



Published in final edited form as:

Eval Program Plann. 2016 August ; 57: 1–7. doi:10.1016/j.evalprogplan.2016.03.006.

Systematic dissemination of a preschool physical activity intervention to the control preschools

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Abstract

For public health interventions to have a meaningful impact on public health, they must be disseminated to the wider population. Systematic planning and evaluation of dissemination efforts can aid translation from experimental trials to larger dissemination programs. The Study of Health and Activity in Preschool Environments (SHAPES) was a group-randomized intervention trial conducted in 16 preschools that successfully increased the physical activity of preschool age children. Following the completion of the research study protocol, the intervention was abbreviated, modified and implemented in four preschools who participated as control preschools in the original research study. The purposes of the current study were to describe the process of refining the intervention for dissemination to the control preschools, and to assess the acceptability of the resulting abbreviated intervention delivery. Five overarching behavioral objectives, informed by process evaluation, data from the original trial and collaboration with intervention teachers, were used to guide the implementation. Teachers in the dissemination classrooms reported high levels of acceptability, potential for sustainability of the program, and positive results in knowledge, skills, and child outcomes. Researchers can include a systematic approach to dissemination of effective intervention elements to the control participants in experimental studies to inform future dissemination efforts and begin to bridge the dissemination gap.

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Keywords

physical activity; young children; intervention; preschool; implementation; translation; dissemination

“I have been impressed with the urgency of doing. Knowing is not enough, we must apply.”

Leonardo da Vinci

Greater than half of children aged three to six attend community-based preschools (Federal Interagency Forum on Child and Family Statistics, 2012), and a large number of them are not meeting physical activity recommendations (Institute of Medicine, 2011). Preschools are an ideal setting for promoting and increasing physical activity, and researchers have targeted those settings to increase children’s physical activity (Hesketh & Campbell, 2010; Monasta et al., 2011; Reynolds & Spruijt-Metz, 2006; Schoenwald & Hoagwood, 2001; Ward et al., 2010). In a recent study, the Study of Health and Activity in Preschool Environments (SHAPES), we successfully increased moderate-to-vigorous physical activity (MVPA) of children in preschools (Pate et al., under review).

Interventions that increase physical activity need to be disseminated successfully to improve public health (Brownson & Jones, 2009; Owen et al., 2006). For this study, dissemination was defined as the active and planned dispersal of an intervention, as opposed to diffusion, which is passive and informal (Greenhalgh et al., 2004). Despite the need for dissemination, a longstanding dissemination gap exists, with effective interventions developed as part of research studies not being widely disseminated (Green et al., 2009). Hence, more information is needed on how to disseminate public health interventions effectively. While researchers should not have the sole responsibility for dissemination (Kreuter & Bernhardt, 2009), they should be involved in the process. Dissemination planning should start from the beginning of the research process, with the design of interventions (Butler et al., 2010; Oldenburg & Glanz, 2008).

Successful physical activity interventions often include multiple components and do not account for varying contextual environments, which makes them difficult to disseminate widely (Bopp et al., 2013; Dobbins et al., 2013; Luckner et al., 2012). Additionally, funds and resources for implementing and disseminating intensive multi-component interventions have been limited. SHAPES was an effective multi-component intervention that included a plan to disseminate the intervention; after the formal trial, schools randomized to the control condition were given the opportunity to participate in the intervention. The researchers used a modified albeit systematic approach for refining and delivering the intervention to these dissemination preschools. These efforts served as a pilot for future dissemination of SHAPES. The refined intervention retained the essential elements needed for program success, yet required fewer resources to implement and was of significantly shorter duration, thus making it more feasible and acceptable for future dissemination. The purposes of the current study were to describe the process of refining the intervention for dissemination to the control preschools and to assess the acceptability of the resulting abbreviated intervention delivery.

Methods

SHAPES Intervention

The original SHAPES intervention (SHAPES-I) was a group-randomized trial with the primary goal to increase physical activity in preschool children (Pfeiffer et al., 2013). Classrooms in eight preschools received intervention materials and interventionists' support across the school year for three consecutive school years (2008–2011). SHAPES-I was a multi-component intervention designed to increase the physical activity of preschoolers in 4-year old preschool classrooms. The intervention was flexible and adaptive, meaning that individual teachers could modify the intervention for their classrooms while adhering to the essential elements (Bopp et al., 2013). The intervention components and the intervention approach used to deliver the components are described in detail elsewhere (Howie et al., 2014; Pfeiffer et al., 2013). Briefly, they included three components: Move Inside (indoor physical activities without a traditional academic component), Move Outside (outdoor recess), and Move to Learn (movement integrated into classroom learning activities). It also addressed the social and physical classroom environments. SHAPES-I was implemented using group workshops and individual classroom site visits throughout the school year. Teachers received intervention materials including printed resources, physical equipment, and newsletters to be distributed to parents. Children in the intervention schools had higher levels of moderate-to-vigorous physical activity after the intervention (Pate et al., under review).

Dissemination Planning

After the completion of the SHAPES-I, the investigators and interventionists reviewed process evaluation data, teacher feedback, and interventionists' experiences to refine the intervention implementation in order to create an approach that could be implemented with fewer interventionists' supports (e.g., less time in workshops, fewer site visits) while adhering to the essential elements. Intervention delivery to dissemination preschools was based on existing literature on the dissemination and sustainability of health interventions. Quality training, capacity building, and collaboration, which previously have been shown to be important for the continued success of interventions (Butler et al., 2010; Chorpita & Nakamura, 2004; Hoelscher et al., 2001; Kreuter & Bernhardt, 2009; Osterling & Austin, 2008), were incorporated into the SHAPES dissemination program (SHAPES-D). These evidence-based practices guided the development of the intervention approach for implementation in the dissemination schools, as seen in Figure 1. The dissemination approach included the following five principles, which were adapted from the original intervention:

1. Innovative program compatible with current practices—SHAPES-D intervention components were flexible and adaptive and included both interventionist-developed and teacher-developed activities. Interventionists worked to highlight the innovative aspects of SHAPES-I in SHAPES-D (Hoelscher et al., 2001). For SHAPES-D, only the activities and materials that were developed during SHAPES-I from the collaboration between interventionists and preschool teachers, and not activities from other sources, were included in the materials. The dissemination study also emphasized adapting

and integrating SHAPES-I concepts and activities into the teachers' and schools' day-to-day operations. Teachers were encouraged to create and modify activities to be incorporated into their existing lessons, while adhering to the overall components of the intervention. For example, part of the training was to select an existing lesson and to "ACTIV-ate" it, or include high-quality physical activity in it. Teachers also were encouraged to observe their current daily practices to see how physical activity could be added to their current practices.

2. Collaborative development—To create an intervention that was compatible with current practices, interventionists collaborated with teachers throughout the implementation of SHAPES-I (Gouldner, 1960; Osterling & Austin, 2008). At the end of the original SHAPES-I three-year study, participating preschool teachers provided their recommendations for future dissemination of SHAPES-D. Additionally, three preschool teachers who participated in the original intervention were identified to continue participating as "SHAPES Enthusiasts" for the dissemination. Their participation included reviewing materials and attending group workshops as peer role-models for the new teachers (i.e., to provide advice and real-world examples).

3. Capacity building and collaboration—The intervention emphasized collaboration and capacity development (i.e., building teacher problem solving with respect to physical activity), which have been identified as critical components of successful implementation and dissemination (Bopp et al., 2013; Hoelscher et al., 2001; Osterling & Austin, 2008). The intervention approach for SHAPES-D was designed with five training modules to achieve the behavioral objectives. Activities to build teacher capacity included discussing and analyzing videotapes of example activities to identify ways to improve and develop their own activities.

For programs to be effectively implemented, disseminated, and sustained, strong partnerships are necessary (Baumann et al., 2006; Butler et al., 2010; Chorpita & Nakamura, 2004; Kreuter & Bernhardt, 2009; Osterling & Austin, 2008). Hence, the interventionists planned partnerships among participating teachers as a "community of practice" beyond the duration of the formal SHAPES-D intervention. Interventionists supported the exchange of contact information among other teachers at the workshops. Workshop activities included brainstorming with teachers about how they could obtain resources for their classrooms, including partnerships within their school (e.g. borrowing equipment from the physical education teacher, garnering parent volunteers to lead recess activities) as well as beyond their schools (e.g. the local physical activity coalition, a nearby fitness expert).

4. Quality training—For SHAPES-D, quality training in the form of two workshops and a site visit, was designed to achieve five behavioral objectives (TABLE 1 and described below) during the first two months of SHAPES-D (Hoelscher et al., 2001; Ringeisen et al., 2003). In addition, onsite and ongoing assistance was provided for six months after the second workshop. To achieve the behavioral objectives, the training was divided into five modules: (1) Initial Contact Visit, (2) Workshop I, (3) Site Visit, (4) Workshop II, and (5) Ongoing Assistance. The modules are described in Figure 2. Workshops were designed to be enjoyable for participants by engaging them in hands-on-activities and providing food,

childcare, and classroom activity supplies. In-person workshops were supplemented with a SHAPES Guidebook, which included a self-assessment tool, example activities, and other printed material to assist with achieving the behavioral objectives.

5. Evaluation plan—To better understand the dissemination process, an evaluation of the process was planned and implemented (Baumann et al., 2006; Kreuter & Bernhardt, 2009; Owen et al., 2006). Internal evaluation in the form of self-assessment, was implemented for the participating teachers. The Guidebook included a self-assessment tool for assessing current physical activity opportunities in their classrooms (both quantity and quality), and afforded teachers a method for developing an action plan to improve physical activity opportunities. While budget constraints did not allow for objective measurement of children’s physical activity, study staff conducted teacher surveys and interviews to assess the level of implementation of the intervention by the dissemination school teachers, as well as to evaluate the acceptability of dissemination activities.

SHAPES-D Implementation

The eight control preschools from the original SHAPES-I study were invited to participate in the SHAPES-D study. Of these, four agreed to participate, for a total of 12 classrooms in four preschools. There were five overarching behavioral objectives that the training to guide the design of material to include, guide evaluation of the training, and facilitate learning (Duchastel et al., 1972) These included (1) knowledge about SHAPES-D, (2) knowledge about physical activity, (3) development of opportunities for high quality physical activity, (4) development of preschool physical activities, and (5) facilitated community partnerships and resource obtainment (see in Table 1). The three components of SHAPES-I were included in SHAPES-D: Move Inside, Move Outside, and Move to Learn. To clearly define the intervention to be implemented, as well as provide the background and rationale for the necessity of intervention (Baumann et al., 2006; Schoenwald & Hoagwood, 2001), the interventionists developed an explicit “SHAPES Philosophy” which outlined the essential beliefs for the SHAPES-D program. All participants were provided with a “SHAPES Guidebook” which outlined the SHAPES philosophy, background and approach of SHAPES-D, and provided illustrative activities. SHAPES-D was delivered in five modules as seen in Figure 2 which included, two workshops, a classroom site visit, and 6-months of additional assistance. During classroom site visits, intervention staff provided feedback on a teacher-led activity, assisted with problem solving, or helped other teacher-requested evaluation or planning activities.

SHAPES-D implementation was evaluated as described above through teacher surveys, interviews, and detailed interventionists notes. Interventionists documented workshop attendance and site visits and conducted workshop evaluations. Detailed descriptions of site visits were maintained, including teacher quotes, activities the interventionists participated in, and suggestions made by teachers. The average minutes of opportunity for physical activity provided by teachers were calculated from the teacher-reported frequency and duration of each component (Move Inside, Move Outside, and Move to Learn) and the total physical activity provided per week, as well as if the teachers met the intervention targets for each component. The total minutes of physical activity opportunities provided per week

were also calculated. Comparisons were made between the SHAPES-D teachers and the results from the intervention teacher surveys from the spring of the final year of SHAPES-I.

Teachers participating in dissemination were invited to complete a brief survey, modified from SHAPES-I teacher surveys, that assessed implementation, acceptability, and feasibility of the dissemination. Close-ended, multiple choice survey items developed specifically for the SHAPES intervention included self-report of providing intervention activities (Move Inside, Move Outside, and Move to Learn), barriers to implementation, and assessment of the SHAPES-D program and the survey questions can be found in the supplementary materials. In addition, a subset of teachers participated in semi-structured interviews administered by an independent evaluator. Questions covered reactions to the SHAPES-D program, implementation barriers, technical support, and sustainability of the program and the question prompts are found in the supplementary material. Interviews were transcribed and analyzed for themes in an iterative process between the interviewer, interventionist, and an additional expert in the field of health intervention process evaluation.

Results

Ten out of 16 teachers in the four participating preschools attended Workshop I. Two out of four directors attended, for a total of 17 participants from the dissemination preschools (including additional participants that were extracurricular teachers or teachers from other grade-levels). Ten out of 16 teachers attended Workshop II, with two directors and a total of 18 participants from dissemination preschools. Participants rated both workshops highly on usefulness, applicability, confidence and excitement in participating in SHAPES. Attendees enjoyed the “hands on” activities and interacting with other teachers. As one teacher wrote, “I really enjoyed this class and have already started planning new activities.”

Interventionists visited the four participating dissemination schools for an average of 3.5 visits per classroom, compared to 19 visits per classroom per year during the original SHAPES intervention. One classroom teacher included a demonstration of a game of monkey in the middle, where students took turns picking an exercise move for the whole class to participate in. As the teacher reported on her evaluation:

The actual demonstration, when they came in and showed me how to do the Monkey in the Middle, and the kids just loved that, and that was something I really did not believe that the children would be able to do, that they would be able to take turns like that and think of different moves and things like that but they did. Sometimes we underestimate the kids, I guess, we’re so attuned to what they’re doing academically. That’s not always the same as what they’re doing with their physical activity so that was kind of an eye opener for me.

Acceptability

Eleven teachers of the dissemination classrooms completed the teacher surveys. Of the 11 teachers, 6 had a 4-year college degree; the teachers had an average of 13.1 years of experience teaching. Overall, teachers found support from both SHAPES staff and their administrators to be “very adequate.” Eight of the 11 teachers felt “very prepared” to

implement SHAPES, with the remaining teachers reporting feeling “somewhat prepared.” Teachers found participation in SHAPES to be “very worthwhile” and all reported being “very likely” to continue using SHAPES. Of the resources provided, all the participants reported each resource to be “very useful” or “somewhat useful.” Ten out of eleven teachers found the equipment to be “very useful,” six out of eleven reported the classroom activity examples and mailings to be “very useful,” five out of eleven found the guidebook to be “very useful” and three out of eleven found the self-assessment tool to be “very useful.”

Implementation

Move Inside—Teachers reported providing an average of 103.6 (SD 59.8, range 50–240 minutes) minutes of Move Inside opportunities per week. The goal for the intervention was 50 minutes of Move Inside opportunities per week; and 100 percent of teachers reported that they met or exceeded this level. Four out of 11 teachers reported that Move Inside activities were “somewhat easy” or “easy” to implement, while 5 reported they were “somewhat difficult” or “very difficult.” The most common barrier to implementing Move Inside activities was “limited space” (eight out of eleven) followed by “administrator barriers” (five out of eleven).

Move Outside—Teachers reported providing an average of 180.0 (SD 97.7, range 30–300 minutes) minutes of Move Outside opportunities per week. The goal for the intervention was 200 minutes of Move Outside opportunities per week; and five out of eleven of teachers reported opportunities that met or exceeded this level. Five out of eleven reported teacher-led activities at least 5 times per week and five out of eleven reported teacher-led outdoor activities 1–3 times per week. The most common barrier was “lack of equipment” (three out of eleven).

Move to Learn—Teachers reported providing an average of approximately 56.6 (SD 39.1, range 24–160 minutes) minutes of Move to Learn opportunities per week. The goal for the intervention was 50 minutes of Move to Learn opportunities per week, and six out of eleven of teachers reported opportunities that met or exceeded this goal. The most common barriers were “limited space” (seven out of eleven) and “not enough time” (six out of eleven).

Comparison of intervention and dissemination teachers—There were no differences in self-reported minutes of opportunity or percentage of classrooms meeting the intervention targets between the dissemination teachers and the intervention teachers, based on data collected at the end of the original SHAPES intervention, as seen in Table 2.

Interviews

Six teachers from 3 schools participated in interviews following dissemination of the program. Five themes emerged from the interviews: (1) support from SHAPES program, (2) benefits from physical activity, (3) results of SHAPES, (4) barriers, and (5) sustainability.

Support for SHAPES-D program—Teachers commented favorably about SHAPES-D support opportunities including interventionists’ responsiveness and encouragement through workshops, e-mails, and visits, supplies, flexible approaches, and newsletters. Teachers

discussed how the support site visits helped them to increase accountability, as well as identify barriers and solve problems to implementing physical activity. For example, one teacher said, “I love the workshops. I love them. They were very interesting. We were up and moving in the workshops the same way we have them up and moving in the classroom.”

Benefits from physical activity—Teachers reported benefits from increasing physical activity opportunities in their classrooms and participating in the SHAPES-D program. They also discussed benefits for teachers, and one teacher noted, “Once they get up and move around, they’re ready to work. Whereas if we just sat, they’re not as calm and everything, they have to get their energy out before they do their work.”

Results of SHAPES-D—Teachers reported that the knowledge and skills they learned through SHAPES-D were valuable. They discussed how they changed their own classroom routines to include more physical activity. In addition, teachers reported learning how to overcome barriers, the importance of physical activity for young children, how to incorporate physical activity into learning, and that physical activity can be fun. They also translated this knowledge into other settings, including home and personal lives. For example, one teacher noted:

I had always thought that my classroom was really active and that I tried hard to make sure there was a lot of action, quiet, action, quiet. I tried to not have them sit too long. It made me even more aware that it’s just not having a break time, it’s getting enough physical activity throughout the day. I’m a lot more aware when on they’re on the playground, are they actually moving and running and getting that activity. It’s taught me a lot about what children need and how to try to motivate them to do more of that kind of stuff.

Barriers—The most frequent barrier reported was a lack of time, often related to scheduling or curriculum constraints. Other barriers included lack of space, teacher health, weather challenges, and concerns about behavior management. One teacher said “Time – not enough time to get, you know, as much done as we want to do because, of course, we have to do our curriculum, so not as much time to incorporate as much movement as we would like.”

Sustainability—Teachers reported that they intended to continue SHAPES-D practices in the future and discussed their individual plans for including physical activity. Teachers were asked how to increase the communication and delivery method of intervention materials. Several teachers reported not using e-mail often, but that they liked seeing videos to get ideas for classroom activities. A teacher noted:

I really liked when we were in the SHAPES program and they showed the video clips and we actually saw children doing things. When we did it, I wish I had a way to share this. [...] But anyway, actually seeing those activities and things I think that’s really good. I don’t know if those kinds of things could be emailed or if you could make a CD to share with everybody, things like that. That really helps when you see.

Lessons Learned

While including randomized non-treatment or waitlist control groups eliminates selection bias to increase study validity, there are accompanying drawbacks with this study design. One issue with randomized trials is the ethical dilemma of how to interact with individuals or groups randomized to serve as controls, and thus do not receive the treatment (Shadish et al., 2002). Researchers should plan study protocols so that participants in control conditions also benefit from participation in studies. This study was a successful example of how control participants can be engaged in dissemination activities. For example, one teacher in a control preschool expressed how happy she was to finally receive the training and resources from the intervention after 3 years of participating in measurement but with no intervention. Because of the ethical dilemma, it is becoming more common in public health to offer control participants a version of the intervention. Unfortunately, due to limited funding, the control participants often receive a reduced intervention, and the process is not carefully monitored and analyzed. The SHAPES dissemination to control schools included evaluation, both self-assessment by the participants for internal evaluation, and surveys and interviews to assess implementation, acceptability and feasibility of the intervention. By implementing a modified, less resource intensive intervention and measurement protocol, we were able to systematically evaluate the dissemination program. Researchers who employ randomized protocols should study subsequent dissemination processes, perhaps adding to the efficiency of the research while providing a better understanding of dissemination.

Conclusions

Very few researchers have described the process of disseminating an intervention to the control participants at the end of the study protocol. This systematic effort was based on literature, information from the original intervention, and input from teachers, to refine a multi-component intervention for dissemination. Teacher report and qualitative analysis showed the dissemination efforts were successful and acceptable. Nevertheless, this small dissemination study was limited by insufficient resources to examine the effects of the intervention on child-level physical activity using objective measures (e.g., accelerometers, direct observation). In addition, this preliminary study was conducted with a limited convenience sample of personnel from four preschools who volunteered to participate. Personnel at the participating schools may have had higher levels of readiness to change physical activity practices than those who did not participate in the dissemination.

Based upon the findings from the current study, further dissemination and translational research efforts with SHAPES are planned (Pate et al., 2015). Future dissemination will include implementation in additional preschools as well as alternative methods of dissemination (e.g., on site consultation, online training modules). Researchers should include a systematic approach to dissemination of effective intervention elements to the control participants so that future dissemination efforts might begin to bridge the dissemination gap.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

This work was supported by grants from the Eunice Kennedy Shriver National Institute of Child Health & Human Development [5R01HD055451] and the National Institute of General Medical Sciences [T32-GM081740 to E.H.], both at the National Institutes of Health.

The authors thank the research staff, teachers, parents, and children, for without their dedication and participation, this project would not have been possible.

Abbreviations

MVPA	moderate to vigorous physical activity
PA	physical activity
SHAPES	Study of Health and Activity in Preschool Environments
SHAPES-D	SHAPES dissemination program
SHAPES-I	SHAPES intervention
TIRE	time intensity reach encouragement

References

1. Baumann BL, Kolko DJ, Collins K, Herschell AD. Understanding practitioners' characteristics and perspectives prior to the dissemination of an evidence-based intervention. *Child Abuse & Neglect*. 2006; 30:771–787. [PubMed: 16846644]
2. Bopp M, Saunders RP, Lattimore D. The tug-of-war: Fidelity versus adaptation throughout the health promotion program life cycle. *The Journal of Primary Prevention*. 2013; 34(3):193–207. [PubMed: 23526141]
3. Bornstein DB, Beets MW, Byun W, McIver K. Accelerometer-derived physical activity levels of preschoolers: a meta-analysis. *Journal of Science and Medicine in Sport*. 2011; 14(6):504–511. [PubMed: 21684809]
4. Brownson RC, Jones E. Bridging the gap: Translating research into policy and practice. *Preventive Medicine*. 2009; 49:313–315. [PubMed: 19555708]
5. Butler H, Bowes G, Drew S, Glover S, Godfrey C, Patton G, et al. Harnessing complexity: Taking advantage of context and relationships in dissemination of school-based interventions. *Health Promotion Practice*. 2010; 11:259–267. [PubMed: 18353909]
6. Chorpita BF, Nakamura BJ. Four considerations for dissemination of intervention innovations. *Clinical Psychology: Science and Practice*. 2004; 11:364–367.
7. Dobbins M, Husson H, DeCorby K, LaRocca RL. School-based physical activity programs for promoting physical activity and fitness in children and adolescents aged 6 to 18. *Cochrane Database of Systematic Reviews*. 2013:2.
8. Duchastel PC, Merrill PF. The effects of behavioral objectives on learning: A review of empirical studies. *Review of Educational Research*. 1973:53–69.
9. Federal Interagency Forum on Child and Family Statistics. *America's Children: Key National Indicators of Well-Being, 2012*. Washington, DC: U.S. Government Printing Office; 2012.

10. Gouldner AW. The norm of reciprocity: A preliminary statement. *American Sociological Review*. 1960; 25:161–178.
11. Green LW, Ottoson JM, Garcia C, Hiatt RA. Diffusion theory and knowledge dissemination, utilization, and integration in public health. *Annual Review of Public Health*. 2009; 30:151–174.
12. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: Systematic review and recommendations. *Milbank Quarterly*. 2004; 82:581–629. [PubMed: 15595944]
13. Hesketh KD, Campbell KJ. Interventions to prevent obesity in 0–5 year olds: An updated systematic review of the literature. *Obesity (Silver Spring)*. 2010; 18(Suppl 1):S27–S35. [PubMed: 20107458]
14. Hoelscher DM, Kelder SH, Murray N, Cribb PW, Conroy J, Parcel GS. Dissemination and adoption of the Child and Adolescent Trial for Cardiovascular Health (CATCH): a case study in Texas. *Journal of Public Health Management and Practice*. 2001; 7:90–100. [PubMed: 12174404]
15. Howie EK, Brewer A, Brown WH, Pfeiffer KA, Saunders RP, Pate RR. The 3-year evolution of a preschool physical activity intervention through a collaborative partnership between research interventionists and preschool teachers. *Health Education Research*. 2014; 29(3):491–502. [PubMed: 24659421]
16. Institute of Medicine. *Early Childhood Obesity Prevention Policies*. Washington, DC: The National Academies Press; 2011.
17. Johnson K, Hays C, Center H, Daley C. Building capacity and sustainable prevention innovations: A sustainability planning model. *Evaluation and Program Planning*. 2004; 27:135–149.
18. Kreuter MW, Bernhardt JM. Reframing the dissemination challenge: a marketing and distribution perspective. *American Journal of Public Health*. 2009; 99:2123–2127. [PubMed: 19833993]
19. Luckner H, Moss JR, Gericke CA. Effectiveness of interventions to promote healthy weight in general populations of children and adults: a meta-analysis. *European Journal of Public Health*. 2012; 22:491–497. [PubMed: 21967748]
20. Monasta L, Batty GD, Macaluso A, Ronfani L, Lutje V, Bavcar A, et al. Interventions for the prevention of overweight and obesity in preschool children: A systematic review of randomized controlled trials. *Obesity Reviews*. 2011; 12:e107–e118. [PubMed: 20576004]
21. Oldenburg, B.; Glanz, K. Diffusion of innovations. In: Glanz, K.; Rimer, BK.; Viswanath, K., editors. *Health behavior and health education: Theory, research, and practice*. 4. San Francisco, CA US: Jossey-Bass; 2008. p. 313-333.
22. Osterling KL, Austin MJ. The dissemination and utilization of research for promoting evidence-based practice. *Journal of Evidence Based Social Work*. 2008; 5:295–319. [PubMed: 19064452]
23. Owen N, Glanz K, Sallis JF, Kelder SH. Evidence-based approaches to dissemination and diffusion of physical activity interventions. *American Journal of Preventive Medicine*. 2006; 31:S35–S44. [PubMed: 16979468]
24. Pate RR, Brown WH, Pfeiffer KA, Howie EK, Saunders RP, Addy C, Dowda M. An ecological intervention to increase physical activity in 4-year-old children: A randomized controlled trial in preschools. under review.
25. Pate, RR.; Saunders, R.; O’Neil, J.; McIver, K.; Howie, E.; Brown, W. *A Training Program to Prevent Childhood Obesity in Preschool-Aged Children*. The Duke Endowment; Charlotte, North Carolina: 2015.
26. Pfeiffer KA, Saunders RP, Brown WH, Dowda M, Addy CL, Pate RR. Study of Health and Activity in Preschool Environments (SHAPES): Study protocol for a randomized trial evaluating a multi-component physical activity intervention in preschool children. *BMC Public Health*. 2013; 13(1):728. [PubMed: 23919808]
27. Reynolds KD, Spruijt-Metz D. Translational research in childhood obesity prevention. *Evaluation & the Health Professions*. 2006; 29:219–245. [PubMed: 16645185]
28. Ringeisen H, Henderson K, Hoagwood K. Context Matters: Schools and the “Research to Practice Gap” in Children’s Mental Health. *School Psychology Review*. 2003; 32:153.
29. Schoenwald SK, Hoagwood K. Effectiveness, transportability, and dissemination of interventions: what matters when? *Psychiatric Services*. 2001; 52:1190–1197. [PubMed: 11533392]

30. Shadish, WR.; Cook, TD.; Campbell, DT. *Experimental and Quasi-experimental Designs for Generalized Causal Inference*. Boston: Houghton Mifflin Company; 2002.
31. Ward DS, Vaughn A, McWilliams C, Hales D. Interventions for increasing physical activity at child care. *Medicine and Science in Sports and Exercise*. 2010; 42:526–534. [PubMed: 20068495]

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Highlights

- A systematic approach based on literature, information from the original intervention trial, and input from participants can be used to refine a multi-component preschool physical activity intervention for dissemination to the control preschools.
- Preschool teachers found the modified intervention to be acceptable and sustainable, and reported positive child outcomes.
- Involvement of control participants in experimental trials can help to inform future dissemination of interventions.

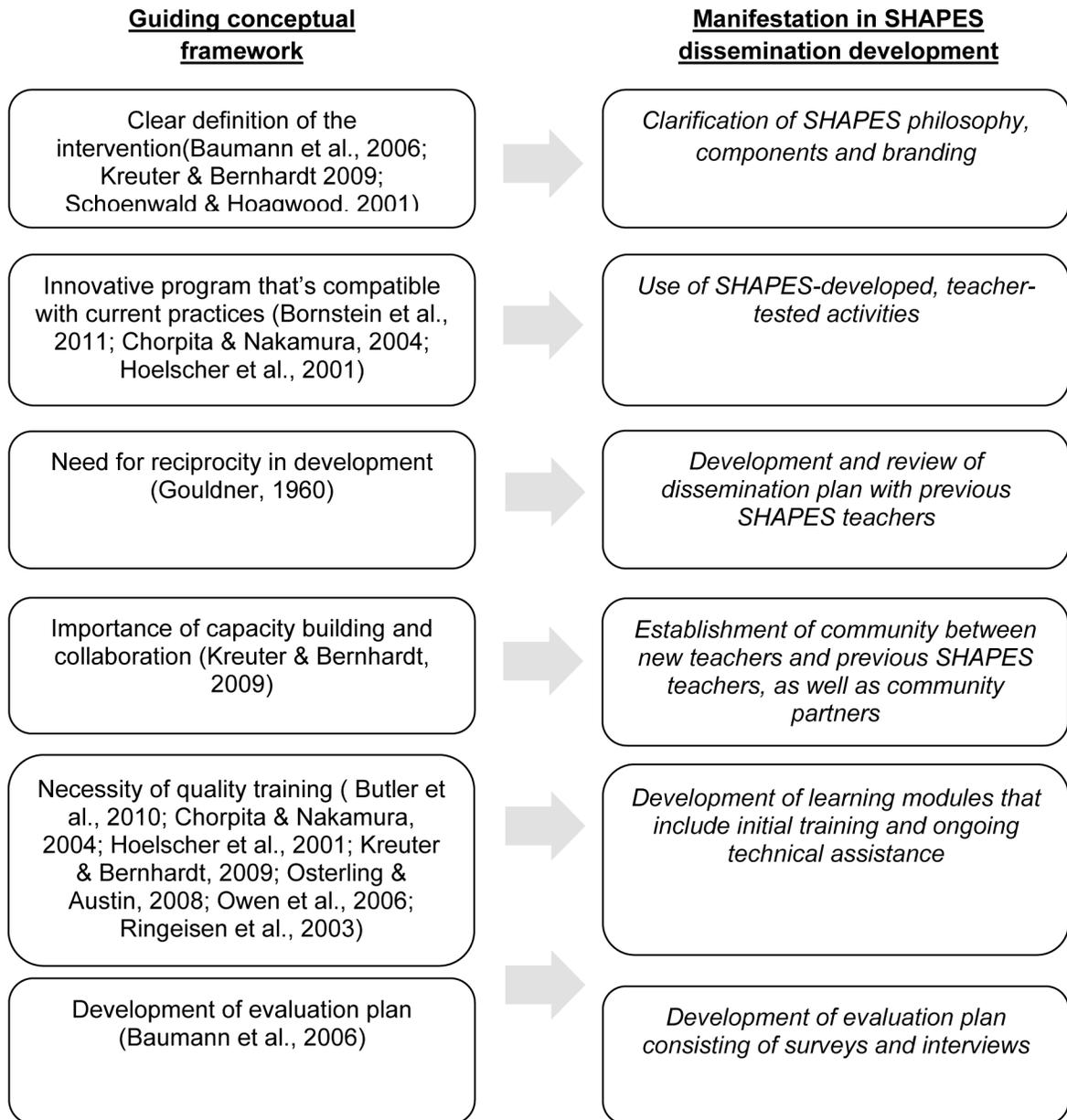


Figure 1.
Conceptual model for the development of SHAPES dissemination

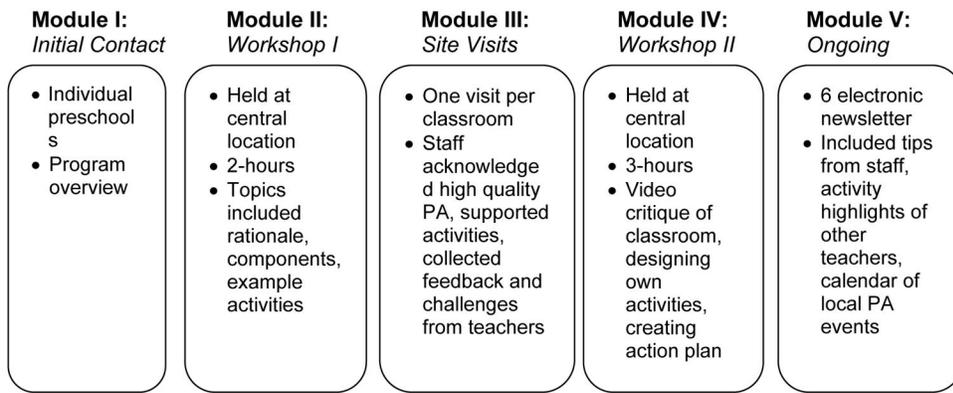


Figure 2.
Training modules for the dissemination to the control schools

Table 1

Behavioral Objectives of SHAPES Dissemination Training? Modules

	Module I	Module II	Module III	Module IV	Module V
<i>SHAPES Knowledge</i>	<ul style="list-style-type: none"> Identify at least 1 SHAPES goal (e.g. Move to Learn) 	<ul style="list-style-type: none"> Identify 3 of the 5 “What is SHAPES?” components Name a benefit of integrating PA into preschool day 	<ul style="list-style-type: none"> Name the 3 environments in which SHAPES targets PA in the school day (Move Inside, Move Outside, and Move to Learn) 	<ul style="list-style-type: none"> Identify “What is SHAPES?” components 	<ul style="list-style-type: none"> Identify “What is SHAPES?” components
<i>PA Knowledge</i>		<ul style="list-style-type: none"> Identify 3 activity intensity levels (sedentary, light, MVPA) via video recognition 	<ul style="list-style-type: none"> Report observation of: <ul style="list-style-type: none"> total time children participate in PA per school day child reaction to PA Identify one benefit PA contributes to school day 	<ul style="list-style-type: none"> Identify 3 activity intensity levels (sedentary, light, MVPA) 	<ul style="list-style-type: none"> Identify 3 activity intensity levels (sedentary, light, MVPA)
<i>Quality Development</i>		<ul style="list-style-type: none"> Identify at least 3 characteristics of high quality PA via video recognition 	<ul style="list-style-type: none"> Report observation of: <ul style="list-style-type: none"> MVPA within school day teacher encouragement within school day children not participating in PA average time spent in various PA per school day 	<ul style="list-style-type: none"> Identify 4 parts of TIRE Describe 4 parts of TIRE Assess and practice classroom PA examples using SHAPES assessment tool/items via 3 incremental support activities 	<ul style="list-style-type: none"> Identify 4 parts of TIRE. Describe 4 parts of TIRE. Assess classroom PA using SHAPES assessment materials. Participants’ classroom PA will display characteristics of TIRE
<i>Activity Development</i>		<ul style="list-style-type: none"> Participants will be able to identify at least 1 of the Top 10 SHAPES activities given demonstration/ participation. 	<ul style="list-style-type: none"> Participants will report practice of at least 1 of the provided SHAPES activities from Module II 	<ul style="list-style-type: none"> Practice development of their own Move In, Move Out, Move to Learn opportunities Complete action plan for current classroom’s goals 	<ul style="list-style-type: none"> Report efficacy for developing their own Move In, Out, to Learn opportunities Report development of their own Move In, Move Out.

	Module I	Module II	Module III	Module IV	Module V
<i>Facilitated Community</i>	<ul style="list-style-type: none"> Report welcome to the SHAPES community Report intention to attend SHAPES training 	<ul style="list-style-type: none"> Report welcome into the SHAPES community Report intention to return for Training Part 2 Report intention to complete homework 	<ul style="list-style-type: none"> Report welcome into the SHAPES community Speak with at least 1 other SHAPES participant about SHAPES Report receipt of follow-up/support prompt from SHAPES 	<ul style="list-style-type: none"> Report efficacy for developing their own PA opportunities Report welcome into the SHAPES community Identify potential school partner for sustaining SHAPES, outside of SHAPES staff Report intention to participate in ongoing assistance resources 	<ul style="list-style-type: none"> Move to Learn opportunities Report welcome into the SHAPES community Participate in ongoing assistance resources Identify as a SHAPES teacher/team member

PA, physical activity; MVPA, moderate to vigorous physical activity; TIRE, time intensity reach encouragement

Comparison of control dissemination and original intervention self-reported minutes of opportunities for Move Inside, Move Outside, Move to Learn and total physical activity.

Table 2

	Average opportunities (min/week)		<i>t-test</i> p-value	% Teachers Meeting Target		<i>Chi-sq</i> p-value
	Control Dissemination	Original Intervention		Control Dissemination	Original Intervention	
Move Inside (<i>goal 50 minutes</i>)	103.6 (59.8)	125.0 (76.2)	.44	100	82.4	.14
Move Outside (<i>goal 200 minutes</i>)	180.0 (97.7)	184.7 (101.7)	.91	45.5	70.6	.88
Move to Learn (<i>goal 50 minutes</i>)	56.6 (39.1)	76.6 (45.3)	.26	54.5	47.1	.57
Total minutes of PA opportunity (<i>goal 300 minutes</i>)	318.7 (107.5)	386.3 (176.9)	.27	72.7	76.5	.82