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What Does It Take: The Roles, Responsibilities, and Fidelity to Implement a Physical Activity in Public Health Training

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Cooperative Extension Service (Extension) Agents are tasked with incorporating physical activity promotion in their work. Physical activity training interventions rarely report specific structures (dose, content) and measures (fidelity, resource cost). The study's purpose was to evaluate the feasibility and resource costs of Physical Activity in Cooperative Extension (PACE), a training to increase physical activity in public health competency. PACE is a virtual, 9-week, 18-hour general capacity-building training based on the Interactive Systems Framework. Fidelity was calculated as the proportion of objectives delivered as intended and total time to deliver core components. Resource cost was calculated as the time spent on each implementation strategy and responsibility and total time spent delivering PACE. Fidelity was 93% (39/42 planned objectives delivered as intended). PACE required 183 hours to implement, with session delivery (45 hours) and participant communication (40 hours) requiring the most time. Overall, time spent included 37 hours per delivery team member and 18 hours per PACE participant. The personnel time spent was within the standard time spent on other Extension training protocols and perceived as feasible. Fidelity to session components was high and easy to track. Future work should determine the scalability and sustainability of PACE within Extension nationally.

Keywords: training, capacity building, fidelity, resource costs

Introduction

Physical activity is well established as a modifiable behavior to prevent or manage non-communicable chronic diseases (Durstine et al., 2013; Warburton et al., 2006). Strong evidence links higher levels of physical activity with decreased risk of developing chronic diseases and experiencing premature death (2018 Physical Activity Guidelines Advisory Committee, 2018; Warburton et al., 2006). Yet, only about 20% of American adults are currently meeting the physical activity guidelines (Bennie et al., 2019). Consequently, Extension has prioritized

physical activity promotion as a priority area to improve the health of Americans (Braun et al., 2014; National Institute of Food and Agriculture, 2015).

Extension Agents (housed in communities), with the support of state-level Specialists (housed in universities), have begun implementing community-based physical activity interventions (Balis, Strayer, et al., 2019; Balis & Harden, 2019; Harden et al., 2016, 2018, 2019, 2020; Strayer et al., 2020). Community-based interventions are advantageous compared to programs delivered in traditional health care settings since they target people in local settings, particularly in their social groups or geographic areas (Brand et al., 2014) and have high reach (Office of Disease Prevention and Health Promotion, 2017). Translating research to practice is not an instantaneous process (Balas & Boren, 2000), and implementing effective, community-based interventions in diverse community settings is difficult (Lattimore et al., 2010). There are challenges in adopting, adapting, and comprehensively evaluating evidence-based physical activity programs in community settings (Balis, Strayer, et al., 2019; Brownson & Jones, 2009; Harden et al., 2019; Lattimore et al., 2010). One challenge is that Extension Agents come from diverse educational backgrounds, and most do not have formal training in the competencies of physical activity to implement evidence-based physical activity programs (Gunter et al., 2017).

Training is recognized as a vital strategy to improve intervention uptake and implementation (Powell et al., 2015). However, there is limited literature on training community-based health educators to deliver physical activity programs (Ramalingam et al., 2019). A new training intervention, Physical Activity in Cooperative Extension (PACE), was developed to increase physical activity in public health (PAPH) competencies among Extension professionals. This competency-based program included a micro-credential (i.e., a non-traditional learning path to gain a skillset in a shorter amount of time (Fribance, 2020) and a certificate, a tangible outcome (Ramalingam et al., 2019). PACE was based on the Interactive Systems Framework (ISF), a user-centered research-to-practice model consisting of three systems (Wandersman et al., 2008). The Prevention Synthesis and Translation System disseminates underlying evidence-based information into formats for the end-user (e.g., staff, volunteers, stakeholders). The Prevention Support System provides training, technical assistance, and other identified support needs to users in the field. The Prevention Delivery System is the delivery personnel who deliver and implement the desired innovation in real-world settings. PACE aimed to provide competency-based training to the Prevention Delivery System (Extension Agents) through the Prevention Support System (Extension Specialists and research assistants).

PACE was piloted in two states through synchronous delivery via Zoom, with 83 participants completing the training. In each of the eight competency categories (e.g., Extension's Role in Physical Activity Promotion, Social Determinants of Health), PACE demonstrated significant increases in competency (Dysart et al., 2021). While the reach and effectiveness of the training represent promising outcomes, measuring fidelity and resource costs are also necessary to scale up interventions to additional settings.

Though there are suggestions for what implementation strategies to use to support the uptake and delivery of evidence-based programs in clinical settings (Powell et al., 2015), there is less detailed information on the invisible work of implementing these strategies, especially in community or work settings. That is, the fidelity (both the degree to which the core components are implemented as well as why and under what context the intervention is successful (Century et al., 2010) of implementation strategies is under-reported in health research (Slaughter et al., 2015). More explicit data on the intensity, frequency, and duration (i.e., dose) of dissemination and implementation strategies would advance dissemination and implementation science.

Related, comprehensive economic measures of interventions are often too generic or not reported (Roberts et al., 2019). Much of the economic measures and evaluations focus on the costs of the intervention related to the outcomes of the target audience (cost-benefit, cost-effectiveness) (Gebreslassie et al., 2020), paying less attention to perceptions of economic generalizability and sustainability (i.e., can the system cover the costs going forward?). Reporting specific measures that provide meaningful insight into the implementation of interventions can improve intervention quality (Ramaswamy et al., 2018). There is a strong urge for more specific resource measures as, unsurprisingly, resource availability is often a limiting factor for implementing effective interventions (Spires et al., 2014). Specific resource measures of an intervention, including the number of staff members, time taken by staff to conduct the intervention, and the time spent on the intervention, can guide the use of critical implementation strategies (Ramaswamy et al., 2018). Therefore, the purpose of this research was to evaluate the feasibility (assessed by fidelity and resource costs) of delivering PACE to train Extension professionals in delivering evidence-based physical activity programs.

Methods

Intervention

The team that developed and delivered PACE was composed of five members: two state-level Extension Specialists, two Ph.D. students, and one undergraduate student. PACE was developed for virtual delivery in an effort to reach Agents across multiple states (beginning with the two states the Specialists were located in, with a goal of delivering future iterations to additional states). The team delivered PACE to Agents in Virginia and Arkansas through the videoconferencing software Zoom. The Virginia Tech Institutional Review Board considered this study as research exempt as the study did not meet the criteria for human subjects research. There was no participation cost for Agents.

PACE included nine hours of live interactive modules via Zoom, with an additional nine hours of between-session assignments. Each module was conducted weekly; participants could view the recorded module if they were absent. Each module was established using learner-centered educational activities (i.e., interactive lectures done synchronously, including Zoom chat prompts and polls, and practice skill homework done asynchronously; Ahmed et al., 2019), group

dynamics strategies (i.e., small group discussions through Zoom breakout rooms; Estabrooks et al., 2012; Harden et al., 2015), and the ISF framework (Wandersman et al., 2008).

PACE was structured around five core components (Powell et al., 2015). First, *Audit and Feedback* were used (in sessions two through nine) to provide feedback on the previous week's homework assignment (Powell et al., 2015). The weekly homework was structured as three to five multiple choice or true-false questions and an application-based open response question (National Physical Activity Society, n.d.). Feedback on the homework included reviewing and discussing correct answers. Second, the *Interactive Learning Education* component consisted of an interactive Zoom presentation (Snell, 1999). Third, a physical activity break was included to provide *Experiential Learning* (Kolb et al., 2001) and set an example for breaking up sedentary time. The physical activity breaks ranged from active responses to questions (e.g., "stand up if you've worked with a community coalition") to five minutes of moderate-intensity aerobic activity. Fourth, to promote *Collective Efficacy* (Sampson et al., 1997) among the Agents, the sessions used chat prompts, poll questions, and breakout groups. Chat prompts were typically used in breakout groups that occurred after the presentation. Poll questions were presented during the presentation for audience engagement. Lastly, at the end of each session there was discussion of the major topics of the live session and application of the topics through a brief overview of the week's homework assignment to promote *Discussion and Application*.

The overall goal of PACE is to build Agents' capacity to deliver impactful physical activity programming. However, measuring Agents' adoption, implementation, and maintenance of evidence-based physical activity interventions was beyond the scope of this initial work, which focused on improving competencies.

Summary of Preliminary PACE Evidence

The individual level outcomes of PACE are reported in more detail elsewhere (Dysart et al., 2021). Briefly, 130 (68%) Extension staff from Virginia and Arkansas enrolled in PACE. Of those, 98 (75%) attended at least one session, average session attendance was 77 (± 6.0) (79%) per week, and 83 (61%) completed the program. Pre to post-program PAPH competency changes were statistically significant ($p < .05$) in each of the eight competency categories (Dysart et al., 2021). The study's purpose is to report implementation outcomes (rather than the aforementioned individual level reach and effectiveness). The current study and individual level outcomes of the PACE study were done concurrently with the same sample.

Measures

Data were captured on 1) fidelity to the PACE intervention and 2) resource costs (i.e., time spent) developing and delivering PACE. Fidelity was measured using checklists (Wilson et al., 2018) of core components created from the original outline of each of the nine interactive modules. Detailed notes recorded if the live sessions deviated from the original outline, how they

deviated, and why. Fidelity also included time spent delivering live sessions of PACE, measured through time sheets to track time spent on each core component: Audit and Feedback; Interactive Educational Component; Physical Activity Break; Experiential Learning and Collective Efficacy; and Discussion and Application. Times were then totaled across all live sessions.

The resource cost of delivering PACE included the total time of implementing PACE, including both preparing for and delivering the training. Total time to deliver PACE was measured by time sheets that tracked staffs' time allotment within each responsibility: Role Clarity and Responsibilities; Intervention Delivery; Evidence-Based Educational Content Development; Ongoing Support (office hours); Competency Check Development; Communication and Reporting; and Module Development, Sequencing, and Objectives.

Data Analysis

Fidelity was represented as dichotomous "content covered" (yes or no) for each core competency of each session and then calculated by the ratio of overall objectives completed to overall objectives planned. Time spent on each core component was totaled across sessions. Ratios of total time spent on each component of the live session versus total time spent on the live session were also calculated. The total time spent implementing PACE was totaled by staff responsibility, and a grand total of time spent on all responsibilities was calculated. From this total, hours spent per each staff member and per PACE completer were also calculated.

Results

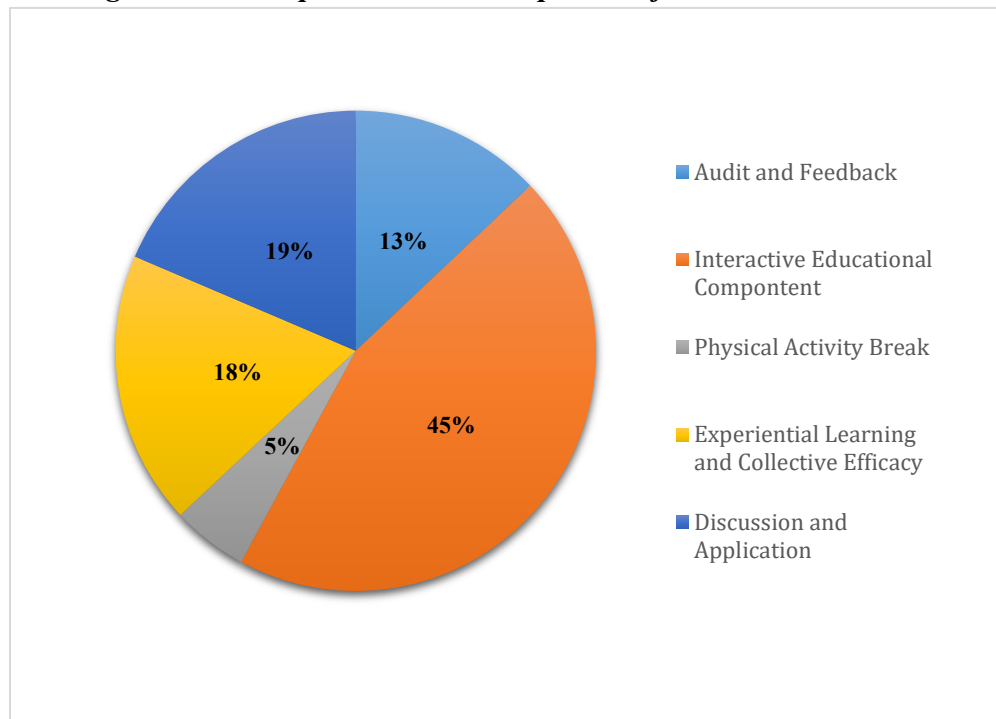
Fidelity

Thirty-nine (93%) core components were included in the live sessions of the forty-two described in the original PACE outline. Table 1 reports the overall dichotomy (yes/no) of whether all core components were met during each session and reports the ratio of core components actually included in each session compared to core components originally intended to be included in each session. The three components missed were the objectives: "Knowledge of training opportunities available in Extension," "Ability to select or modify physical activity programs that are appropriate to meet the needs of a specific community or population," and "Information on how to produce an evaluation report and disseminate findings to stakeholders and decision-makers." Detailed notes revealed that time was the barrier to covering all course topics mentioned in the original training outline. Over the course of all nine live sessions (549 minutes), 71 minutes (13%) were devoted to audit and feedback of homework assignments, 247 minutes (46%) to the didactic educational component, 28 minutes (5%) to the physical activity breaks, 101 minutes (19%) to experiential learning and collective efficacy, and 102 minutes (17%) to discussion and application. See Figure 1.

Table 1. A Summary of Fidelity for Pace Live Session

Session	Yes/No	Fidelity Ratios	Duration (minutes)
1	No	6/8 (75%)	64
2	Yes	5/5 (100%)	57
3	Yes	5/5 (100%)	62
4	Yes	5/5 (100%)	59
5	Yes	4/4 (100%)	60
6	Yes	4/4 (100%)	61
7	Yes	3/3 (100%)	60
8	No	5/6 (83%)	64
9	Yes	2/2 (100%)	62
Total		39/42 (93%)	549 (~9 hours)

Figure 1. Time Spent in Each Component of PACE Live Sessions

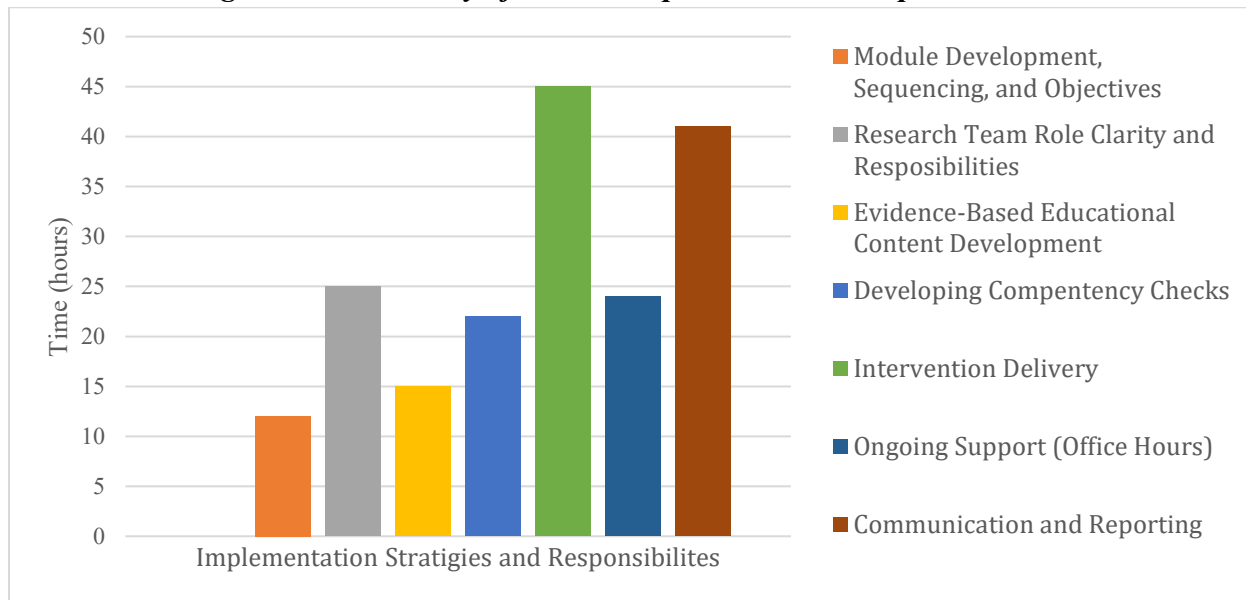


Resource Cost

Across the entire intervention and among the five staff members, PACE took 183 hours to develop, deliver, and evaluate. This time averaged 37 hours per staff member. Of the 183 hours for implementing PACE, the staff members spent 68, 43, 32, 25, and 15 hours individually. Specifically, the time allotments for each implementation strategy and responsibility included: intervention session delivery (45 hours), communicating with and reporting results to participants (41 hours), research team role clarity and responsibilities (25 hours), ongoing support (24 hours), developing competency checks (22 hours), evidenced-based educational content development (15 hours), and module development, sequencing, and objectives (12

hours). The 183 hours spent developing and implementing PACE was 2.4 hours total per PACE completer and four hours per week per staff member. Figure 2 compares the time spent on each component across the intervention.

Figure 2. A Summary of the Time Spent on PACE Implementation



Discussion

This study assessed the fidelity and resource costs of delivering a virtual micro-credentialing program for employees of a preventive health service system. Overall, PACE was delivered with high fidelity, at the cost of 183 hours for staff or 2.4 hours per completing participant ($N = 78$). For the participant, the cost of attending the program was monetarily free but took approximately 18 hours to complete. These results are important for understanding “what it takes” to plan, deliver, and evaluate implementation strategies in community settings.

The high fidelity to PACE core components indicates that training content and structure were realistic for delivery in a real-world setting. High fidelity was likely the result of PACE’s design being founded on physical activity in public health competencies and tailored by Extension Specialists to meet Extension Agents’ needs. That is, objectives were adapted from established competencies (the Essentials for Public Health Physical Activity Practitioner (National Physical Activity Society, n.d.) and the Modified Version of the Core Competencies for Public Health Professionals (The Council on Linkages Between Academia and Public Health Practice, 2017). Then, using knowledge from prior Specialist and Agent experiences, specifically over the last six years (Balis et al., 2021; Harden et al., 2020; Strayer et al., 2020), the implementation team tailored these objectives to their specific audience. This approach—made similar to an integrated research-practice partnership (Estabrooks et al., 2019; Harden et al., 2017) through the input of a former Agent—may have positively impacted the actual tailoring of content.

However, it is notable that PACE was delivered and evaluated by the team that developed it. While this may lead to higher fidelity than delivery by other teams, establishing whether the program can be delivered with high fidelity before scaling out was necessary. That is, it was unknown if the planned core components of PACE were feasible within the time constraints of each session. Including fidelity information (e.g., time required for delivery and evaluation) when PACE is packaged and disseminated to other Specialists may increase the likelihood of widespread adoption. Further research is needed to understand if other implementation teams can deliver PACE with high fidelity (e.g., other Extension Specialists).

The high fidelity results found within PACE are difficult to compare to other studies because of the lack of reporting fidelity and strategies to achieve high fidelity. Though training is an established implementation strategy (Powell et al., 2015), reporting of the strategies or details of the trainings remains unclear or nonreplicable (Ramalingam et al., 2019). For example, a review of how community health workers are trained to deliver physical activity programs found only three of the 29 studies mentioned training for increasing practitioners' capacity; moreover, the details on the frequency, duration, modality, and mechanisms of the capacity-building strategies used within the training protocols were unreported (Ramalingam et al., 2019). Through our findings, we aim to increase transparency around critical components needed for successful training (Powell et al., 2015) and serve as a model for reporting the frequency, duration, modality, and mechanisms of training sessions for community health practitioners (Ramalingam et al., 2019). Effectively executing the core components of the training may have played a critical factor in significantly increasing post-program competency scores, indicating a successful training program.

As for the time spent delivering each PACE component, the interactive educational component of each session consumed most of the time. This result was expected as the interactive educational component was determined to be the leading strategy in increasing participants' general capacity. By tracking time spent on each component during the live training session, future studies can look at varying dose-response relationships of different strategies used in training sessions. It is possible that increasing the time spent on certain components of the program could result in more effective capacity building.

Related, PACE focused on general capacity building (i.e., increasing practitioners' skills) rather than innovation-specific capacity building (i.e., providing information or technical assistance about a specific evidence-based physical activity program; Wandersman et al., 2008).

Innovation-specific support, such as follow-up technical assistance or coaching (Wandersman et al., 2008), may enhance the adoption, implementation, and maintenance of specific Extension physical activity programs. However, adding innovation-specific components to PACE would take more time and may change the intervention's feasibility and effectiveness. Future studies should also examine the long-term impacts of PACE and, potentially, the need for, and impacts of, additional strategies to build innovation-specific capacity.

For the overall development and implementation of PACE, Intervention Delivery along with Communicating and Reporting took the most time. That is, implementing the training took more time than developing the training. This is likely the result of Specialists' previous experience of developing content and working with Agents. Communicating and Reporting included any emails sent to participants throughout the intervention (e.g., encouraging participants to complete the competency checks) and reporting competency check results. Admittedly, Communication and Reporting could have been more time efficient with a web-based learning management system such as Blackboard (Cader & McGovern, 2003) or Canvas (Claar et al., 2014). Manually checking results to determine whether participants completed competency checks was time-consuming. Also, participants who forgot whether they completed a competency check could not easily find this information; they had to email a staff member. Manually checking results and office hours that most PACE participants did not attend increased the time spent by one staff member. Office hours by appointment only may have lowered the resource costs.

The resource costs to both deliver PACE (2.4 hours total per PACE completer and four hours per week per staff member) and participate in PACE (18 hours) were deemed feasible given the potential return on investment. This return on investment is two-pronged: 1) the resource costs for the second iteration of the program would decrease as the start-up costs (material development and sequencing) would already be completed, and 2) this training allows Agents to evolve along with public health needs (i.e., training builds capacity). A common barrier to implementing new trainings for employees is insufficient time (Solomons & Spross, 2011). Trainings that can increase general capacity in a new focus area in a time-effective manner may yield higher returns in the organization's success and, ultimately, the health of the communities served. Furthermore, Specialists may be able to effectively plan and structure time for supporting staff with a better understanding of resource costs associated with training. Also, PACE was delivered with no external funding. The resource costs of time to develop, implement, and evaluate the training is critical information for future funding proposals. Understanding resource costs may facilitate more efficient methods and more realistic grant deliverables. Related, grants ending or insufficient funding can be a barrier to sustaining programs (Bodkin & Hakimi, 2020). Evaluating resource costs may produce higher sustainability post-grant by demonstrating the resources needed to continue programs.

PACE was delivered with high fidelity and feasible resource costs. We also highlight strategies for lowering costs, increasing reach over time, and indicators of sustainability and scalability. Future studies should investigate the long-term effectiveness of PACE, ultimately evaluating if Agents do indeed increase uptake of evidence-based physical activity programming in their communities. Future work should also investigate the scalability and sustainability of PACE, and interventions like PACE, focusing on costs. We suggest Extension Specialists work together to adopt a common set of measures for evaluating program implementation. For example, other studies assessing the implementation of Extension programs have used checklists based on core components (Balis et al., 2018; Wilson et al., 2018), which are publicly available and can be

adopted for other programs (Wilson et al., 2018). The RE-AIM (reach, effectiveness, adoption, implementation, maintenance) framework also offers guidance on evaluating aspects of real-world program delivery (Glasgow et al., 2019) and has been recommended for program planning and evaluation in Extension (Balis et al., 2019; Downey et al., 2017).

This study lays the foundation for the overarching goals of PACE: 1) offer PACE nationally to establish long-term impacts on Agents' adoption, implementation, and maintenance of evidence-based physical activity programming in communities, and 2) disseminate PACE to Specialists nationwide to continue training Agents in their states.

Finally, it is noteworthy that PACE was delivered during the COVID-19 pandemic. The original intention was to deliver PACE virtually in an effort to reach Agents across multiple states (rather than pivoting from in-person to virtual delivery as a response to the pandemic). The team decided to pilot PACE delivery during the pandemic, as Agents shared a desire for professional development activities during this time of transition. The 2021 iteration of PACE (full results outside the scope of this study) reached 78 Agents across seven states, indicating high reach beyond the 2020 pilot study.

Limitations

It is challenging to objectively identify the efficiency of the development and implementation of PACE compared to other physical activity trainings as many other trainings are not currently reporting resource costs (Ramalingam et al., 2019). This study also used subjective measures of feasibility developed by the creators of the training; however, the findings are still meaningful as this training program is perceived to be replicable, which is critical for the future efforts of scaling-out PACE to Extension Agents on the national level.

Conclusion

Physical activity scientists continue to investigate feasible and resource-efficient strategies to shrink the gap between physical activity recommendations versus physical activity completion. Specific to Extension Agents, the absence of training, competence, and confidence are common barriers to implementing evidence-based physical activity programs (Gunter et al., 2017). When physical activity programming training is provided, there is a lack of reporting fidelity and resource costs. PACE is an effective, low-resource training that can be delivered with high fidelity. The staff completed the Standard for Reporting Implementation (StaRI) checklist (Pinnock et al., 2017) for this intervention (see Appendix) and deemed PACE to be feasible. Future works will scale out PACE nationally through Extension.

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Appendix

The STaRI Checklist (Pinnock et al., 2017)

Checklist item	Reported on page #	Implementation Strategy	Reported on page #	Intervention
		“Implementation strategy” refers to how the intervention was implemented		“Intervention” refers to the healthcare or public health intervention that is being implemented.
Title and abstract				
Title	1	1	Identification as an implementation study, and description of the methodology in the title and/or keywords	
Abstract	2	1	Identification as an implementation study, including a description of the implementation strategy to be tested, the evidence-based intervention being implemented, and defining the key implementation and health outcomes.	
Introduction				
Introduction	3	1	Description of the problem, challenge or deficiency in healthcare or public health that the intervention being implemented aims to address.	
Rationale	4	1-2	2	The scientific background and rationale for the implementation strategy (including any underpinning theory/framework/model, how it is expected to achieve its effects and any pilot work). The scientific background and rationale for the intervention being implemented (including evidence about its effectiveness and how it is expected to achieve its effects).
Aims and objectives	5	3	The aims of the study, differentiating between implementation objectives and any intervention objectives.	
Methods: Description				
Design	6	3	The design and key features of the evaluation, (cross referencing to any appropriate methodology reporting standards) and any changes to study protocol, with reasons	
Context	7	4	The context in which the intervention was implemented. (Consider social, economic, policy, healthcare, organisational barriers and facilitators that might influence implementation elsewhere).	
Targeted ‘sites’	8	4	4	The population targeted by the intervention and any eligibility criteria.
Description	9	4	3	A description of the implementation strategy A description of the intervention

Checklist item		Reported on page #	Implementation Strategy	Reported on page #	Intervention
Sub-groups	10	N/A	Any sub-groups recruited for additional research tasks, and/or nested studies are described		
Methods: Evaluation					
Outcomes	11	5	Defined pre-specified primary and other outcome(s) of the implementation strategy, and how they were assessed. Document any pre-determined targets	5	Defined pre-specified primary and other outcome(s) of the intervention (if assessed), and how they were assessed. Document any pre-determined targets
Process evaluation	12	4	Process evaluation objectives and outcomes related to the mechanism by which the strategy is expected to work		
Economic evaluation	13	4	Methods for resource use, costs, economic outcomes and analysis for the implementation strategy	4	Methods for resource use, costs, economic outcomes and analysis for the intervention
Sample size	14	4	Rationale for sample sizes (including sample size calculations, budgetary constraints, practical considerations, data saturation, as appropriate)		
Analysis	15	4	Methods of analysis (with reasons for that choice)		
Sub-group analyses	16	N/A	Any a priori sub-group analyses (e.g., between different sites in a multicentre study, different clinical or demographic populations), and sub-groups recruited to specific nested research tasks		

Results					
Characteristics	17	N/A	Proportion recruited and characteristics of the recipient population for the implementation strategy	5	Proportion recruited and characteristics (if appropriate) of the recipient population for the intervention
Outcomes	18	5-6	Primary and other outcome(s) of the implementation strategy	5-6	Primary and other outcome(s) of the Intervention (if assessed)
Process outcomes	19	5-6	Process data related to the implementation strategy mapped to the mechanism by which the strategy is expected to work		
Economic evaluation	20	7	Resource use, costs, economic outcomes and analysis for the implementation strategy	7	Resource use, costs, economic outcomes and analysis for the intervention
Sub-group analyses	21	N/A	Representativeness and outcomes of subgroups, including those recruited to specific research tasks		
Fidelity/adaptation	22	5	Fidelity to implementation strategy as planned and adaptation to suit context and preferences	6	Fidelity to delivering the core components of intervention (where measured)
Contextual changes	23	N/A	Contextual changes (if any) which may have affected outcomes		
Harms	24	N/A	All important harms or unintended effects in each group		
Discussion					
Structured discussion	25	7-11	Summary of findings, strengths and limitations, comparisons with other studies, conclusions and implications		
Implications	26	9-10	Discussion of policy, practice and/or research implications of the implementation strategy (specifically including scalability)	10	Discussion of policy, practice and/or research implications of the intervention (specifically including sustainability)
General					
Statements	27	3	Include statement(s) on regulatory approvals (including, as appropriate, ethical approval, confidential use of routine data, governance approval), trial/study registration (availability of protocol), funding and conflicts of interest		