., 2007) examined changes in CHWs physical activity behaviors, through interviews and surveys respectively. In both studies, CHWs reported an increase in personal physical activity behaviors post-training, but this increase was only reported by older CHWs by Muramatsu et al. Two studies (Seguin et al., 2008; Wilcox, et al. 2007) reported on the number of those trained who implemented the intervention. In one study (Wilcox et al., 2007), over half the people interviewed had implemented the program. In the same study (Wilcox et al., 2007), among individuals who had not yet implemented the intervention, one third believed that further training would facilitate implementation of the program. In the other study (Seguin et al., 2008), the majority (70%) of trainees surveyed had implemented the intervention at least with a mean class size of 11. Program leaders who engaged in their own personal strength training routine before attending the training or who were sent by

their employer or an organization to attend the training were more likely to implement the intervention. This study also examined fidelity to the intervention through class observations by program manager across multiple sites within three different states. Program managers graded each observation on a 5-pt. scale (1=unacceptable, 5=excellent) in four areas: adequate space, equipment safety, location safety and accessibility, execution of exercise program. All sites received an average score of 4.25 supporting high levels of adherence. In another study (Haughton et al., 2015), fidelity to the intervention was evaluated at three levels: 1) class observations with a fidelity checklist with unspecified items completed by the physical activity specialist who trained the CHWs; 2) objective evaluations of the type, intensity, and quality of the participant physical activity in CHW classes by the System for Observing Fitness Instruction Time for Group Exercise Classes conducted by trained assessor; and 3) Intervention participant process evaluation surveys. Across all three measures, fidelity to and quality of intervention delivery was rated highly (See Table 2). Surprisingly, only one study (Muramatsu et al., 2017) examined CHW perceptions of trainings, with >90% of the CHWs reporting an increase in knowledge of physical activity and ability to motivate, communicate, and lead their clients through physical activity. Notably, no studies included description of training costs, however, one study (Seguin et al., 2008) described a fee paid by CHWs to attend training.

Discussion

This primary purpose of this review was to determine the characteristics of training, the characteristics of trainees, and the methods of training evaluation employed to build an evidence base for community-based physical activity training programs. While the intention of this review was to describe the current best practices for physical activity trainings, there was a limited number of existing studies and lack of detail included. These results led to the

description of recommendations and avenues for future research on physical activity training strategies. These recommendations include further exploration on 1) characteristics of training and trainees; 2) mechanisms of training effectiveness; and 3) training outcome measures.

Across studies, there was limited and varied reporting on characteristics of training and trainees. Reporting guidelines (Pinnock et al., 2015; Proctor et al., 2013) have been developed for characterizing implementation strategies in a similar fashion as treatment interventions. The ultimate goal of these guidelines is the inclusion of sufficient detail in order to address issues related to interpreting and using findings from implementation research. These guidelines suggest that implementation strategies are named consistent with existing literature and definitions of the strategy and components are included. The guidelines encourage specificity with regards to 1) who is enacting the strategy; 2) the specific actions, steps and processes involved, 3) targets of the actions (i.e., who or what the strategy is intended to effect) according to conceptual models of implementation; 4) unit of analysis for measuring implementation outcomes; 5) when the strategy is used; 6) dose of the strategy; 7) theoretical, empirical, or pragmatic justification for choice of implementation strategies; and 8) implementation outcomes affected. Notably, only two of the articles included in the review were published after the publication of reporting guidelines. These articles were more likely to include characteristics of the CHW sample (100% vs. 40% of those published before 2013) and included increased precision when describing the dose of the training. Taken together, aligning intervention characteristics with reporting guidelines may improve transparency in reporting and the ability to replicate the training intervention. As so few studies systematically reported characteristics of the training implementation strategy, there also remains a gap in the degree to which theories or conceptual models have been applied in training.

Relatedly, while there were studies included that employed randomized controlled design, the randomization was at the level of the intervention participants. Most studies did include outcomes at the level of training, however, the lack of experimental design at the level of the trainees remains problematic because it contributes to a lack of internal validity or ability to assess causal relationships. This lack of rigor inhibits the understanding of for whom, under what conditions, and why these training strategies are working or not working. While a true randomized controlled trial design may not align with community needs or produce relevant evidence to facilitate “real-world” implementation, there are a number of pragmatic designs (Curran, Bauer, Mittman, Pyne, & Stetler, 2012; Glasgow, 2013; Glasgow & Chambers, 2012; Tunis, Stryer, & Clancy, 2003) that can elicit the needed details to understand the mechanistic underpinnings of physical activity training strategies.

Related to “for whom” training strategies are effective, this review provides preliminary support for further investigation into differential training effectiveness across sub-groups. Two studies noted significant findings related to age, institutional support, and physical activity levels. It is unsurprising that increased institutional support or higher personal physical activity levels lead to increased buy-in and uptake of physical activity programming. These results support the premise that training serves as an avenue for capable and confident CHWs to learn the mechanics of program delivery as opposed to building capacity among those CHWs to deliver physical activity. In fact, much of the literature on capacity-building and adult learning theory assumes innate motivation to learn. To sufficiently increase the number, proportion, and representativeness of CHWs willing and able to deliver physical activity interventions, it is necessary to investigate and develop strategies to build capacity in those that are not already psychologically or behaviorally prepared to deliver physical activity interventions.

This review highlighted the diversity of training outcomes measures. There was a lack of consistency across outcome measures and methods, making it difficult to compare studies or identify components that might characterize a successful training. Moving forward, it is necessary to identify training outcomes of interest to be applied consistently across studies. Evaluations of trainings frequently do not identify relationships between training competencies and public health impact. Evaluation measures predominantly focuses on training satisfaction and increased trainee knowledge. However, the knowledge-intention-behavior gap (Sheeran & Webb, 2016; Sniehotta, Scholz, & Schwarzer, 2005) is well established in the behavior change literature, so the assumption that a change in trainee knowledge will lead to better public health outcomes is tenuous at best. In other words, developing a knowledge base of the physical activity recommendations will not necessarily lead to successful in-person physical activity intervention. CHWs are employed from various backgrounds and skillsets and the training may be their first encounter with leading physical activity interventions. Further, while the majority of the interventions included behavior change strategies in addition to physical activity delivery, there was limited or no assessment of the CHW delivery of behavior strategies. It is well established that behavior change strategies facilitate sustained health behavior adoption and change (Michie et al., 2011). CHWs build health knowledge and self-sufficiency of community members to engage in health behaviors, a primary distinction between their role and that of American Council of Exercise or EIM-certified fitness professionals (Bryant, Franklin, & Newton-Merrill, 2007; Hooker & Buchner, 2009; Paternostro-Bayles, 2009; Witmer et al., 1997). Future studies should aim to evaluate CHWs fidelity to behavior change strategy delivery, in addition to physical activity delivery, to ensure long-term physical activity behavior change for adults.

There are several limitations and strengths of this study that are notable when interpreting the findings. The search strategy was intended to be broad and comprehensive to capture any physical activity trainings that might exist for CHWs, nonetheless, only seven studies were ultimately included in the study. Based on other work that queries adoption-level data (i.e., those that deliver or adopt a program), descriptions and outcomes of training are generally underreported so this small sample size is unsurprising. There were many articles that were excluded from this review due to lack of physical activity specificity, however trainings from other disciplines could be used in future work to inform models for physical activity trainings for CHWs. Further, this study was limited to adult physical activity interventions. There is significantly more reporting on youth physical activity and training for youth physical activity delivery specifically within school settings due to the underlying assumption that physical activity literacy, skills, and confidence are developed in youth and carried forward into adulthood. This is the first known study investigating training mechanisms for physical activity within an adult setting.

Conclusions

Descriptions of CHWs trainings for physical activity are limited in the extant literature. Similar to the identification of core elements for evidence-based interventions, studies that identify training structures (e.g., dose, components, theoretical basis) are necessary. Further guidance and research is needed to understand the mechanistic underpinnings to understand for whom, under what conditions, and why physical activity trainings strategies are working or in the community.

Figure 1. Eligibility and inclusion of peer-reviewed literature for training for community-based physical activity programs.

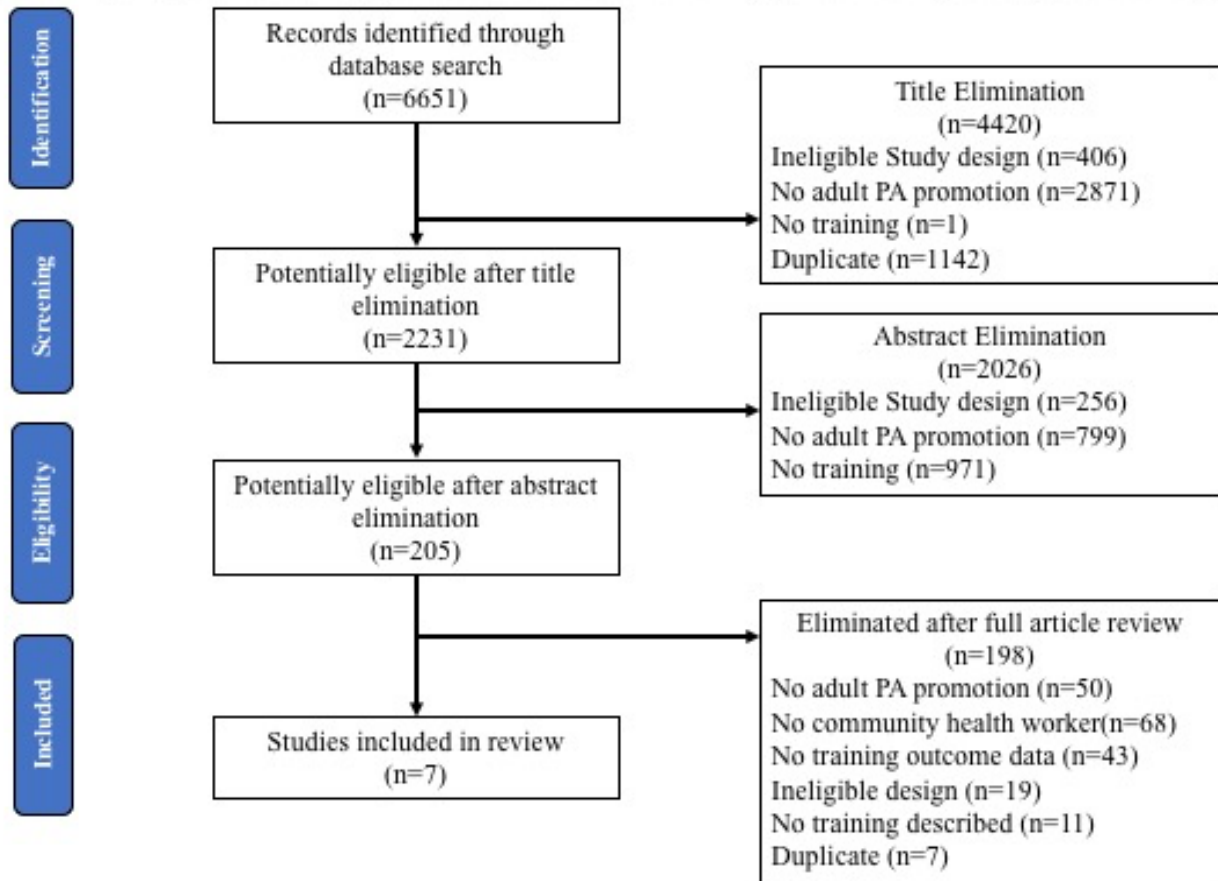


Table 3.1 Summary of publications included in the review.

Study	Year	Geographic Location	Study Design	Setting Type and n	CHW Type, n, and Intervention Delivery Rate	Physical Activity Type CHWs Trained to Implement	Behavioral Intervention Theories	Behavior Change Strategies Incorporated	Training Intervention Theories	Data Provided on CHW Sample
Zoellner et al.	2007	US-Mississippi	Quasi-experimental design	Volunteer coaches recruited walking groups from their community (n=8)	Volunteer coach, (n=40, 20%)	Walking	Transtheoretical model, Social support	Yes	-	Gender, race, age, and education level
Wilcox et al.	2007	US-South Carolina	Randomized design with delayed control group	Churches, (n=20)	Health ministry (n= 205, -)	Walking, praise aerobics	Transtheoretical model, Socioecological model	Yes	-	-
Seguin et al.	2008	US-National	Retrospective outcomes based on administrative data	Community or educator based location (n= not reported)	Program leaders, (n=881, -)	Walking, balance, flexibility, strength	-	No	-	-
Ory et al.	2010	US-Texas	Pre-post design	Association of Area Agencies of Aging Sites (n=4)	Lay educators, (n=402, 31%)	Strength, flexibility, balance	-	Yes	-	-
Ayala	2011	US-California	Pre-post design	Community or educator based location (n=4)	Promotoras, (n=30, -)	Group exercise class, walking and strength	-	No	-	Gender and ethnicity
Haughton et al.	2015	US-California	Group randomized trial	Churches, (n=6)	Community health worker (n=25, 32%)	Strength, cardio dance, walking	Socioecological model	Yes	-	Gender, age, education level, and income level
Muramatsu et al.	2017	US-Illinois	Pre-post design	Homes of patients, (n=4)	Health care aide, (n=46, 67%)	Strength and flexibility	Transtheoretical model	Yes	-	Gender, race, age, and education level

Table 3.2 Summary of outcomes as reported in the publications.

Study	Dose and Mode	Capacity Building Strategies	Primary Training Outcome	Descriptions of Training Outcomes	Method of assessment	Findings
Zoellner et al.	In person, dose not reported	Not reported	No	-	-	-
Wilcox et al.	Attended one of three, half day large group trainings	Didactic training, Skill building workshop, tools	No	Implementation of intervention Changes in CHW's PA behaviors	Interviews (n=39)	21 people (54%) reported that they had implemented at least one PA program in their church. 1/3 of churches stated that an additional booster training session would help them begin to implement. 30 people (77%) reported that they had increased their own PA
Seguin et al.	Full-day in-person workshop (i.e., 8 hours, including a working lunch)	Didactic training, Skill building workshop, tools	Yes	Fidelity to intervention delivery Implementation of intervention	Class observations (8 classes across three sites) and interviews Telephone Survey (n=103)	In Kansas, two classes at one site scored an average of 4.25; in Oregon, three classes at one site scored an average of 4.5; and in Massachusetts, three classes at one site scored an average of 4.25. Program leaders wanted more guidance on fee structures and scheduling 72 (70%) had implemented one StrongWomen Program with a mean class size of 11. Program leaders who strength trained themselves before attending or their employer or an organization to attend the workshop were more likely to implement the StrongWomen Program.
Ory et al.	Not reported	Not reported	No	-	-	-
Ayala	8, 2 hour in-person sessions	Consultation, Didactic training, Skill building workshop, tools	No	-	-	-
Haughton et al.	Twice a week for 2 hours each session, over 6 weeks.	Consultation, Assessment and Feedback, Didactic Training, tools	Yes	Fidelity to intervention delivery Assessment of quality of PA class Participant perceptions of classes	Class observations (160 observations of 20 CHWs) System for Observing Fitness Instruction Time for Group Exercise Classes (n=28) Process evaluation surveys	Although all components averaged “good” or “excellent,” the 2 areas needing the most improvements were warm-up and cool-down and the area with the greatest variability across CHWs was strength training. On average, participants engaged in moderate to vigorous PA 65% of class time, which was the level of activity expected. The quality of all class instruction was high, with a mean score on the Instructor Behavior Checklist of 19.4 (SD = 2.3) of 23.
Muramatsu et al.	4-hour in-person training session	Not reported	Yes	Changes in CHW's PA levels Perceptions of trainings	Surveys (5 pt. Likert scale) (n=41) Surveys (n=41) and Focus Groups	Older HCAs aged 50+ reported they spent more time doing the types of physical activity (stretching or strengthening) that they delivered to their clients Most HCAs “strongly agreed” or “agreed” that the Healthy Moves training increased their ability to motivate clients to be physically active (90%), their ability to help clients with safe exercise (95%), and their ability to communicate with their clients (90%). They felt their knowledge about physical activity increased (95%). HCAs agreed that they have used what they learned from the program for their clients (95%) as well as their family or friends (85%). 98% of HCAs were satisfied with the program.

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CHAPTER 4

Mansucrypt 3: Training as an implementation strategy: A mixed methods exploration of what is typically done in practice to promote physical activity in community settings.

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ABSTRACT

Background: Descriptions of community-based physical activity intervention training structures, mechanism, and content are nascent. To fill this gap, this study sought to (1) generate rich descriptions of the development and implementation of a collaboratively adapted training, and (2) evaluate the feasibility of a training-specific observational protocol for attendees and trainees.

Methods: Community-based health educators were invited to participate in district-wide trainings for an evidence-based physical activity program. Mixed methods data were collected through observation of the health educators and those who conducted the training as well as pre- and post-training surveys (n=16) assessed demographics, intervention perceptions, predictors of implementation, positive intent to deliver, and training satisfaction.

Results: At the completion of the training, health educators were significantly more likely to intend to delivery LIFT. Health educators reported high levels of satisfaction and enjoyment with training. Interrater reliability between the observers on both the health educator and trainer observational checklists was high. Consistent themes reported on the trainer checklist were actual starting and ending times of sections, interruptions by participants, additional content provided by trainer, and content rearrangement. The most frequent themes reported on the health educator checklist were body language, verbal responses, and questions asked.

Discussion: This study highlights the complexities and time investment of training development and delivery process. The results from this study provide evidence that a training adapted through collaborative approach has positive effects on training outcomes such as reach and representativeness of trainees and training satisfaction. Pilot testing of the observational checklist revealed many adaptations needed to increase usability.

Background

Only 10% of Americans are meeting physical activity recommendations (i.e., 150 minutes weekly of aerobic activity and twice weekly strength training) (Haskell et al., 2007; Tucker, Welk, & Beyler, 2011). Population-level interventions have shown to have the most impact on individual level physical activity behavior change initiation and maintenance. (Kahn et al.; World Health Organization, 2000) In addition, place-based interventions target participants where they work, live, learn, and play (Frieden, 2010; Sallis, Owen, & Fisher, 2008). Place-based approaches create a stronger public health impact as these interventions have higher reach, greater sustainability at the individual and system-level, use less resources, while equal in effective when compared to an individualized behavior change approach (Heath et al., 2012; Kahn et al.).

However, community-based practitioners are often unfamiliar with how to find, use, or evaluate evidence-based practices and commonly rely on best practices from the field or the status quo of the system (Leeman et al., 2015). One way to improve intervention uptake is to target implementation strategies— “an integrated set, bundle, or package of discreet implementation interventions ideally selected to address specific identified barriers to implementation success (Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015, p. 4).” Training is frequently cited as a solution to increase practitioner capacity and improve real-world practice behaviors, which thereby, would improve participant outcomes (Powell et al., 2015). That is, training is considered or assumed to be a strong implementation strategy. However, the vague articulations of training in the literature and the increased calls-to-action for specification and reporting of implementation strategies indicate the need to problematize our understanding of the structure, content, modality, and evaluation of training. Further, training (as an

implementation strategy) is often a role and responsibility of the research team members, hindering widespread dissemination and implementation of these interventions. Often times intervention developers and researchers are “training [community-based health educators] and hoping [that they will deliver their program over time]” (Beidas, Edmunds, Marcus, & Kendall, 2012, p. 1; Fixsen, Naoom, Blase, & Friedman, 2005). This leads to a gap in understanding what training structures and content are most necessary to engage the attendees and lead to increased intervention uptake. Due to this, even when interventions see initial success with potential for large-scale uptake, that success is often short lived or not scaled broadly outside of its original delivery system.

Although it is generally accepted that training is necessary, there remains a persistent gap between reporting on training components and connection with outcomes (Harden et al., 2015). Training is treated as a “black box,” disconnected from intervention delivery and rarely are the effects that poor or little training has on the end program outcome of interest considered. Taken together, more is known about why and how interventions work and for whom (i.e., large evidence base for physical activity interventions), but less is known about types of training strategies employed, the frequency and intensity at which they are used, and the conceptual domains and levels of the implementation context that are targeted by training. Hoagwood and Kolko (2009) caution that “it is difficult and perhaps foolhardy to try to improve what you don’t understand.” (p. 35) In order to improve community-based trainings for physical activity interventions, there is a need to understand their current functioning, identify what is broken, and tailor improvement efforts for maximal potential impact (Ramalingam, Strayer III, Breig, & Harden, 2018). In other words, there is a need to better understand usual care settings, and in particular, what constitutes “training as usual.”

In a recent systematic review of training structures, it was concluded that as reported in the literature, trainings are heterogeneous and there is a lack of understanding of training mechanisms (Ramalingam et al., 2018). Based on these findings, there is a need to determine both *what* training components are effective and *why* they are effective. Notably, honing in on specific training structure is merely a first step. Once best practices for training are established, within large systems, there are usually multiple sites and cohorts of delivery personnel who need training (Aarons, Sklar, Mustanski, Benbow, & Brown, 2017). Therefore, understanding the quality and consistency of applying these training structures are necessary. The quality and consistency of training structures may be impacted by the instructor's characteristics such as enthusiasm, expertise, self-efficacy, competence, and capacity (Damschroder et al., 2009). Similarly, these personal and system-level characteristics impact the replication of trainings within and across settings. One way to start this exploration is to develop and pilot observational protocols. It is often recommended to include implementation checklists or observational protocols (Proctor et al., 2011; Slaughter, Hill, & Snelgrove-Clarke, 2015), but these documents are rarely readily available, validated, and easily adapted. Highly successful and previously validated observation protocols exist to measure physical activity within interventions and the delivery of a physical activity class (e.g., SOPLAY (McKenzie, 2002; Saint-Maurice, Welk, Ihmels, & Krapfl, 2011), SOFIT (McKenzie, Sallis, & Nader, 1992)) but one does not exist to evaluate physical activity trainings. These checklists are necessarily to pragmatically measure or track adaptations or changes to the program in different settings, by different staff members, or over time.

Taken together, it is imperative that efforts to identify and develop training strategies be grounded in a thorough understanding of real world settings. The specific aims of the case study

were two-fold: first, to generate rich descriptions of what actually occurs during community-based physical activity trainings, and second, to provide concrete targets for improvement based upon what actually occurs in usual trainings and insights into the types of training processes that are likely to be successful in the real world. A secondary aim was to evaluate the feasibility of observational tools for physical activity trainings.

Methods

Design

Case-study research promotes “in-depth, multifaceted explorations of complex issues in their real-life settings,” (Crowe et al., 2011) making it a particularly salient approach to examining implementation issues. Specifically, this was an instrumental case study, through the use a particular case to gain a broader appreciation of the current best practices in physical activity training (Stake, 1995). In this study, the general goal was to increase understanding of current physical activity training practices and how these practices influence delivery personnel intervention perceptions of intervention and intervention delivery. The Virginia Tech Institutional Review Board approved this study.

Setting for the case study

One community-based system that serves millions of Americans per year is the federally funded Cooperative Extension System (herein: Extension). Each statewide system operates independently but has a somewhat similar structure (Franz & Townson, 2008). Physical activity has recently been added as a priority area within Extension (Agriculture Act, 2015). Within Virginia Cooperative Extension (VCE), county-based health educators are assigned to one of four districts. Virginia is 432 miles wide and is the 35th largest state in the U.S. The size of Virginia makes in-person or statewide trainings burdensome on trainee, but in-person trainings

remain the standard across Extension as well as other public health or healthcare systems. In VCE, each district meets quarterly but most trainings happen in-person at the land grant university, resulting in drive time of up to six hours for most county-based health educators. Community-based health educators are responsible for programming spanning nutrition and wellness, financial education, and family and human development content areas. These masters-trained community-based health educators act as primary points of contact for community members, identifying the complex needs and issues within their community, fostering local relationships and collaborative partnerships, and putting scientific knowledge to work through learning experiences that improve economic, environmental, and social well-being of their communities (McFerren, Margheim, Hutson, Strong, & Roth Gehrt, 2013).

To assist with program delivery, Extension health educators can recruit and train master food volunteers (MFVs) (Chase, 2012). These MFVs undergo a 30-hour, 28 module online training course ranging from MFVs responsibilities, how to work with diverse populations, and general nutrition and physical activity knowledge. MFVs are required to volunteer 30 hours of service over a one-year time period to remain an active in the community through Extension.

Training development and description

Table 4.1 provides a timeline of events leading to the case study and trainings in 2017. As part of larger, ongoing efforts within Extension, a needs assessment was conducted to evaluate health educators' perceptions on delivering physical activity interventions. Barriers to delivering physical activity intervention included lack of 1) training to deliver physical activity interventions, 2) explicit language supporting physical activity as part of the health educator's job description, 3) validated and simple-to-administer evaluation tools and 4) knowledge of available curricula. To address these barriers to physical activity intervention delivery, a

collaborative partnership—defined as one in which researchers and community stakeholders work together on projects designed, initiated, and managed by the research team—was developed to train, support, and evaluate physical activity efforts in the state of Virginia (S. M. Harden, Johnson, Almeida, & Estabrooks, 2016; Wilson, Strayer III, Davis, & Harden, 2018). Leveraging this collaborative partnership, an older adult strength-training intervention, LIFT, was adapted for statewide delivery (Wilson, Strayer III, Davis, & Harden, 2018).

In 2015, training was based on typical training needs within Extension (Ghimire, 2010; Koundinya & Martin, 2013; Radhakrishna & Martin, 1999), best practices as described in the training literature (Salas, Tannenbaum, Kraiger, & Smith-Jentsch, 2012), and prior personal training experience. Thirteen health educators were trained in 2015, with six ultimately delivering LIFT. The 2017 training was based on adoption-implementation gap outcomes as reported by the health educators trained in 2015 that 1) low self-efficacy, 2) need for experiential learning, and 3) lack of peer support contributed to low implementation rates (Ramalingam & Harden, 2016). To address these needs, three changes were made to the training structure. First, trainings were limited to LIFT program specifically (rather than physical activity behaviors with signature programs as was done in 2015). This allowed a specific focus on LIFT program principles and exercises and more time for the mastery exercises. Second, trainings occurred at a district level vs. a state-wide level. This change brought health educators together with their district peers, promoting an environment to share tacit knowledge on implementation challenges and solutions. In a similar vein, the third adaptation to training was the recruitment of previous LIFT deliverers in each district to act as program champions (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004). These program champions hosted the training within their county and acted as the primary point person for recruitment and coordination of training logistics.

Further, program champions were asked to share anecdotes from their program delivery experiences and how they address implementation barriers. As no health educators has previously delivered the training in the Central district, health educators from the Central district were invited to attend the Southeast training. In total, three district level trainings were planned in 2017 with the Northern district training occurring first, the Southeast/Central training occurring the next day, and the Southwest training taking place three weeks later. In Table 3, the characteristics of the training in 2017 are detailed as compared to the training in 2015.

Sample and recruitment

Forty-eight VCE county-based health educators across the state were invited via email by the Principal Investigator to attend the district level LIFT trainings in 2017. Health educators were also prompted to invite any MFVs who may assist them in delivering LIFT. Table 4.2 provides details on the total sample of county-based health educators broken down by district.

Data Collection

Mixed methods data were collected through observation of the trainees and trainers as well as pre-and post-training surveys of the trainees. Separate pre- and post-training surveys were developed and administered to health educators and MFVs who attended training. Health educators (n = 7) and MFVs (n=9) for a total of 16 trainees. All trainees were invited to complete surveys assessing 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) predictors of implementation (i.e., self-efficacy, diffusions of innovation, stage of change, expertise, role clarity, personal physical activity behaviors) on a 5-point Likert scale 1- strongly disagree; 5- strongly agree; 4) positive intent to deliver physical activity programming in general and the specific trained intervention

(on a 5-point Likert scale 1- strongly disagree; 5- strongly agree); 5) perceptions of LIFT based on RE-AIM dimensions (on a 5-point Likert scale 1- strongly disagree; 5- strongly agree); and 6) training satisfaction. Body Mass Index (kg/m^2) was calculated from self-reported height and weight. Physical activity levels were measured via the International Physical Activity Questionnaire (Craig et al., 2003).

As no training observational checklist currently exists, the health educator observational checklist was modeled from the System of Observing Play (SOPLAY) and System for Observing Fitness Instruction Time (SOFIT) observational protocols. SOPLAY consists of scans, or a single observation movement from left to right across a Target Area or Scan space. During a scan, each individual in the area is counted and coded as being Sedentary (S), Walking (W), or Very Active (V) (McKenzie, 2002). SOFIT is an objective tool for assessing the quality of physical education instruction, providing measures of student activity levels, lesson context, and teacher behavior during class time (McKenzie et al., 1992). Similarly, the checklist contained two parts, a dichotomous variable (check for yes, x for no) for each of the training sections (e.g., small group discussions, Functional fitness experiential practice) to indicate completion and areas for qualitative notes to allow comments on the health educator behavior during training.

The trainer observational checklist was based on the training agenda (see Appendix H). The training agenda included 7 sections: Welcome and overview, Active name game, Foundations of LIFT, LIFT Teach Back, LIFT mastery experience, Small Group discussion, and Functional Fitness Test mastery experience. Each section of the agenda had corresponding check boxes for key content to be discussed with trainees. There was also space on the checklist for field notes to capture adaptations including, but not limited to, content rearrangement and

feedback from participants. See Appendix I for a sample health educator observational checklist and Appendix H for sample trainer observational checklist.

At each training, randomly selected health educators and trainers were conducted by two trained graduate research assistants (GRA) to determine engagement with and fidelity to the training components using a checklist. The total number of health educator observed at each training was limited to four to reduce cognitive load and increase the likelihood that rich descriptions of health educator behaviors during training were captured (Engle, 2002). One of the GRAs assisted with the development of the training and the other was a new masters student who did not participate in training development or have familiarity with the LIFT program. These observers were specifically chosen to a) test for interrater reliability (Gwet, 2014) and b) decrease observational bias (Anfara Jr, Brown, & Mangione, 2002)

Data analysis

Statistical analyses were conducted using statistical analysis software (SPSS v. 23.0 for Windows, SPSS Inc., Chicago, Illinois). Means and standard deviations of continuous variables and frequencies and proportions of nominal variables were calculated for the samples overall. Ratings for predictors of implementation and perceptions of LIFT were standardized to a z-distribution and compared to the mean rating to identify statements that trainees were significantly more or less likely to agree with ($p < .05$). Wilcoxon signed ranked test were conducted to determine differences between pre and post-training survey responses. Content analysis of observation checklists and field notes were conducted to derive themes and establish inter-rater reliability. Field notes from observations augmented the analysis by placing observational checklists in context, providing a better understanding of the setting and rationale for why adaptations were made.

Results

Overall, sixteen people attended the trainings in 2017, with the majority of attendees being middle-aged, females who were predominantly African-American. See Table 4 for details on demographic characteristics. The average BMI of trainees was $31.83 \text{ kg/m}^2 (\pm 7.32)$. Attendees represented 15% of the counties across Virginia, with the majority (9, 56%) from the Southeast district. Half of trainees were masters-educated, earning either a Master of Science (30%), Master of Education (55%), or Masters of Business Administration (10%). Degree programs were varied, including specializations in Business, Education/Human Services, Exercise Science, Leadership Studies, Merchandising Management, Nutrition, Agriculture (Food Safety), Family Life and Youth Development, Psychology, Special Education. When asked to compare their health to others their age, three quarters of trainees rated their health good or very good, with 70% reporting being diagnosed with at least one chronic disease. Around half of the trainees ($n=7$) considered themselves confident in meeting physical activity recommendations. Four trainees (25%) were insufficiently active according to self-reported IPAQ.

A Wilcoxon signed rank test showed that the training did elicit statistically significant changes in trainee's 1) intent to deliver in their plan of work ($Z=-2.236$, $p=0.03$); 2) perceptions of the relative advantage of LIFT as compared to other physical activity programs ($Z=-2.33$, $p=0.02$); and 3) perceptions that LIFT has been successful when tested in research settings under optimal conditions ($Z=-2.121$, $p=0.03$). While not statistically significant, trainees perceived that it was easier to deliver LIFT after training ($Z=-1.732$, $p=0.08$). None of the other implementation indicators or perceptions of REAIM outcome expectations exhibited a statistically significant change after training.

Trainees had positive perceptions of the reach, effectiveness, adoption, implementation, and maintenance of LIFT. Pre-training, trainees were most likely to feel that other Extension county-based professionals recommended this program (adoption), though this difference was not statistically significant ($p=.09$). Trainees were significantly ($p=.008$) less likely to feel as though they had the resources (e.g. time, cost, handouts, volunteers) to conduct LIFT program (implementation). Post-training, although not statistically significant ($p=.072$), trainees were most likely to feel that they could deliver LIFT according to the program manual (implementation). Trainees were significantly ($p=.018$) less likely to feel as though the program could be maintained or sustained easily for longer than one year without special funding (maintenance).

Trainees were significantly ($p=0.05$) more likely to feel that LIFT was not part of their job responsibility (role clarity) pre-training. Post-training, they were more likely to feel that they were physically active, increasing their comfort in delivering a physical activity program (personal PA behaviors), although this was not statistically significant ($p=0.54$). Trainees were least likely to feel that compared to other physical activity programs, LIFT was easy to deliver (relative advantage), both pre-training ($p=0.11$) and post-training ($p=0.079$) See Figs. 1-4 for standardized-and-ranked perception ratings.

Overall, post-training, trainees had positive perception of the training, with the majority agreeing or strongly agreeing that they enjoyed the training. While all of the trainees felt that the training had been useful for furthering their learning in delivering physical activity programming and 90% felt that their training on delivering LIFT specifically was “good” or “excellent,” two thirds of the trainees would have liked more training on delivering LIFT. See Table 5 for more details. Qualitatively, multiple health educators stated that the most positive

aspects of the training were the interactive nature, the ability to ask questions, and practice application of the material at their own pace. Health educators did not report negative aspects of the training, instead focusing on perceived difficulties with implementation of the program itself. Multiple health educators reported the functional fitness testing as a barrier, specifically related to length of the assessment and the difficulty scheduling.

Health educator and trainer observational checklists

Interrater reliability between the observers on both the health educator and trainer observational checklists was high (>95%). This high reliability was reflected in the subjective, qualitative observations as well. For example, one GRA recorded “‘It was an embarrassment’- talking about seniors being more active than her” and the other GRA wrote that the participant “‘found that other seniors are already more advanced than her, was very embarrassed when she had to line dance with seniors.” Similarly, both observers noted similar form, counting, and cueing errors such a participant not turning arm during a biceps curl or using incorrect counts (e.g., 2 up and 2 down instead of 2 up and 4 down). Body language, verbal responses to questions from trainer, questions asked, and deviations during experiential practice were among the most frequent themes of qualitative observations noted by both observers for the health educator observational checklist.

When considering the trainer checklist, field notes captured by observers included actual starting and ending times of sections, late arrival of participants, participant question and responses, additional content provided by trainer, and content rearrangement. These themes exposed the inconsistencies between the three trainings and the deviations from the planned schedule. For example, actual length of trainings varied, with the Northern training starting later due to late participants (10:30 am instead 10 am) and the Southeast/Central ended later (3 PM

instead of 2 PM). Notably, the Southeast/Central training had more attendees (n=10) than either the Northern (n=2) or Southwest (n=4) training which may account for the increased length of time need to cover the same amount of material. Deviations in content covered were also captured. In the Northern training, the functional fitness assessment was demonstrated by the trainer, however, no time was allocated for experiential learning practice. Another example was the content of the small group discussions. In the Northern training, GRAs used field notes to capture the presence of late arrivals (Northern, n=1; Southeast/Central, n=2; Southwest, n=1) and when they arrived (i.e., so the amount of content missed could be determined).

Discussion

The purpose of this paper was to report details of the process for developing and implementing a physical activity training for community settings and to pilot test a training specific observational checklist. A rich description of the context for training is critical to enable other researchers to decide how the context as reported in the study compares to their situation and whether the training strategies can be directly transposed or will need adapting. A secondary objective of this study was to evaluate the use of a training-specific observational protocol and inform future iterations of this tool. The results presented here highlight the complexities and time investment of the training development and delivery process, the effects of a collaboratively adapted training on outcomes (e.g., reach and representativeness of trainees, effectiveness of training), and the heterogeneity of multiple trainings as captured by the observational protocol.

As reported in this study, development of the 2017 training was a part of three-year iterative process. While there have been many calls for specification of implementation strategies (Pinnock et al., 2015; Proctor, Powell, & McMillen, 2013), this the first known study to provide

explicit detail on how and why a physical activity training for community settings was constructed. By systematically reporting on the characteristics of training, the ultimate goal is to improve transparency and increase the ability to replicate the training intervention in other systems and settings. Future work, with an extended research time horizon, is needed to determine if the updated training protocol led to improvements in delivery rates and implementation fidelity.

To improve intervention adoption and delivery, strategies such as on-going support or consultation (Edmunds, Beidas, & Kendall, 2013) are suggested. Consultation consists of expert-led training to develop delivery personnel skills and capacity as they attempt to implement a new intervention (Edmunds et al., 2013; Nadeem, Gleacher, & Beidas, 2013). However, these training structures are resource intensive. To capitalize on existing peer relationships and knowledge to employ consultation in a scalable and sustainable way, previous LIFT deliverers as program champions were enlisted within each district to assist with recruitment and coordination of the trainings. Program champions sharing their experience and skills around intervention delivery can be operationalized as internal consultants, which may be more sustainable because it does not require external, expert consultation but has the potential to achieve the same level of support (Kothari et al., 2012). Indeed, when participants were asked during the training the reason for attendance, as captured in the observer checklists, multiple participants claimed it was because they felt obligated to the program champion. This was corroborated by the survey results as pre-training, trainees were most likely to feel that other Extension county-based professionals recommended this program. Usage of program champions within each district also increased the number of trained health educators in the Southeast in 2017, with four times as many trained in 2017 as compared to 2015. The Southeast district also has the greatest number of

health educators who do not racially identify as Caucasian and this was reflected in the increased proportion of African American health educators and MFVs trained in 2017. Taken together, usage of a previous peer deliver as a training coordinator may increase the reach and representativeness of training attendees.

The use of the training satisfaction is limited in physical activity trainings in community settings (Ramalingam, Strayer III, Breig, & Harden, 2018). The high training satisfaction as reported here may indicate a greater fit of within the mission, values, and resources of the delivery personnel and setting due to the use of a participatory approach. After attending the training, the trainees were more likely to intend to deliver LIFT, had positive perceptions of the relative advantage of LIFT as compared to other physical activity programs, and positive perceptions of the efficacy of LIFT as a research program, signifying that the objective of “Understanding evidence-based physical activity behavior change strategies within LIFT” was met. However, trainees were significantly less likely to feel as though the program could be maintained or sustained easily for longer than one year without special funding and qualitatively reported the logistics of the functional fitness test as a barrier. This was further reflected in trainee’s desire for additional training. These findings highlight areas to address for future trainings. Previous LIFT delivers have obtained external local funding to deliver LIFT, reported sustained delivery of LIFT in their communities, and shared the value and ease of the functional fitness test as an objective measure of physical activity (Ramalingam, Balis, Strayer III, Wilson, & Harden, 2018; Wilson, Strayer III, Davis, & Harden, 2018). While that information was effectively disseminated to the research team, the above results imply that it was not clearly communicated by the program champions during the trainings. Further work is necessary to determine how best to present this information during the training.

The tertiary aim of this work was to pilot test a training observational checklist. The checklist developed for this study borrowed from structures of the SOPLAY validated observational protocol. In order to develop specific, relevant codes for training, the observational checklist used in this study was primarily qualitative. For example, SOPLAY include codes for whether the area scanned is accessible, usable, supervised, organized, and if equipment is provided (McKenzie et al., 2002). Similarly, the 3-phase system of SOFIT contains codes at the levels of 1) student physical activity engagement; 2) lesson context (e.g., fitness, skill practice, game play or other) and content (e.g., general content, knowledge content, motor content, and 3) teacher interactions (in-class physical activity promotion or out of class physical activity promotion) and teacher involvement (e.g., promotes fitness, demonstrates fitness, instructs, manages, observes, and other). While the context of the health educator and trainer observational checklists pilot tested in this study was similar to SOFIT, the results of this study provide preliminary support that the intended objectives (i.e., engagement levels and content received) require additional codes such as affective mood state and content rearrangement for trainees and trainers, respectively. The qualitative nature of this tool mimics methods from grounded theory approaches, to allow the construction of training specific observation protocol through systematic gathering and analysis of the data (Lewis, 2015). With consistent themes for field notes across three trainings and two interviewers, the results from this study provide guidance for specific, relevant codes that can be used in future iterations of the observational checklists. Further, while the observational checklists have not yet been tested or validated, the results provide support for the heterogeneity of the trainings across districts. Some of these variations were due to time constraints, participant attendance, and variations in participant skillset and confidence. These variations and observations alongside the high training satisfaction as reported

by trainees, highlight the importance of soft skills when responding to the needs of the people in the room. Soft skills such as communication, flexibility, and interpersonal, are recognized as important (Robles, 2012), however less is known about their direct impact on implementation. Going forward, it is important to consider the effects of heterogeneous trainings on program adoption and implementation outcomes.

There are several limitations to this case study. As an “intrinsic case study,” the site selected (i.e., Virginia Extension) was unique as the Principal Investigator has championed the physical activity training process which may not be the case in other states or systems. While this made Virginia Cooperative Extension, an appealing site to study, it limits the generalizability and transferability of the results to other settings. However, the results of this study represent the beginning of an exploration of physical activity training structures, content and mechanisms in community settings and a methodology for capturing and reporting training data that can be applied outside of Virginia Extension. Another limitation relates to the need for further data is needed to determine long term effects of training (e.g., program uptake and delivery fidelity). This study represents initial but vital steps in the adoption-decision-making process, as lower attendance, satisfaction, acceptability and appropriateness of trainings, limits the potential of widespread dissemination.

Conclusion

While training is often cited as a solution to increasing capacity and change practice behaviors, little is known about how training is developed and implemented in practice. Through the results of this study, it is evident that a training developed through a collaborative partnership is key in improving the reach, representativeness, acceptability and appropriateness. Several insights were gleaned about the usability and appropriateness of training-specific observational

protocols. Findings from this case study will inform future approaches to physical activity training development and implementation in community settings.

Table 4.1. LIFT events in Virginia Cooperative Extension prior to the case study.

Date	Event	Data collection	Research team members involved	Extension personnel involved
<i>Fall 2014</i>	Physical activity needs assessment	Surveys, focus groups	Principal investigator	74 VCE professionals from across the state
<i>Winter 2015</i>	Establishment of Physical Activity Leadership Team	-	Principal investigator	2 VCE county-based representatives from each of the four districts
<i>June 2015</i>	Introduction and selection of older adult strength training program, Stay Strong, Stay Healthy (SSSH)	-	Principal investigator	Physical Activity Leadership Team
<i>June 17, 2015</i>	Scheduled training for SSSH	-	Principal investigator, Steve Ball	-
<i>August 2015</i>	SSSH training in Missouri	-	Principal investigator	Program Champion from the Northern District
<i>August-October 2015</i>	Development of LIFT: adapting SSSH to fit the needs of stakeholders (Wilson et al., 2018)	-	Principal investigator, program manager	Program champion from the Northern district, Physical Activity Leadership Team
<i>October 2015</i>	In-service training	Pre and post-training surveys	Principal investigator, 2 program managers, 1 research assistant	26 VCE county-based health educators, 13 eligible to deliver LIFT
<i>Spring-Summer 2016</i>	Establishing the effectiveness of LIFT	Reach and Effectiveness trial	Principal investigator, Program manager	6 VCE county-based health educators
<i>Fall 2016</i>	Evaluating barriers to LIFT adoption and implementation	Qualitative interviews	Graduate student Training manager	6 VCE county-based health educators
<i>Spring 2017</i>	Participatory development of training for 2017 (including need for district-based trainings)	-	Principal investigator, Training manager	Physical Activity Leadership Team
<i>Summer 2017</i>	District-level trainings and feasibility tests of observational protocols	Pre and post-training surveys, observations	Principal investigator, Training manager, Program manager, 2 research assistants	7 VCE county-based health educators, 9 master food volunteers and community volunteers

Table 4.2. Virginia cooperative extension county and health educator distribution.

	Total	Northern	Central	Southeast	Southwest
N (%) of counties	112	29(26)	26(23)	36(32)	21(19)
n (%) of counties without health educators	32 (29)	1(3)	15(47)	10(31)	6(19)
m (sd)	1.6(1.52)	2.21(1.38)	1	1.62(2.2)	1.37(.5)
Range counties per health educator	R= 1-10	R= 1-5	R = 1	R=1-10	R=1-2
N (%) of health educators as of January 2015	52	15(29)	11 (21)	16(31)	10(19)
n (% of trained) trained 2015	15(29)	6(40)	4(27)	1(7)	4(27)
n (% of trained) delivered LIFT 2015-16	6(40)	4(67)	0(0)	1(-)*	1(50)
N (%) of health educators as of January 2018	46	15(31)	11 (23)	12(25)	8(17)
n (%) Female	45(98)	14(93)	10(91)	11(93)	8(100)
n (%) Caucasian	33 (72)	13(87)	8(73)	4(33)	8(100)
n (%) educators trained in 2017	8 (18)	1(7)	1(10)	4 (33)	2 (25)
n of volunteers trained in 2017	8	1	1	4	2
n of total trained in 2017	16	2	2	8	4
N (%) of health educators trained as of 2018	23(50)	7 (47)	5 (46)	5 (42)	6 (75)

* Implementer was part of the PALT and did not attend the in-service training

Table 4.3: LIFT training characteristics in 2017 compared to 2015.

	2015	2017
Dose	Location: Land Grant University Duration: 2-day training from 12PM -5 PM on day 1 and 9 AM-1PM on day 2 Intensity: Training on physical activity offerings within Virginia Extension (3 programs)	Location: District training at location chosen by health educator host Duration: One-day four-hour training from 10AM -2 PM. Intensity: Strength training program specific
Content and structure	1. Introduction to Physical Activity (1 hour) 2. Description of three evidence-based programs with integrated small group discussion sessions to discuss barriers—an eight week online statewide walking program (1 hour), Funtervals (1 hour) and an eight week in-person strength training program for older adults (2 hours) 3. Functional Fitness demonstration and experiential learning (1 hour) 4. Strength training class demonstration (45 minutes)	1. Strength Training class demo with exercise cues (30 minutes) 2. Teach-back of key strength training program principles (30 minutes) 3. Experiential practice of leading strength training exercises (45 minutes) 4. Small group discussions on barriers and goal setting (30 minutes) 5. Functional Fitness demonstration (25 minutes) 6. Functional Fitness experiential practice (30 minutes)
Objectives	- Describe program logistics - Identify evidence-based principles for group dynamics physical activity programming - Practice functional fitness assessment and strength training exercises	- Understand evidence-based physical activity behavior change strategies within LIFT - Employ group dynamics evidence-based principles within LIFT - Build capacity and comfort with functional fitness assessment and strength training exercises
Participatory elements	-	Training development <i>Collaborative partnership:</i> - Provided qualitative feedback via research study - Reviewed 2017 training materials and structure and offered feedback Training implementation <i>Peer program champion:</i> - Hosted the training - Assisted with recruitment - Shared anecdotes and tacit knowledge of program delivery from the field

Table 4.4. Trainee sample characteristics in 2017.	
<i>Characteristics</i>	<i>Total Sample (n=16)</i>
Age, years (m,sd)	48.6 (13.70)
Race (n,%)	
White	4(25)
Black/African American	11(68.8)
Other	1 (6.3)
Ethnicity (n,%)	15(100)
Female (n,%)	13 (81.3)
BMI (m, sd)	31.83 (7.32)
Number of counties represented (n, %)	17 (15)
Agent (n, percent of total in district)	
Northern	1 (6)
Central	1 (9)
Southeast	4 (33)
Southwest	1 (13)
Master Food or Community Volunteer (n)	
Northern	1
Central/Southeast	5
Southwest	3
Education (%)	
Some college	6.3
College graduate	3.8
Graduate degree	50
Health Status (%)	
Excellent	0
Very good	25
Good	56.3
Fair	18.8
Poor	0
Smoking (%)	
Currently smoke	6.3
Don't smoke	87.5
Ex-smoker	6.3
Chronic Disease (%)	
One	31.4
Two	18.9
Three or more	18.9
None	25
Declined to answer	6.3
Sleep, hours (m, sd)	6.77 (.75)
Confidence in meeting PA recommendations (%)	
Somewhat	12.5
Moderately	43.8
Very	31.3

Completely	12.5	0
Physical Activity training (%)		
Excellent	12.5	1
Good	37.5	
No opinion	31.3	2
Fair	6.3	
Poor	12.5	3
IPAQ (%)		
HEPA Active	44	4
Minimally Active	31	
Insufficiently active	25	5

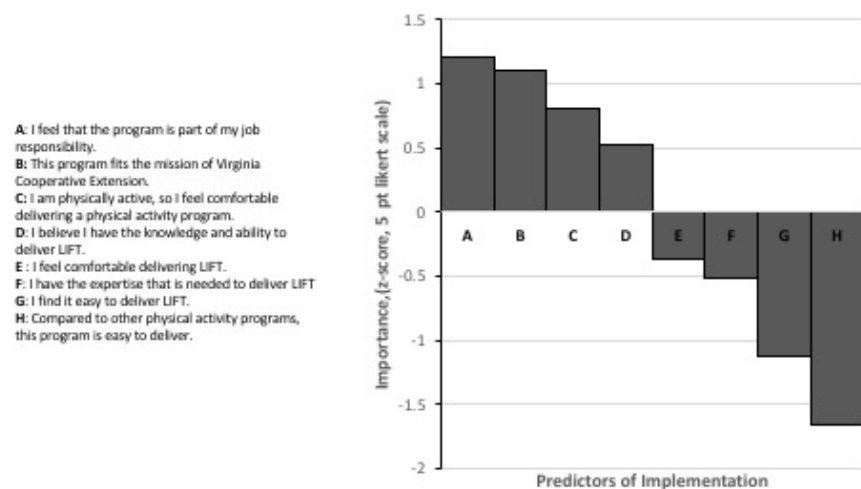


Fig. 1 Pre-training ratings of trainees perceptions of predictors of implementation, ranked and standardized to a z-distribution

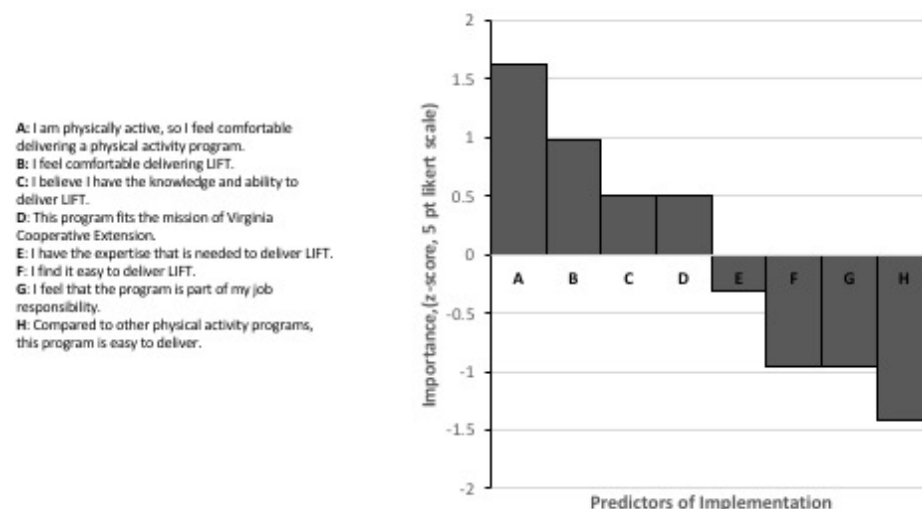


Fig. 2 Post-training ratings of trainees perceptions of predictors of implementation, ranked and standardized to a z-distribution

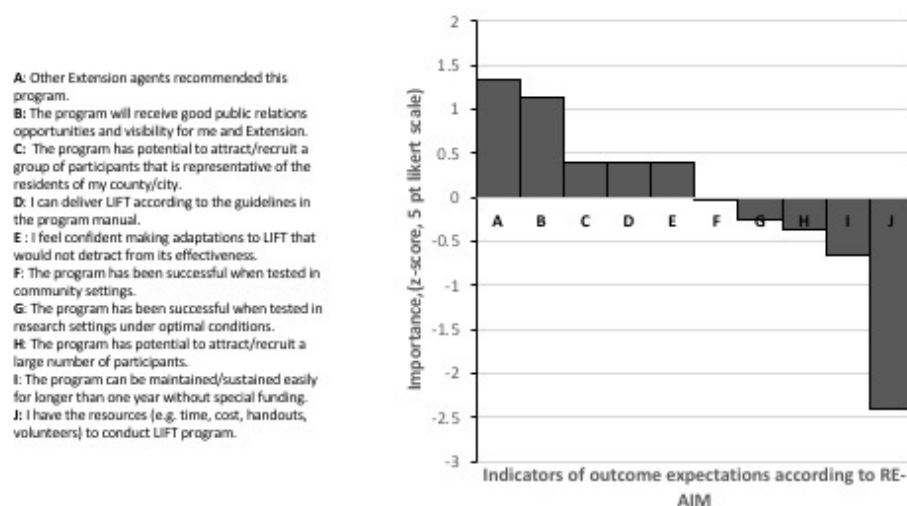


Fig. 3 Pre-training ratings of trainees perceptions of outcomes expectations according to RE-AIM, ranked and standardized to a z-distribution

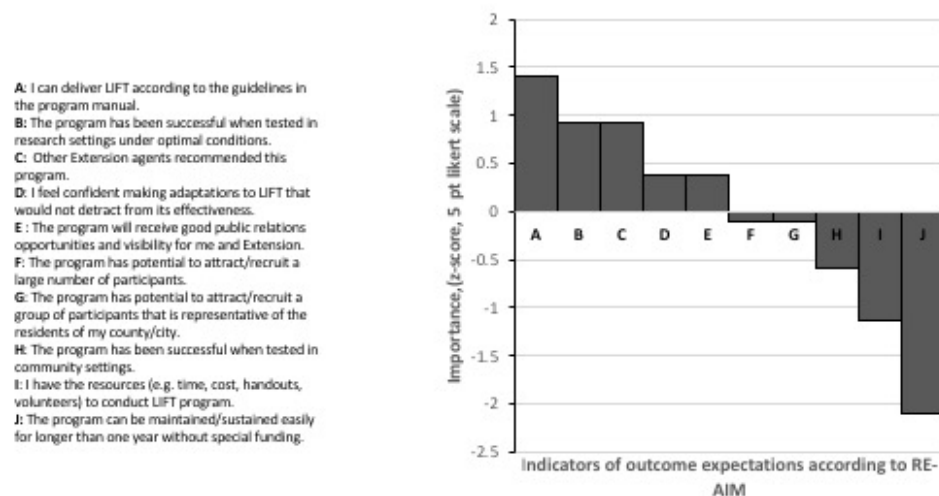


Fig. 4 Post-training ratings of trainees perceptions of outcomes expectations according to RE-AIM, ranked and standardized to a z-distribution

Table 4.5. Health educator self-reported training satisfaction.

<i>Training Outcomes</i>	<i>Total Sample (N=12)</i>
I feel that my training with regard to delivering LIFT was (n,%)	
Excellent	6 (60)
Good	3 (30)
No opinion	1 (10)
Poor	0 (0)
Fair	0 (0)
I would have liked to receive more training about delivering LIFT (n,%)	
Strongly agree	2 (22.2)
Agree	4 (44.4)
Neutral	3 (33.3)
Disagree	0 (0)
Strongly disagree	0 (0)
To what extent has the course been useful for your learning in delivering physical activity programming (n,%)	
To a very large extent	6 (54.5)
To quite a large extent	5 (45.5)
To some extent	0 (0)
To a small extent	0 (0)
Not at all	0 (0)
To what extent did the course content contribute to your achievement of the learning outcomes (n,%)	
To a very large extent	6 (54.5)
To quite a large extent	5 (45.5)
To some extent	0 (0)
To a small extent	0 (0)
Not at all	0 (0)
Overall, I enjoyed the LIFT training (n,%)	
Strongly agree	3 (37.5)
Agree	2 (25)
Neutral	3 (37.5)
Disagree	0 (0)
Strongly disagree	0 (0)

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CHAPTER 5: CONCLUSIONS

The high levels of physical inactivity in adults is alarming due to its association with numerous chronic diseases and adverse health effects. While the evidence-base of interventions to increase physical activity continues to grow, translation into community practice remains a problem. Training of community-based practitioners who are tasked with delivering these programs is one proposed way to reduce this translational gap. However, descriptions and training mechanism for physical activity are nascent. Thus, there is a critical need to evaluate how to adapt, develop, and implement training strategies to increase replicability, generalizability, and evaluation.

This dissertation contributes to physical activity promotion from an implementation science lens to have both empirical and practical implications. Namely, this work contributes to the evidence-base of training as an implementation strategy within community settings by 1) demonstrating the importance of delivery personnel characteristics, skillset, and knowledge when considering training modalities and components; 2) highlighting areas where future research is needed to build a training evidence base that generalizable and pragmatic; 3) providing preliminary evidence that training adapted through collaborative approach has positive effects on training outcomes such as reach and representativeness of trainees and training satisfaction.

In Manuscript 1, health educators who ended up implementing the strength training program were both psychologically and behaviorally prepared to deliver the program prior to attending training. They were more likely to be preparing to delivering physical activity programming and were personally physically active. Similarly, the systematic review included studies that found age, personal physical activity levels and institutional support to be salient factors that led to increased buy-in and uptake of physical activity programming. This is not surprising, but prior to this work, in this context, had been anecdotal. While this dissertation does

not fill the gaps in the literature related to impact of trainee characteristics on differential adoption and implementation following training, it does generate and support hypotheses that should be examined in larger scale studies across additional contexts, including clinics, worksites, and YMCAs.

As evidenced by the systematic review in Manuscript 2, descriptions of training for physical activity programs within community settings are vague and inadequate. When included in the literature, trainings were often reported descriptively as part of the methods for intervention delivery instead of an evaluation of the training itself. The training-specific part of the studies often lacked both internal and external validity, leading to the absence of sound theoretical foundation or generalizability of the training processes, measures and methodologies. Further, the heterogeneity of reported mode, dose, and structures and inconsistencies in reporting make comparisons between studies problematic and conclusions regarding training effectiveness difficult to state. Future research is needed to establish for whom, under what conditions, and why training strategies are effective, acceptable and appropriate, to both delivery personnel and the intended delivery systems.

While it is critical to develop a better understanding of the potential of trainings to improve the delivery of community-based physical activity intervention, it is equally important to understand the unique cultural context under which this translation will occur. This understanding will increase the likelihood that the training will fit the mission, values, and resources of the intended delivery system. Manuscript 3 present methods to arrive at this understanding through the description of a training developed and adapted through collaborative approach with research and practice members. This approach, while time and resource intensive, provided valuable insight into the needs, available resources, and norms that influence the

implementation of a training across the state. The results from this study suggest the usage of program champions as an appropriate and acceptable method by which the reach, representativeness, and effectiveness of training can be improved.

Lessons Learned and Future Directions

Overall, the manuscripts presented here highlight the complexities and assumptions of training in a community setting. This work was, in part, inspired by the difficulty finding information and evidence related to the attrition rates from training to delivery and the adoption-decision-making process. It is often assumed that “training” works as intended and that best practices are employed. However, as seen in Manuscript 3, heterogeneity exists between training sessions, even when delivered following a set agenda by the same trainer. These discrepancies are seldom captured and are important when considering the overall context of physical activity intervention delivery. Indeed, an observational approach of training was not employed in the first training for LIFT (i.e., Manuscript 1) and we found low adoption rates. Retrospectively, observations and more systematic qualitative inquiry throughout the adoption-decision-making process may have led to more robust data to better inform future training iterations. Finally, in an attempt to use best practices for training CHWs to lead exercise programs, it was challenging to find a number of interventions (robust or not) to compare training structures and components (Manuscript 2). Notably, this concentration on how to deliver *physical activity* also detracted from equally training the CHWs of Virginia Cooperative Extension on *behavior change strategies*. Discrepancies during training delivery have the potential to influence intervention delivery by the health educators, and ultimately, participant public health outcomes. However, there have yet to be randomized controlled trials to establish causal relationships between training elements and delivery rates or delivery quality.

The primary purpose of the work presented here was two fold. Concretely, we sought to increase adoption of physical activity programming within Virginia Extension, and more abstractly, we sought to explore the use a iterative, participatory approach to increase the effectiveness of training. As discussed within the introduction, training does not happen in a silo—changes occur every year and within years in response to adjustments and growth within health educators, the research team, trainers, and the system. As previously mentioned, currently within Extension, specialists act as the bridge to disseminate research information to health educators who then bring the knowledge to community members. This structure often unintentionally positions the research team and specialists as the keepers of knowledge. Instead, as supported by this work, health educators would be receptive to the incorporation of peer networking and social support. This deviation from the current banking system of knowledge (Livingstone, 2001) may empower the Extension health educators to lean on and learn from each other through shared knowledge and experiences surrounding program delivery. This may contribute to greater penetration across the state and reduce training-to-deliver- gap. Essentially, if LIFT was developed for Extension by Extension, training on the program could (and should) be developed and delivered in the same way.

Clarity in methodology, measures, and processes is needed when considering training as an implementation strategy especially for community-based physical activity interventions. Documentation of training in practice may provide insight into why particular strategies or adaptations are working within a given context, and further, other systems or settings maybe be able to extrapolate why those processes may not fit within their system. Through the use of adaptive, iterative designs, we may reach our ultimate goal of bringing our research and practice closer together.

References

Livingstone, D. W. (2001). Adults' Informal Learning: Definitions, Findings, Gaps, and Future Research. NALL Working Paper# 21.

Appendecies

Appendix A

Pre-training Survey for Manuscript 1

Virginia Cooperative Agent In-Service 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 agents' 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.

Any questions regarding the research or survey should be directed to the Principal Investigator:	Any questions about rights as human research participants can be directed to the <u>Institutional Review Board Chair</u> :
Dr. Samantha Harden Email: harden.samantha@vt.edu Phone: (540) 231-9960	Dr. David M. Moore Email: moored@vt.edu Phone: (540) 231- 4491

By completing this survey, you are indicating that you have read and understood the research description provided, are fully aware of what will be asked of you and that you agree to take part in this study.

Personal Identifiers:

First 3 letters of your first name ____ ____ ____

First 3 letters of your last name ____ ____ ____

Birth month ____

Birth-day ____

County where you live _____

Counties served _____

PART A: Tell us about you.

1. What is your sex? O₁ Male O₂ Female
2. What is your age? _____ years
3. About how tall are you without shoes? _____ feet _____ inches
4. About how much do you weigh without shoes? _____ lbs
5. Please indicate which of the following best describes you:
O₁ White O₂ Black or African American O₃ Asian
O₄ American Indian/Native Alaskan O₅ Native Hawaiian/Pacific Islander
O₆ Not Sure O₇ Other _____
6. Please indicate which of the following best describes you:
O₁ Hispanic or Latino O₂ Not Hispanic or Latino O₃ Not Sure
7. What discipline is your Master's degree? _____

8. I feel that my training with regard to delivering physical activity programs during my college education was:
- O₁ Excellent O₂ Good O₃ No Opinion O₄ Fair O₅ Poor
9. In general, compared to other persons your age, how would you rate your health?
- O₁ Extremely healthy O₂ Somewhat healthy O₃ Not healthy
- O₄ Very unhealthy O₅ Don't know
10. What is your smoking status?
- O₁ Currently Smoke O₂ Don't Smoke O₃ Ex-Smoker
11. Has your doctor ever diagnosed you with any of the following?
- 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
12. How many hours of sleep do you usually get in the evening? _____ hours
13. 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

Physical activity over the past week.

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.

14. 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 16

15. 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.

17. 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 19

18. 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.

19. 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 21*

20. 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.

21. 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

22. Do you do activities to increase muscle strength, such as lifting weights or calisthenics, twice a week or more?

O₁ Yes O₂ No

23. Tech confidence/use	Please select items that you know how to use:	Please select items that you use consistently:
☐ Desktop Computer		
☐ Laptop		
☐ Non-smartphone Cellular Phone		
☐ Apple iPhone		
☐ Android Based Smartphone (Any phone that uses Android)		
☐ Smartphone (other)		
☐ Apple iPad		
☐ Android Based Tablet		
☐ Tablet(other)		
☐ iPod (or any other music portable player)		
☐ Fitness Tracker or Smartwatch		
☐ other _____		

24. Please indicate your level of agreement with the following statements.

I am able to:	Strongly Disagree	Dis agree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Update profile picture on a social media page						
Make a post with a picture on a						

social media website						
Make a comment on social media website						
upload videos						
email a picture						
Filter out unwanted posts and notifications on a social media website						
Create events in a web-based calendar						
Create doodle polls						
Communicate via Skype or any other instant messaging service						
Watch movies on Netflix, Hulu and etc.						

The following questions are related to your perception of physical activity programming in VCE.

25. Please rate how important each of the following factors is to YOU, when you are deciding whether to adopt a 'new' program in your county(ies)/city.	Not at all important	Somewhat	Moderately	Very	Extremely Important
The number of high and low risk members of the population it could reach.					
the scientific evidence that the program is efficacious (i.e. peer reviewed journal publications).					
The number of settings like yours that have delivered the program.					
Having resources that detail how to implement each program component.					
Scientific evidence that the program leads to sustained behavior change for participants.					

The ability of the program to be sustained or institutionalized within Extension for a long period of time.					
---	--	--	--	--	--

26. Similar to the previous question, please rate how important you think each factor is to YOUR STAKEHOLDERS.	Not at all important	Somewhat	Moderately	Very	Extremely Important
The number of high and low risk members of the population it could reach.					
The scientific evidence that the program is efficacious (i.e., peer-reviewed journal publications).					
The number of settings like yours that have delivered the program.					
Having resources that detail how to implement each program component.					
Scientific evidence that the program leads to sustained behavior change for participants.					
The ability of the program to be sustained or institutionalized within Extension for a long period of time.					

27. Which of the following best describes your current situation?	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
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.					

Think about the different facilities in and around your neighborhood by this we mean the area ALL around your home that you could walk to in 10-15 minutes. The first seven items refer to the county in which you live.

28. The next items are statements about your neighborhood related to walking and bicycling.	Strongly disagree	Somewhat disagree	Somewhat Agree	Strongly Agree	Don't Know/Not Sure
Many shops, stores, markets or other places to buy things I need are walkable.					
It is within a 10-15 minutes walk to a transit stop (such as bus, train, trolley, or tram) from my neighborhood .					
There are sidewalks on most of the streets in my county.					
There are facilities to bicycle in or near my neighborhood, such as special lanes, separate paths or trails, shared use paths for cycles and pedestrians.					
My county has several free or low cost recreation facilities, such as parks, walking trails, bike paths, recreation centers, playgrounds, public swimming pools, etc.					
The crime rate in my county makes it unsafe to go on walks					

29. The next items refer to residents' perceptions of your county or counties	Strongly disagree	Somewhat disagree	Somewhat Agree	Strongly Agree	Don't Know/Not Sure
Residents of my county or counties perceive there are many four-way intersections.					
Residents of my county or counties perceive the sidewalks are well maintained (paved, with few cracks) and not obstructed.					
Residents of my county or counties perceive places for bicycling (such as bike paths) are well maintained and not obstructed.					

Residents of my counties perceive there is so much traffic on the streets that it makes it difficult or unpleasant to ride a bicycle.					
Residents of my county or counties perceive there are many places to go within easy walking distance of their home.					

30. Would you say your counties in which you serve are similar regarding your above responses? If not, please describe key differences. (Allow text entry)

***If you only serve 1 county AND it is the county in which you live you can disregard this question

This is the end of the questionnaire, thank you for participating.

Appendix B
Post-Training survey for Manuscript 1

Virginia Cooperative Agent Post In-Service 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 agents' 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.

Any questions regarding the research or survey should be directed to the Principal Investigator:	Any questions about rights as human research participants can be directed to the <u>Institutional Review Board Chair</u> :
Dr. Samantha Harden Email: harden.samantha@vt.edu Phone: (540) 231-9960	Dr. David M. Moore Email: moored@vt.edu Phone: (540) 231- 4491

By completing this survey, you are indicating that you have read and understood the research description provided, are fully aware of what will be asked of you and that you agree to take part in this study.

Personal Identifiers:

First 3 letters of your first name ____ _

First 3 letters of your last name ____ _

Birth month ____

Birth day ____

In regards to physical activity programming in extension:	Strongly Disagree				Strongly Agree
I am already delivering another physical activity program, and will not be adding or changing to the physical activity program that has been presented.					
These programs include appropriate Agent and participant education					
These programs acknowledge staff input and opinions					
The tasks and timelines for these programs are clearly outlined					
These programs identify specific roles and responsibilities for Extension agents.					

In 2016-2017:	Strongly Disagree				Strongly Agree
I intend to deliver FitEx					
I intend to deliver LIFT					
I intend to deliver physical activity programming					
I intend to incorporate physical activity in my existing programs					

Based on your current knowledge and perceptions of FitEx, please indicate your level of agreement/disagreement with the following statements.	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
The program has potential to attract/recruit a large number of participants.					
The program has potential to attract/recruit a group of					

participants that is representative of the residents of my county/city.					
The program has been successful when tested in research settings under optimal conditions.					
The program has been successful when tested in community settings.					
The on-line training made me feel like I could offer this program.					
Other Extension agents recommended this program.					
There is an Extension Specialist assigned to the program.					
Your District Director supports the program.					
The VCE Director (Dr. McCann)supports the program.					
The FCS Associate Director (Dr. Gehrt) supports the program.					
Your stakeholders are likely to support the program. (ELC,County/City Govt.)					
Your community partners (organizations and agencies) are likely to support the program.					

Based on your current knowledge and perceptions of the FitEx program, please indicate your level of agreement/disagreement with the following statements.	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Compared to other physical activity programs, this program is easy to deliver.					
Compared to other Extension food or nutrition programs, this program is easier to deliver.					
This program helps people start being more active and "stick					

with it" even after the program is over.					
This program fits the mission of Virginia Cooperative Extension.					
This program will attract more residents in my area than other FCS programs.					
This program was adapted specifically to work within Virginia Cooperative Extension.					
I could recruit a strong volunteer base using this program.					
I could easily solicit support from local community organizations.					
Other Extension Agents or Program Assistants will help implement the program.					
The program can be maintained/sustained easily for longer than one year without special funding.					
The program will receive good public relations opportunities and visibility for me and Extension.					
The program will become a Statewide "branded" program.					
VCE will provide ongoing financial support for the program.					

Based on your current knowledge and perceptions of FitEx, please indicate your level of agreement/disagreement with the following statements.	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
I do not have the resources (e.g. time, cost, handouts, volunteers) to conduct FitEx program.					
I do not have the expertise that is needed to deliver FitEx					
I do not feel that the program is part of my job responsibility.					

Physical activity was not considered a priority from my situational analysis.					
I am not physically active, so do not feel comfortable delivering a physical activity program.					
I am already delivering another physical activity program, and will not be adding or changing to the physical activity program that has been presented.					

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	Strongly Agree
The program has potential to attract/recruit a large number of participants.					
The program has potential to attract/recruit a group of participants that is representative of the residents of my county/city.					
The program has been successful when tested in research settings under optimal conditions.					
The program has been successful when tested in community settings.					
The on-line training made me feel like I could offer this program.					
Other Extension agents recommended this program.					
There is an Extension Specialist assigned to the program.					
Your District Director supports the program.					
The VCE Director supports the program.					

Your stakeholders are likely to support the program. (ELC,County/City Govt.)					
Your community partners (organizations and agencies) are likely to support the program.					

Based on your current knowledge and perceptions of the LIFT program, please indicate your level of agreement/disagreement with the following statements.	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
Compared to other physical activity programs, this program is easy to deliver.					
Compared to other Extension food or nutrition programs, this program is easier to deliver.					
This program helps people start being more active and "stick with it" even after the program is over.					
This program fits the mission of Virginia Cooperative Extension.					
This program will attract more residents in my area than other FCS programs.					
This program was adapted specifically to work within Virginia Cooperative Extension.					
I could recruit a strong volunteer base using this program.					
I could easily solicit support from local community organizations.					
Other Extension Agents or Program Assistants will help implement the program.					
The program can be maintained/sustained easily for longer than one year without special funding.					
The program will receive good public relations opportunities					

and visibility for me and Extension.					
The program will become a Statewide “branded” program.					
VCE will provide ongoing financial support for the program.					

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	Strongly Agree
I do not have the resources (e.g. time, cost, handouts, volunteers) to conduct LIFT program.					
I do not have the expertise that is needed to deliver LIFT					
I do not feel that the program is part of my job responsibility.					
Physical activity was not considered a priority from my situational analysis.					
I am not physically active, so do not feel comfortable delivering a physical activity program.					
I am already delivering another physical activity program, and will not be adding or changing to the physical activity program that has been presented.					

This section is meant to inform us about your perceptions of your training with regard to delivering physical activity programs.

1. I feel that my training with regard to delivering physical activity programs during my inservice was:

1
Excellent

2
Good

3
No opinion

4
Fair

5
Poor

2. I would have liked to receive more training about delivering physical activity programs during inservice.

1	2	3	4	5
Strongly agree	Agree	Neutral	Disagree	Strongly disagree

This section is meant to inform us about your satisfaction with the In-service curriculum.

1. In my opinion the planned objectives were met.

1	2	3	4	5
Completely disagree				Completely agree

2. The topic was discussed in as much in depth as the length of the course allowed.

1	2	3	4	5
Completely disagree				Completely agree

3. The length of the course was adequate for the objectives and content.

1	2	3	4	5
Completely disagree				Completely agree

4. The educational method was well suited to the objectives and content.

1	2	3	4	5
Completely disagree				Completely agree

5. The educational method used enabled us to take an active part in training.

1	2	3	4	5
Completely disagree				Completely agree

6. The training enabled me to share professional experiences with colleagues.

1	2	3	4	5
Completely disagree				Completely agree

7. The training was realistic and practical.

1	2	3	4	5
Completely disagree				Completely agree

8. The documentation given out was of good quality.

1	2	3	4	5
Completely disagree				Completely agree

9. The training context was well suited to the training process.

1	2	3	4	5
Completely disagree				Completely agree

10. The training received is useful for my specific job.

1	2	3	4	5
Completely disagree				Completely agree

11. The training received is useful for my personal development.

1	2	3	4	5
Completely disagree				Completely agree

12. The training merits a good overall rating.

1	2	3	4	5
Completely disagree				Completely agree

Appendix C
Semi Structured Interview guide for Manuscript 1

In-Service training Key Informant Interviews

Thank you for speaking with me today to participate in the In-Service training 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 the In-Service Training in Virginia Cooperative Extension, covering topics ranging from training to program delivery specifically related to LIFT.

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 VCE, the county you are employed in, and your assigned participant number.

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

Thank you.

Training

- 1. What do you know about the program LIFT; also know as Lifelong Improvements through Fitness Together?**
 - a. Probe:** goals of program, audience, frequency, duration
 - b. Provide brief synopsis of the program**
- 2. What did you think about the In-Service Training?**
 - a. Probes:** things we did well, things that were unnecessary, suggestions for improvements, things that need to be included in the future, what content did you feel like you could deliver, what content did you feel like you needed more knowledge
- 3. What did you think of LIFT after the in-service training?**
 - a. Probes:** likes, dislikes, how has that changed
- 4. What were the reasons that you decided to deliver (or not deliver) LIFT?**
 - a. Probe:** presence or absence of materials, time, lack of knowledge, lack of fit, feedback from other agents

Adopters: LIFT specific

5. **Overall, how did delivering LIFT go?**
 - a. **Probe:** how many sessions did you deliver, costs, issues,
6. **Please describe the ease or difficulty of implementing LIFT.**
 - a. **Probe:** Resources provided,
7. **How did you use volunteers, individuals or groups to help with the planning, promotion or delivery of LIFT?**
8. **Did you reach as many people as you hoped to?**
9. **Tell me about your perceptions of LIFT in improving functional fitness for older adults?**
10. **What are you perceptions of LIFT in maintaining functional fitness for older adults after its over?**
11. **Do you plan on delivering LIFT again?**
 - a. **Probe:** why/why not?, barriers on a individual and systematic level, what would change your mind?, would you recommend this program to others?
12. **How did LIFT fit with your current Extension work?**
 - a. **Probe:** compatibility with your current responsibilities, support from superiors, perceptions of degree to which other agents are delivering LIFT

Non-Adopters: LIFT specific

1. **What are your perceptions of the reach of LIFT?**
2. **Tell me about your perceptions of LIFT in improving functional fitness for older adults?**
3. **What are you perceptions of LIFT in maintaining functional fitness for older adults after its over?**
4. **Please describe your perceptions of the ease or difficulty of implementing LIFT?**
5. **How did LIFT fit (or not fit) with your current Extension work?**
 - a. **Probe:** compatibility with your current responsibilities, support from superiors, perceptions of degree to which other agents are delivering LIFT
6. **Do you plan on delivering LIFT in the future?**
 - a. **Probe:** why/why not?, barriers on a individual and systematic level, what would change your mind?, would you recommend this program to others?

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 improve in-service trainings in VCE. If at any time during this process you wish to retract all or part of your statements, you may do so.

[Salutations]

Appendix D
Coding Sheet for Manuscript 2

Study ID: Created study ID number

Title: Title of study copied and pasted verbatim

Abstract: Abstract copied and pasted from manuscript

Coder: Coder of the full abstract

Nithya Ramalingam (1)

Samantha Harden (2)

Eligibility Title:

Yes (1)

No (2)

Title Exclusion Reason: Reason manuscript was excluded based on title

Ineligible study design (1)

No adult physical activity promotion (2)

No training described (3)

Duplicate (4)

Eligibility Abstract

Yes (1)

No (2)

Abstract Exclusion Reason: Reason manuscript was excluded based on abstract

Ineligible study design (1)

No adult physical activity promotion (2)

No training described (3)

Duplicate (4)

Eligibility Full

Yes (1)

No (2)

Full Exclusion Reason: Reason manuscript was excluded based on full article text

No adult physical activity promotion (1)

No community health worker (2)

No training outcome data (3)

Ineligible study design (4)

No training described (5)

Duplicate (6)

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

List any additional papers related to citation

Country Conducted

Country name

Study design:

Randomized Controlled (1)

Quasi experimental with control (2)

Pre-post design (3)

Theory: Theory or Framework for Training

CFIR (1)

ISF (2)

Diffusions of Innovation (3)

Getting To Outcomes (4)

Edmunds Consultee approach (5)

Social Cognitive Theory (6)

Transtheoretical model (7)

Self-regulation theory (8)

Theory of Planned Behavior (9)

Health Beliefs Model (10)

Group Dynamic Theory (11)

Social Ecological Model (12)

Other (specify) (13)

Atheoretical or not mentioned (999)

Theory of Intervention: Theory or Framework underlying behavior change intervention

CFIR (1)

ISF (2)

Diffusions of Innovation (3)

Getting To Outcomes (4)

Edmunds Consultee approach (5)

Social Cognitive Theory (6)

Transtheoretical model (7)

Self-regulation theory (8)

Theory of Planned Behavior (9)

Health Beliefs Model (10)

Group Dynamic Theory (11)

Social Ecological Model (12)

Other (specify) (13)

Atheoretical or not mentioned (999)

Delivery Mode Webinar: Training component (s) was delivered via webinar. If Yes, include total (duration of contact * frequency * weeks. Example: 1 hour sessions, 3 times a week for 8 weeks = 1440)

Yes (1)

No (0)

Not reported (999)

Delivery Mode Online: Training component(s) was delivered online

Yes (1)

No (0)

Not reported (999)

Delivery Mode In-person: Training component(s) was delivered in-person

Yes (1)

No (0)

Not reported (999)

Delivery Mode Telephone: Training component (s) was delivered via telephone

Yes (1)

No (0)

Not reported (999)

Delivery Mode Other: Training component (s) was delivered via other

Yes (1)

No (0)

Not reported (999)

Delivery Mode Otherdescription: Description of other method of training delivery

Webinar Frequency: number of webinar sessions

Not reported (999)

Webinar DurationofContact: length of one session

Not reported (999)

Webinar LengthofIntervention : number of weeks

Not reported (999)

Webinar Total: duration of webinar contact * frequency * weeks. Example: 1 hour sessions, 3 times a week for 8 weeks = 1440

Not reported (999)

Online Frequency: number of online sessions

Not reported (999)

Online DurationofContact: length of one session

Not reported (999)

Online LengthofIntervention: number of weeks

Not reported (999)

Online Total: duration of online contact * frequency * weeks. Example: 1 hour sessions, 3 times a week for 8 weeks = 1440

Not reported (999)

In-person Frequency: number of in-person sessions
Not reported (999)

In-person DurationofContact: length of one session
Not reported (999)

In-person LengthofIntervention: number of weeks
Not reported (999)

In-person Total: duration of in-person contact * frequency * weeks. Example: 1 hour sessions, 3 times a week for 8 weeks = 1440
Not reported (999)

Telephone Frequency: number of telephone sessions
Not reported (999)

Telephone DurationofContact length of one session
Not reported (999)

Telephone LengthofIntervention number of weeks
Not reported (999)

Telephone Total: duration of telephone contact * frequency * weeks. Example: 1 hour sessions, 3 times a week for 8 weeks = 1440
Not reported (999)

Total Dose Contact: Total_Duration x Frequency x Length across all delivery modes

Description Program Dose: Describe program dose if methods are too vague. Example:
Ongoing program that meets 2x/week for a year

Implementation strategies:

Technical assistance (1)

Training (2)

Consultation (3)

Didactic training (4)

Skill-building workshop (5)

Assessment and feedback (6)

Peer networking (7)

Implementation Strategies description: Copy and paste from manuscript

Objectives Reported (e.g., purpose of a module, learner-centered outcomes targeted).

Yes (1)

No (0)

Not reported (999)

Objectives Description: Copy and paste from manuscript

Not reported (999)

PA competency Partnerships: Explicit mention of improving the competency of “Developing and sustaining effective partnerships” via training

Yes (1)

No (0)

Not reported (999)

PA competency Data Guidelines: Explicit mention of improving the competency of “Make use of public health data and scientific information in developing and prioritizing community based intervention to address physical activity (e.g., knowledge of guidelines, summarizing and utilizing data to determine needs, review and recommend appropriate practice and procedures for development and implementation” via training

Yes (1)

No (0)

Not reported (999)

PA competency Planning and Evaluating: Explicit mention of improving the competency of “Understanding and Implementing a Sound Approach to Physical Activity Planning and Evaluating” via training

Yes (1)

No (0)

Not reported (999)

PA competency Implementation Explicit mention of improving the competency of “Strategically Implementing Evidence-Based Intervention Strategies at the Informational, Behavioral and Social, and Environmental and Policy Levels” via training

Yes (1)

No (0)

Not reported (999)

PA competency OrganizationalStructure Explicit mention of improving the competency of “Developing an Organizational Structure That Facilitates Program Growth and Sustainability (eg, Staffing, Professional Development, Resources, Successful Internal and External Collaborations)” via training

Yes (1)

No (0)

Not reported (999)

PA Competency Description: Copy and paste from manuscript

Training Autonomy (e.g., level of autonomy to attend training)

Mandatory (0)

Volunteer (1)

Other: ENTER

Not reported (999)

Intervention Characteristics

InterventionType: Did the intervention include direct Physical Activity Delivery

PA delivery (1)

No PA delivery (0)

Prog Walking: Program trained included walking

Yes (1)

No (0)

Not reported (999)

Prog Strength training: Program trained included strength training

Yes (1)

No (0)

Not reported (999)

Prog General aerobic: Program trained included general aerobics

Yes (1)

No (0)

Not reported (999)

Prog Flexibility: Program trained included flexibility

Yes (1)

No (0)

Not reported (999)

Prog Balance : Program trained included balance

Yes (1)

No (0)

Not reported (999)

Prog Mind-Body: Program trained included Thai Chi, Qigong, yoga or other mind-body intervention

Yes (1)

No (0)

Not reported (999)

Prog Water aerobics: Program trained included water aerobics /strength training

Yes (1)

No (0)

Not reported (999)

Prog Other Copy and pasted program trained on from manuscript

Prog Not specified

Yes (1)

No (0)

Individual Strategies Goal setting : Explicit mention of individual goal setting within Intervention

Yes (1)

No (0)

Not reported (999)

Individual Strategies Action planning : Explicit mention of individual action planning within Intervention

Yes (1)

No (0)

Not reported (999)

Individual Strategies Problem solving: Explicit mention of individual problem solving within Intervention

Yes (1)

No (0)

Not reported (999)

Individual Strategies Feedback : Explicit mention of individual feedback within Intervention

Yes (1)

No (0)

Not reported (999)

Individual Strategies Tailoring: Explicit mention of individual tailoring within Intervention

Yes (1)

No (0)

Not reported (999)

Individual Strategies Self-monitoring Explicit mention of individual self-monitoring within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Goal setting Explicit mention of Group goal setting within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Action planning: Explicit mention of Group action planning within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Problem solving : Explicit mention of Group problem solving within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Feedback: Explicit mention of Group feedback within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Competition: Explicit mention of Group competition within Intervention

Yes (1)

No (0)

Not reported (999)

Group Strategies Facilitated interactions Explicit mention of Group facilitated interactions within Intervention

Yes (1)

No (0)

Not reported (999)

Intervention Functions Education : Explicit mention of increasing knowledge or understanding within Intervention

Yes (1)

No (0)

Not reported (999)

Intervention Functions Persuasion Explicit mention of using communication to induce positive or negative feelings or stimulate action within Intervention

Yes (1)

No (0)

Not reported (999)

Intervention Functions Incentivisation Explicit mention of creating expectation of reward within Intervention

Yes (1)

No (0)
Not reported (999)

Intervention Functions Coercion Explicit mention of creating expectation of punishment or cost within Intervention

Yes (1)
No (0)
Not reported (999)

Intervention Functions Training Explicit mention of imparting skills within Intervention

Yes (1)
No (0)
Not reported (999)

Intervention Functions Restriction Explicit mention of using rules to reduce the opportunity to engage in the target behavior within Intervention

Yes (1)
No (0)
Not reported (999)

Intervention Functions Environmental restructuring Explicit mention of changing the physical or social context within Intervention

Yes (1)
No (0)
Not reported (999)

Intervention Functions Modeling Explicit mention of providing an example for people to aspire to or imitate within Intervention

Yes (1)
No (0)
Not reported (999)

Intervention Functions Enablement Explicit mention of increasing means / reducing barriers to increase capability or opportunity within Intervention

Yes (1)
No (0)
Not reported (999)

PAOnlyNoBehaviorChange: Dichotomous variable, did the intervention trained on include only physical activity delivery and no behavior change components

Yes (1)
No (0)
Not reported (999)

Reach

Recruitment Strategies: Strategies the Trainees were recruited by

Email (1)
Word of mouth(2)
Flyers (3)
Listserv (4)
Newspaper (5)
E Newsletter (6)

SampleSize Total Baseline:

TOTAL Sample Size, Baseline

SampleSize Analyses:

TOTAL Sample Size included in Analyses (i.e. completed pre and post assessments)

Attrition

Number not included in post assessments

Sex:

Female % _____, at baseline

*What is reported; If calculated, take to the first decimal

Age M- Total, at baseline

Not reported (999)

Age SD

Not reported (999)

BMI M- Total, at baseline

Not reported (999)

BMI SD

Not reported (999)

Race Reported:

% African American

% Asian

% White

% Other (specify)

Not reported (999)

Ethnicity

% Hispanic/Latino

Not reported (999)

Education: High school or less, %:

Completed High School/GED %
Some College %
Completed College %
Completed Graduate degree %
Not reported (999)

Income: Less than 40k, %
Not reported (999)

SampleRepresentative Comparisons: if experimental, copy and paste comparisons between groups

Descriptive Type of Educator: Copy and paste from manuscript

Effectiveness

Primary Outcome:

DESCRIBE

e.g., reach, training effect, training satisfaction

Primary Outcome method:

Qualitative (1)

Quantitative (2)

Both (3)

Primary Outcome Summary: Copy and paste from manuscript

Primary Outcome validatedScale:

Yes (1)

No (0)

Primary Outcomes description : Copy and paste from manuscript what the actual results are

Primary Outcome Scale: text description scale of Primary outcome
999-not applicable

Other OutcomesofInterest: copy and paste from manuscript

Med Analysis: Mediation analyses

Yes (1)

No (0)

Med Analysis Factors: Copy and paste from manuscript

Implementation

Cost categories_reported:

Yes (1)

No (0)

Cost description: Copy and Paste from manuscript

Fidelity measured: Was fidelity to the training components, dose, frequency etc. measured

Yes (1)

No (0)

Fidelity measured description: Copy and paste from manuscript

Adoption

Trainer sample size:

TOTAL Sample Size, Baseline

Trainer Descrip:

- Research personnel (1)
- Program manager (2)
- Outside consultant (3)
- Health care provider/Clinician (4)
- Nurse Practitioner (5)
- Implementation scientist (6)
- Dietician (7)
- Physical Therapist (8)
- Kinesiologist (9)
- Other (specify)
- Not specified (999)

Trainer Other Specified

Write out text

Trainer characteristics (yes = 1; no = 0)

- PA behaviors
- self efficacy
- age
- BMI

Setting number:

TOTAL number of settings delivering the training (e.g., 3 local health departments)

Setting type:

- Local health departments (1)
- University (2)
- Parks and Rec (3)
- Agency
- Nonprofit
- Other (4)

Setting type other specified: Write out text

Appendix E
Pre-Training Survey for Case study

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 personnels' 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	Dr. David M. Moore, Chair, Institutional Review Board Email: moored@vt.edu Phone: (540) 231-4991

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(s) 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

I am thinking about delivering a physical

I am preparing to deliver a physical activity program (e.g. have compiled some resources, looked at

I am planning on delivering a physical activity

I am delivering a physical activity program.

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

county(ies)/city at all.	activity program.	possible programs/curricula, etc.).	program in the next 30 days.
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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 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

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 F

Post Training survey for Case Study

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 personnels' 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	Dr. David M. Moore, Chair, Institutional Review Board Email: moored@vt.edu Phone: (540) 231-4991

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 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.

In 2018:	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I intend to incorporate physical activity in my existing programming	1	2	3	4	5
I intend to deliver physical activity programming	1	2	3	4	5
I intend to deliver LIFT	1	2	3	4	5
I will include LIFT in my Plan of Work for 2018	1	2	3	4	5

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 G
Training Agenda

Training Agenda

10:00-10:30 AM

- Surveys and consent completed
- Introductions and overview of the day

10:30 AM-11:00 AM: ½ LIFT Class

- Trainer will demonstrate one set of each exercise within the LIFT program

11:00-11:30: Discussions of Program Components

- a. What is the LIFT program?
- b. Why do we suggest an *active* name game?
- c. Why is this a *health education* program?
- d. What resources are available? Are there any more that you might need?
- e. What resources are available? Are there any more that you might need?

11:30-12:15 PM LIFT Mastery Experience: Practice Leading

- In small groups, all trainees will practice leading the LIFT exercises

12:15 pm-12:30 pm: Break

12:30 pm-1:00 pm: Working Lunch

Reflection on challenges and opportunities for exercise delivery

Feedback on program delivery

Creating SMART goals | Specific | Measurable | Attainable | Realistic | Timely

Personal Action Plan

The most important reasons I want to deliver LIFT are:

My recruitment goal for this year is:

Other LIFT goals are:

What are some barriers for meeting my goals?

What resources do you need to achieve your goals?

1:00-1:45pm Functional Fitness Demonstration and Practice

- Trainer and volunteer to demonstrate the functional fitness assessment protocol
- Trainees practice functional fitness protocol

1:45 pm-2:00 pm Wrap Up and Take Aways

- Trainer to review next steps and review of action plans (*5 minutes*)
- Completion of Post-training survey (*15 minutes*): Tablets or paper/pencil

Appendix H

Trainer Observational Checklist

9:30AM

- Site arrival, set up registration table with sign-in sheet, surveys and consent forms **(15 min)**

10:00-10:30 AM

- Surveys completed
- **Trainer:** Introductions, introduce Parking lot and overview of the day

10:30 AM-11:00 AM: LIFT Class led by Trainer

Trainer: Overall goal is to demonstrate warm-ups, 8 exercises, and cool-down with training participants making up a class (10 reps of each exercise, demonstrate counting, and cues)

☐Chairs in U-shape ☐Shoes tied ☐Bottles under chairs ☐Why GD?

☐Towels ☐Weights ☐Music/No Music

Trainer to demonstrate Session 1 group dynamics

Active Name Game (10 minutes)

Trainer to demonstrate 8 Strength Exercises: One set each move/side

1. Wide Leg Squat

- ☐Start seated ☐Feet and knees hip distance apart ☐Cross arms over chest
☐Stand up ☐Keep your knees behind your toes ☐Sit down and back
☐Move slowly ☐Breathe steadily ☐Back & shoulders straight ☐Engage core

2. Standing Leg Curl

- ☐Stand behind a sturdy chair ☐Hold on for balance ☐Lift one leg straight back
☐Bend at the knee ☐Flex your toe ☐Slight bend in opposite leg
☐Kick back like you are trying to touch your heel to your bottom
☐Move slowly ☐Breathe steadily ☐Back & shoulders straight ☐Engage core

3. Knee Extension

- ☐Sit all the way back in a sturdy chair ☐Put a rolled towel (or noodle) at the edge of the chair under your thighs for support
☐Keep foot flexed ☐Extend your leg as if you were kicking a ball away from you ☐Keep shoulders back and down ☐Engage core
☐Move slowly ☐Breathe steadily ☐Back & shoulders straight ☐Engage core

4. Side Hip Raise

☐ Stand behind a sturdy chair ☐ Feet hip distance apart, toes forward ☐ Slight bend in knee

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

5. Biceps Curls

☐ Stand or sit with your feet shoulder-width apart ☐ Hold weight straight down at your sides ☐ Palms facing forward ☐ Keep wrists straight

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

6. Overhead Press

☐ Sit or stand in with your feet should-width apart ☐ Hold weights by your side at shoulder height with palms facing forward ☐ Keep your wrists straight

☐ Reach your arms above your head like you're punching the ceiling

☐ Relax your back, neck, and shoulders

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

7. Seated Row

☐ Sit in a chair, feet flat on floor, shoulder-width apart ☐ Keep your back straight

☐ Bend at a 45 degree angle at your hips ☐ Relax arms down by your side

☐ Keep head and chest up ☐ Pull both elbows back until your hands are at your hips

☐ Squeeze shoulders together like you are holding a pencil between your shoulder blades

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

8. Toe Stand

☐ Stand behind a sturdy chair, feet shoulder-width apart ☐ Hold on to the back of chair for balance ☐ Maintain an upright posture ☐ Lift up on your toes

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

a. Hamstring and Calf Stretch

☐ Stand facing a sturdy chair ☐ Slowly bend forward at the hip ☐ Keep legs straight

☐ Move slowly ☐ Breathe steadily ☐ Back & shoulders straight ☐ Engage core

b. Chest and Arm Stretch

- ☐ Stand with your arms down by your side
- ☐ Extend both arms behind you and clasp hands together
- ☐ Keep arms straight and lift them up
- ☐ Keep chest and shoulders back
- ☐ Use a towel if your hands cannot reach each other
- ☐ Move slowly
- ☐ Breathe steadily
- ☐ Back & shoulders straight
- ☐ Engage core

c. Upper Back Stretch

- ☐ Stand with feet should-width apart
- ☐ Clasp your hand in front of you
- ☐ Rotate your hands so that your palms face the ground
- ☐ Raise your arms to the height of your chest
- ☐ Press your palms away from chest
- ☐ Move slowly
- ☐ Breathe steadily
- ☐ Back & shoulders straight
- ☐ Engage core

11:00-11:30: LIFT Teach Back

d. Teach Back of LIFT: What do participants know?

- ☐ 8-week
- ☐ 2x/week
- ☐ Strength Training in Person
- ☐ Older Adults
- ☐ Aerobics outside class
- ☐ Self-monitoring
- ☐ Goal setting
- ☐ Feedback

e. Teach Back of GD: Why active name game?

- ☐ Fun
- ☐ Surface Level Similarities
- ☐ Break Ice
- ☐ Warm up
- ☐ Allow Instructor to ease into class

f. Teach Back of Group Dynamics: What do participants know?

- ☐ Group cohesion
- ☐ Natural by-product
- ☐ Social support
- ☐ Maintenance
- ☐ Reduce isolation
- ☐ Independent living
- ☐ Deep Level Similarities
- ☐ Accountability
- ☐ Roles

f. Teach Back of Resources Available

- ☐ Program Manual
- ☐ Audio/ Visual Exercises
- ☐ Cues for Exercises
- ☐ Exercise Modifications
- ☐ Full Class
- ☐ Liability Forms
- ☐ Participants Resources
- ☐ All Evaluation
- ☐ ePARmed-X+
- ☐ Shared Use Agreement

11:30-12:15 PM LIFT Mastery Experience: Practice Leading

- a. **Agent Host:** Describe strategies used to deliver LIFT efficiently, effectively, and safely. Adaptations and suggestions that have improved delivery without reducing fidelity in the field. **(10 minutes)** Prompts: any hesitations and how they were reduced after practice
 - b. Participant Small group experiential learning of exercises **(30 minutes)**
Trainer to say: Participants get into small groups, with each person leading through each exercise for 2 reps to practice cues, counting, and form
 - ☐provide feedback to participants
 - g. Wrap up and Trainer feedback
- 12:15 pm-12:30 pm: Break**
12:30 pm-1:00 pm: Working Lunch
 Small group discussions: **Facilitated by Trainer (30 minutes)**
- ☐Reflection on challenges and opportunities or exercise delivery
 - ☐Feedback from peers on how delivery went well or could be improved

- ☐Feedback from Specialist/previous delivers on how delivery went well or could be improved
- ☐How to create SMART goals ☐Goal Setting for recruitment ☐Goal Setting for delivery

1:00-1:45 Functional Fitness Demonstration and Practice

- a. **Trainer to describe set up and structure of Functional Fitness Assessments (5 minutes)**
 - ☐Demonstrate each station prior to beginning ☐Allow each participant to try each station twice ☐No encouragement

Reminders:

 - ☐The same individual must proctor the pre- and post- functional fitness assessments
 - ☐Allow approximately 15 minutes per person
 - ☐Use the same arm for arm curls and back scratch (both trials) and same leg for chair sit and reach
- b. **Trainer to demonstrate Functional Fitness Assessments and discusses Needs and Steps of each assessment (20 minutes)**

1. Balance Station

Need: ☐ Stopwatch, chair or space near a wall

☐ Do not move on to the next pose unless the participant is able to stay in the pose for 10 seconds

- a. **Mountain Pose:** ☐ Stand behind a chair ☐ Feet side by side and touching ☐ Don't use hand for support ☐ Hold for 10 seconds
- b. **Tandem Stand:** ☐ Stand behind chair (or by wall) using one hand for support ☐ Place one foot directly in front of other, heel of one foot touching toe of other foot ☐ Let go of chair (or wall) and hold for 10 seconds
- c. **One-legged Stand:** ☐ Stand behind chair (or by wall) using one hand for support ☐ Shift weight to one foot and bend the knee of other leg ☐ Let go of chair (or wall) and hold for 10 seconds
- d. **Tandem Stand W/ Eyes Closed:** ☐ Stand behind chair (or by wall) using one hand for support ☐ Place one foot directly in front of other, heel of one foot touching toe of other foot ☐ Close eyes, let go of chair (or wall), and hold for 10 seconds
- e. **Tandem Stand w/ Eyes Closed and Head Turning** ☐ Stand behind chair (or by wall) using one hand for support ☐ Place one foot directly in front of other, heel of one foot touching toe of other foot ☐ Close eyes and turn head slowly to the left, slowly to the right, and return to the center ☐ Let go of chair (or wall), and hold for 10 seconds
- f. **One-Legged Stand w/ Eyes Closed** ☐ Stand behind chair (or by wall) using one hand for support ☐ Shift weight to one foot and bend the knee of other leg ☐ Close your eyes, let go of chair (or wall) and hold for 10 seconds

2. 30-Second Chair Stand:

Need: ☐ Stopwatch and chair

Steps: ☐ Place chair securely against wall ☐ Explain to participant, "In this exercise you will stand and sit as many times as you can in 30 seconds. I will signal you with the word go, or I will start the timer when you begin standing" ☐ Demonstrate for participant ☐ Explain position, "Sit in the middle of the chair; feet flat on floor; arms crossed at

shoulders" ☐ Count the total number of stand and sits in 30 seconds (more than halfway up counts as a full stand)

3. 30-Second Arm Curl:

Need: ☐ Stopwatch, chair without arms rests, dumbbell (5 lbs for women; 8 lbs for men)

Steps: ☐ Participant should be seated with back against chair, feet flat on floor, dominant side of body close to edge of chair ☐ Place hand on elbow of participant for guidance ☐ Explain to participant, "In this exercise you will do an arm curl, starting with your hand in a handshake position by your side, bring the dumbbell up towards your chin and turn wrist so that fingers are facing upwards" ☐ Demonstrate for participant ☐ The timer will start when you begin moving (or when I say go) ☐ Count the total number of arm curls in 30 seconds, half way up is one full curl

4. 2-Minute Step Test

Need: ☐ Stop watch, meter stick, tape markers

Steps: ☐ Measure the distance between the participants patella (knee cap) and iliac crest (bottom of hip) –mark on the wall with hand or tape ☐ Instruct the participant to bring the knee of the leg closest to the wall up to the marked height on the wall ☐ Explain to participant to step in place, starting with leg closest to wall, and continue stepping for two minutes ☐ Demonstrate ☐ If at any point their knee cannot reach the height of the mark on the wall, ask them to take a break and resume when ready or pick their leg up higher (do not count the steps that do not meet the mark) ☐ Only count the leg closest to the wall ☐ If at any point they take a break, they can resume within the 2 minutes but the timer does not stop ☐ Inform participant when one minute has passed and when there are 30 seconds to go

5. Chair Sit and Reach

Need: ☐ Chair ☐ 18-inch ruler

Steps: ☐ Place the chair against the wall ☐ Position participant towards the front of the chair with the crease between the top of leg and buttocks inline with the edge of the seat ☐ Instruct participant to keep one leg bent, foot flat on floor, and extend other leg, flexing toe towards them ☐ Place measuring tool overtop of the leg that is extended ☐ Instruct participant to take a deep breathe, hinge at the hips and dive forward with their

hands on top of each other without arching back or bending the straightened leg ☐ Demonstrate ☐ If participant is short of reaching the toe (minus score); if they exceed the toe (positive score). The middle of the toe at the end of the shoe is a "0" Measure to the nearest ½ inch

6. Back Scratch:

Need: ☐ 18-inch ruler

Steps: ☐ Instruct participant to stand with feet should-width apart ☐ Explain that you will measure the distance between their fingers behind their back or the distance that their hands can overlap ☐ The movement includes extending arms out into a "T" shape, taking a breath, placing one arm over shoulder and other arm under shoulder blade. ☐ Try bringing hands together behind back ☐ Demonstrate ☐ If hands do not meet behind back (negative score); if they overlap (positive score); if they touch the tips (score of "0"). Measure to the nearest ½ inch

7. 8-Foot-Up-And-Go

Need: ☐ Chair ☐ Stopwatch ☐ Cone or distance marker

Steps: ☐ Place a chair securely against the wall ☐ Measure 8-foot away from the edge of the seat and mark the distance with the cone ☐ Instruct participant to sit in the middle of the chair, hands on thighs and feet flat on floor ☐ Explain to participants that the test is timed, they should walk as quickly as possible around the cone and back to a seated position ☐ Person recording time should stand half way between chair and cone in case participant loses balance ☐ The timer can start on your movement or when I say, "Go" and will stop when you are seated back in the chair ☐ Record the time elapsed to the nearest 1/10th of a second

Grab some water

c. Participant small group experiential learning of FFA (**30 minutes**)
Trainer to say: Participants get into pairs, with both people leading through each assessment to practice cues, counting, and form
☐ provide feedback to participants

1:45 pm-2:00 pm Wrap Up and Take Aways

- **Trainer to review next steps and review of action plans (5 minutes)**
- Completion of Post-training survey (**15 minutes**): Tablets or paper/pencil

Appendix I

Delivery Personnel Observational Checklist

Delivery Personnel-Training Observational Checklist

Observer ID: _____ Date: ____ Training Location: _____ Program: _____
 # Registered: _____ #Present: _____ Scheduled Start Time: _____ AM/PM Actual Start Time: _____ AM/PM

Participant ID									
		Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments
Set-Up									
Active Name Game									
Foundations of LIFT									
Resources available									
LIFT Exercises									
		Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments
Warm-up	Practice								
	Led								
	Count								
	Cues								
Wide Leg Squat	Practice								
	Led								
	Count								
	Cues								
Leg Curl	Practice								
	Led								
	Count								

Delivery Personnel-Training Observational Checklist

Observer ID: _____ Date: _____ Training Location: _____ Program: _____
 # Registered: _____ #Present: _____ Scheduled Start Time: _____ AM/PM Actual Start Time: _____ AM/PM

Cues									
Participant ID									
		Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments
Knee Extension	Practice								
	Led								
	Count								
	Cues								
Side Hip Raise	Practice								
	Led								
	Count								
	Cues								
Biceps Curls	Practice								
	Led								
	Count								
	Cues								
Overhead Press	Practice								
	Led								
	Count								
	Cues								
Seated Row	Practice								
	Led								
	Count								
	Cues								
Toe Stand	Practice								
	Led								
	Count								
	Cues								

Delivery Personnel-Training Observational Checklist

Observer ID: _____ Date: ____ Training Location: _____ Program: _____
 # Registered: _____ #Present: _____ Scheduled Start Time: _____ AM/PM Actual Start Time: _____ AM/PM

Participant ID									
		Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments
Cool-down	Practice								
	Led								
	Count								
	Cues								
Small Group Discussion									
Functional Fitness Assessment									
Balance Test	Practice								
	Led								
	Cues								
	Count								
Chair Stand	Practice								
	Led								
	Cues								
	Count								
Arm Curl	Practice								
	Led								
	Cues								
	Count								
2-minute Step Test	Practice								
	Led								
	Cues								
	Count								

Delivery Personnel-Training Observational Checklist

Observer ID: _____ Date: ____ Training Location: _____ Program: _____
 # Registered: _____ #Present: _____ Scheduled Start Time: _____ AM/PM Actual Start Time: _____ AM/PM

Participant ID									
		Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments	Y/N	Additional Comments
Chair Sit and Reach	Practice								
	Led								
	Cues								
	Count								
Back Scratch	Practice								
	Led								
	Cues								
	Count								
8 Foot up-and-go	Practice								
	Led								
	Cues								
	Count								
Overall									
Ongoing Notes									

Appendix J

IRB Memorandum Manuscript 1

MEMORANDUM

DATE: July 5, 2016

TO: Samantha Marie Harden, Paul Estabrooks, NithyaPriya Priya Shivanthi Ramalingam, Andrey Esakia, Meghan MacGhee, Alicia Everette, Daniel Giraldo Herrera, Shelby Alexis Keye

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

PROTOCOL TITLE: Adoption, Implementation, and Maintenance of Statewide PA Programs in Extension

IRB NUMBER: 15-984

Effective July 5, 2016, the Virginia Tech Institution Review Board (IRB) Chair, David M Moore, 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) 5,6,7**
Protocol Approval Date: **October 14, 2015**
Protocol Expiration Date: **July 4, 2017**
Continuing Review Due Date*: **June 20, 2017**

*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.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.

Appendix K

IRB Memorandum Manuscript 3

MEMORANDUM**DATE:** October 10, 2017**TO:** Samantha Marie Harden, Nithya Priya 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 October 9, 2017, the Virginia Tech Institutional Review Board (IRB) Chair, David M Moore, approved the New Application 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) 5,7**
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.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future

Date*	OSP Number	Sponsor	Grant Comparison Conducted?

* Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office (irbadmin@vt.edu) immediately.