AN ABSTRACT OF THE DISSERTATION OF

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Brian R. Flay

Research regarding factors that promote high-quality implementation of school-based prevention programs has increased markedly over the past decade as it has become increasingly recognized that evidence-based programs are often not well implemented. Whole-school interventions may be particularly complex to implement because they are intended to involve all school personnel and students. The manuscripts in this dissertation contribute to this important area of study by addressing three factors thought to be important influences on implementation quality: 1) school organizational climate, 2) technical assistance to teachers, and 3) program adaptations made by teachers. These studies use data from a six-year, Chicago-based trial of *Positive Action (PA)*, a comprehensive whole-school program designed to promote a range of social-emotional, character development, academic, and health promotion outcomes. The *PA* program includes a curriculum that teaches specific positive actions related to physical, intellectual, social, and emotional aspects of the self. Supplementary program materials (e.g., posters, music) and activities (awarding certificates of recognition) reinforce and expand upon the concepts taught during classroom lessons.

The first manuscript reports a study in which ordinary least squares regression was used to analyze associations between teachers' perceptions of three dimensions of school organizational climate and the dosage and quality of the implementation of *PA*. It found that a) teacher perceptions of a school's tendency to be innovative were associated with greater implementation dosage and quality and b) teacher perceptions of teacher collegiality within a school were associated with a higher use of supplementary materials and activities.

The study described in the second manuscript used path modeling to examine the potential influence of technical assistance (TA)—a type of support used to augment training—on teachers' implementation of *PA* during the 2008-2009 and 2009-2010 school years (the last two years of the trial). The analysis found that higher dosages of TA were associated with a higher number of lessons per week in 2008-2009 and greater use of *PA* materials in both years. Furthermore, there were significant indirect associations between TA dosage and more positive attitudes toward *PA* in 2008-2009, which, in turn, predicted higher levels of implementation in 2009-2010.

The third manuscript addresses associations between teacher adaptation of *PA*, student engagement (an intermediate outcome), and four student outcomes—social-emotional and character development, normative beliefs in support of aggression, bullying, and disruptive behavior. Prior studies have indicated that adaptation of prevention programs by teachers is very common, but, to date, research examining relationships between adaptation and student outcomes is scarce. This study found that adaptations for the purpose of making lessons more appropriate for students (as self-reported by teachers) might be beneficial with respect to student engagement and outcomes for middle-school, but not for younger, students.

Factors That Influence the Quality of Teacher Implementation of a School-Based

Social-Emotional Learning and Health Promotion Program

by
Margaret Malloy

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APPROVED

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Dean of the Graduate School

I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Margaret Malloy, Author

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CONTRIBUTION OF AUTHORS

Margaret Malloy conducted all literature reviews; conceptualized, outlined, and performed all data analyses; completed initial drafts of all manuscripts; and made manuscript revisions based on input from co-authors.

Dr. Brian R. Flay designed the trial and provided support for the conceptualization of each manuscript, as well as editorial comments, analytic advice, and suggestions on the interpretation of the results.

Drs. Alan C. Acock, David Dubois, and Samuel Vuchinich provided editorial comments, analytic advice, and suggestions on the interpretation of the results.

Drs. Joseph Day, Peter Ji, and Naida Silverthorn implemented the program and collected data.

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CHAPTER 1: GENERAL INTRODUCTION

Background and Significance

In 2005, Fixsen and colleagues published a review of implementation research. Their goal was to identify important themes, detect relationships among implementation components, and further the development of the practice and science of implementation. A theme repeatedly emphasized in the report is that in human services settings, important outcomes that are the goal of an intervention can only be achieved by influencing the implementation behavior of the practitioners who deliver it. "Evidence-based practices and programs," they wrote, inform when and how practitioners interact with the recipients of an intervention, but ultimately, it is the "words and actions" of the person who delivers it that mostly directly impacts recipient outcomes (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005, p. 45).

Since the 1990s, there has been a rapid increase in research, scholarship, and policy directives to identify the best ways to ensure that evidence-based practices are used—and used well—in health, education, and other human services settings (Neta et al., 2015; Spoth et al., 2013; Wandersman et al., 2008). Both the Centers for Disease Control and Prevention (Saul et al., 2008) and the U.S. Department of Education (Fixsen, Blase, Metz, & van Dyke, 2013) fund projects in this area and the use of evidence-based practices is required by many federal agencies (Wandersman et al., 2008).

Although the study of how to best ensure the diffusion of innovations and promote high-quality implementation has long been an area of scholarship in many fields (Fixsen et al., 2005; Greenhalgh, Robert, MacFarlane, Bate, & Kyriakidou, 2004; Rogers, 1995), it is now evolving into a distinct field of study in its own right, known as implementation science

(Eccles & Mittman, 2006; Madon, Hofman, Kupfer, & Glass, 2007) or type 2 translation research (Spoth et al, 2013). Implementation science has been defined as the "scientific study of methods that promote the systematic uptake of research findings and other evidence-based practices into routine practice," in order to improve the quality and effectiveness of health care services (Eccles, & Mittman, 2006). Tabak, Khoong, Chambers, & Brownson (2012, p. 338) have described its purpose as being "to better understand the complex task of spreading ideas" across multiple socioecologic levels (i.e., individual, organization, community, system). The Society for Prevention Research Type 2 Translational Task Force uses a narrower definition of implementation. They describe it as being solely related to the stage during which an intervention is put into practice, as compared to type 2 translation research which addresses all stages of the diffusion of innovations process as defined by Rogers (1995)—pre-adoption, adoption, implementation, and sustainability (Spoth et al., 2013). Specifically, according to the Task Force, type 2 translation research is the investigation of "the complex processes and mechanisms through which tested and proven interventions are integrated into practice and policy on a large scale and in a sustainable way, across targeted populations and settings" (Spoth et al., 2013, p. 321).

The three studies included in this dissertation were designed to contribute to the knowledge base regarding factors that influence or promote high-quality implementation of social-emotional learning and health promotion (SELHP) interventions for children and youth. Although, there has been extensive research conducted related to the development of a variety of SELHP programs, studies of their implementation indicate that a) commonly-used programs frequently are not evidence-based (Ringwalt et al., 2011) and b) when evidence-based programs are used, they are often not well-implemented (Ennett et al., 2011). The

studies described herein, address the second area of concern—limited implementation quality. Using data from a matched-pair, cluster-randomized, efficacy trial of *Positive Action* (*PA*), a SELHP program, they examine three areas of current interest related to the implementation of complex school-based interventions: 1) the influence of school organizational climate on teacher implementation; 2) the use of technical assistance as an implementation support; and 3) the influence of program adaptation on student engagement and outcomes.

Definition of Implementation

Implementation has been defined in a variety of ways ranging from narrow ("when the innovation is used," Mihalic & Irwin, 2003, p. 309) to broad ("a process, . . . a continuous and interactive accomplishment, rather than . . . a final outcome," May, 2013), and from general ("what a program consists of when it is delivered in a particular setting," Durlak & DuPre, 2008, p. 329) to specific ("a specified set of activities designed to put into practice an activity or program of known dimensions," Fixsen et al., 2005, p. 5). Implementation is hard to define, yet consists of specific elements; both a process and a series of measurable outcomes. In this proposal, I use the following definition by Damschroder et al. (2009) because it captures the evolving understanding of the complexity of implementation, while succinctly describing the variety of factors involved.

> *Implementation is the constellation of processes intended to get an intervention into use within an organization; it is the means by which an intervention is assimilated into an organization. Implementation is the critical gateway between an organizational decision to adopt an intervention and the routine use of that intervention; the transition period during which targeted stakeholders become increasingly skillful, consistent, and committed. [Implementation is also] by its very nature, a social process that is intertwined with the context in which it takes place.*

Conducting Implementation Research

The above highlights the range of interacting variables that fall under the purview of implementation research. In recent years a number of expert workgroups and taskforces have developed frameworks to guide this complex area of research (Glasgow et al., 2012; Neta et al., 2015; Tabak et al., 2009). Key issues that have been identified include: 1) a need to consider future implementation needs early during the process of designing and conducting intervention efficacy and effectiveness studies (Neta et al., 2015); 2) methodological difficulties related to the complexity of the settings and contexts in which implementation occurs (Fixen, Blase, Naoom, & Duda, 2015; Neta et al., 2015; and 3) the need for specific research into factors that "drive" or support implementation (Fixen et al., 2015; Wandersman et al., 2008).

Efficacy/Effectiveness Research and Implementation

As outlined by standards of evidence developed by the Society for Prevention Research Standards Committee, programs must not only be of proven effectiveness, they must also meet criteria that ensure agencies will adopt them and providers can effectively us them (Flay et al., 2005, p. 166). Consideration of factors that influence the likelihood that an intervention will be successfully implemented and sustained should begin at the time that intervention research projects are conceptualized. As noted by Neta and colleagues (2015, p. 50):

> *If the products of efficacy or effectiveness research are substantially misaligned with conditions, resources, and policies that have an impact on real world public health and health care delivery contexts, it is very unlikely that such interventions or guidelines will ever be adopted, or if adopted, will be implemented with quality or will be sustained.*

A related issue regards how research findings are translated or synthesized to create understandable interventions—type 1 translation (Spoth et al., 2013). In order to be usable, theoretical and research-based knowledge must be converted into accessible language and easy-to-use materials (Wandersman et al., 2008).

Methodological Difficulties Related to Implementation Contexts

Implementation occurs in settings of great complexity and involves influences at multiple levels including: a) individual characteristics of persons who are recipients of an intervention as well as those who are responsible for its delivery); b) organizations); c) communities; and d) broader systems (Damschroeder et al., 2009; Flaspoehler et al., 2008). For example, within schools, mounting evidence suggests that there are numerous inter-related influences at teacher, classroom, and school levels that govern how well a program is implemented (Pas, Waasdorp, & Bradshaw, 2014). Furthermore, each level encompasses personal, social, economic, cultural, and structural influences that affect how and whether an intervention will be adopted, implemented, and sustained (Neta et al., 2015). This creates numerous methodological research challenges related to identifying and operationalizing multiple, interacting variables. Because the essence of quality intervention is behavior change (i.e., the promotion of positive implementation behaviors), an understanding of the importance of addressing these myriad, interacting influences is consistent with an ecological approach to health promotion found within the field of public health. The field has a long history of designing and researching interventions that address multiple levels and types of influences on behavior (Flay, Snyder, & Petraitis, 2009; Hovell, Wahlgren, & Gehrman, 2002; McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 2000). Conducting studies that

accurately identify and measure relevant influences, however, is still quite difficult and is typically not comprehensively addressed (Neta et al., 2015).

Implementation Drivers and Supports

Research is also needed into tools and support services that aide program deliverers to be successful in their implementation of an intervention (Le, Anthony, Bronheim, Holland, & Perry, 2014; Wandersman et al., 2008). This includes a broad array of technical assistance activities. Fixsen and colleagues (2015) refer to these types of supports as "competency drivers" (e.g., training, coaching). Despite the ubiquity of these types of supports, very little research has been conducted regarding their effectiveness and relevant characteristics (Le et al., 2014). One of the core challenges that must be addressed in order for evidence-based practices to have a population-level impact on health, education, and other societal goals is to identify strategies that effectively build the capacity of prevention delivery systems to adopt, implement, and sustain the use of evidence-based practices (Spoth et al., 2013, p. 322).

Applying Research Findings

Ultimately, the point of research to identify and understand influences that lead to quality implementation is to develop strategies and supports that build individual, organizational, and community capacity to conduct interventions well. Like the evidence-based interventions implementation research aims to support, this growing body of knowledge also requires a great deal of synthesis and translation. One good example of this, to date, is a project called the "State Implementation and Scaling-Up of Evidence-Based Practices Center" (SISEP) funded by the US Department of Education (Fixsen, et al., 2013). This project arose from the review of implementation research mentioned at the beginning of this introduction. The SISEP Center has designed a variety of tools and resources that can be used by program

delivers and technical assistance providers to apply the best implementation research knowledge to date, to large-scale implementation of evidence-based programs (National Implementation Research Network, no date). Another tool for practitioners is the Quality Implementation Framework, a 14-step guide to quality implementation based on literature from a variety of domains (education, health care, management) (Meyers, Durlak, & Wandersman, 2012).

Implementation Terminology

Terminology used to describe the measurement of implementation varies somewhat from source to source. The terms "quality" (Domitrovich et al., 2008) and "fidelity" (Durlak & DuPre, 2008) are both used to characterize the overall "goodness" of implementation, but there is considerable overlap in the meaning of these constructs. Fidelity has been defined as the extent to which implementation of a program faithfully corresponds to what was intended by the program developers (Durlak & DuPre, 2008; Fagan, Hanson, Hawkins, & Arthur, 2008) and quality as the "discrepancy between what is planned and what is actually delivered when an intervention is conducted" (Domitrovich et al. (2008, p. 7). Measures of fidelity that have been described include adherence, dose, quality of delivery, participant responsiveness, and program differentiation (Dusenbury, Brannigan, Falco, & Hansen, 2003). Similarly, measures of quality include adherence (in terms of fidelity and dosage) and quality of delivery (Domitrovich et al., 2008). In addition, there is no clear consensus on how these constructs should be operationalized. For example, Domitrovich, et al. (2008, p. 11) define dosage as "specific units of an intervention and support system," while Dusenbury, et al. (2003, p. 240) define it as the "amount of the program delivered." Given the lack of standardization of terms in the literature, in this dissertation I chose to do the following:

- I use the terms "quality" and "fidelity" interchangeably when referring generally to the overall success or lack of success of implementation.

- I typically use the original authors' terminology for specific measures of implementation when describing ideas and findings from prior theory and research.

- Within each manuscripts I describe how each measure was operationalized by the *Positive Action* research team.

Conceptual Framework

As noted above, a number of frameworks have been developed to help guide implementation research and/or practice (Damschroder et al., 2009; Glasgow, Vogt, & Boles, 1999; Greenhalgh et al., 2004; Helfrich, et al., 2010. Tabak and colleagues (2012) identified 61 models that were specifically designed to inform implementation and dissemination research.

The framework I have used as a guide is the Interactive Systems Framework (ISF) for Dissemination and Implementation, an ecological framework developed specifically for prevention efforts (Wandersman et al., 2008). Its development was motivated by a need identified by the Division of Violence Prevention of the Centers for Disease Control and Prevention for knowledge about effective violence prevention efforts to be more broadly applied. Two strong features of the ISF make it ideal for studying prevention efforts that take place in school settings: 1) it identifies the *systems* that carry out the functions needed in order for implementation to occur (Wandersman et al., 2008, p. 173) and 2) it highlights the importance, and encourages examination of, the influence of various types of *capacity* on implementation (Flaspohler et al., 2008).

The *Interactive Systems Framework (ISF)*

The ISF posits that there are 3 systems that must be in place in order for implementation to occur (see Figure 1):

1) Synthesis and Translation System – distills information about innovations and prepares it for implementation by practitioners.

2) Prevention *Support* System – supports the work of those who will actually put the innovations into practice.

3) Prevention *Delivery* System – implements the innovations in the field (e.g., in schools or communities).

The purpose of conceptualizing implementation and dissemination in terms of systems is to help stakeholders "see prevention not only through the lens of their own needs and perspectives, but also as a way to better understand the needs of other stakeholders and systems" (Wandersman et al., 2008, p. 171). In addition, the framework provides a structure for summarizing existing research and highlighting areas where new research is needed (Wandersman et al., 2008).

Implementer Capacity

A great deal has been written about the influence of capacity (Chinman et al., 2005; Livet & Wandersman, 2005) or similar constructs (e.g., Aarons, Hurlburt, & Horwitz, 2011; Greenhalgh et al., 2004) on implementation. Chinman et al. (2005) and Livet and Wandersman (2005) suggest that the gap between research and practice is really an issue of a lack of capacity to implement interventions.

The basic meaning of capacity is "the capability to perform or produce" (Thinkmap, Inc., 1998-2015), but there is not yet a shared terminology to describe aspects of capacity that

are likely to influence the success or failure of implementation efforts. Other terms that have been used to define similar constructs include structural determinants of organizational innovativeness (Damanpour, 1991), contextual factors (Aarons et al., 2011), and readiness for change (Lundgren, Chassler, Amodeo, D'Ippolito, & Sullivan, 2012).

Because of the importance of the concept of capacity in the Interactive Systems Framework, the developers created a capacity taxonomy based on a review of the capacity literature (Flaspohler et al., 2008). Within the taxonomy, the term "capacity" encompasses a wide variety of resources, knowledge, skills, and attitudes, classified into two types (general and innovation-specific) and three levels (individual, organizational, and community). For example, at the organizational level, types of *innovation-specific capacity* include such things as fit with organizational and program needs, strong administrative support, and staff agreement ("buy-in") regarding program values. Examples of *general capacity* include organizational climate, organizational complexity, and the size and maturity of the organization.

Application of the *Interactive Systems Framework*

In this section, I use the *Interactive Systems Framework* to illustrate how the studies detailed in manuscripts 1, 2, and 3 address the three systems that are important for effective implementation (see Figure 1).

Synthesis and Translation System

The role of the knowledge and translation system is "to synthesize existing research and translate it for use by practitioners" (Wandersman et al., 2008, p. 175). Each of the studies described herein uses data from a recent trial of *Positive Action (PA)*, which is an output of the synthesis and translation system. The *PA* program is based on a synthesis of

theoretical knowledge and research findings from the fields of education, psychology, and health promotion (Flay & Allred, 2010). The *PA* curricular content was designed to be easy to use, engaging, and interactive (Flay & Allred, 2010). All materials required for the lessons are conveniently packaged, together with a teacher's manual, in separate kits for each grade. Learning activities include discussions, group activities, games, role-playing, and the practice of new skills. Interaction between students is encouraged. In addition to the curriculum, there is a school-climate kit consisting of materials to encourage and reinforce *PA* concepts. The kit includes posters, music, tokens, and certificates as well as information on how to conduct assemblies, create a *PA* newsletter, and promote a school-wide *PA* culture.

Prevention Delivery System (Manuscripts 1 and 3)

Ultimately, prevention interventions are implemented by individuals, organizations, and communities with varying levels and types of general and innovation-specific capacities that they put to use when implementing interventions (Wandersman et al., 2008). The study reported in Manuscript 1 investigated the effect of a school's organizational climate (an area of general capacity) on teachers' implementation of *PA*. The reported Manuscript 3 examined how teachers' capacity to adapt the *PA* curriculum influences student engagement and outcomes.

Prevention Support System (Manuscript 2)

The support system provides a link between the synthesis and translation system and the delivery system. Its role is to help build the capacity of the delivery system to implement innovations (Chinman et al., 2008; Wandersman et al., 2008). As noted above, capacity refers to virtually anything that impacts an organization's ability to implement a program (Flaspohler et al., 2008). During the Chicago trial, the *PA* research team provided materials,

training, and technical assistance to educators at the seven treatment schools to assist them in their use of the program. The study described in Manuscript 2 examines the specific impact of technical assistance on teacher implementation.

Specific Aims and Hypotheses

Collectively, the manuscripts address several key areas for which a need for additional research has been identified, including characteristics of the organizations in which interventions are being implemented; impact of training and technical assistance on implementation; factors that enhance student participation; and the effect of adaptations on outcomes (Aarons et al., 2011; Acosta et al., 2013; Chinman et al., 2008; Little, Sussman, Sun, & Rohrbach, 2013; Miller-Day et al., 2013; Moore, Bumbarger, & Cooper, 2013; Reyes, Brackett, Rivers, Elbertson, & Salovey, 2012; Spoth et al., 2013).

Aim 1 (Manuscript 1)

Use multivariate regression to explore one aspect of general capacity—teachers' perceptions of school organizational climate—on the dosage and quality of implementation.

Hypothesis 1: Teachers who perceive that their schools rate higher on four psychosocial dimensions of school organizational climate (innovation, teacher-teacher affiliation, participatory decision-making, and student support for teachers), will deliver a higher number *PA* lessons and associated activities and implement the program with higher quality.

Hypothesis 2: Teachers' attitudes toward SECD programs will be positively related to the same measures of implementation.

Aim 2 (Manuscript 2)

Use path analysis to explore whether a) technical assistance dosage has a direct effect on implementation dosage and b) if the effect is partially mediated by increases in teachers' positive attitudes toward the program (a form of innovation-specific individual capacity).

Hypotheses 1: Higher dosages of TA will predict greater teacher-reported implementation of the PA program.

Hypothesis 2: Higher dosages of TA will indirectly predict more positive teacher attitudes toward the PA program (mediated by greater teacher-reported implementation).

Hypothesis 3: There will be a significant association between greater implementation of PA and positive teacher attitudes, with greater implementation predicting more positive attitudes during a single school year and more positive attitudes predicting greater implementation from one year to the next.

Aim 3 (Manuscript 3)

Use structural equation modeling to investigate associations between teacher adaptation of PA lessons, student engagement, and student outcomes.

Hypothesis 1: Teacher adaptation of PA for the purpose of making lessons more appropriate for students would enhance the relationship between number of lessons taught and students' emotional engagement.

Hypothesis 2: Teacher adaptation of PA would enhance the association between number of lessons taught and social-emotional learning and health promotion (SELHP) outcomes.

Hypothesis 3: The association between number of lessons and SELHP outcomes would be mediated by student engagement.

Overview of Social-Emotional Learning and Health Promotion Programs (SELHP) and *Positive Action*

As the discussion thus far illustrates, for many years there have been intensive ongoing efforts to identify public health and prevention programs that are based on high-quality experimental research. Determining evidence-based strategies that promote or support effective implementation of these programs has received less attention, but is now a rapidly expanding area of research. The purpose of this dissertation is to contribute to this growing body of knowledge by examining important areas of implementation science that relate to SELHP programs for children and youth in schools. Each of the studies in this proposal uses data from a longitudinal, cluster-randomized, controlled trial of a SELHP called *Positive Action*, conducted in Chicago from 2004 through 2010. The following sections on SELHP programs, *Positive Action*, and the Chicago trial provide background information for the three manuscripts. Additional information, relevant to each proposed study, is provided within the manuscripts.

Social-Emotional Learning and Health Promotion Programs

Over the past several decades, there has been a growing emphasis on the need for schools to teach social and emotional skills that improve students' health and well-being while they are in school and prepare them well for adulthood (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011; Elias, 2009; Flay, 2002). That is, the mission of schools should not only be to provide academic education, but also, as Greenberg et al. (2003, p. 466) succinctly put it, to educate students to be "responsible, socially skilled, *healthy*, caring, and contributing citizens" (emphasis added).

These types of programs go by a variety of names, including social and emotional learning and social-emotional and character development. *Social emotional learning (SEL)* has been defined as "the process of acquiring core competencies to recognize and manage emotions, set and achieve positive goals, appreciate the perspectives of others, establish and maintain positive relationships, make responsible decisions, and handle interpersonal situations constructively" (Durlak et al., 2011, p. 406). S*ocial-emotional and character development (SECD)* is similarly defined, but includes specific competencies related to promoting moral development (Berkowitz & Bier, 2007). In contrast to interventions that target single high-need areas of prevention such as substance abuse or youth violence, SEL and SECD programs are intended to address the underlying causes of a variety of behaviors, especially health-related behaviors (Catalano, Hawkins, Berglund, Pollard, & Arthur, 2002; Flay, 2002). Because of their important influence on health, the term *social-emotional learning and health promotion* (SELHP) is also used.

Literature reviews suggest that SELHP programs have the potential to contribute to numerous positive outcomes related to physical and mental health, social competency, and academics (Berkowitz & Bier, 2007; Greenberg et al., 2003). For example, a meta-analysis of 213 school-based programs found that they lead to improved academic performance, positive social behaviors, fewer conduct problems, and less emotional distress (Durlak et al., 2011). Not surprisingly, there is strong evidence that better outcomes for these and other health promotion and prevention programs are linked to high levels of implementation (DuBois, Holloway, Valentine, & Cooper, 2002; Durlak and Dupre, 2008; Smith, Schneider, Smith, & Ananiadou, 2004).

Hand-in-hand with ongoing efforts to identify evidence-based practices that promote positive health, behavioral, and social outcomes for children and youth, have been efforts to identify evidence-based strategies to ensure that these interventions are implemented with quality. As Mihalic and Irwin (2003, p. 308) wrote about youth violence prevention programs, researchers reached a point where they were beginning to have a pretty good idea about *what* to implement, but very little about *how*.

Positive Action

Positive Action (Flay & Allred, 2010) is a comprehensive, school-wide, program grounded on a broad theory of self-concept (DuBois, Flay, & Fagen, 2009; Purkey, 1970; Purkey & Novak, 1970), which posits that what people do has a stronger influence on their self-concept than what they think or feel, and that positive actions result in feelings of self-worth (Flay & Allred, 2010). The *PA* curriculum teaches specific positive actions related to physical, intellectual, social, and emotional aspects of the self that are consistent with social learning theory (Akers, 1998; Bandura, 1986) and current knowledge of social development, health promotion, and prevention of unhealthy behaviors (Flay & Petraitis, 1994; Flay, Snyder, & Petraitis, 2009; Hawkins & Weis, 1985; Peters & McMahon, 1996).

Prior studies from the current cluster-randomized controlled trial in Chicago have found that *Positive Action* has favorable effects on a wide range of SELHP measures including those related to emotional health (e.g., anxiety, depression; Lewis et al., 2013a), substance use (Lewis et al., 2012; Li et al., 2011), other problem behaviors (e.g., violent, disruptive, or bullying behavior; Lewis et al., 2013b; Li et al., 2011), positive youth development (e.g., character, social interactions, self-concept, and self-control; Lewis et al., in press), academic outcomes (Bavarian et al., 2013), and health outcomes (Bavarian et al.,

under review). Prior quasi-experimental and experimental evaluations of *PA* have also found

significant favorable effects on a variety of outcomes (Beets et al., 2009; Flay & Allred, 2003;

Flay, Allred, & Ordway, 2001; Snyder et al., 2010; Snyder, Vuchinich, Acock, Washburn, &

Flay, 2012).

Trial of Positive Action in Chicago Public Schools

The Chicago trial (2004-2010) was conducted in low-performing, high-poverty

elementary and middle schools that had largely racial-ethnic minority student populations.

The trial was one of 7 sites nationwide participating in a study funded by the U.S. Department

of Education's Institute of Education Sciences to evaluate the effects of school-based social

and character development programs. Data collection involved surveying students, parents,

teachers, and administrators on a wide array of measures. The surveys were administered by

the *PA* research team at the University of Illinois, Chicago (UIC) and by a multi-site

contractor, Mathematica Policy Research, Inc. The full trial involved eight waves of data

collection across 6 years.

The unit of randomization was the school. After an extensive sampling and

recruitment process from the population of 483 K–6 and K–8 schools within the Chicago

Public Schools system (see Ji, DuBois, Flay, & Brechling, 2008 for a detailed description of

this process), seven matched-pairs of schools were enrolled in the trial and schools within

each pair were randomly assigned to either the *PA* or the control condition. Data collection

involved surveying students, parents, teachers, and administrators on a wide array of

measures.

Students in seven matched pairs of schools were followed, beginning in grade 3 (Fall

2004 and Spring 2005), and at six additional time points: Grade 4 (Fall 2005 and Spring

2006), Grade 5 (Spring 2007), Grade 7 (Fall 2008 and Spring 2009), and Grade 8 (Spring 2010). At the beginning of the study, nine schools were K–8, and five were K–6. Once the students reached middle school (grades 6–8) 13 schools were K–8, one was K–5, and one was a grades 6–8 school that students from the one K–5 matriculated to.

Overview of Measures

Student data was collected for a cohort of students who were in the 3rd grade at the beginning of the trial. However, because *PA* is a whole-school program, all teachers in the *PA* schools were expected to teach the program in their classrooms. Data collection involved surveying students, parents, teachers, and administrators on a wide array of measures.

Over the course of the study, a total of 56 student, 19 teacher, and 13 parent (or primary caregiver) scales were used to assess a variety of student outcomes. Student-report measures included questions about social-emotional and character development, emotional health, problem behaviors, self-esteem, and academic achievement. Questions about substance use, violence, depression, and anxiety were asked of students beginning in grade 5 (Waves 5 through 8).

Implementation and Work Climate Measures

Teacher surveys about implementation efforts and work climate were key data sources for the studies in this dissertation. Teachers in the treatment schools were asked to complete extensive implementation reports at the end of each of the six *PA* units (approximately every six weeks). At the end of each year (except for 2007-2008 where there was a gap in funding), they also completed end-of-year process reports. During the first three years of the study only cohort teachers were asked to complete these reports. During the last two years, all teachers were asked to do so.

Human Subjects Approvals

This trial was approved by Institutional Review Boards at the University of Illinois, Chicago and Oregon State University, the Research Review Board at Chicago Public Schools, and the Public/Private Ventures Institutional Review Board for Mathematica Policy Research. Parental consent was obtained before students, parents, or teachers completed surveys when students were in grade 3. Students joining the study at later waves were consented at that time. All students were re-consented for the second phase of funding at Wave 6 (beginning of grade 7). All students provided assent at the beginning of each survey session; non-consented and non-assenting students were provided with other work to do during survey sessions. Consent was obtained from teachers and other school staff before completing surveys on their school's social climate, social and character development activities occurring at the school, and basic background information about themselves.

Figure 1.1 Mapping of manuscripts onto Interactive Systems Framework
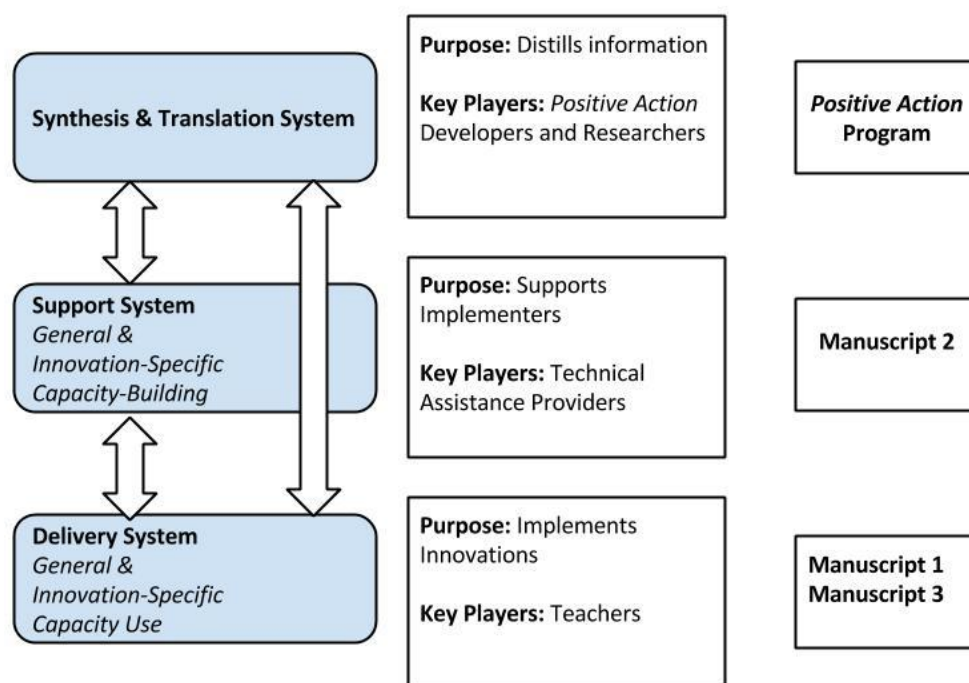
Adapted from Wandersman et al., 2008

CHAPTER 2: Manuscript 1

Teachers' Perceptions of School Organizational Climate as Predictors of Dosage and Quality
of Implementation of a Social-Emotional and Character Development Program

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Abstract

Organizational climate has been proposed as a factor that might influence a school's readiness to successfully implement school-wide prevention programs. The aim of this study was to evaluate the influence of teachers' perceptions of three dimensions of school organizational climate on the dosage and quality of teacher implementation of *Positive Action*, a social-emotional and character development (SECD) program. The dimensions measured were teachers' perceptions of a) the school's openness to innovation, b) the extent to which schools utilize participatory decision-making practices, and c) the existence of supportive relationships among teachers (teacher-teacher affiliation). Data from 46 teachers in 7 schools enrolled in the treatment arm of a longitudinal, cluster-randomized, controlled trial were analyzed. Teacher perceptions of a school's tendency to be innovative was associated with a greater number of lessons taught and self-reported quality of delivery, and teacher-teacher affiliation was associated with a higher use of supplementary activities. The findings suggest that perceptions of a school's organizational climate impact teachers' implementation of SECD programs and have implications for school administrators and technical assistance providers as they work to implement and sustain prevention programs in schools.

Introduction

Over the past decade, a number of studies (Payne & Eckert, 2010), literature reviews (Durlak & DuPre, 2008; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004), and conceptual frameworks (Aarons, Hurlburt, & Horwitz, 2011; Domitrovich et al., 2008; Wandersman et al., 2008) have emphasized the need to better understand individual, organizational, and community readiness associated with fidelity of implementation of human services programs. Consistent with theories that recognize the importance of contextual factors in all aspects of human behavior (Bronfrenbrenner, 2005; Flay, Snyder, & Petraitis, 2009), this emerging area of implementation science highlights the extent to which service providers are influenced by multiple interacting ecological factors as they implement programs to promote positive behaviors.

One focus of this research concerns the impact of organizational climate on school readiness to implement prevention programs for children and adolescents (Beets et al., 2008; Domitrovich et al., 2008; Gregory, Henry, & Shoeny, 2007). Increased knowledge of the relationship between organizational climate—defined as staff perceptions of a school's psychosocial work environment (Rentoul & Fraser, 1983)—and quality of teacher implementation, could assist educational administrators and technical assistance providers in identifying strategies that support more effective implementation. Although a number of previous studies have investigated a link between a school's organizational climate and implementation (e.g., Beets et al., 2008; Ennett et al., 2003; Gregory et al., 2007; Kallestad & Olweus, 2003; Low, Van Ryzin, Brown, Smith, & Haggerty, 2013; McCormick, Steckler, & McLeroy, 1995; Ringwalt et al., 2003), few have involved social-emotional and character development (SECD) programs.

The present study uses data from the treatment arm of a matched-pair, cluster-randomized trial of the SECD program *Positive Action* (*PA*). Because *PA*, as a comprehensive, whole-school program is expected to be most effective when the majority of teachers at a school engage in a high level of program implementation, we were interested in exploring whether general organizational factors at a school—specifically measures of climate—are related to fidelity of implementation by teachers. A previous study of *PA* conducted in 10 Hawai'i elementary schools found that teachers' perceptions of the quality of school-based relationships had both direct and indirect effects on implementation (Beets et al., 2008). In the present study, our primary aim was to explore whether multiple aspects of organizational climate were associated with *PA* implementation in a low-income, urban setting.

Background

Organizational climate is a type of "general organizational capacity," a term that encompasses a variety of factors important to an organization's overall functioning, but unrelated to a specific intervention (Flaspohler, Duffy, Wandersman, Stillman, & Maras, 2008). Because organizations that function well are believed to be better positioned to implement a variety of types of interventions, high levels of general capacity may provide a foundation for organizational readiness (Wandersman et al., 2008; Weiner, 2009).

School organizational climate can be understood from the perspective of Moos' (1974) conceptualization of social environments. Moos' theory, based on research regarding human behavior in an array of settings, posits that social environments, like people, have unique "personalities" characterized by a variety of measurable factors (Moos, 1974, p. 1) that are classified into three categories (Moos, 1994; Rentoul & Fraser, 1983): (1) factors associated

with ***system maintenance and system change***—the extent to which an environment is

orderly, provides clear expectations, and is responsive to change; (2) factors associated with

the ***quality of relationships*** that occur within a particular setting , and (3) factors associated

with ***personal growth*** and self-enhancement. Using a number of different measures—often in

combination—to investigate pertinent factors, prior investigations have primarily focused on

the first two of these three categories.

This idea for this paper was also influenced by elements of the Interactive Systems

Framework (ISF) for Dissemination and Implementation, an ecological framework developed

specifically for prevention efforts (Wandersman et al., 2008). The ISF strongly emphasizes

the importance of alignment between the requirements of a specific intervention and the

capacity of an entity (i.e., an individual, organization, or community) responsible for

conducting the intervention to meet those requirements. Because a mismatch between

program requirements and capacity can result in poor program implementation (Flaspohler et

al., 2008), understanding capacity is "central to addressing the gap between research and

practice" (Wandersman et al., 2008, p. 173). Once understood, steps can be taken to help

build capacity. Although general capacity building is intended to enhance "the infrastructure,

skills, and motivation of an organization" rather than the knowledge and skills required for a

specific intervention (Wandersman et al., 2008), improved general capacity may influence

readiness by contributing to improved organizational functioning (Flaspohler et al., 2008).

Weiner (2009) theorizes that contextual factors such as organizational functioning and quality

of working relationships promote or dampen implementation by influencing members'

assessment of the organization's ability to carry out change-related activities ("change

efficacy") and their attitude regarding the likely benefits of the change itself ("change valence").

Aims of the Present Study

The earlier study of the influence of organizational climate on teacher implementation of *PA* (Beets et al., 2008) used measures of teacher perceptions of the quality of relationships in a school. It found that a composite measure of two factors—perceived administrative support and school connectedness—was directly associated with school-wide *PA* material usage and indirectly associated with the amount curriculum delivered (mediated by teacher beliefs about their responsibility to teach SECD programs and attitude towards *PA*). The first aim of the present study is to test whether teacher perceptions of the quality of work relationships was associated with implementation of *PA* in a different population and using a different measure, teacher-teacher affiliation. Prior studies have found positive correlations with similar relationship measures such as "openness in communication" (Kallestad & Olweus, 2003), "community spirit," (Ennett et al., 2003), and "supportive climate" (Gregory et al., 2007).

The present study's second aim is to explore whether two measures of Moos' system maintenance and systems change category—innovation and participatory decision-making— were also associated with implementation. Innovation refers to a school's openness to change and new teaching approaches. Innovative organizations are believed to "cultivate an atmosphere conducive to trying new approaches" (Durlak & DuPre, 2008). Participatory decision-making refers to the extent to which teachers have the opportunity to share in decision-making that impacts the school as a whole (Fisher & Fraser, 1990).

Participatory decision-making is often cited as an important influence on the diffusion

of innovations (Damanpour, 1991; Domitrovich et al., 2008; Durlak & DuPre, 2008).

McCormick et al. (1995) found that a composite measure consisting of teacher perceptions of five factors (job satisfaction, satisfaction with supervisors, involvement in decision-making, organizational risk-taking, conflict management, and work motivation) was positively correlated with implementation of tobacco prevention programs at the school district level. However, although including teachers in school decisions to adopt a specific program may be particularly important for gaining buy-in and support (Coffey & Horner, 2012; Fixsen et al., 2013), whether a school's *general* climate of participatory decision-making influences quality of implementation is still an open question (Ennett et al., 2003; Ringwalt et al., 2003).

Our hypothesis was that teachers who perceive that their schools rate higher on these three psychosocial dimensions of school organizational climate would deliver a higher number of *PA* lessons and associated activities and implement the program with higher quality. Consistent with Weiner's theory (2009) that contextual organizational factors lead to readiness for change, in part, by influencing individual attitudes toward the change, we hypothesized that teachers' attitudes toward SECD programs would also be positively related to the same measures of implementation.

Methods

Study Design

The present study uses data from the treatment arm of a longitudinal, cluster-randomized, controlled trial (CRCT) of *PA*. The sample was from low-performing, high-poverty K–8 schools in Chicago, with largely minority student populations. The trial was one of seven sites nationwide participating in a study funded by the U.S. Department of

Education's Institute of Education Sciences to evaluate the effects of school-based

interventions to promote social-emotional and character development.

Sampling and recruitment of schools took place during spring 2004. Participating

schools were drawn from the population of 483 K–6 and K–8 schools within the Chicago

Public Schools (CPS) system. Exclusion criteria were as follows: 1) non-community schools

(e.g., charter and magnet schools), 2) current use of *PA* or a similar SEL/SECD intervention,

3) enrollment below 50 or above 140 students per grade, 4) annual student mobility rates

under 40%, 5) greater than 50% of students who met or exceeded grade-level standards on the

Illinois State Achievement Test, and 6) fewer than 50% of students who received free or

reduced-price lunch. Sixty-eight schools were eligible to participate and 36 principals

attended a recruitment meeting. Of these, 18 agreed to participate in the study. The following

variables from the 2003-2004 CPS data were used for matching the 18 schools into 9 pairs:

percentage of White, African American, Hispanic, and Asian students; percentage of students

who met or exceeded standards on the state achievement tests; attendance rate; truancy rate;

percentage of students who received a free or reduced-price lunch; percentage of students who

enrolled or left school during the school year (mobility); number of students per grade;

percentage of parents who were involved with school activities; percentage of teachers

employed by the school who met minimal teaching standards; and geographic location within

the city. Because funding for the study allowed for only seven pairs, the seven best-matched

pairs were recruited for participation. All agreed and were randomly assigned to either *PA* or

the control condition. Data collection involved surveying students, parents, teachers, and

administrators on a wide array of measures. The present study uses teacher data from the first

year of the trial, 2004–2005.

Program Overview

     PA (Flay & Allred, 2010) is a comprehensive, school-wide, SECD program grounded in theories of self-concept, particularly Self-Esteem Enhancement Theory (SET) (DuBois, Flay, & Fagen, 2009), and consistent with social learning theories (Akers, 1998; Bandura, 1986) and other theories and approaches related to social development, health promotion, and prevention of unhealthy behaviors (Flay et al., 2009; Hawkins & Weis, 1985; Peters & McMahon, 1996). The program includes classroom curricula consisting of 140 lessons taught for 15 to 20 minutes 4 days per week for grades K through 6, and 70 lessons taught 2 to 3 days per week for grades 7 and 8 (lessons for grades 9 through 12 are also available, but were not tested in this trial). The core curricula consists of the following six units: 1) self-concept, 2) positive actions for body and mind, 3) social and emotional positive actions for managing oneself responsibly, 4) social and emotional positive actions for getting along with others, 5) social and emotional positive actions for being honest with one's self and others, and 6) social and emotional positive actions for self-improvement. Supplementary program materials (e.g., posters, music) and activities (awarding certificates of recognition) reinforce and expand upon the concepts taught during classroom lessons and are an integral part of the overall school-wide program. Previous quasi-experimental and experimental evaluations have found significant effects of *PA* on a variety of outcomes (Bavarian et al., 2013; Beets et al., 2009; Flay & Allred, 2003, 2010; Flay, Allred, & Ordway, 2001; Lewis et al., 2013a, 2013b; Li et al., 2011; Snyder et al., 2010, 2012).

     A 4-hour teacher and staff training workshop was provided to each *PA* school by the program developer at the beginning of the year. These were generally attended by all teachers and staff present at the school on the day of training. A *PA* implementation coordinator

provided ongoing consultation to principals, teachers, and other staff.

Participants

This study required linking two separate data sources—unit implementation reports (UIRs) collected by the *PA* research team at the University of Illinois at Chicago (UIC) and baseline work climate and demographic data collected as part of a teacher work climate survey (TWCS) administered by a multi-site contractor, Mathematic Policy Research, Inc. (MPR). Because the TWCS data were collected only from teachers in grades 3 to 5, our analysis was limited to those grades. Sixty-three third- through fifth-grade teachers in the *PA* schools were expected to teach the program. Of these, 52 completed UIRs for one or more units and 54 responded to the TWCS administered at the beginning of the school year. Forty-six teachers who completed both surveys and had complete data for the predictor variables were included in the present analysis. The majority (78.7%) were female; 42.6% self-identified as black, 44.7% as white, and 12.8% as Hispanic. Their mean years teaching experience was 14.7 (range 1–34 years) and 46.8% had a graduate degree. The demographics for the eight teachers who were part of the TWCS sample of 54 teachers, but were not included in the present study due to lack of UIR data (or, in the case of one teacher, incomplete data for the predictor variables), were not significantly different from the 46 teachers included in the study.

Measures

The predictor variables were collected at baseline in the fall of 2004 after the seven schools had received *PA* training, but before they began implementing the program. The implementation outcome data were collected at six subsequent time points throughout the remainder of the school year. All data were collected via teacher self-report.

Predictor variables

The climate data were collected as part of the TWCS, using the School Level Environment Questionnaire (SLEQ). The SLEQ was adapted from Moos' Work Environment Scale and was designed specifically to measure teachers' perceptions of the school work environment (Fisher & Fraser, 1991). When selecting predictors for the present study, we started with scales from a version of the SLEQ that had been revised based on psychometric testing (Johnson, & Stevens, 2001) and modified them for our sample using principal component factor analyses conducted using a larger sample of 102 teachers that included the 46 teachers in this study as well as teachers in the control-school arm of the trial. The responses for all items used a 5-point response scale (strongly disagree to strongly agree). The final measures (Table 1) were as follows: 1) "teacher-teacher affiliation" (Example item: *I feel that I could rely on my colleagues for assistance if I needed it*), 2) "innovation" (Example item: *New and different ideas are always being tried out in this school*), and 3) "participatory decision-making" (Example item: *teachers are frequently asked to participate in decisions concerning administrative policies and procedures*). "Attitudes toward SACD" was a single item that asked teachers to indicate which of the following best described their attitudes toward social and character development efforts at their school: enthusiastic, cooperative, or openly dislike. No teachers selected "openly dislike," so we dichotomized this variable (1= enthusiastic; 0=cooperative).

Program Implementation Variables

Program implementation variables were collected via UIR surveys administered by the *PA* research team at UIC. Teachers were asked to complete these at the end of each of the six units. Two of the variables were dosage measures ("average number of lessons taught per

week" and "use of supplementary materials and activities") and one was a quality measure ("quality of delivery"). Dosage refers to how much of the program was delivered and quality refers to how well the program components were carried out (Domitrovich et al., 2008; Durlak & DuPre, 2008).

The response options for "average number of lessons taught per week" ranged from 1 (one lesson) to 5 (five or more lessons). Based on implementation report data averaged over units, an estimated 53% of teachers met the program benchmark of teaching at least four lessons per week (Bickman et al., 2009).

"Use of supplementary materials and activities" was a composite variable indicating the average number of times teachers used one or more of nine activities that are part of the *PA* program, but not part of the classroom curriculum. For each unit, teachers indicated how many times they did each of the following during an average week: 1) gave out "words of the week cards" (27% met benchmark of distributing five cards per week); 2) gave out "*PA* stickers" (25% met benchmark of distributing five stickers per week); 3) gave out "*PA* tokens" (no benchmark set; 14% gave out at least five tokens); 4) read "*PA* notes" from the "ICU box" (49% met benchmark of reading five notes); 5) wrote "Positive notes" (no benchmark set; 29% gave out at least five notes per week; 6) used "*PA* music" (13% met benchmark of playing music two days per week); 7) filled out "*PA* certificates of recognition" (no benchmark set; 37% distributed two or more certificates per week); 8) talked to parents about the *PA* program (19% met benchmark of speaking with two parents per week); and 9) infused *PA* ideas into curriculum areas (no benchmark set; 21% infused five or more ideas per week). Fifty-three percent of teachers met the benchmark for at least one of the

supplementary activities for which benchmarks were set. Possible responses ranged from 0 to 5 or more and were averaged across units to create a scale for analysis.

"Quality of delivery" was measured by asking teachers, "How well do you think you delivered the *Positive Action* program during this unit?" (Response options: 1 – poorly; 2 – about average; 3 − quite well; 4 – very well). The program benchmark of reporting that the program was delivered very well or quite well was met by an estimated 69% of teachers. Again, responses were averaged across the units.

Teachers responded to an average of 3.36 of the 6 UIRs. The fact that most teachers responded to several of the program units allowed for a composite across-unit measure of the outcomes with no missing data. To assess the validity of this approach, we compared UIR data for the number of lessons per week with similar data collected during an end-of-year survey completed by the third-grade teachers in the sample (data were not available for fourth- and fifth-grade teachers). With the exception of one missing data point, the 18 teachers who completed the end-of-year survey reported that they taught all of the lessons in all six units. This suggests that the missing data in the UIR reports were due to failure to complete the reports rather than to teachers not delivering the lessons. However, for the entire sample, the number of missing UIRs was negatively correlated with the dosage variable "average number of lessons taught per week" ($r=-0.4$), raising the possibility that teachers who completed fewer reports implemented fewer lessons. The number of missing UIRs was positively correlated with a measure of work pressure, suggesting that teachers who felt more work pressure completed fewer reports ($r=.25$).

Although this study relied on teacher self-report for both the predictor and outcome variables, the reports from a subset of the participants (18 teachers who taught the Grade 3

student cohort) demonstrated modest positive correlations between average student ratings of engagement with the *PA* program and teacher reports of number of lessons taught, use of supplementary materials and activities, and quality of implementation ($r=$ .24, .46, and .31, respectively). This provides support for the validity of teacher-reported implementation as students could not be engaged in something that was not happening or lacked sufficient quality.

Analytic Strategy

Stata 12.1 was used for all analyses including: descriptive statistics for demographic characteristics and model variables; bivariate correlations; missing data reports; scale analysis of the three school organizational climate scales; and model estimation. Model estimation was conducted using ordinary least squares regression with Stata's vce (cluster *variable*) command. This command is ideal for studying teachers in schools because it provides robust estimates of standard errors in the presence of non-independent observations. The small number of clusters (7) for the present sample is considered too low for multi-level analysis (Hox, 2010).

Results

Descriptive statistics for the predictor and outcome variables are shown in Table 1 and bivariate correlations in Table 2. Bivariate correlations indicated that quality of delivery was positively correlated with both average number of lessons taught per week ($r=$.28) and use of supplementary materials and activities ($r=$.45). All three outcome variables were also positively correlated with "attitudes toward SACD" programs, although not all were statistically significant. Among the climate variables, innovation was positively correlated with participatory decision-making and teacher-teacher affiliation. Intraclass correlations

(teachers within schools) for the three outcome variables were as follows: average number of lessons per week, .30; use of supplementary materials and activities, .04; and quality of delivery, .11.

Findings for the regression analyses are provided in Table 3. As can be seen, teacher perceptions of their school's innovativeness were a significant and positive predictor of the average number of lessons taught per week as well as of self-rated quality of program delivery. Ratings of teacher-teacher affiliation were a significant predictor of greater reported use of supplementary program activities and materials. Finally, teachers' perceptions of their schools' participatory decision-making climates were a significant predictor of lower self-rated quality of program delivery.

Discussion

Despite its small sample size, this study had several significant and interesting results that extend the findings of the previous study of the influence of school organizational climate on the implementation of *PA* (Beets et al., 2008). Teachers' perceptions of their school's tendency to be innovative were predictive of their reports of delivering a greater number of *PA* lessons and a higher quality of delivery. This is an expected finding given that prior research and theory suggests that employees of organizations that have a climate of being open to experimentation and new ideas are more likely to assimilate new practices (Cook et al., 2012; Greenhalgh et al., 2004). In the case of the current analysis, it is reasonable to assume that when teachers viewed their school's organizational culture as innovative, they were more likely to embrace and use *PA*.

Perceptions of teacher-teacher affiliation as a dimension of school climate were predictive of greater reported use of supplementary program activities and materials. As

noted earlier, "teacher relationships" has been the subject of a number of prior studies, although the measures used, as well as the findings, have varied. Several have found a significant positive association with some aspect of implementation (Beets et al., 2008; Ennett et al., 2003; Gregory et al., 2007), while others showed no significant relationship (Kallestad & Olweus, 2003, Low et al., 2013). Our study found no association between teacher-teacher affiliation and curriculum implementation. Teacher-teacher affiliation was, however, significantly associated with the use of supplementary activities and materials, many of which are school-wide in nature, rather than limited to the classroom. Stronger affiliation among teachers likely led to more opportunities to share ideas about *PA* materials and observe other teachers as they carried out *PA* activities outside of the classroom. This may have influenced teachers' use of these supplementary program components, with higher levels of use by teachers who had perceptions of high engagement and support among teachers in their schools.

One unexpected finding was a negative association between perceptions of the extent to which a school uses participatory decision-making practices and implementation. Participatory decision-making practices are often cited as an important influence on program implementation efforts (Domitrovich et al., 2008; Durlak & DuPre, 2008). As noted under "Aims of the Present Study" above, prior research indicates that obtaining teacher buy-in for specific programs is likely to influence implementation (Coffey & Horner, 2012; Fixsen et al., 2013). Our findings suggest, however, that a *general* climate of participatory decision-making in a school may not necessarily be conducive to greater program implementation. This is consistent with a study of school-based substance use prevention programs that found no association between teacher perceptions of a school's shared decision-making climate and

curriculum guide usage (Ringwalt et al., 2003). The finding of a negative association between implementation and a climate of participatory decision-making is hard to explain, however. Perhaps when teachers perceive their school environments as supportive of their involvement in decision-making, they are more comfortable making their own determinations of whether and how much to implement a program that is being introduced into the school, thus potentially lowering levels of implementation. It is also possible that this finding occurred due to chance and would not be replicated in future studies.

Finally, we found a significant association between "attitudes toward SACD" and the use of supplementary activities and materials. Weiner (2009) has theorized that organizational contextual factors may influence organizational change, in part, because, if positive, they inspire organizational members' to have favorable attitudes toward the impending change. This, in turn, contributes to organizational readiness to implement an intervention effectively.

Limitations

There are a number of limitations that must be kept in mind when interpreting the results of this study. First, because of the small sample size, the study had limited statistical power to detect significant associations. Second, collecting detailed implementation data from busy teachers was challenging and there was a significant amount of missing data for the program implementation variables. Our findings are based on the assumption that a teacher's average value for each implementation variable reflects their true value for the school year regardless of the number of units they reported on.

Both the predictor and outcome data were collected via teacher self-report. Measures from the same source tend to be more highly correlated than measures from different sources,

which may result in finding an association that is due to the method of measurement rather than a true relationship. This may be offset, however, by the fact that the data were collected at different times (climate data at the beginning of the school year and implementation data following each unit). In addition, implementation data for a subset of the sample was correlated with student-reported levels of engagement with the program, which supports the validity of these data.

Another common criticism of self-report data is that it overestimates treatment integrity as compared to observational measures (Lane, Bocian, MacMillan, & Gresham, 2004). Some studies, however, have shown a correspondence between teacher self-report data and independent observations of program use (Abry, Rimm-Kaufman, Larsen, & Brewer, 2013; Biggs, Vernberg, Twemlow, Fonagy, & Dill, 2008; Ransford, Greenberg, Domitrovich, Small, & Jacobson, 2009), suggesting that that teacher self-report is a reliable measure of implementation. Furthermore, due to the expense of observing teachers in classrooms, observational data are usually limited to short, intermittent blocks of time and may not capture teachers' true performance when they are not being observed or videotaped.

Finally, because of the small sample size and small number of schools, it was not feasible to aggregate the measures of teachers' perceptions of organizational climate. In future studies, it would be useful to test aggregated perceptions, as well as unaggregated perceptions, as climate is often understood as the shared perceptions of a setting (Tseng & Seidman, 2007).

Implications and Suggestions for Future Research

A key strength of this study was that it measured baseline indicators of school organizational climate and analyzed their association with later implementation outcomes. It

also used measures of school organizational climate that have a strong theoretical foundation and could be easily used by schools to assess organizational climate perceptions of teachers and other personnel. Finally, the sample of low-income, low-performing, largely minority population schools provided a setting in which program implementation may be particularly challenging.

Although there has been extensive research conducted related to the development of a variety of social-emotional learning and other prevention programs, studies indicate that they are often not well-implemented (Durlak et al., 2011; Ennett et al., 2011) and research and theory designed to better explain and address the complex processes involved in moving evidence-based interventions from research to practice is rapidly expanding (Spoth et al., 2013). Because implementation is a "social process that is intertwined with the context in which it takes place" (Damschroder et al., 2009), current research efforts to address the problem of fidelity of implementation involve studies to better understand the variety of contextual influences on implementation behavior (Fixsen et al., 2005; Weiner, 2009). It is to this area of implementation research that the present study contributes.

Awareness of the potential positive influence on implementation of two of the climate measures explored in this study—innovation and teacher-teacher affiliation—may be useful to school administrators and technical assistance providers who are interested in building general capacity to successfully implement SECD and related programs. Of note in this regard, the range of observation values for each of the implementation outcome measures described above spanned the specified benchmarks set by the program developers (detailed in the measures section). Thus, there is reason to believe that the predictive relationships found here have practical importance.

At the same time, studies are needed that include a broader array of variables that influence implementation so that the relative importance of organizational climate on readiness and ongoing program delivery can be assessed. Future research, both quantitative and qualitative, will likely benefit from examining organizational climate in the context of other possible influences on implementation. It is generally conceded that schools that function well are more likely to implement programs with fidelity and that very disorganized or poorly functioning schools have difficulty implementing new programs (Gottfredson, Jones, & Gore, 2002), but it is not known to what extent organizational climate, as one influence on a school's overall functioning, is an influential factor. Organizational climate is just one aspect of this overall complexity.

Knowing the current strengths and needs of an organization prior to selecting and attempting to implement an innovation is essential (Fixsen et al., 2005, p. 8). If the results of the present and other studies with positive findings are replicated, and causal mechanisms identified, this could provide a useful foundation for utilizing knowledge of organizational climate to support the use of evidence-based prevention programs in schools.

Acknowledgements

Table 2.1. Descriptive statistics for model variables (N=46)

Variables	# of items	Mean(SD) or %	Range	α
Innovation	4	3.47(0.60)	1.75–5.00	0.68
Participatory decision-making	4	2.91(0.61)	1.75–4.25	0.69
Teacher-teacher affiliation	7	4.09(0.65)	2.43–5.00	0.89
Enthusiastic toward SACD		76.09%	0.00–1.00	
Average number of lessons taught per week		3.59(1.07)	1.00−5.00	
Use of supplementary activities and materials		15.44(10.33)	0.00–36.0	
Quality of delivery		2.90(0.67)	2.00–4.00	

Table 2.2. *Bivariate correlations of model variables (N=46)*

Measure	1	2	3	4	5	6
1. Average number of lessons taught per week						
2. Use of supplementary materials and activities	.39**					
3. Quality of delivery	.28†	.45**				
4. Innovation	.28†	.18	.19			
5. Participatory decision-making	.00	−.10	−.24	.49***		
6. Teacher-teacher affiliation	.25†	.31*	.16	.33*	.20	
7. Attitude toward SACD	.37*	.25†	.24	.04	−.04	.10

†p <.10   *p <.05   **p <.01   ***p <.001

Table 2.3. Summary of ordinary least squares regression analysis (N = 46)

Predictor variable	Average Number of Lessons Taught per Week		Quality of Delivery		Use of Supplementary Activities and Materials	
	B (SE)	β (SE)	B (SE)	β (SE)	B (SE)	β (SE)
Participatory decision-making	−0.28 (0.18)	−0.16 (0.10)	−0.46 (0.14)*	−0.42 (0.13)*	−4.10 (3.10)	−0.24 (0.18)
Innovation	0.53 (0.16)*	0.30 (.09)*	0.40 (0.06)***	0.36 (0.05)***	3.52 (4.12)	0.20 (0.24)
Teacher-teacher affiliation	0.26 (0.18)	0.16 (.11)	0.12 (0.11)	0.11 (0.10)	4.26 (1.05)**	0.27 (0.07)**
Attitudes toward SACD	0.83 (0.41)†	0.33 (0.16)†	0.30 (0.22)	0.19 (0.14)	4.93 (1.77)*	0.21 (0.07)*
R^2	0.25		0.23		0.20	

†p <.10   *p <.05   **p <.01   ***p <.001

Note: Standard errors were adjusted for the 7 school clusters.

CHAPTER 3: MANUSCRIPT 2

Supporting Teachers in Their Implementation of *Positive Action*: Investigation of the Influence of Technical Assistance

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Abstract

Background

Technical assistance (TA) can be a useful adjunct to training for teachers who implement school-based prevention programs, but evidence regarding the effectiveness of different dosages of TA for this purpose is limited.

Methods

Path analysis was used to analyze associations between teachers' level of implementation of *Positive Action*, a school-based social-emotional learning and health promotion program, attitudes toward the program, and dosage of TA received from a *PA* implementation coordinator. Participants were 48 teachers who completed end-of-year surveys during the last two years of a 6-year trial of *PA* in a low-performing, high-poverty, largely racial-ethnic minority population schools in Chicago.

Results

Higher dosages of TA were associated with a higher number of lessons per week in 2008-2009 and greater use of PA materials in both 2008-2009 and 2009-2010. Furthermore, there were significant indirect associations between TA dosage and more positive attitudes toward PA in 2008-2009, which, in turn, predicted higher levels of implementation in 2009-2010.

Conclusions

The findings suggest that providing a consistent source of TA in the form of consultation, information, and advice is associated with higher levels of implementation and, indirectly, with more positive attitudes toward the intervention.

Introduction

Program implementers often need support that goes beyond simply receiving information about an intervention (Wandersman et al., 2008). Training workshops, for example, are a common means of sharing knowledge about the scope and content of an intervention, but available research suggests that their ultimate effect on the quality of practitioner implementation, or improvement in outcomes to target audiences, is small (Davis, Thomson, Oxman, & Hayes, 1995; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Forsetlund et al., 2009; Joyce & Showers, 2002). In the case of school-based prevention programs, it is primarily teachers who are responsible for delivering classroom curricula and other program components. However, these programs are often implemented with poor fidelity (Ennett et al., 2011) and evidence identifying effective strategies to influence the quality of teacher implementation is limited (Reyes et al., 2012).

In this study, we used path modeling to examine the potential influence of technical assistance (TA)—a type of support used to augment training—on teachers' implementation of *Positive Action*, a school-based social-emotional learning and health promotion program. Technical assistance (TA) has long been used to enhance training in both public health (Davis et al., 2000; Mitchell, Stone, Wiggins, Stevenson, & Florin, 2004; Wandersman et al., 2012) and educational initiatives (McInerney & Hamilton, 2007; Wesley & Buysse, 1996). It can be broadly thought of as individualized consultation and other forms of support that occur outside of a formal training context (Wandersman et al., 2012)[1]. Like training, TA is intended

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[1] Technical assistance varies greatly in terms of intensity and scope. In some public health and education contexts, the term technical assistance refers to a much broader array of services (Mitchell et al., 2002).

to build individual or organizational capacity to implement an intervention (Chinman et al., 2005).

The *Positive Action (PA)* program includes classroom curricula consisting of over 140 lessons taught for 15 to 20 minutes 4 days per week for grades K through 6, and 70 lessons taught 2 to 3 days per week for grades 7 and 8. The core curricula consists of the following six units: 1) self-concept, 2) positive actions for body and mind, 3) social and emotional positive actions for managing oneself responsibly, 4) social and emotional positive actions for getting along with others, 5) social and emotional positive actions for being honest with one's self and others, and 6) social and emotional positive actions for self-improvement (Flay & Allred, 2010). The program also includes extra-curricular materials that reinforce and expand upon the concepts taught during classroom lessons and improve classroom and school climate. They are an integral part of the overall program. Previous quasi-experimental and experimental evaluations have found evidence of significant effects of PA on a variety of outcomes (Bavarian et al., 2013; Beets et al., 2009; Flay & Allred, 2003, 2010; Flay, Allred, & Ordway, 2001; Lewis et al., 2013a, 2013b; Li et al., 2011; Snyder et al., 2010, 2012).

Conceptual Model

Our analysis was designed to investigate associations between hours of TA received, teacher-reported implementation of *PA*, and teacher attitude toward *PA*. Specifically, as depicted in Figure 1, we hypothesized that *within* two separate school years (2008-2009 and 2009-2010) greater amounts of TA would predict higher levels of implementation. Higher levels of implementation would, in turn, predict more positive teacher attitudes and mediate an association between hours of TA and attitudes. In addition, because behavioral theories support an association between positive attitudes about an intervention and better

implementation of the intervention (Chinman et al., 2008), we hypothesized that the association between level of implementation and attitudes would also flow in the opposite direction or have a feedback effect. Thus, the model indicates that *across* school years, more positive attitudes in the 2008-2009 predict higher levels of implementation in 2009-2010.

Technical Assistance and Practitioner Implementation

Several studies have suggested that training followed by onsite or distance TA is associated with better program implementation or other measures of program performance than training alone (Acosta et al., 2013; Dusenbury et al., 2010; Joyce & Showers, 2002; Mihalic & Irwin, 2003; Rohrbach, Gunning, Sun, & Sussman, 2010a). Rohrbach et al. (2010a) compared the association of two training approaches with high school teachers' implementation of the *Project Towards No Drug Abuse* program. One approach consisted of a standard training workshop, whereas the other was more comprehensive, including the workshop plus follow-up web-based support, onsite coaching, and additional TA via phone and e-mail. The analysis, which involved 54 teachers from a sample of high schools across the U.S., found that implementation fidelity was significantly higher for teachers who received comprehensive support as compared to those who did not (Rohrbach et al., 2010b). Mihalic and Irwin (2003) reported on a 2-year study of programs designed to reduce violence and other problem behaviors implemented in 42 sites (a mix of schools and state and community agencies) across the U.S. Multivariate regression models found that the number of TA visits was a marginally significant predictor of greater implementation dosage.

Other studies have evaluated an intervention that uses a combination of a manual, face-to-face training, and on-site TA to help prevention providers use the *Getting To Outcomes (GTO)* model, a 10-step process (e.g., needs assessment, goal setting, program

planning, evaluation) designed to help organizations or agencies effectively implement any type of prevention program (Chinman et al., 2008; Chinman et al., 2013). In one study, Chinman and colleagues (2008) found a marginally significant correlation between improvement in implementation of the 10 steps, as assessed by a rating instrument called the GTO-Innovation Configuration Map (data for the map was collected via interviews with program directors), and the total number of TA hours received by six substance abuse prevention programs. A second study (Acosta et al., 2013; Chinman et al., 2013) found a high (r=.66), but not statistically significant (possibly due to a sample size of only seven), correlation between better implementation of a variety of GTO domains and TA hours received by 17 positive youth development programs.

Technical Assistance and Practitioner Attitudes

Research on an association between TA and practitioner attitudes toward public health and prevention programs is limited. One exception is a study of the *Project Towards No Drug Abuse* program, which found a trend toward a positive change in teachers' beliefs about the value of the program for those who participated in comprehensive training (training workshop plus follow-up support) as compared to those who only participated in a training workshop (Little et al., 2013). Beliefs did not, however, have a mediating effect on implementation.

Despite the little research that has been conducted in this area, it is well accepted that the purpose of implementation support, whether in the form of tools, training, or TA is to influence implementation behavior by building the capacity of practitioners to deliver an intervention (Wandersman et al., 2008), where "capacity" refers not only to the knowledge and skills needed to conduct an intervention correctly, but also to the attitudes or "buy-in" that

provide the motivation needed to conduct the intervention in the right dose and manner (Flaspohler et al., 2008). In the field of teacher education, the term "disposition" is used to describe a similar, but less specific concept than attitude toward a behavior (Thornton, 2013). National teacher education standards recognize that teachers must possess a combination of knowledge, skills, and dispositions in order to have a positive impact on student learning (NCATE, 2006). Research into the influence of dispositions on teacher performance has been limited to date, likely because of the lack of clarity of the construct (Thornton, 2013), but its inclusion in national standards indicates that the goals of teacher training are to influence not just knowledge and skills, but also attitudinal constructs that drive behavior.

Practitioner Attitudes and Implementation Behavior

As noted, the conceptual model examined in the current research accounts for an association between level of implementation and attitude toward *PA* that flows in both directions. Greater levels of implementation are linked to more positive attitudes toward *PA* within each year and more positive attitudes toward *PA* are expected to predict higher implementation across years. The path indicating that higher levels of implementation lead to more positive attitudes is based on studies suggesting that positive experiences with an intervention are associated with more positive attitudes toward it (Deutsch, Herrmann, Frese, & Sandholzer, 2012; Katz et al., 2013). We make the assumption that because higher levels of implementation reflect the achievement of greater behavioral capability (Barnowski, Perry, & Parcel, 2002), greater use of *PA* is associated with teacher mastery of new skills and knowledge and, thus, more positive experiences.

Because the relationship between attitude and level of implementation is bidirectional, Figure 1 also shows a path from "attitude toward *PA*" to implementation. This is consistent

with theories such as the Theory of Planned Behavior, which predict that beliefs and attitudes toward behaviors account for a substantial proportion of the variance in intention to engage in them and, ultimately, also in actual performance of the relevant behaviors (Ajzen, 1991). Available evidence suggests that when teachers have positive attitudes related to social and emotional learning and health promotion interventions, they are more likely to deliver them in a consistent and engaging manner (Jennings & Greenberg, 2009; Reyes et al., 2012). Previous studies also have found that positive attitudes toward a given prevention program is associated with better implementation (Beets et al., 2008; Reyes et al., 2012). For example, in an earlier trial of the *PA* program in Hawai'i, more positive teacher attitudes toward *PA* predicted greater amounts of curriculum delivered (Beets et al., 2008); and a study of the use of the *RULER Approach* to social and emotional learning found that greater teacher ($N = 28$) buy-in to the program was highly correlated ($r = .62$) with better program delivery as rated by implementation coaches (Reyes et al., 2012). Similarly, teacher adherence to a school-based violence prevention program called *CAPSLE* (*Creating a Peaceful School Learning Environment*) was positively and significantly correlated with the belief that it was a helpful program (Biggs et al., 2008).

Hypotheses

The present study was designed to add to existing knowledge in two ways. First, it uses TA dosage as a measure of TA. Although evidence from prior research indicates that training plus follow-up TA is associated with better program implementation than training alone (Joyce & Showers, 2002, Fixen, et al., 2005), data about the extent to which different dosage levels are relevant is limited. Second, we explicitly include an examination of a direct association between TA dosage and attitudes toward *PA*, and an indirect association between

TA and implementation, via attitudes. Although influencing beliefs and attitudes is a key objective of TA (Flaspohler et al., 2008), published findings in this area are sparse.

Using survey data from 48 teachers who participated in the Chicago *PA* trial for two consecutive school years, we investigated associations among each of the areas described above. Our specific hypotheses were as follows:

1) Higher dosages of TA will predict greater teacher-reported implementation of the *PA* program.

2) Higher dosages of TA will indirectly predict more positive teacher attitudes toward the *PA* program (mediated by greater teacher-reported implementation).

3) There will be a significant association between greater implementation of *PA* and positive teacher attitudes, with greater implementation predicting more positive attitudes during a single school year and more positive attitudes predicting greater implementation from one year to the next.

Method

Participants

The sample for the present study consisted of classroom teachers from schools in the program schools ("treatment arm") of a longitudinal, cluster-randomized, controlled trial of the *PA* program that was conducted with low-performing, high-poverty K–8 Chicago schools that had largely racial-ethnic minority student populations. The present analysis used non-randomized data from surveys administered to teachers in the treatment schools only. In addition, participants were limited to teachers who were present in the last two years of the trial (the 2008-2009 and 2009-2010 school years) when data about technical assistance (TA) were collected. Eighty-seven teachers were eligible to participate, but only 48 completed the

survey that provided the data for this study in both years and thus comprise the sample for the present study. Demographic data were available for only 26 of the 48 participants (demographic data was collected as part of a separate survey that was not completed by all teachers). The majority (61.5%) were female; 15.4% self-identified as black, 38.5% as white, and 11.5% as Hispanic. Their mean years teaching experience was 5.9 (range 2–27 years) and 53.9% had a graduate degree.

Instrumentation

TA Dosage Measures

Two items queried survey respondents about the total amount of time over the course of the school year that "technical support" was provided to them a) individually and b) in a group setting (not including the training event held at the beginning of the year). There were five potential response options ranging from none to greater than three hours. Based on initial analysis of the distribution of these variables, they were recoded into 3 categories (0, less than 2 hours, 2 hours or more). The group and individual measures were averaged to create one "TA dosage" variable for each school year.

Teacher Attitude Measure

Teacher "attitude toward *PA*" was measured by asking respondents to rate their level of agreement or disagreement with the following four statements using a 4-point Likert scale: a) "the time required by *PA* is well worth it in improved student behavior and easier classroom management," b) "the more effort I put into *PA*, the more effective it is," c) "the longer I use *PA*, the easier it will make my job," and d) "I benefit personally from teaching *PA*." These items are consistent with Fishbein and Ajzen's expectancy-value model of

attitudes, in which attitudes are considered positive or negative evaluations of specific behaviors and their likely consequences (Ajzen, 1991).

Implementation Dosage Measures

Two scales were used to measure implementation dosage. Each reflects a different perspective on teachers' use of the *PA* program. The first, "lessons per week," consisted of 6 items reflecting the average number of lessons teachers taught per week for each unit. There were 6 possible response options (0, 1, 2, 3, 4, 5 or more). The second measure, "*PA* materials use," consisted of four items that asked teachers how "often/much" they used four different types of *PA* materials (tokens, "word of the week" cards, SOS or ICU boxes, and positive notes). Response options ranged from 0 to 4 (never, rarely, sometimes, often, always). The materials are briefly defined as follows: 1) *PA* tokens are tokens awarded to classrooms that follow their classroom rules; 2) word of the week cards emphasize key concepts from *PA* lessons; 3) SOS ("Salute Our Students") and ICU ("I See You Doing Something Positive") boxes are for students and teachers to put messages recognizing people who do positive actions; and 4) positive notes are notes about a student sent to his or her parents.

Procedure

Data Collection

The Chicago *PA* trial was initiated as part of a seven-site nationwide study, funded by the Institute of Education Sciences, to evaluate the effects of school-based interventions to promote social-emotional and character development (Social and Character Development Research Consortium, 2010). Data were collected as part of an end-of-year process survey

administered to teachers of grades K–8 in the spring of the 2008-2009 and 2009-2010 school years. The surveys were not anonymous, but responses of individual teachers were not shared with school administrators in accordance with the potential this would present for biased reporting. Although end-of-year process surveys were also administered to teachers at three other time points during earlier years of the study, they did not include items related to technical support, a key measure required for the present analysis. Demographic data were obtained from a separate "Teacher Report on Classroom and School" survey.

Training and Technical Assistance (TA)

At the beginning of each school year, the program developer and the *PA* implementation coordinator conducted a 2-hour staff training workshop at each school. Follow-up TA was provided throughout the year via individual and group consultation by the *PA* implementation coordinator, who was a PhD student in Public Health and had a Master's degree in psychology. The coordinator visited the schools weekly to answer questions, share materials, and make suggestions. TA was both proactive (e.g., reaching out to talk with a teacher that had not been submitting implementation reports to find out if he or she needed assistance) and reactive (e.g., responding to questions and requests).

Data Analysis

Stata 12.1 was used for all analyses including: descriptive statistics, bivariate correlations, missing data reports scale analyses, and model estimation. We opted to examine the two implementation outcome variables—"lessons per week" and "*PA* materials use"— separately, rather than as indictors of one latent variable, because they represent distinct components of the *PA* program and thus could demonstrate differing associations with the other measures included in the model.

Because the variables were not normally distributed, we used Stata's "vce(robust)" option to obtain estimates of standard errors that were robust to non-normality. There were no missing data for 6 of the 8 variables in the model. The exceptions were "TA dosage" for 2008-2009, which was missing 3 of the 48 observations and "lessons per week" for 2009-2010, which was missing 1 observation. We used a Stata's "method (mlmv)" option to account for these few missing values. Because Stata output does not report fit statistics when the "method (mlmv)" option is used and reports only SRMR when the "vce(robust)" option is used, we also ran the models using maximum likelihood without both options to obtain fit statistics (χ^2, CFI, RMSEA,SRMR). Model fit was assessed using the following indices: χ^2, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), and Standardized Root Mean Square Residual (SRMR) according to accepted guidelines (Brown, 2006; Kline, 2005).

Although, the model we tested is theoretically based, we examined modification indices to identify options to re-specify the model. Suggested modifications did not have a substantial impact on model fit and were not consistent with our theory so were not incorporated.

There were seven treatment schools in the study, only but 6 schools were represented by the 48 teachers in the sample used for this study. In addition, one of the six schools was represented by only one teacher. Thus we were unable to account for clustering (teachers nested within schools), due to the small number of clusters. Intraclass correlations (ICCs) for the "lessons per week" variable were .24 and .19 for 2008-2009 and 2009-2010 respectively; 0.11 for "TA dosage" in 2009-2010; and less than 0.10 for the remaining variables.

Results

Descriptive statistics and zero-order correlations for all model variables are shown in Table 1. Bivariate correlations indicated that there was no direct association between TA dosage and attitude toward *PA* in either year. We tested an initial model (not shown) that included these paths, but they were non-significant and were dropped. The subsequent model also contained a number of non-significant paths. They were dropped from the final model, which is shown in Figure 2 and Table 2.[2]

TA and Implementation Path Findings

In 2008-2009, there was a significant association between TA dosage and teacher-reported implementation. Higher dosages of TA directly predicted a greater number of lessons per week and indirectly predicted (through lessons per week) a greater use of *PA* materials. In 2009-2010, higher dosages of TA predicted greater materials usage, but were not associated with the number of lessons delivered.

TA and Attitudes Path Findings

There was a significant indirect association between higher TA dosage and more positive attitudes toward *PA* (TA → lessons → materials → attitude) in 2008-2009 and a marginally significant association (TA → materials → attitude) in 2009-2010.

Implementation and Attitude Path Findings

In 2008-2009, greater use of *PA* materials predicted more positive attitudes toward *PA* and more positive attitudes subsequently predicted higher levels of implementation in 2009-

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[2] The fit indices were tested using maximum likelihood without Stata's "method(mlmv)" and "robust(vce)" options and were consistent with accepted values: χ^2(df) =20.71(18) RMSEA = 0.059; CFI = 0.98; SRMR = 0.065.

2010. The latter association was direct for lessons per week and indirect (through lessons per week) for *PA* materials use. A greater number of lessons per week also indirectly (through materials usage) predicted more positive attitudes toward *PA* in both years.

Discussion

This study investigated patterns of association between technical assistance dosage (TA), teacher attitude toward *PA*, and implementation of two key components of the *PA* program: delivery of program lessons and use of PA materials. The findings provide some support for all three of our hypotheses but were not consistent across measures of the types of implementation. In keeping with our first hypothesis, greater hours of TA received were associated with both higher levels of implementation of lessons in the first year of the study and greater use of program materials during the second year. This suggests that during the latter year, teachers no longer needed TA related to implementation of lessons, but still required assistance related to use of the extra-curricular materials. Although the data for these paths were cross-sectional, given theoretical understanding identifying TA as a means of improving implementation (Flaspohler et al., 2008; Wandersman et al., 2008), as well as prior research suggesting a positive influence of TA on implementation (Chinman et al., 2008; Chinman et al., 2013; Mihalic and Irwin, 2003; Rohrbach et al., 2010b), the assumption that the direction of the path flows from TA to the implementation measures is reasonable. In keeping with our second hypothesis, higher dosages of TA were indirectly linked to teacher attitudes via lessons and materials in 2008-2009 and via materials alone in 2009-2010. The latter finding was not surprising given the above noted lack of a direct association between TA dosage and number of lessons taught per week.

Finally, consistent with our third hypothesis, greater levels of each type of implementation were linked to more positive attitudes toward *PA* in both years. This association was direct for *PA* materials use and indirect, via PA materials use, for lessons per week. Again, although these paths used only cross-sectional data, it is reasonable to assume the proposed directional flow as at least partially accounting for the observed associations given prior research and theory on the influence of attitudes on behavior (Ajzen, 1991; Beets et al., 2008; Reyes et al., 2012). Our other finding regarding the association between attitudes and implementation, however, is longitudinal, providing stronger evidence for causality— more positive attitudes toward *PA* in year 1 of the study predicted higher scores on both measures of implementation in year 2.

Limitations

A number of limitations of the current research merit discussion. First is the small sample size, which limited the power of the analysis to detect significant associations among measures and also constrained the potential complexity of the model. Such sample sizes are not uncommon in implementation research for school-based prevention programs as the number of teachers involved is typically small (Reyes et al., 2012; Rohrbach et al., 2010a). Second, measures of a number of constructs that would likely enhance the model were not available, including self-efficacy beliefs and subjective norms, as specified by the Theory of Planned Behavior (Ajzen, 1991). In particular, we were not able to control for the influence of self-efficacy beliefs for implementation, which have been found to be associated with training and TA in a previous study (Little et al., 2013). Third, the only measure of TA available for this investigation was dosage. Therefore, other potentially significant elements such as technical assistance quality, format, and content (Wandersman et al., 2012) were not

evaluated. Finally, data on TA dosage were available only for the last two years of the 6-year

trial. Future studies should evaluate the influence of TA over a longer period of time that

encompasses earlier stages of the implementation process.

Conclusions

Despite limitations, this study adds to a growing body of knowledge regarding

effective implementation supports for school-based prevention programs. By using path

modeling, it builds on previous studies, which have primarily been analyzed using bivariate

correlations. Furthermore, by including teacher attitudes toward the program as a mediator, it

examined a potential mechanism by which TA may influence teacher implementation

behavior. Although, ideally, implementation studies should be conducted outside of the

context of an efficacy trial in order to investigate "real-world" effectiveness (Flay, 1986; Flay

et al., 2005; Rohrbach et al., 2010a), the TA data gathered during the Chicago trial provided a

unique opportunity to explore an area of support for school-wide programs that has not been

well-researched.

Implications for School Health

When implementing a whole-school intervention designed to impact a range of student

health and behavioral outcomes, it is the responsibility of school administrators to ensure that

personnel are prepared to deliver the intervention. Previous research, however, has shown

that supplying information about a program to teachers via training workshops is not

sufficient for improving implementation behavior (Chinman et al., 2005; Joyce & Showers,

2002); this is likely to be particularly true for complex whole-school programs like *PA* that

require a strong joint effort on the part of school personnel. The findings of this study suggest

that providing a consistent source of TA in the form of consultation, information, and advice

is associated with higher levels of implementation and, indirectly, with more positive attitudes toward the intervention.

Table 3.1. Descriptive statistics and zero-order correlations for model variables

	1	2	3	4	5	6	7	8
1.TA Dosage 2008-2009	−							
2.TA Dosage 2009-2010	0.52***	−						
3.Average Number Lessons per Week 2008-2009	0.05*	0.28†	−					
4.Average Number Lessons per Week 2009-2010	−0.09	0.16	0.63***	−				
5.PA Materials Usage 2008-2009	0.25†	0.04	0.63***	0.57***	−			
6.PA Materials Usage 2009-2010	0.26†	0.35*	0.46***	0.55***	0.42**	−		
7.Attitude Toward PA 2008-2009	0.08	0.03	0.19	0.41**	0.43**	0.37**	−	
8.Attitude Toward PA 2009-2010	0.10	0.09	0.36*	0.43**	0.42**	0.53***	0.56***	−
Observations	45	48	48	47	48	48	48	48
Mean	0.97	0.80	2.69	2.81	1.88	1.91	3.10	2.98
SD	(0.69)	(0.66)	(1.31)	(1.17)	(0.97)	(0.94)	(0.66)	(0.69)
Range	0–20–2	0–2	0–5	0–5	0–4	0–3.75	1.25–4	1–4
Items	2	2	6	6	4	4	4	4
Alpha	0.75	0.85	0.97	0.94	0.82	0.80	0.92	0.91

***$p<.001$, **$p<.01$, *$p<.05$ †$p<.10$

Table 3.2. Unstandardized and standardized estimates and significance levels for model paths shown in figure 3 (Standard Errors in Parentheses; N = 48)

Parameter estimate	Unstandardized	Standardized	p^{a}
Direct Paths			
Lessons 08-09 → Materials 08-09	.48(.08)	.63(.10)	<.001
Materials 08-09 → Attitude 08-09	.28(.08)	.43(.11)	<.001
TA 08-09 → Lessons 08-09	.66(.23)	.36(.11)	.002
Attitude 08-09 → Lessons 09-10	.67(.22)	.36(.12)	.004
Lessons 08-09 → Lessons 09-10	.53(.09)	.56(.08)	<.001
Lessons 09-10 → Materials 09-10	.44(.10)	.55(.12)	<.001
TA 09-10 → Mater+-ials 09-10	.41(.20)	.27(.13)	.036
Attitude 08-09 → Attitude 09-10	.45(.10)	.43(.12)	.001
Materials 09-10 → Attitude 09-10	.26(.08)	.38(.11)	.001
TA 08-09 → TA 09-10	.50(.11)	.54(.10)	<.001
Indirect Paths[b]			
TA on implementation			
TA 08-09 → Lessons 08-09 → Materials 08-09	.32(.12)	.22(.08)	.005
TA on attitude			
TA 08-09 → Lessons 08-09 → Materials 08-09 → Attitude 08-09	.09(.05)	.10(.05)	.047
TA 09-10 → Materials 09-10 → Attitude 09-10	.11(.06)	.10(.06)	.085
Implementation on attitude			
Lessons 08-09 → Materials 08-09 → Attitude 08-09	.14(.05)	.27(.09)	.003
Lessons 08-09 → Lessons 09-10 → Materials 09-10 → Attitude 09-10	.06(.03)	.12(.05)	.014
Lessons 09-10 → Materials 09-10 → Attitude 09-10	.12(.05)	.21(.08)	.007
Materials 08-09 → Attitude 08-09 → Attitude 09-10	.13(.05)	.18(.08)	.022
Attitude on implementation			
Attitude 08-09 → Lessons 09-10 → Materials 09-10	.30(.12)	.19(.09)	.027

[a]*p*-value calculated using standardized values.
[b]Only significant paths shown.

Figure 3.1. Conceptual model
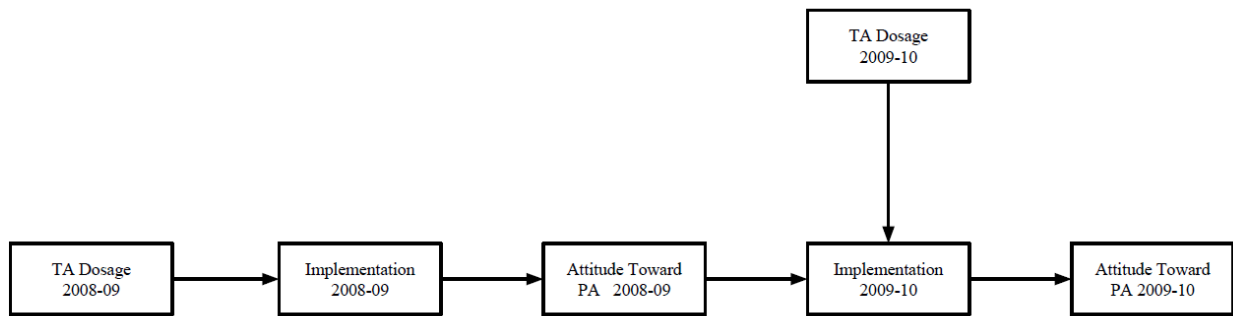
Figure 3.2. Path model with parameter estimates
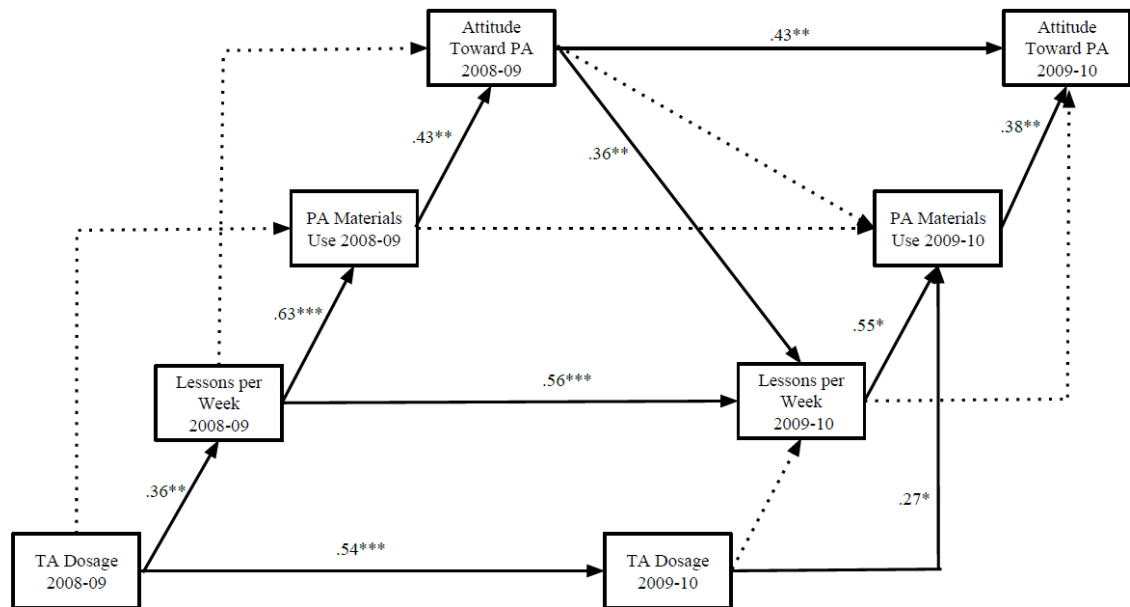
Dashed lines represent non-significant paths that were dropped from the model.

CHAPTER 4: MANUSCRIPT 3

Teacher Adaptations of *Positive Action*: A Structural Equation Model of Student Engagement and Social-Emotional Learning and Health Promotion Outcomes

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Abstract

Background

It is widely recognized that teachers commonly adapt school-based prevention programs. However, research regarding the influence that adaptations have on student engagement and outcomes is limited.

Methods

Using data from the treatment arm of a longitudinal trial of *Positive Action (PA)*, a social-emotional learning and health promotion (SELHP) program, we used structural equation modeling analyses to investigate whether teacher adaptation of *PA* would enhance the relationship between number of lessons taught and a) student emotional engagement and b) SELHP outcomes. We also explored whether SELHP outcomes would be mediated by student engagement. Participants were teachers and students who completed surveys at the end of the school year in spring 2005 (Grade 3), spring 2006 (Grade 4), and spring 2010 (Grade 8).

Results

Overall fit of the models were satisfactory. A higher number of lessons predicted greater emotional engagement for students in high-adaptation classrooms during the eighth grade, but not during the third and fourth grades. Similarly, during the eighth grade, a greater number of lessons predicted improvement in intended outcomes for three of four outcome variables (increased social-emotional and character development, decreased beliefs in support of aggression, and decreased bullying) that was mediated by student engagement in high- but not low-adaptation classrooms.

Conclusion

The results suggest that teacher adaptations of PA that are made with the intention of making lessons more appropriate for students result in increased student engagement in the program and beneficial social-emotional learning and health promotion outcomes for middle school, but not younger, students. However, this finding may have also been influenced by greater school and teacher experience with the program in the final year of the trial when students were in the eighth grade.

Introduction

Schools are ideal settings for prevention programs for children and youth (Domitrovich, et al., 2008; Little et al., 2013). They provide access to large populations of students in structured environments, making it possible to deliver interventions that reach individuals at a time of life when they can truly be preventive—before problems such as substance abuse, violent behavior, and mental health challenges develop (Kaftarian, Robertson, Compton, Davis, & Volkow, 2004).

As evidence has accumulated on the effectiveness of many school-based prevention programs, there has been increased attention to factors that support high-quality implementation of these types of programs. One topic that has been much discussed frequently is that of teacher adaptations. Although it is well-established that teachers do commonly adapt prevention programs (Dusenbury, Brannigan, Hansen, Walsh, & Falco, 2005; Hansen, et al., 2013; Miller-Day, et al., 2013; Ringwalt, Ennett, Vincus, & Simons-Rudolph, 2004), and there is a growing body of evidence on the nature of those adaptations (Hansen, et al., 2013; Miller-Day, et al., 2013; Sterling, et al., 2013), research on the influence that teacher adaptations have on student engagement and outcomes, has been limited (Domitrovich et al., 2008; Durlak & DuPre, 2008).

Using data from a longitudinal trial of *Positive Action* (*PA)*, a social-emotional learning and health promotion (SELHP) program, the aim of the present study was to investigate associations between teacher adaptation of *PA* lessons, student engagement in the program, and student outcomes. Specifically we considered the following research questions: (1) Does level of teacher adaptation of *PA* moderate the association between the number of lessons delivered and student engagement in the program? (2) To what extent

does level of teacher adaptation moderate the association between number of lessons delivered and student outcomes, both directly and indirectly (as mediated by student engagement). Figure 1 illustrates the conceptual framework for these research questions.

Adaptation

Adaptation has been defined as "a clear and obvious deviation from what is called for in a program manual" (Bishop et al., 2014). Fidelity to programs as they were originally intended to be delivered is thought to be crucial to their success (Burke, Oats, Ringle, Fichtner, & DelGaudio, 2011; Durlak & Dupre, 2008). Yet, the challenges schools face as they work to educate students can make it difficult to implement programs with fidelity (Miller-Day et al., 2013). As noted above, to date, there has been little research into how adaptations may influence the effects of prevention programs on their targeted outcomes. In a review of the impact of implementation on outcomes related to health promotion and prevention programs for children and adolescents, only 3 of the 59 studies that met review criteria included findings that addressed the potential impact of adaptation on outcomes (Durlak & Dupre, 2008).

A number of papers have summarized an ongoing "fidelity versus adaptation" debate in the field of prevention science (Blakely et al., 1987; Elliot & Mihalic, 2004; Giles et al., 2012; Hansen et al., 2013; Moore et al., 2013). On one hand, adaptations have been viewed as a break in fidelity, signified by a lack of adherence to core program components and carried out by teachers or other frontline practitioners "without any knowledge of the theoretical/conceptual rationale for the program" being implemented (Elliot & Mihalic, 2004, p. 51). Elliot and Mihalic (2004) suggest that the best way to address this concern is through building the capacity of individuals and agencies to implement programs with

fidelity. An alternate and increasingly accepted point of view, however, is that "adaptation" and "fidelity" should be evaluated separately and that as long as adaptations align with a program's original design and theory, they may not necessarily be harmful, and may, in fact, result in improved outcomes (Durlak & DuPre, 2008; Hansen et al., 2013; Moore et al., 2013; Ozer et al., 2010). A recent descriptive study of the *All Stars* program used video observation to examine this latter possibility (Hansen et al., 2013). Video coders assessed the frequency and valence of adaptations made by nine teachers (each teaching three classes; $N = 27$ classes). Adaptations were classified as positive or negative based on the likelihood that they would enhance or detract from program effectiveness. Teachers rated as positive adapters were more likely to be judged by the evaluators as having better adherence to program activities, higher overall teaching quality, better understanding of the program, and students who were more engaged in program sessions. The results showed an interaction between the number and valence of adaptations. A higher percentage of students who were non-drug users at the beginning of the study remained non-drug users at post-test if they were in classrooms of teachers who made infrequent positive adaptations, rather than frequent negative adaptations.

Teachers have reported a number of reasons for adapting lessons to make them more appropriate for students, including concerns that material is not age or culturally appropriate (Sterling et al., 2013) and a desire to clarify or emphasize content (Hill, Maucione, & Hood, 2007; Ringwalt et al., 2004). A qualitative analysis of classroom implementation ($N = 31$ teachers in 25 schools) of the *keepin' it REAL* drug prevention curriculum found that teachers adapted materials to make the lessons easier to understand and adjust them to student's apparent attention spans and level of engagement with the material (Miller-Day et al., 2013).

Student Engagement

Higher levels of student engagement in prevention programs are associated with better outcomes. For example, a study of *Steps to Respect*—a school-wide bullying prevention program—found that greater student engagement in lessons, as measured by teacher observations, predicted improved attitudes toward intervening in bullying incidents, more positive perceptions of school climate, and lower levels of being a victim of bullying (Low, Van Ryzin, Brown, Smith, & Haggerty, 2014). Pettigrew et al. (2015) found that student engagement, as part of a composite variable that also included teacher engagement and global teaching quality (all three assessed via video analysis), predicted reductions in substance use in students participating in the *keepin' it REAL* program. Higher levels of student self-reported engagement in the *All Stars* drug prevention curriculum predicted positive intermediate outcomes (e.g., understanding that substance use is incompatible with achieving life goals, commitment not to use substances, bonding to school), but not reduced substance use (Ringwalt et al., 2009). These findings are consistent with a larger body of evidence on associations between the broader construct of student engagement in school and positive academic, social and emotional, and behavioral outcomes (Reschly & Christenson, 2012).

As evidence of the importance of student engagement in predicting positive outcomes has grown, investigators have turned to examining factors that promote engagement. Because engagement is a characteristic that can potentially be influenced by circumstances (Archambault et al., 2010), researchers have explored a variety of contextual factors that may influence a student's level of engagement with a prevention program. Not surprisingly, evidence is emerging that teacher behaviors predict levels of student engagement; these

teacher behaviors include general teaching quality and practices (Goncy, Sutherland, Farrell, Sullivan, & Doyle, 2014), communication style (Giles et al., 2013), and the competence with which the teacher delivers the prevention program (Goncy et al., 2104; Low, et al., 2013).

One question that has not yet been extensively addressed is the relationship between teacher adaptations of prevention curricula and student engagement. To our knowledge, only two prior studies have examined this topic. One was a descriptive study of nine teachers using *All Stars*, which found an association between positive adaptations (i.e., consistent with the program's objectives as rated by independent observers) and student engagement during intervention sessions (Hansen et al., 2013). The other, a pilot study involving 11 teachers using the *Life Skills Training (LST)* program, found that teachers who had greater experience with *LST* were more likely to make positive adaptations and that their classes were more likely to be engaged in high-quality interactions during lessons as assessed by interviews and observations (the study did not test a direct association between adaptations and engagement) (Dusenbury et al., 2005).

Although, there is no consensus on how to best operationalize and measure student engagement (Appleton et al., 2008), there is broad agreement that it is a multifaceted construct consisting of a variety of dimensions related to behavioral, emotional, and cognitive engagement with institutions, other individuals, and learning (Fredricks, Blumenfeld, & Paris, 2004; Reschly & Christenson, 2012). Measures of engagement used in prior implementation studies of school-based prevention programs have been behavioral in nature (e.g., attention to and participation in curriculum lessons in the classroom). In the present study, we investigate students' emotional engagement in the *Positive Action* program. Emotional engagement, in the context of a student's overall engagement with school has been

defined by Fredericks and colleagues (2004) as "positive and negative reactions to teachers, classmates, academics, and school" that are presumed to "create ties to an institution and influence willingness to do the work" (p. 60). It is the extent to which a student values and is interested in school and what happens at school (Fredricks & McColskey, 2012). Although Fredericks et al. (2004) and others use this construct as it applies to overall school engagement, this concept of emotional engagement as exemplifying values, interest, and willingness to participate is also an appropriate way to conceptualize a student's attitudes toward a whole-school intervention like *PA*.

Present Study

The present study was designed to explore an area where prior research has been limited—associations of teacher adaptations of prevention programs with student engagement and outcomes. As part of annual training for *PA*, teachers in the trial were first encouraged to deliver the program with integrity. However, they were also trained in how to appropriately adapt lessons without compromising the integrity of the program. They were encouraged in this regard to engage students by making lessons relevant to them and provided with information about how to do this. Appropriate adaptations included changes to names of characters, settings, stories, and cultural references. Teachers were told that changes to concepts, methodologies, and strategies would be inappropriate adaptations.

We hypothesized that adaptations made to *PA* for the purpose—from the teacher's perspective—of making lessons more appropriate for students, should enhance the influence of *PA* on student engagement with the program as well as improve student outcomes. Our specific hypotheses were as follows:

- Teacher adaptation of *PA* for the purpose of making lessons more appropriate for students would enhance the relationship between number of lessons taught and students' emotional engagement.

- Teacher adaptation of *PA* would enhance the association between number of lessons taught and social-emotional learning and health promotion (SELHP) outcomes.

- The association between number of lessons and SELHP outcomes would be mediated by student engagement.

Method

Setting and Participants

Data are from students and teachers in the program schools ("treatment arm") of a longitudinal, cluster-randomized, controlled trial of *PA*. The sample was from low-performing, high-poverty K–8 schools in Chicago, with largely racial-ethnic minority student populations. The trial was one of seven sites nationwide participating in a study funded by the U.S. Department of Education's Institute of Education Sciences to evaluate the effects of school-based interventions to promote social-emotional and character development. Data collection involved surveying students, parents, teachers, and administrators on a wide array of measures. The surveys were administered by the *PA* research team at the University of Illinois, Chicago (UIC) and by a multi-site contractor, Mathematica Policy Research, Inc. The trial was approved by Institutional Review Boards at the University of Illinois, Chicago and Oregon State University, the Research Review Board at Chicago Public Schools, and the Public/Private Ventures Institutional Review Board for Mathematica Policy Research.

The full trial involved eight waves of data collection across six years, beginning with a cohort of students in the third grade and ending when the cohort was in the eighth grade.

Participants for the present study were students who completed surveys at the end of the school year in spring 2005 (Grade 3), spring 2006 (Grade 4), and spring 2010 (Grade 8). In these waves, a sufficient number of students could be matched to teacher implementation data using a classroom identification number. Variables from the same participants who were also present in the prior waves (fall 2004, fall 2005, and spring 2009, for grades 3, 4, and 8 respectively) were used as covariates for the outcome variables.

Program

PA (Flay & Allred, 2010) is a comprehensive, school-wide, SECD program grounded in theories of self-concept, particularly Self-Esteem Enhancement Theory (SET) (DuBois, Flay, & Fagen, 2009), and consistent with social learning theories (Akers, 1998; Bandura, 1986) and other theories and approaches related to social development, health promotion, and prevention of unhealthy behaviors (Flay et al., 2009; Hawkins & Weis, 1985; Peters & McMahon, 1996). The *PA* curriculum teaches specific positive actions related to physical, intellectual, social, and emotional aspects of the self that are consistent with social learning theory (Akers, 1998; Bandura, 1986) and current knowledge of social development, health promotion, and prevention of unhealthy behaviors in whole-school ecologies (Flay & Petraitis, 1994; Flay, Snyder, & Petraitis, 2009; Hawkins & Weis, 1985; Peters & McMahon, 1996).

The program includes classroom curricula consisting of over 140 lessons taught for 15 to 20 minutes 4 days per week for grades K through 6, and 70 lessons taught 2 to 3 days per week for grades 7 and 8 (lessons for grades 9 through 12 are also available, but were not tested in this trial). The core curricula consist of the following six units: 1) self-concept, 2) positive actions for body and mind, and social and emotional positive actions for 3)

managing oneself responsibly, 4) getting along with others, 5) being honest with one's self

and others, and 6) self-improvement. Supplementary program materials (e.g., posters,

music) and activities (awarding certificates of recognition) reinforce and expand upon the

concepts taught during classroom lessons and are an integral part of the overall school-wide

program.

At the beginning of each school year, the program developer and the *PA*

implementation coordinator conducted a 2-4 hour staff training workshop at each school. As

noted above, this training included specific instructions on how to deliver the program with

integrity and how to appropriately adapt lessons if a teacher deemed it necessary in order to

make a lesson more appropriate for students.

Measures

Classroom-Level Variables

Classroom-level implementation data were collected as part of an end-of-year process

survey administered to teachers in the spring of 2005, 2006, and 2010. There were 17

classrooms in 7 schools in Grade 3, 15 classrooms in 7 schools in Grade 4, and 12

classrooms in 6 schools in Grade 8 (14 of the 15 classroom teachers in the Grade 4 sample

had been teaching at the same the school at the start of the trial the previous year; 7 of the 12

teachers in the Grade 8 sample were teaching at the same school in Grade 4). Five of the

schools were K-8 schools that were consistent across all three samples. The number of

schools for the present sample dropped to 6 in Grade 8 because the teacher of the one class

of students enrolled in the study at that school did not complete the end-of-year survey.

Average number of lessons per week. This implementation dosage measure is a scale consisting of the mean of six items (corresponding to the six units) reflecting the average number of lessons teachers taught per week. Teachers were asked, "On the average week during Unit "X", how many lessons did you teach?" There were 6 possible response options (0, 1, 2, 3, 4, 5+). Because the dataset used for the present study was obtained from an end-of-year survey, teachers retrospectively provided data for each of the six units. Alpha reliability ranged from .88 to .98 across waves. This variable was linked to students by classroom.

Level of adaptation. Level of adaptation was a single-item measure obtained from teachers by asking the following question, "How much did you adapt lessons to make them more appropriate for your students?" There were four possible responses options ("none," "a little," "some," "a lot"). The responses were converted to a dichotomous variable where 1 = low adaptation ("none," "a little") and 2 = high ("some," "a lot"). Teacher adaptation levels were linked to students by classroom. In Grade 3, 34% of students were in low-adaptation classrooms and 66 were in high-adaptation classrooms. In Grade 4, 64% of students were in low- and 36% were in high-adaptation classrooms. In Grade 8, 38% of students were in low- and 62% were in high-adaptation classrooms.

Student-Level Variables

Student-level variables were all collected via student self-report and included emotional engagement in *PA* and four outcomes reflecting two key categories of social-emotional learning and health promotion: 1) social-emotional and character development and 2) problem behaviors.

Student engagement. The measure of student engagement, developed specifically for this study, consisted of the following four items from the student survey: 1) "I like the Positive Action program"; 2) "I like what we talk about and do in the Positive Action program"; 3) "I plan to use positive actions when I grow up; and 4) I plan to use positive actions in the near future (on student surveys this was worded as "I plan to use positive actions this summer" in grades 3 and 4 and as "I plan to use positive actions for the rest of this year" in Grade 8). There were four possible response options ("No!" "no," "yes," "Yes!"). Alpha reliability ranged from .83 to .93. In analyses, student engagement was represented as a latent variable with the 4 items as indicators. All loadings were strong and statistically significant (see Figure 2 and Table 4).

Social-emotional and character development (SECD). SECD was assessed using the following scales from the *Social-Emotional and Character Development Scale* (Ji, DuBois, & Flay, 2013): (a) prosocial interactions—6 items (alphas ranged from .80–.84 for the three waves); (b) honesty—5 items (alphas .78–.80); (c) self-control—4 items (alphas .66–.77); (d) self-development—4 items (alphas .75–.83); and (e) respect for teachers—5 items (alphas .82–.89). Evidence of reliability and validity for these scales has been demonstrated using student data from the first five waves of the Chicago *PA* trial (Ji, et al., 2013). A sixth subscale, respect for parents, was not included because initial confirmatory factor analyses indicated that using just the other five subscales provided a better fit for the relevant latent variable in structural equation modeling analyses for the present sample. Multi-level growth curve analyses of the effect of *PA* on SECD using the full (28-item) SECD scale (Lewis et al., 2012; Washburn et al., 2011) and individual subscales (Lewis et al., in press), have found that although there was a general decline in SECD for both *PA* and

control students over the 8 waves of the study, the decline was significantly lower for students who participated in *PA*. For study analyses, as noted above, the 5 scales were used as indicators of a latent variable.

Problem behaviors. The problem behavior measures are a) normative beliefs supporting aggression, b) bullying, and c) disruptive behavior. Normative beliefs supporting aggression is a latent variable measured by six indicators of student beliefs about aggression from the *Normative Beliefs About Aggression Scale*, for which reliability and validity have been established for school-age children (Huesmann & Guerra, 1997). Example items: *If you're angry, it is OK to say mean things to other people*; *It is wrong to insult other people*. There were four possible response options ("really wrong," "sort of wrong," "sort of OK," "perfectly OK"). Scores for some items were recoded so that higher scores reflect the belief that aggression is more acceptable. Cronbach's alpha ranged from .80–.89 across the three grades. For study analyses, the 6 items assessing normative beliefs supporting aggression were used as indicators of a latent variable.

The "bullying" and "disruptive behavior" outcomes were represented as observed, rather than latent variables in analyses. Six items regarding the frequency with which students engaged in bullying behaviors were adapted from the *Aggression Scale*, which has previously been demonstrated to be reliable among early adolescents (Orpinas & Frankowski, 2001). Items were rated on a 4-point scale (never to many times; α range .80–.85). Responses to scale items were first converted to a dichotomous variable (0=never and 1=ever) and converted to a count of the number of items to which a student responded ever. Disruptive behaviors were assessed using modified questions from child problem-behavior scales (Loeber & Dishion, 1983). Like the bullying behavior items, responses were rated on

a 4-point scale (*never* to *many* times; α range .66 – .76) and converted first to a dichotomous variable (0=*never* and 1=*ever*) and then to a count of the number of items to which a student responded *ever*. Previous multi-level growth-curve analyses for this trial have shown that *Positive Action* mitigates increases over time in students' normative beliefs supporting aggressive behaviors (boys and girls), engagement in disruptive behavior (boys and girls), and bullying (girls only) (Lewis et al., 2013b).

Analytic Strategy

Descriptive analyses were conducted using Stata, version 12.1 (http://www.stata.com). Structural equation modeling (SEM) was performed with M*plus* v. 7.1 (http://www.statemodel.com). A full information maximum likelihood estimator robust to non-normality (the M*plus* MLR estimator) was used to derive model estimates for both the measurement and structural models.

SEM was conducted first using Grade 3 data from Wave 2 and then replicated using Grade 4 and Grade 8 data from waves 4 and 8. Although these are not true replications using new samples, there was a great deal of mobility in the student sample during the trial (181 of the 277 students in the Grade 4 sample were also present in Grade 3; only 50 of the 154 students in the Grade 8 sample were also present in Grade 4). The following four outcome variables were evaluated for each grade for a total of 12 models: a) SECD (latent), b) normative beliefs supporting aggression (latent); c) bullying (observed); and d) disruptive behaviors (observed). To control for student scores at prior waves, we regressed each outcome at waves 2, 4 and 8 on the same outcome at waves 1, 3, and 7, respectively, to create residualized-change scores, which were used in the structural equation models.

Only students in classrooms for whom teacher-reported data on "average number of lessons delivered" and "level of adaptation" were available were included in the sample; thus, there were no missing data for the classroom-level variables. At the student level, frequency of missing data for the student emotional engagement items was low—8.5 to 8.9% in Grade 3, 7.9 to 12.3% in Grade 4, and 0.0 to 0.6% in Grade 8. However, due to student mobility, a portion of students at waves 2, 4, and 8 were not present at the respective prior waves (1, 3, and 7), resulting in substantial percentages of missing data for the residualized-change scores for the outcome variable indicators: 19.6 to 26.6 in Grade 3, 32.1 to 37.2 in Grade 4, and 22.1 to 25.3 in Grade 8. Missing data were addressed by using full information maximum likelihood estimation, which is the default in M*plus* (Acock, 2005).

The process for estimating the models was as follows: a) confirmatory factor analysis (CFA) of the measurement model using the full sample; b) factor loading and intercept invariance testing of the measurement model using level of adaptation (low and high) as the grouping variable; c) structural equation modeling using level of adaptation as the grouping variable for the paths from *average number of lessons* → *student engagement* and *average number of lessons* → *outcome*. An equality constraint was imposed on the *student engagement* → *outcome* path as it was not hypothesized to vary based on level of adaptation (in line with this expectation, for each of the 12 models, Chi-square difference tests indicated there was no significant difference between the models in which this path was and was not constrained).

At each stage of model testing, we used model fit statistics and Chi-square difference tests (accounting for the scaling correction factor required when using the MLR estimator per Mplus guidelines; Muthén & Muthén, 1998-2012, p. 487) to compare nested models.

Respecification of the models (correlating item error terms and allowing some loadings or intercepts to be freely estimated) was guided by the results of these tests and modification indices when they could be substantively justified. Model fit was assessed using the following indices: Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker Lewis Index (TLI) and Standardized Root Mean Square Residual (SRMR).

Intraclass correlations (ICCs) at the classroom level for all of the model variables were .05 or lower, except for the residualized-change scores for "bullying" (ICC=.08) and "disruptive behavior" (ICC=.07) in Grade 4; the residualized-change scores for "honesty" (ICC=.07), "okay to push" (ICC=.06), "wrong to insult" (ICC=.07), and "disruptive behavior" (ICC=.11) in Grade 6; and student engagement in Grade 8 (ICC was .15 for two of the four scale items). Because there were only 12 to 17 clusters (depending on grade analyzed; see Table 1) and multi-level analyses require a large numbers of clusters (Hox, 2010; Vuchinich, Flay, Aber, & Bickman, 2012), we were unable to conduct either multi-level modeling or to conduct analyses that adjust standard errors for clustering. However, because most cluster sizes were relatively small and the intraclass correlations were low for most variables, this was unlikely to negatively impact the results (Muthen & Satorra, 1995).

Results

Table 2 shows descriptive statistics for all model variables. Note that the mean average number of lessons is lower for Grade 8 than for Grades 3 and 4 because, by design, *PA* involves four lessons per week during the younger grades and two to three lessons per week in middle school. Table 3 presents the outcomes for all twelve SEM models. The results for SECD for each grade are also shown in Figure 2.2 The fit indices for all but one

of the final models were within reasonable parameters: RMSEA <0.08; CFI >0.95; TLI >0.95: and SRMR <0.10 (Brown, 2006; Kline, 2005). The exception was Model 6 (normative beliefs supporting aggression during the fourth grade) for which CFI, TLI, and SRMR were 0.89, 0.88, and 0.101, respectively. Table 4 provides measurement model details including loading and intercept invariance, loading values for latent variable indicators, and correlated error terms.

Student Engagement and Outcomes

There were significant associations between greater student emotional engagement and expected outcomes (i.e., an increase in SECD and a decrease in normative beliefs in support of aggression, bullying, and disruptive behavior) at each grade level, except during the third grade. During the third grade, the association was not significant for bullying and only marginally significant for disruptive behavior.

Average Number of Lessons and Student Engagement

There was a significant association between a greater average number of lessons delivered and higher levels of emotional engagement for students in high-, but not low-, adaptation classrooms (this difference between the high- and low-adaptation groups was significant for the models for bullying and disruptive behavior, but not for SECD and normative beliefs in support of aggression[3]). This same finding, however, was not present during the third and fourth grades.

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[3] We checked to see if this discrepancy was due to the fact that SECD and normative beliefs in support of aggression were represented as latent variables by running both of those models using a scale score instead of indicator variables. In both cases, there was still no significant difference between high- and low-adaptation groups.

Direct and Indirect Paths from Average Number of Lessons to Outcomes

 Our analysis did not show any direct associations between average number of lessons and the first three outcome variables (SECD, normative beliefs in support of aggression, and bullying) for any grade. There were, however, significant indirect paths from number of lessons to these outcomes via student engagement for the high-adaptation group during the eighth grade. The presence of an indirect effect, in the context of the lack of a direct effect, is consistent with indirect-only mediation as defined by Zhao, Lynch, and Chen (2010) and underscores the relevance of student engagement as a potentially key element of achieving desired outcomes.

 The pattern of results for the fourth outcome, disruptive behavior, departs from that seen for the other three. In the eighth grade, there was a marginally significant direct path from average number of lessons on disruptive behavior in the high-adaptation group, but it was in an unexpected direction—higher levels of adaptation were associated with more disruptive behavior. The indirect path was in the expected direction, however—associated with fewer disruptive behaviors (marginally significant). In this case, the mediation is classified as competitive because the direct and indirect paths point in opposite directions, suggesting that a potential mediator has been omitted (Zhao et al., 2010). In the third and fourth grades, there was a statistically significant direct association between average number of lessons and disruptive behavior for students in the low-adaptation group. However, in the third grade more lessons were associated with fewer disruptive behaviors in the low-adaptation group and in the fourth grade with more disruptive behaviors.

Discussion

Our first hypothesis was that the level of teacher-reported adaptation of *PA* would moderate an association between average number of lessons delivered and student level of emotional engagement in the program. Specifically, we hypothesized that students in classrooms of teachers who reported that they made "some" or "a lot" of adaptations, carried out with the intent of making program lessons more appropriate for students, would report higher levels of engagement than those in classrooms where teachers reported "none" or "a little." Our findings support this hypothesis for students in the eighth grade, as indicated by a significant association between a greater average number of lessons delivered and higher levels of emotional engagement for students in high-, but not low-, adaptation classrooms, but not for third- and fourth-grade students. Although not part of our original hypothesis, in retrospect, these results make sense in light of prior research and theory indicating that student engagement is at its peak during elementary school and declines in middle school (Eccles et al., 1993; Mahatmya, Lohman, Matjasko, & Farb, 2012; Marks, 2000). It is likely that in the third and fourth grades, students were easily engaged in *PA* lessons, mitigating the potential influences on engagement of either positive or negative adaptations. Another possible reason for the disparity between the results for the early grades and the eighth grade is that the eighth grade was the sixth and final year of the trial. At that point in time, schools and teachers had much more experience with *PA* (five of the schools and six of the teachers represented in the Grade 8 sample were also involved in the trial when the study cohort was in Grades 3 and 4 during the 2004-05 and 2005-06 school years). Teachers' understanding of how to make adaptations that did not adversely impact program integrity was very possibly much higher once they had acquired significant experience with the program.

Our second hypothesis was that any associations between number of lessons taught and the four social-emotional and character development and health promotion outcomes would be both mediated by level of student emotional engagement and moderated by teacher level of adaptation, with the association stronger for students in high-adaptation classrooms. Again, the results for the eighth-grade sample, but not the third- and fourth-grade samples, support this hypothesis for the first three outcomes variables (SECD, normative beliefs in support of aggression, and bullying). There were significant or marginally significant direct associations, between number of lessons and the fourth outcome, disruptive behavior, although the direction of these associations and their relationship to low or high levels of adaptation varied by grade. Our available data did not allow us to test potential mechanisms for this discrepancy, but there are a number of potential explanations, including overall teaching quality and specific quality of delivery of the *PA* lessons. The fact that there was no direct path from number of lessons taught to the other three outcomes is not surprising. Similar findings have occurred in other studies, indicating that adherence to a curriculum, alone, might not lead to positive outcomes and that other factors, such as overall teacher instructional style and quality with which the curriculum is delivered, are also potentially important (Low et al., 2013; Pettigrew et al., 2015).

Finally, we found statistically significant associations between greater student emotional engagement and expected outcomes for SECD, normative beliefs in support of aggression, bullying, and disruptive behavior in the fourth and eighth grades and for SECD and normative beliefs in support of aggression in the third grade. This aspect of our results suggests that student emotional engagement in *PA* is an important factor for achieving desired program results. This is consistent with prior evidence that points to the role of student

engagement in achieving a variety of academic and non-academic outcomes (Low et al., 2013; Pettigrew et al., 2015; Reschly & Christenson, 2012).

Limitations

The adaptation measure was a single item that asked teachers to report how much they adapted lessons to make them more appropriate for their students. Because the measure was solely by teacher report, it may not fully reflect the extent or nature of adaptations that were made. Other investigators have used methods that involve analysis of video-taped lessons by trained observers and have found higher rates of adaptation than those identified by teachers themselves (Miller-Day et al., 2013). Observational methods also provide the opportunity to classify adaptations as positive (e.g., enhance the program) or negative (Hansen et al., 2013). Other variables were also obtained via self-report—the number of lessons per week as reported by teachers and outcomes reported by students, which may be influenced by social-desirability bias or, in the case of lessons, an inaccurate recollection of activities that took place earlier in the year.

Another challenge was related to the high level of student mobility mentioned earlier. As described in Vuchinich et al. (2012), many students either joined or left the study over the course of the eight waves and the number that was consistently present across waves is small. Other analyses from the Chicago *PA* trial have used a cluster-focused, intent-to-treat approach (using both treatment and control schools), in which the school (the level at which randomization occurred) is the focus of analysis (Lewis et al., in press). This approach was not possible for the present analysis, however, because the data were from the seven treatment schools only, and there was no randomization of the predictors for level of adaptation and implementation dosage. In addition, because of the small number of clusters, we were unable

to factor clustering into our analysis. This was not likely to be a serious drawback, however, given the generally low ICCs and small cluster sizes. There clearly is a need, however, for larger studies in this area that include a sufficient number of clusters to conduct multi-level analysis.

Conclusion

Given the high prevalence of adaptation of prevention programs by teachers, it is essential that researchers and practitioners have a good understanding of how adaptations impact student engagement and outcomes. The Chicago trial of *PA* provided an opportunity to assess the impact of program adaptations on student engagement and SELHP outcomes under circumstances in which teachers received training on how to adapt lessons to make them more appropriate for their students without compromising program integrity. The results suggest two possible interpretations. First, adaptations in this context may be beneficial with respect to student engagement and SELHP outcomes for middle school, but not younger, students. Second, experience with the program leads to higher quality adaptations that are genuinely engaging. In either case, our findings suggest that program adaptations may sometimes enhance program effectiveness. Although fidelity of implementation to evidence-based interventions as designed is important, programs that have built-in flexibility that allows for a balance between fidelity and adaptation, while still adhering to core program components and methods, "may provide the most fruitful approach to maximizing effectiveness" (Giles et al., 2013).

Table 4.1. Student demographics by grade

	3rd Grade (2004-2005)	4th Grade (2005-2006)	8th Grade (2009-2010)
Number of classrooms	17	15	12
Number of students reporting per class (range)	8–21	8–24	5–23
Number of Students	270	277	154
% Female	47.04	50.90	46.75
% Hispanic	35.19	33.21	21.43
% Black	39.26	45.49	62.99
% Other	25.56	20.94	15.58

Table 4.2. Descriptive statistics – study measures by grade[a]

		3rd Grade (2004-2005) N=270		4th Grade (2005-2006) N=277		8th Grade (2009-2010) N=154	
		Classroom level variables					
		Mean (SD) or %	Range	Mean (SD) or %	Range	Mean (SD) or %	Range
Adaptation level							
	low	34.07%		63.90%		38.31%	
	high	65.93%		36.10%		61.69%	
Average number lessons per week		3.96(1.83)	1.83–5.00	3.56(1.18)	1.00–4.67	1.67(.85)	0.04–5.00
		Student level variables					
		Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Emotional engagement indicators							
Like PA		3.68(.65)	1.00–4.00	3.47(.83)	1.00–4.00	2.90(.92)	1.00–4.00
Like PA activities		3.57(.72)	1.00–4.00	3.48(.76)	1.00–4.00	2.88(.88)	1.00–4.00
Plan to use positive actions in adulthood		3.54(.83)	1.00–4.00	3.37(.83)	1.00–4.00	3.00(.83)	1.00–4.00
Plan to use positive actions in near future		3.62(.77)	1.00–4.00	3.55(.72)	1.00–4.00	3.07(.78)	1.00–4.00
SECD indicators							
Prosocial		3.32(.62)	1.17–4.00	3.28(.65)	1.00–4.00	3.00(.59)	1.00–4.00
Honesty		3.35(.63)	1.20–4.00	3.20(.68)	1.00–4.00	2.84(.60)	1.00–4.00
Self-Control		3.12(.70)	1.25–4.00	3.02(.78)	1.00–4.00	2.83(.70)	1.00–4.00

Table 4.2. Descriptive statistics – study measures by grade[a] (continued)

	Student level variables					
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
SECD indicators (cont.)						
Self-improvement	3.47(.58)	1.67–4.00	3.40(.66)	1.00–4.00	3.22(.63)	1.00–4.00
Respect for teacher	3.54(.59)	1.20–4.00	3.44(.66)	1.00–4.00	3.10(.68)	1.00–4.00
Normative beliefs supporting aggression indicators						
Wrong to hit (R)	1.18(.54)	1.00–4.00	1.44(.86)	1.00–4.00	1.71(.74)	1.00–4.00
Okay to say mean things	1.27(.56)	1.00–4.00	1.49(.84)	1.00–4.00	1.53(.77)	1.00–4.00
Okay to yell and say bad things	1.20(.56)	1.00–4.00	1.37(.76)	1.00–4.00	1.46(.72)	1.00–4.00
Okay to push/shove if mad	1.25(.57)	1.00–4.00	1.40(.80)	1.00–4.00	1.40(.74)	1.00–4.00
Wrong to insult (R)	1.34(.69)	1.00–4.00	1.49(.87)	1.00–4.00	1.42(.64)	1.00–4.00
Wrong to say mean things when mad (R)	1.34(.70)	1.00–4.00	1.36(.78)	1.00–4.00	1.41(.70)	1.00–4.00
Bullying and disruptive behaviors						
Bullying	1.92(2.11)	0.00–6.00	2.41(2.17)	0.00–6.00	3.26(2.03)	0.00–6.00
Disruptive behavior	1.19 (1.57)	0.00–6.00	1.20(1.41)	0.00–6.00	2.01(1.81)	0.00–6.00

[a] The values in this table were measured in the spring of each year. As noted in the text, the actual analysis used residualized change scores, which had a mean of zero. SDs for the latent variable indicators (SECD and normative beliefs supporting aggression) ranged from .53–.72 (Grade 3), .55–.85 (Grade 4), and .52–.79 (Grade 8). SDs for bullying and disruptive behavior ranged from 1.27–1.90 across grades.

Table 4.3. Structural equation modeling results

Model	Outcome	Grade	Observations		Student engagement → *outcome*[a]	Average number lessons → student engagement		Average number lessons → *outcome*		Average number lessons → student engagement → *outcome*	
			Group			Group		Group		Group	
			Low	High		Low	High	Low	High	Low	High
1		3	90	163	.39***	−.03	09	.08	.02	−.01	.04
2	SECD	4	168	94	.32***	−.01	.02	−.06	−.06	.00	.01
3		8	59	95	.32***	.04[b]	.24*[b]	−.05	.03	.01	.08*
4	Normative beliefs supporting aggression	3	92	176	−.31†	−.03	.07	.00	.05	.01	−.02
5		4	168	95	−.37***	.03	.02	−.04	.09	−.01	−.01
6		8	59	95	−.16**	.06[b]	.42***[b]	−.10	.10	−.01	−.07*
7	Bullying	3	91	176	−.28	−.03	.09	−.33	.00	.01	−.03
8		4	168	95	−.51†	−.01	.02	.05	.30	.01	−.01
9		8	59	95	−.43*	−.06[c]	.42***[c]	−.22	.08	.03	−.18*
10	Disruptive behavior	3	91	176	−.58†[a]	−.03	.09	−.50*	.25†	.02	−.05
11		4	168	95	−.50*[a]	.03	.02	.25***	.17	−.01	−.01
12		8	59	95	−.36*[a]	−.06[c]	.42***[c]	−.16	.49†	.02	−.15†

Table 3. Structural equation modeling results (continued)

Notes:
† *p*<.10, * *p*<.05, ** *p*<.01, *** *p*<.001
[a] Groups constrained to be equal. There was no significant difference between this model and a model where they are not constrained.
[b] Difference between groups is not significant.
[c] Difference between groups is significant.

Table 4.4. Measurement model details

Model	Outcome	Grade	Loadings and Intercepts	Correlated Error Terms
1	SECD	3	Loadings and intercepts invariant Student engagement loadings 1.05-1.20 SECD loadings .91-.99	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future*
				Low adapt group 0.02 High adapt group 0.21
2	SECD	4	Partial loading invariance; intercepts invariant Student engagement loadings 0.63-1.05 SECD loadings 0.87- 1.05	No correlated errors
3	SECD	8	Loadings invariant; intercepts partially invariant Student engagement loadings .94-1.07 SECD loadings .77-1.05	*Like PA* with *Like PA activities* Low adapt group 0.17 High adapt group 0.23
4	Normative beliefs in support of aggression	3	Loadings and intercepts invariant across groups Student engagement loadings 1.24-1.75 Normative beliefs loadings 1.13-1.61	*Like PA* with *Like PA activities* Low adapt group 0.05 High adapt group 0.15
5	Normative beliefs in support of aggression	4	Partial loading invariance; intercepts invariant Student engagement loadings 0.92-1.14 Normative beliefs loadings 0.80-1.19	*Like PA* with *Like PA activities* Low adapt group 0.05 High adapt group 0.15

Table 4.4. Measurement model details (continued)

6	Normative beliefs in support of aggression	8	Loadings and intercepts invariant across groups Student engagement loadings Normative beliefs loadings .53-.94	*Like PA* with *Like PA activities* Low adapt group 0.15 High adapt group 0.07
7	Bullying	3	Loadings and intercepts invariant across groups Student engagement loadings 1.03-1.25	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future* Low adapt group 0.03 High adapt group 0.22
8	Bullying	4	Partial loading invariance; intercepts invariant Student engagement loadings 0.62-1.08	No correlated errors
9	Bullying	8	Partial loading invariance; intercepts invariant Student engagement loadings 0.56-0.94	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future* Low adapt group 0.14 High adapt group 0.20

Table 4.4. Measurement model details (continued)

|				
10	Disruptive behavior	3	Loadings and intercepts invariant across groups Student engagement loadings 1.04-1.23	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future*
				Low adapt group 0.03
				High adapt group 0.21
11	Disruptive behavior	4	Partial loading invariance; intercepts invariant Student engagement loadings 0.64-1.07	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future*
				Low adapt group 0.06
				High adapt group 0.14
12	Disruptive behavior	8	Partial loading invariance; intercepts invariant Student engagement loadings 0.56-0.94 Engagement indicators 3 and 4 correlated - .14 (low adapt); .20 (high adapt)	*Plan to use positive actions in adulthood* with *Plan to use positive actions in near future*
				Low adapt group 0.14
				High adapt group 0.20

Figure 4.1. Conceptual model
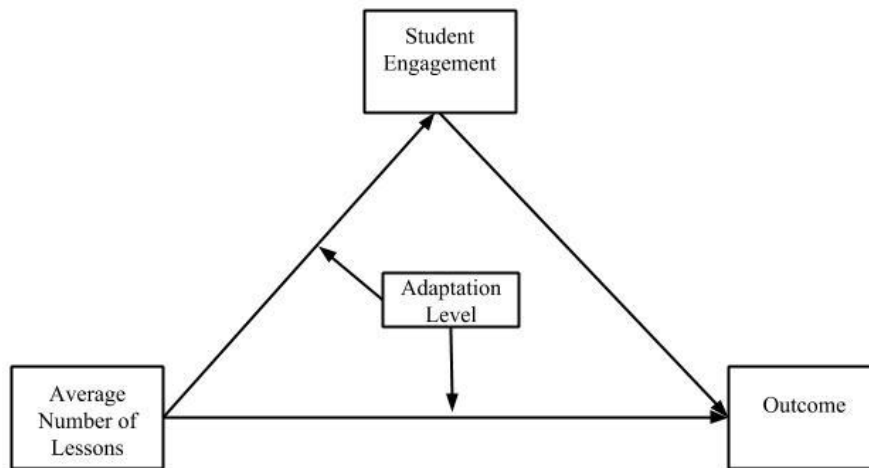
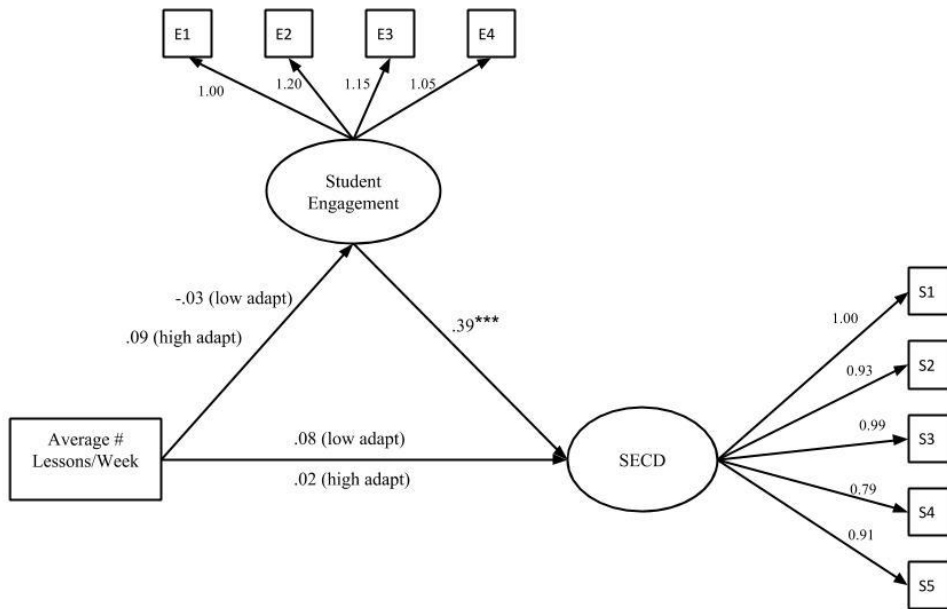Figure 4.2. Structural equation models for SECD outcome
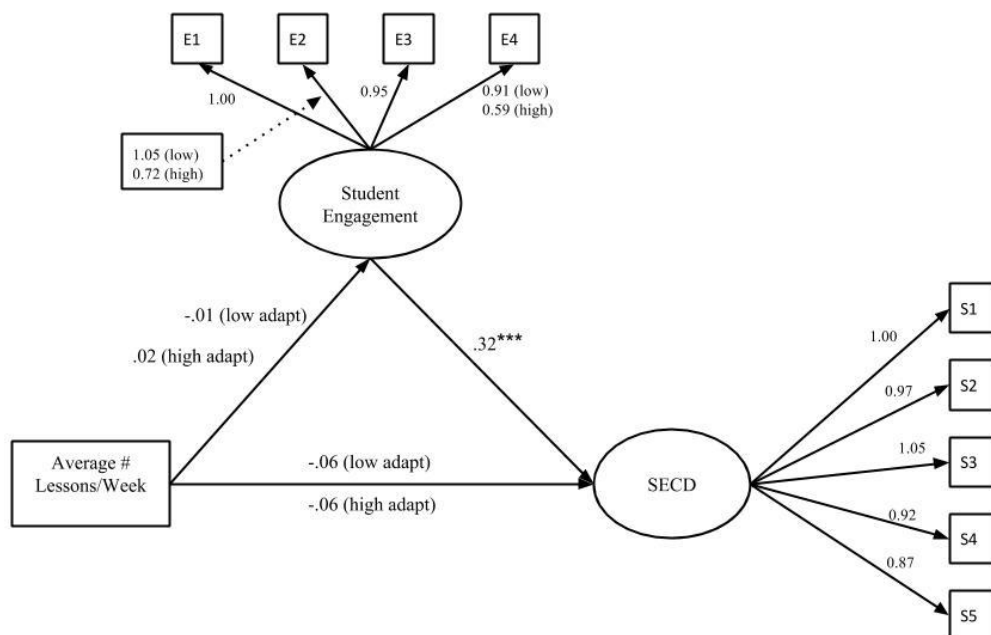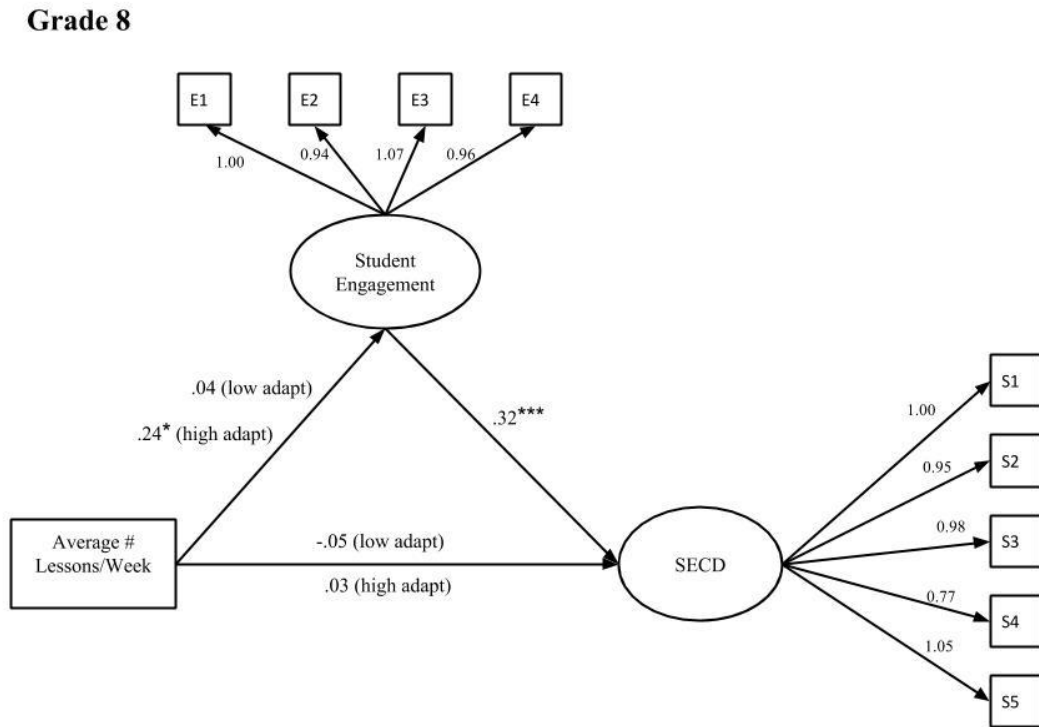
Grade 3

Grade 4

Figure 4.2. Structural equation models for SECD outcome (continued)

Grade 8

CHAPTER 5: GENERAL CONCLUSIONS

Historically, public policy has tended to emphasize the importance of new interventions over the development of infrastructures that support quality implementation (Spoth et al., 2013). In recent times, however, as evidence of effective prevention programming has accumulated, there has been greater financial and structural support for implementation science and researchers have begun to investigate the complex array of influences on implementation (Aarons et al., 2011; Meyers et al., 2012; Pas et al., 2014).

The Chicago trial of *Positive Action* provided an opportunity to contribute to this expanding area of research as it pertains to the implementation of whole-school social-emotional learning and health promotion (SELHP) programs. The primary purpose of the trial was to test the effectiveness of the *PA* program, but because the research team also collected a range of implementation data from teachers and students, I and my co-authors were able to explore a number of potential influences on teacher implementation of the program. Each of the studies reported in this dissertation investigated potential influences that prior research and theory have indicated warrant additional research: a) a school's organizational climate (Manuscript 1); b) technical assistance dosage (Manuscript 2); and c) program adaptations (Manuscript 3). All three factors are related, in different ways, to a teacher's capacity to implement a program.

The term "capacity" encompasses a wide variety of resources, knowledge, skills, and attitudes that exert a general (reflecting overall functioning of an individual, organization, or community) or innovation-specific effect on implementation quality (Flaspohler et al., 2008). Because capacity is such a broad concept, it is important for researchers to carefully operationalize the factors they hypothesize contribute to an entity's capacity to conduct an

intervention. As noted in Chapter 1, a lack of capacity to implement interventions is the core issue at the heart of the gap between research and practice (Chinman et al., 2005; Livet & Wandersman, 2005) and the need to understand and develop capacity in order to achieve a level of implementation that results in intended outcomes is emphasized by the Interactive Systems Framework (ISF) for Implementation and Dissemination, the conceptual framework which guided my research.

Although, the studies had a number of limitations including small sample sizes, lack of randomization of the data (the Chicago trial used a randomized design, but the studies in this dissertation included only teachers and students who were in *PA* schools), and lack of observational data to supplement self-reports, each provides interesting findings that add to an understanding of implementation research and can inform future research. Some primary findings are highlighted here.

Review of Manuscript 1 Findings

The first study investigated teachers' perceptions of their schools' work climates, a type of *general* organizational capacity that reflects a school's overall functioning. Although a number of previous studies have investigated links between various aspects of school organizational climate and implementation (e.g., Beets et al., 2008; Ennett et al., 2003; Gregory et al., 2007; Kallestad & Olweus, 2003; Low et al., 2013; McCormick et al., 1995; Ringwalt et al., 2003), few have involved SELHP programs like *PA*. An exception is a previous study of *PA* in Hawai'i, which found that a composite measure consisting of two factors—perceived administrative support and school connectedness—was directly associated with school-wide *PA* materials usage.

The present study found the following statistically significant associations between three measures of organizational climate and implementation: a) perceptions of school innovativeness predicted a greater average number of lessons taught per week and higher self-reported quality of program delivery; b) perceptions of a school's level of participatory decision-making predicted lower self-rated quality of program delivery; and c) perceptions of teacher collegiality predicted greater reported use of supplementary program activities and materials. Because these climate variables reflect teachers' perceptions of their schools at the beginning of the study, they can be seen as existing organizational features that appear to be related to better (or in the case of participatory decision-making, worse) implementation of *Positive Action*.

Of the three findings listed above, the last one is of most interest for future research. First, the effect was substantial—for each 1-point increase in perceptions of collegiality, the average number of the supplementary activities and materials used by teachers per week increased by 4.3. Second, whole-school programs like *PA* typically have a variety of components that are implemented outside of the classroom. Thus, assessing the quality of teacher relationships in a school and employing strategies to improve relationships, if indicated, may be an important implementation support. Future studies should include a broader array of variables that potentially influence implementation so that the relative importance of teacher collegiality can be assessed relative to other influences.

Review of Manuscript 2 Findings

As compared to the study described in Manuscript 1, which looked at an aspect of general capacity that existed in schools at the time they began using the *PA* program, the study described in Manuscript 2 investigated a factor—technical assistance—intended to build innovation-specific capacity *during* the implementation process. Technical assistance to support implementation has been used for decades in both public health and education (Davis et al., 2000; McInerney & Hamilton, 2007; Mitchell et al., 2002; Wandersman et al., 2012), but surprisingly little research has been conducted regarding its effectiveness (Le et al., 2014).

The technical assistance (TA) provided in the present study was in the form of individual and group consultation by a *PA* implementation coordinator, who visited the schools weekly. Using data collected during the last two years of the Chicago trial (2008-2009 and 2009-2010), the study analyzed patterns of association between technical assistance dosage, teacher attitudes toward *PA*, and implementation and discovered the following significant relationships: a) more hours of TA were directly associated with higher levels of *PA* lessons in 2008-2009 and with greater use of program materials during 2009-2010; b) higher dosages of TA were indirectly linked to teacher attitudes via both measures of implementation; c) greater levels of implementation were linked to more positive attitudes toward *PA* within each year; and d) more positive attitudes toward *PA* predicted higher implementation across years.

These findings help fill out an emerging picture of how technical assistance supports the implementation of prevention programs. It is well-recognized that training followed by onsite or distance TA is associated with better implementation than training alone (Acosta et al., 2013; Dusenbury et al., 2010; Joyce & Showers, 2002; Mihalic & Irwin, 2003; Rohrbach

et al., 2010a), but research into the relative usefulness of different dosages of TA is limited and primarily consists of analyses of bivariate correlations (Acosta et al., 2013; Chinman et al., 2008; Chinman et al., 2013; Mihalic & Irwin, 2003; Wandersman, Chien, & Katz, 2012). The present study builds on prior ones by using path modeling and including teacher attitudes toward the program as a potential mechanism by which TA may influence teacher implementation behavior. Two aspects of the findings listed above are particularly worth highlighting. First, finding "a" suggests that higher levels of TA were required to support implementation regarding the use of supplementary program materials (i.e., materials that are in addition to, but enhance, classroom lessons) even after there was no significant association between TA dosage and number of lessons delivered. Similar to a key finding from Manuscript 1, this suggests that particular attention should be paid to teacher support needs for implementing features of whole-school programs beyond those related to delivery of the classroom curriculum. Future research that examines which program elements require more focused or lengthy teacher support would guide how to use TA in the most cost-efficient ways. Second, finding "b" provides support for conventional wisdom that TA influences attitudes as well as knowledge and skills (Flaspohler et al., 2008; Le et al., 2014). Given the importance of attitudes in determining behaviors, including implementation behaviors (Ajzen, 1991; Beets et al., 2008; Jennings & Greenberg, 2009; Reyes et al., 2012), this suggests one possible mechanism for TA as an effective support.

Review of Manuscript 3 Findings

Given the ubiquity of teacher adaptation of prevention programs (Dusenbury et al., 2005; Hansen et al., 2013; Miller-Day et al., 2013; Ringwalt et al., 2004), there is a great need for studies that examine the influence of various aspects of adaptation on student

outcomes and identify practical training and technical assistance strategies that promote appropriate adaptations and limit those that might negatively impact program integrity. To date, research into how adaptations may influence the effects of prevention programs on their targeted outcomes has been limited (Durlak & DuPre, 2008).

The study described in Manuscript 3 explored patterns of association between teacher adaptations of *PA*, student engagement, and several social-emotional learning and health promotion outcomes (SECD, normative beliefs in support of aggression, bullying, and disruptive behavior). Statistically significant findings included the following: a) higher levels of adaptation moderated (enhanced) the association between number of lessons delivered and student engagement during the eighth grade, but not during third or fourth grades; b) associations between number of lessons delivered and most outcome variables were mediated by student engagement (indirect-only mediation as defined by Zhao et al., 2010) during the eighth, but not third or fourth grades; and c) higher levels of student engagement were associated with desired results for most outcome variables in all grades.

These findings suggest that not only is student engagement key to achieving desired outcomes as has been shown in previous studies (Low et al., 2014; Pettigrew et al., 2015; Reschly & Christenson, 2012), but that teacher adaptation may directly enhance program engagement under some circumstances and thus, promote positive outcomes. There are, however, a number of areas that must be clarified by future research. First, why were benefits seen for eighth-grade students, but not those in younger grades? Can the finding be replicated and, if so, what is the mechanism for this phenomenon? For example, is it because student engagement is already high during elementary school, but declines during middle school (Eccles et al., 1993; Mahatmya et al., 2012; Marks, 2000), thus leaving little room for changes

in engagement due to adaptation? Alternatively, does the result indicate that more years of teacher experience with the program led to more effective adaptations?

Second, this study did not assess the quality of adaptations (i.e., consistency with core program elements). Although instruction on how to appropriately adapt lessons was part of the annual training provided to teachers in the Chicago trial, no data was collected regarding the impact of that training on teacher adaptation behavior. In future studies it will be crucial to identify the extent to which training and technical assistance result in high-quality adaptations that serve the integrity of the program and, if so, whether the adaptations consequently lead to improved student outcomes.

Finally, for what purposes do teachers adapt *PA*? Although, the present study indirectly queried teachers about the purpose of adaptations, this involved a single, self-report measure ("How much did you adapt lessons to make them more appropriate for your students?"). Prior research has shown that the most common reason for adapting prevention lessons is lack of time (Hill, Maucione, & Hood, 2007; Miller-Day et al., 2013; Moore et al., 2013; Sterling et al., 2009) and that even when adapting for the purpose of making lessons more appropriate, it is done for a variety of reasons—e.g., to make materials more age or culturally appropriate (Sterling et al., 2013) or to clarify or emphasize content (Hill et al., 2007; Ringwalt et al., 2004). A better understanding of the reasons why teachers make adaptations will inform an additional crucial area of research, identification of interventions (e.g., information dissemination, training, and technical assistance) to build the capacity of teachers to make appropriate adaptations.

Future Directions

As evidence of effective school-based prevention programming has accumulated, researchers have begun to investigate the complex array of influences that contribute to high-quality implementation (Aarons et al., 2011; Pas et al., 2014). This is part of an overall trend in health, education, and other human services settings to view implementation as an important area of study in its own right (Eccles & Mittman, 2006; Spoth et al, 2013). As with all areas of implementation research, identifying and interpreting the array of factors that influence the implementation of school-based prevention programs is a complex task for researchers and practitioners.

Schools are a key settings for the delivery of prevention interventions to children and youth, but students cannot benefit from interventions they do not fully experience (Fixsen, Blase, Horner, & Sugai, 2009). For programs like *Positive Action*, the extent to which students experience an intervention as intended depends greatly upon the quality of teachers' implementation. In order for students to have access to key components of prevention programs, many teachers will likely need support at times—from their schools, their colleagues, and external experts—to build their capacity to carry out high-quality implementation. The findings of the studies in this dissertation add to current knowledge and underscore the importance of future research in this area.

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