School Psychology Review,
2015, Volume 44, No. 4, pp. 480–498

# A Focus on Implementation of Positive Behavioral Interventions and Supports (PBIS) in High Schools: Associations With Bullying and Other Indicators of School Disorder

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*Abstract.* There is growing interest in the use of a multitiered system of supports framework to address issues related to school climate and bullying. Positive Behavioral Interventions and Supports (PBIS) is one such model that has received considerable attention; however, nearly all of the extant literature has focused on elementary and middle schools, with limited research on high schools. Furthermore, research on PBIS implementation in high schools, particularly in relation to school context, is scant. The current article examined the adoption and implementation of PBIS in 31 high schools randomly assigned to implement PBIS, within the context of a larger 58 high school randomized trial. We first present descriptive data on the rollout of the core features of PBIS, as measured by a set of research-based implementation tools administered by outside observers. We then explore the extent to which baseline rates of bullying and other school-level indicators of disorder were associated with the adoption of the multitiered PBIS framework over the course of 2 years. Multilevel analyses on the longitudinal implementation data indicated that schools with higher baseline rates of bullying generally implemented PBIS with greater fidelity over time. This suggests that schools with increased bullying may be particularly motivated to adopt PBIS. However, other baseline indicators of disorder were generally not associated with PBIS implementation and thus do not appear to be barriers to adoption. Implications for implementation research and practice in high schools are discussed.

Many high schools struggle to address issues related to school climate and bullying and thus are turning to school-wide applications of a multitiered system of supports (MTSS) as a framework for addressing these concerns. Positive Behavioral Interventions

Support for this project comes from the U.S. Department of Education and the William T. Grant Foundation. The authors acknowledge support from the Maryland State Department of Education and Sheppard Pratt Health System through the Maryland Safe and Supportive Schools Initiative. The authors declare that they have no conflicts of interest with the conduct of this research.

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and Supports (PBIS; Sugai & Horner, 2006) is one such MTSS framework that has received considerable attention. Previous randomized trials and rigorous studies of PBIS at the elementary school level have demonstrated significant impacts on bullying, school climate, and other disciplinary problems, as well as academic performance (see Bradshaw, 2013; Bradshaw, Koth, Thornton, & Leaf, 2009; Horner et al., 2009; Horner, Sugai, & Anderson, 2010; Waasdorp, Bradshaw, & Leaf, 2012). However, there has been less investigation of PBIS implementation or outcomes at the high school level (Flannery, Sugai, & Anderson, 2009; for notable exceptions of research on PBIS in high schools, see Caldarella, Shatzer, Gray, Young, & Young, 2011, and Freeman et al., 2016).

The current article aimed to extend our understanding of the implementation of PBIS in high schools, with particular interest in the extent to which baseline levels of bullying and other indicators of school disorder were associated with PBIS implementation over the course of 2 years. Our interest in school contextual correlates of implementation was motivated by prior implementation research, largely at the elementary school level (Domitrovich et al., 2008; Pas & Bradshaw, 2012), which suggests that these factors may predict adoption and implementation fidelity of the three-tiered PBIS model. Furthermore, there is growing awareness of the importance of considering fidelity of program implementation within the bullying literature (for a review, see Polanin & Espelage, 2014). These implementation issues were explored within the context of 31 high schools randomly assigned to the PBIS intervention condition, as a part of a larger 58 high school randomized controlled trial. These findings have particular relevance to educators and school psychologists, given the widespread dissemination of PBIS and scale-up of an MTSS, as well as increasing concerns related to bullying in U.S. schools (Bradshaw, 2015).

## POSITIVE BEHAVIORAL INTERVENTIONS AND SUPPORTS

PBIS promotes setting-level change as a means for systematically and consistently preventing student behavior problems and promoting a positive school environment. The model draws on behavioral, social learning, organizational, and positive youth development theories and promotes strategies that are used by all staff consistently across all school contexts (Lewis & Sugai, 1999; Lindsley, 1992; Sugai, Horner, & Gresham, 2002). Through PBIS, staff and students work together to create a school-wide program that clearly articulates positive behavioral expectations, provides incentives to students meeting these expectations, promotes positive student–staff interactions, and encourages data-based decision-making by staff and administrators. The model aims to alter the school environment by creating improved systems (e.g., discipline, reinforcement, data management) and procedures (e.g., collection of office referral data, training) and using data-based decision-making in order to promote positive change in student and teacher behaviors (Knoff, 2000; Kutash, Duchnowski, & Lynn, 2006; Sugai & Horner, 2006; Sugai et al., 2002). The PBIS model follows a multitiered prevention approach (Mrazek & Haggerty, 1994; O'Connell, Boat, & Warner, 2009), whereby Tier 2 (selective) and Tier 3 (indicated) programs and supports are implemented to complement the Tier 1 (universal) components (Sugai & Horner, 2006; Walker et al., 1996).

The Tier 1 school-wide PBIS component is composed of the following seven critical features: (a) Within the school, a PBIS team is formed that includes 6–10 staff members and an administrator, all of whom provide building-level leadership regarding the implementation of PBIS. The team attends annual training events, establishes an action plan for implementation, develops materials to support program implementation, trains other staff members, and meets approximately twice a month to discuss school-wide behavior management systems and procedures. (b) A behavioral support coach provides on-site consulta-

tion and technical assistance regarding the implementation of PBIS. The coach is typically a school psychologist or guidance counselor who has prior experience working with PBIS and conducting functional behavioral assessments. (c) Expectations for positive student behavior are defined and known by staff and students. The school team establishes three to five positively stated school-wide expectations for student behavior (e.g., "Be respectful," "Be responsible," and "Be ready to learn"), which are posted in all school settings. (d) Defined behavioral expectations are taught to all students. Plans are developed and implemented by the school staff to teach students the behavioral expectations. (e) A school-wide system is developed to reward students who exhibit the expected positive behaviors. School staff establish and use a school-wide system for reinforcement that includes a tangible reinforcer (e.g., high-fives or bucks) that is used consistently by all staff. (f) An agreed-upon system is created to respond to behavioral violations. Staff and administrators agree on what constitutes classroom- versus office-managed discipline problems, and students across all classrooms receive consistent consequences for disciplinary infractions. (g) A formal system is developed to collect, analyze, and use data for data-based decision-making (for additional details, see Horner et al., 2010; Sugai & Horner, 2006; Walker et al., 1996).

Although the three-tiered PBIS framework has been widely promoted by the U.S. Department of Education and many state departments of education, dissemination and research efforts have largely focused on the Tier 1 elements. Consistent with a response-to-intervention approach (Hawken, Vincent, & Schumann, 2008), it is hypothesized that 80% of students will respond to the Tier 1 PBIS model and that the remaining 20% of youth will need Tier 2 or Tier 3 prevention programming to be successful at school. These selective and indicated programs are offered to a subset of students usually by someone other than their classroom teacher (e.g., school psychologist). Moreover, PBIS can serve as a framework for the integrated implementation of other evidence-based programs (EBPs; Bradshaw, Bottiani, Osher, & Sugai, 2014; Domitrovich et al., 2010).

The selection of other EBPs is intended to be guided by the collection, review, and use of various sources of data. In fact, PBIS schools are encouraged to collect multiple data elements and receive training on the collection of these elements, which are regularly analyzed and summarized; these data are used by the PBIS team to make decisions regarding program implementation, as well as to identify whether the majority of students are responsive to the universal Tier 1 supports and to select other EBPs to meet the needs of students. To date, most schools have focused on suspensions and office disciplinary referral data (Irvin et al., 2006); however, there is increasing interest in the use of school climate and bullying data as well (Bradshaw, 2013). For example, review of school climate data may suggest high rates of bullying, and therefore, the school may opt to integrate an additional bullying-focused EBP within the PBIS framework to address this particular challenge (Bradshaw, 2013). Yet, research suggests that most schools struggle to collect and effectively use different types of data to determine the most appropriate Tier 2 and 3 interventions to meet the needs of nonresponders to the Tier 1 supports (Barrett, Bradshaw, & Lewis-Palmer, 2008; Debnam, Pas, & Bradshaw, 2012; Bradshaw, Debnam, et al., 2014).

## Evidence Base for PBIS

As noted earlier, although PBIS is intended to be multitiered in its implementation, most of the wide-scale adoption of the model, as well as the research demonstrating its effectiveness, has focused on Tier 1 supports and has been conducted in elementary schools (Horner et al., 2010). For example, nonrandomized evaluations indicate that training schools in PBIS was associated with changes in the internal discipline practices (Nersesian, Todd, Lehmann, & Watson, 2000); these effects have been found to persist over several years (e.g., Taylor-Greene & Kartub, 2000). Schools achieving a high level of PBIS imple-

mentation fidelity experienced 20%–60% reductions in office discipline referrals (Kartub, Taylor-Greene, March, & Horner, 2000; Lewis, Colvin, & Sugai, 2000; Taylor-Greene et al., 1997). More recently, there have been two randomized controlled trials of Tier 1 PBIS in elementary schools, which demonstrated significant impacts on suspensions and office referrals, bullying, and peer rejection, as well as improved academic achievement and school climate (see Bradshaw, Koth, Bevans, Ialongo, & Leaf, 2008; Bradshaw, Koth, et al., 2009; Bradshaw, Mitchell, & Leaf, 2010; Bradshaw, Waasdorp, & Leaf, 2012; Horner et al., 2009; Waasdorp et al., 2012). Another randomized trial combining Tier 1 and 2 supports (relative to Tier 1 only) in elementary schools also demonstrated significant impacts on teacher and student behaviors (e.g., special education use, need for advanced-tier supports, teacher efficacy; Bradshaw, Pas, Goldweber, Rosenberg, & Leaf, 2012). Although these findings from elementary schools are promising, little is known about the implementation of PBIS or impacts at the secondary level, particularly in high schools (Flannery et al., 2009). In fact, some practitioners and researchers have suggested that implementation of PBIS, particularly within the context of integrating other EBPs across the advanced tiers, may be more challenging in high schools and that achieving high-fidelity implementation may take longer (Bradshaw, Debnam, et al., 2014). This may be due in part to some organizational challenges that high schools face (Domitrovich et al., 2008) or misperceptions that PBIS components (e.g., need to teach and reward behavioral expectations) are not developmentally appropriate for high school students (Flannery et al., 2009).

## POTENTIAL FACILITATORS AND BARRIERS TO PBIS IMPLEMENTATION

Understanding the implementation of school-based programs has received increased attention in both the conceptual and empirical literature (Bruhn, Hirsch, & Lloyd, 2015; Forman et al., 2013); however, this literature has largely focused on implementation in elementary schools. Several models and frameworks have been developed to characterize various factors that influence the implementation process and program fidelity, such as leadership, buy-in, and characteristics of the implementers (Han & Weiss, 2005; Wandersman et al., 2008). Similarly, organizational capacity is an area of growing interest within the field of implementation science (Fixsen, Naoom, Blasé, Friedman, & Wallace, 2005; Glisson & Green, 2006). For example, it has been posited that schools with a high rate of disorder will struggle to implement programs with fidelity (Domitrovich et al., 2008). There is also some empirical literature that supports this hypothesis. Specifically, research has shown that schools' structural composition (e.g., school size, ratio of students to teacher) and student demographic composition (e.g., high concentration of poverty and mobility)—which relate to negative student outcomes and serve as proxies for school disorder (e.g., Bradshaw, Sawyer, & O'Brennan, 2009; Gottfredson & Gottfredson, 2002)—hinder implementation (Beets et al., 2008; Bradshaw, Koth, et al., 2009; Domitrovich et al., 2008; Hoy & Feldman, 1987; Payne, Gottfredson, & Gottfredson, 2006). Greater student mobility has also been associated with lower implementation fidelity of Tier 1 PBIS in elementary and middle schools (Pas & Bradshaw, 2012).

In contrast, elementary and middle schools with more qualified (i.e., certified) teachers achieved better implementation of PBIS (Pas & Bradshaw, 2012). Similarly, mental health services research has shown that environments that are more efficient, have positive norms, and have shared beliefs about implementation support the delivery of higher quality services (Glisson & Green, 2006; Schoenwald & Hoagwood, 2001). Taken together, these findings regarding the link between school context and implementation fidelity suggest that it would be important to consider baseline school contextual factors when examining the adoption and rollout of PBIS, particularly in high schools, which generally are larger, are more diverse, and have

higher levels of disorder than elementary schools (Bradshaw, Sawyer, et al., 2009; Domitrovich et al., 2008; Molloy, Moore, Trail, Van Epps, & Hopfer, 2013).

## CURRENT STUDY

The PBIS model has been widely disseminated throughout the United States, with an estimated 22,000 schools currently implementing the Tier 1 supports. Moreover, much of the focus of PBIS implementation and outcomes-based research has been on elementary schools. As a result, less is known about the implementation of PBIS and the integration of other EBPs across the tiers, especially in high schools. The current study aimed to expand our understanding of the implementation of PBIS in high schools. Specifically, we examined how the fidelity with which high schools implement PBIS changed over time and explored whether school-level indicators of school disorder, including bullying, predicted implementation of PBIS.

We used data from 31 high schools implementing PBIS that were part of a larger 58 high school randomized trial of PBIS. This model of PBIS combined training across all three tiers, data-based decision-making using school climate and bullying data, and coaching supports. Given our interest in understanding the adoption and implementation of PBIS, we focused on the 31 schools randomized to the intervention condition. Specifically, our first aim described the rollout of PBIS by reporting school-level data assessing the core features of PBIS implementation across 2 years, using two implementation fidelity tools. We then leveraged baseline data on bullying and other school-level indicators of school disorder (e.g., suspensions, mobility rates, student–teacher ratio, certified teachers) to explore the extent to which these factors predicted implementation of PBIS across the first 2 years of the trial. On the basis of prior efficacy studies of PBIS, we hypothesized that there would be some baseline features of PBIS in place prior to formal training in PBIS but that implementation of the core features would increase significantly after formal training and as schools gain more experience implementing the model (Bradshaw & Pas, 2011; Bradshaw, Reinke, Brown, Bevans, & Leaf, 2008; Pas & Bradshaw, 2012). We also hypothesized that schools with greater baseline disorder (e.g., students per teacher, higher mobility rates, and greater prevalence of bullying and suspensions) would have greater difficulty implementing PBIS (Bradshaw & Pas, 2011; Pas & Bradshaw, 2012).

This study is novel, in part because of the setting in which it is conducted. Much of the extant randomized research on PBIS has been conducted in elementary school settings; to our knowledge, no rigorous randomized trials of PBIS have been conducted in high schools. The design of the trial allowed for longitudinal exploration of implementation of PBIS. This, in turn, may provide insight into potential areas of quick adoption of PBIS features and tiers, as well as potential challenges in implementation over time. We also explored the extent to which contextual factors previously linked with implementation at the elementary school level (Domitrovich et al., 2008) were also associated with implementation in high schools. Finally, we focused on bullying as a particular form of school disorder in this study, given its link with school climate and findings from a prior randomized trial in elementary schools (Waasdorp et al., 2012) suggesting that it is a potentially important factor to be considered in relation to PBIS.

## METHOD

Data from this study came from 31 traditional (i.e., Grades 9–12) high schools across 12 Maryland counties, which were involved as intervention schools in a group randomized controlled effectiveness trial (Murray, 1998) testing PBIS as part of the Maryland Safe and Supportive Schools (MDS3) initiative. The 27 control (i.e., comparison or business as usual) schools were not included in the current study because they did not receive training in PBIS. The 31 schools had a diverse student population, with a racial minority rate of 45.7% and a mean student en-

**Table 1. MDS3 School-Level Demographics for the 31 Intervention Schools**

| School Characteristics | *M* | *SD* |
|---|---|---|
| School enrollment | 1,331.6 | 488.9 |
| School attendance (%) | 92.8 | 2.0 |
| Student mobility (%) | 18.6 | 10.9 |
| Free or reduced-price meals (%) | 35.3 | 16.4 |
| Special education (%) | 5.1 | 0.3 |
| Racial minority (%) | 45.7 | 25.7 |
| Student–teacher ratio | 19.8 | 3.0 |
| Suspension rate (%) | 28.6 | 17.5 |
| Algebra passing rate on HSA (%) | 87.8 | 8.1 |
| Biology passing rate on HSA (%) | 85.6 | 8.1 |
| English passing rate on HSA (%) | 85.5 | 7.5 |

*Note.* HSA = High School Assessment (state's standardized academic test); MDS3 = Maryland Safe and Supportive Schools.

rollment of 1,331.6 (*SD* = 488.9; see Table 1 for sample demographic data). Approximately 35.3% of the students at the participating schools received free or reduced-priced lunch, and 5.1% received special education services.

## Study Design

The project was led by the Maryland State Department of Education (MSDE) and included two subcontracts: one to a private, nonprofit mental health provider for training and implementation supports (i.e., implementation partner) and the other to a team of university-based researchers for research design and evaluation supports (i.e., research partner). The MSDE led recruitment for the project; they approached districts based on need and willingness to participate. All approached districts consented to participate. Following district recruitment, principals were approached about enrolling their schools and were asked to provide written consent for participation. The 58 recruited schools were randomized, by use of a group randomized controlled design (Murray, 1998), following the baseline (spring) administration of the MDS3 School Climate Survey and fidelity assessments. A slightly higher proportion of schools ($n$ = 31) was randomly assigned to the intervention condition to afford more statistical power when examining the implementation-related research questions of this study. Baseline data and 2 years of postintervention training data were analyzed in the current study.

The 31 schools randomized to the intervention condition received training in the PBIS model as a framework for implementing an MTSS by the state's implementation partner. Following the initial training in the three-tiered PBIS model (Sugai & Horner, 2006), intervention schools used the baseline school climate data to select from a menu of EBPs (see "Training and Support to Intervention Schools" subsection and Table 2). The MDS3 initiative provided coaching supports and the necessary resources to implement one or more of the EBPs in the intervention schools. The researchers' institutional review board approved this study. For additional details on the trial design, see Bradshaw, Debnam, et al. (2014).

## Data Collection

Students anonymously provided information about their experiences with bullying in the school via a password-protected, web-based survey (see details on the MDS3 School Climate Survey later). Each spring, a random sample of 25 classrooms of students (Grades 9–12) was selected for participation in each school (i.e., seven 9th-grade language arts classrooms and six language arts classrooms per grade for 10th- to 12th-grade language arts classrooms). Student participation was obtained through a waiver of active parental consent and youth assent process. Site visits were conducted annually by contractors hired, trained, and supervised by the research partner to assess the fidelity with which PBIS was implemented across all project schools; all site visitors were unaware of the school's intervention status.

**Table 2. Summary of Evidence-Based Programs Implemented Through MDS3 Initiative**

| Evidence-Based Program | Tier | Brief Overview of Program or Model |
|---|---|---|
| Olweus Bullying Prevention Program | 1 | Team-based process<br>Emphasis on collection of data (e.g., bullying surveys) to inform program implementation<br>Uses lessons, classroom meetings, and school-wide expectations regarding bullying<br>Aims to change social norms regarding bullying<br>Includes parent and community partners in prevention process |
| Botvin LifeSkills Training (High School Program) | 1 | Classroom-based social skills training program<br>Primarily teacher facilitated<br>Provides instruction, demonstration, feedback, reinforcement, and practice<br>Covers personal self-management skills, general social skills, and drug resistance skills<br>10 class sessions, approximately 40–45 min each |
| Check-In/Check-Out | 2 | Targeted intervention for students needing positive adult attention and reinforcement<br>Builds on PBIS model to develop behavior plan for meeting school-wide behavioral expectations<br>Home/school communication<br>Facilitated by trained staff (e.g., paraprofessionals) |
| Check & Connect | 2 | Student engagement model<br>School-based mentoring model to promote student engagement and attendance and prevent dropout<br>Includes home visits and family-focused activities<br>Facilitated by trained staff (e.g., paraprofessionals, pupil personnel workers) |
| Cognitive-Behavioral Intervention for Trauma in Schools | 3 | Focused on youth at greatest risk for behavioral and substance abuse problems<br>Promotes use of effective coping strategies<br>Facilitated by trained student services staff (e.g., counselors, social workers, school psychologists)<br>10 sessions focused on education about reactions to trauma, relaxation training, stress or trauma exposure, and social problem-solving<br>Family and community focused and culturally sensitive and relevant for urban, racial minority youth |

*Note.* MDS3 = Maryland Safe and Supportive Schools; PBIS = Positive Behavioral Interventions and Supports.

## Training and Support to Intervention Schools

Consistent with the PBIS framework, a train-the-trainer framework was used, whereby the PBIS teams received initial training and implementation materials from coaches and national trainers, whereas the training activities at the school level were led by the school-specific PBIS teams with support from project-assigned coaches. Specifically, each school was assigned an interven-

tion support coach, who served three schools. The coaches were expected to spend approximately two days per week working with each of their three assigned schools to support high-quality implementation of the prevention programs. For the initial training for the 31 MDS3 intervention schools, 10 personnel (i.e., school psychologists, teachers, administrators) from each school were brought together to serve as the MDS3 school-based leadership team. This first training included a large-group overview of the content of the initiative, an explanation of the targeted domains of school climate (i.e., safety, engagement, environment), and information on how to access and use the online MDS3 School Climate Survey System to facilitate data-based decision-making. The training also provided detailed information about each EBP being offered (discussed in the next paragraph) and included activities, opportunities for practice, and action planning.

Following the initial large-scale training, coaches worked with their three implementing high schools over the course of the project. The coaches co-led trainings at the schools with school-level PBIS team members; the coaches also provided on-site technical assistance relevant to high schools and the specific schools they served to promote high-fidelity implementation of PBIS. The coaching model was collaborative and focused on supporting the school teams. Using data from the web-based MDS3 School Climate Survey, which was specifically developed for use in high schools, coaches assisted school-level PBIS teams in the selection of the EBPs to implement within the PBIS framework (Bradshaw, Bottiani, et al., 2014). Each coach was trained in the relevant EBPs, consistent with the program developers' specifications. The menu of EBPs included the Olweus Bullying Prevention Program (Olweus et al., 2007), which is a Tier 1 approach for preventing bullying; the LifeSkills Training for High Schools Program (Botvin, Griffin, & Nichols, 2006), which is a Tier 1 substance abuse prevention model; Check-In/Check-Out (Hawken & Horner, 2003), which is a Tier 2 model for preventing behavior problems within the PBIS framework; Check & Connect (Sinclair, Christenson, & Thurlow, 2005), which is a Tier 2 mentoring model that emphasizes the school–home connection through trained school-based mentors; and Cognitive-Behavioral Intervention for Trauma in Schools (Stein et al., 2003), which provides a Tier 3, group-based preventive intervention to youth exposed to trauma and who are at risk of developing a behavioral or mental health problem. See Table 2 for details.

A subset of members of the MDS3 school-based team from all intervention schools attended a centralized, annual 2-day summer booster training session. The majority of the EBP trainings were delivered regionally or on site, specifically targeting each school's needs. School-based personnel were trained to implement PBIS and the EBPs by the coach in conjunction with the PBIS team; this train-the-trainer implementation framework is used to bolster internal implementation capacity and increase sustainability of the EBPs. Finally, coaching and technical assistance were provided to the school district to encourage high-quality implementation and sustainability of the EBPs.

## Fidelity Measures

Two fidelity measures served as the outcomes of interest for the current study. The School-wide Evaluation Tool (SET; Sugai, Lewis-Palmer, Todd, & Horner, 2001) is an observational tool used to assess the degree to which schools implement the key Tier 1 features of PBIS (Horner et al., 2004). The SET involves an observer conducting brief interviews with staff and students, touring the school, and reviewing materials to document evidence of implementation. The external observer incorporated this information and provided ratings for a series of items that comprise seven sub scales on a scale of 0 (*not implemented*) to 2 (*fully implemented*). The scales are as follows: (a) expectations defined, (b) behavioral expectations taught, (c) system for rewarding behavioral expectations, (d) system for responding to behavioral violations, (e) monitoring and decision making, (f) management, and (g) district-level support (see

Horner et al., 2004). Scores on the sub scales were calculated by summing all points earned, dividing by the total possible points, and multiplying by 100. Therefore, scores range from 0% to 100%, with higher scores indicating greater fidelity. An overall summary score was computed by averaging all seven scores (referred to as the *overall SET score*), which also ranges from 0% to 100% (Cronbach's $\alpha = 0.93$ in the current study). An overall SET score of 80% or higher is considered high fidelity (Horner et al., 2004; Sugai et al., 2001). The SET is the most widely used research-based measure of PBIS Tier 1 implementation; it has been previously validated in several studies of PBIS (Bradshaw, Reinke, et al., 2008; Horner et al., 2004; Pas & Bradshaw, 2012). The current trial used identical training and reliability assessment procedures to those used by Debnam et al. (2012). Specifically, all trained observers participated in a 2-day SET training and reached and maintained at least 80% reliability with a trainer to participate in data collection for the project. All observers were unaware of the school's intervention status (for additional details on the SET, training, and psychometric procedures, see Bradshaw, Reinke, et al., 2008; Debnam et al., 2012).

The Individual Student Systems Evaluation Tool (I-SSET, Version 1.2; Lewis-Palmer, Todd, Horner, Sugai, & Sampson, 2005) was similarly administered by the external assessor to document the support services provided at the more advanced tiers (i.e., Tiers 2 and 3). The I-SSET includes four subscales: (a) the foundations subscale measured the basic processes and procedures in place for individual student systems; (b) the school-wide interventions subscale included specific questions about school-wide social–emotional and behavioral interventions in place at the school; (c) the targeted interventions subscale included specific questions about Tier 2 and 3 behavioral interventions in the school; and (d) the intensive individualized interventions subscale measured the quality of the school's team members involved in functional behavioral assessments. The I-SSET is similar in structure, form, and administration to the SET. For example, as with the SET, the observer provided ratings on a scale of 0 to 2 for each item and the percentage of components implemented was calculated for each scale. An overall I-SSET score was created by averaging the four subscale scores (0%–100%); again, higher scores indicate better implementation of the MTSS ($\alpha = 0.92$ in the current study). Research by Debnam et al. (2012) indicated that the I-SSET is a valid and reliable measure of the fidelity of advanced-tier EBPs. All trained observers participated in a 2-day I-SSET training and reached and maintained at least 80% reliability with a trainer to participate in data collection for the project. All observers were unaware of the school's intervention status; for additional details on the I-SSET, training, and psychometrics, see Debnam et al. (2012).

### School-Level Indicators of Disorder

Information regarding school disorder (i.e., data about students as well as staff; use of exclusionary discipline practices) were collected from the MSDE. These included the percentage of suspension events (i.e., total number of suspensions divided by student enrollment), student mobility rate (i.e., total entrants and withdrawals divided by student enrollment), student-to-teacher ratio, and percentage of teachers in the school with a standard or advanced teaching certification. These school-level indicators of school disorder have been used in prior research examining the association between school characteristics, PBIS adoption, and implementation at the elementary and middle school levels (e.g., Bradshaw & Pas, 2011; Pas & Bradshaw, 2012). Another source of school disorder data came from the MDS3 School Climate Survey (Bradshaw, Waasdorp, Debnam, & Lindstrom Johnson, 2014), through which students reported their experience of bullying victimization within the past 30 days, including five forms of verbal victimization (e.g., being called names; being threatened; being teased) and three forms of physical victimization (i.e., being pushed or shoved; being hit, slapped, or kicked). These indicators were adapted from

previously published and validated measures of bullying (see Bradshaw, Sawyer, et al., 2009; Sawyer, Bradshaw, & O'Brennan, 2008; Solberg & Olweus, 2003).

### Overview of Analyses

A series of descriptives, repeated-measures analyses of variance (ANOVAs), and correlational analyses were conducted in SPSS, Version 22.0, to first examine trends in the implementation of the MTSS across three school years (i.e., baseline and the first two intervention years of the study), using all subscales of the implementation measures (i.e., SET and I-SSET). Specifically, a single repeated-measures multivariate analysis of variance (MANOVA) was run for the SET and I-SSET subscales to determine whether there was an overall change across time on the measures and whether there was a scale-by-time interaction. Post hoc repeated-measures ANOVAs were then used to examine the unadjusted change for all SET and I-SSET subscales individually; to adjust for the number of tests conducted (i.e., MANOVAs and post hoc ANOVAs), we applied a conservative Bonferroni correction of $p = .004$. We then examined the zero-order correlations between the baseline rates of bullying and other school-level indicators of disorder with scores on the overall SET and I-SSET scales for each time point and for change scores.

Hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) was used to examine the association between the repeated measures of the overall SET and I-SSET scores (i.e., at baseline, followed by Year 1 after training and Year 2 after training) and baseline bullying prevalence and other indicators of school-level disorder. The repeated measures of the SET and I-SSET scores were modeled in separate models at Level 1. First, models were run with no predictors; then, just the uncentered time variable was added to Level 1 (i.e., 0 for baseline, 1 for Year 1 of intervention, and 2 for Year 2). At Level 2, the error term for the slope of time was freed to allow for the modeling of random effects of time between schools. The statistical tests indicated that the random variance for time was nonsignificant, and thus, it was fixed in subsequent models. The school-level variables were modeled at Level 2 and included the percentage of students who reported that they were verbally bullied, the percentage of students who reported that they were physically bullied, the suspension rate, the student–teacher ratio, the student mobility rate, and the percentage of teachers with certification. All Level 2 variables were grand mean centered (Luke, 2004). Two separate models were analyzed; the first model included bullying and other school-level disorder characteristics predicting the intercept to examine the association of preintervention level of implementation of PBIS, and the second model examined whether bullying and other school-level characteristics measured at baseline related to the change in implementation over time by modeling all predictors on the slope of time. These HLM analyses allowed us to determine whether baseline rates of bullying and school disorder were associated with implementation, as indicated by overall SET and I-SSET scores. Changes in the intraclass correlation coefficients (ICCs) and deviance were used to examine the variability explained by the models.

## RESULTS

Statistics of central tendency were computed to assess the level of implementation as indicated by both the SET and I-SSET at each time point. The means for the SET and I-SSET subscale scores at baseline and at the end of Year 1 and Year 2 are presented in Table 3.

### SET and I-SSET Descriptive Information

The average implementation score on the SET was below the 80% threshold at baseline and after 1 year of implementation for all but two subscales (i.e., system for responding to behavioral violations, as well as monitoring and decision making; for overall SET scores at baseline and Year 1, $M = 60.59$ and $M = 70.63$, respectively). After 2 years of implementation two subscales (i.e., behavioral expectations taught and system for rewarding

**Table 3. Repeated-Measures ANOVAs for SET and I-SSET Scale Scores**

| | Baseline | | Year 1 | | Year 2 | | Within-Subject Effects | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *F* | *p* |
| SET scales | | | | | | | | |
| Expectations defined | 46.77[b,c] | 41.70 | 72.58[a] | 37.28 | 82.26[a] | 27.53 | 11.13 | < .01* |
| Expectations taught | 47.74[b,c] | 35.19 | 62.90[a,c] | 31.33 | 78.06[a,b] | 24.42 | 14.06 | < .01* |
| Rewarding expectations | 33.87[c] | 33.19 | 46.24[c] | 35.15 | 61.83[a,b] | 35.80 | 8.17 | < .01* |
| Responding to violations | 81.61[b,c] | 16.55 | 90.32[a] | 11.69 | 93.23[a] | 7.91 | 7.33 | < .01* |
| Monitoring | 83.47 | 20.00 | 82.66[c] | 23.20 | 91.94[b] | 14.63 | 3.59 | .03 |
| Management | 69.35[c] | 32.13 | 70.36[c] | 33.46 | 86.29[a,b] | 18.64 | 4.20 | .02 |
| District-level support | 61.29[c] | 42.25 | 69.35 | 40.16 | 83.87[a] | 29.96 | 3.47 | .04 |
| Overall SET score | 60.59[b,c] | 23.70 | 70.63[a,c] | 23.24 | 82.50[a,b] | 16.21 | 15.51 | < .01* |
| I-SSET scales | | | | | | | | |
| Foundations | 68.50 | 15.47 | 71.11 | 11.94 | 76.25 | 18.06 | 2.04 | .14 |
| School-wide interventions | 58.06 | 29.02 | 55.88 | 31.24 | 62.79 | 27.29 | 0.67 | .51 |
| Targeted interventions | 37.47[b,c] | 31.75 | 61.29[a,c] | 32.21 | 79.53[a,b] | 25.52 | 18.31 | < .01* |
| Intensive interventions | 76.81[b,c] | 24.00 | 86.49[a] | 14.97 | 91.94[a] | 9.44 | 7.50 | < .01* |
| Overall I-SSET score | 60.24[c] | 19.52 | 68.69[c] | 16.94 | 77.62[a,b] | 14.33 | 10.36 | < .01* |

*Note.* ANOVA = analysis of variance; I-SSET = Individual Student Systems Evaluation Tool; SET = School-wide Evaluation Tool.
[a] Significant pairwise comparison versus baseline.
[b] Significant pairwise comparison versus Year 1.
[c] Significant pairwise comparison versus Year 2.
* Significant at $p < .004$ level (i.e., Bonferroni correction).

behavioral expectations) remained below the 80% benchmark, whereas all other scales were above this 80% benchmark (for overall SET score, $M = 82.50$; see Table 3 for listing of all subscale score means). By Year 2, 71% of the schools reached the benchmark of achieving 80% or higher on the overall SET score. On the I-SSET, only the average score on the intensive individualized interventions subscale reached 80% or higher by the end of the first year. After 2 years, none of the other scales had reached this benchmark, on average, although the mean scores for the targeted interventions subscale and overall I-SSET were similar, at 79.53 and 77.62, respectively. After the second year of implementation, only 45% of the schools had reached the 80% fidelity benchmark on the overall I-SSET scale.

The repeated-measures MANOVA indicated a significant effect for time, $F(2, 56) = 27.03$, $p < .001$, $\eta^2 = 0.49$; subscale, $F(10, 48) = 40.39$, $p < .001$, $\eta^2 = 0.89$; and time-by-subscale interaction, $F(20, 38) = 6.34$, $p < .001$, $\eta^2 = 0.78$. It is worth highlighting that the effect size is rather sizable, particularly in light of the relatively small sample size. On the basis of the overall significant MANOVA results, we then conducted post hoc repeated-measures ANOVAs to compare the individual SET and I-SSET subscale scores across time; this enabled us to determine specifically which scales changed significantly over time. The repeated-measures ANOVAs showed that most SET subscale scores improved significantly over time. In particular, there were immediate and continued improvements on the subscale for behavioral expectations taught (i.e., all pairwise comparisons reflected significant increases), as well as the overall SET score. Specifically, the scores improved after both the first and second years of implementation. Significant differences emerged after the first year of implementation for the subscale for expectations defined and the subscale for system for responding to behavioral violations (i.e., differ-

**Table 4. Correlations Between the SET and I-SSET Implementation Measures for the 31 Intervention Schools**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Baseline SET | | | | | | | | | |
| 2. Baseline I-SSET | .325 | | | | | | | | |
| 3. Year 1 SET | .556** | –.059 | | | | | | | |
| 4. Year 1 I-SSET | .240 | .133 | .555** | | | | | | |
| 5. Year 2 SET | .383* | .056 | .504** | .420* | | | | | |
| 6. Year 2 I-SSET | .398* | .271 | .357* | .308 | .345 | | | | |
| 7. SET 1-year change | –.487** | –.410* | .455* | .326 | .119 | –.052 | | | |
| 8. SET 2-year change | –.760** | –.295 | –.218 | .048 | .309 | –.167 | .585** | | |
| 9. I-SSET 1-year change | –.095 | –.717** | .438* | .596** | .250 | –.003 | .562** | .273 | |
| 10. I-SSET 2-year change | –.031 | –.750** | .300 | .087 | .184 | .433* | .349 | .162 | .669** |

*Note.* I-SSET = Individual Student Systems Evaluation Tool; SET = School-wide Evaluation Tool.
* $p < .05$. ** $p < .01$.

ences between baseline and Year 1); however, no further significant improvements emerged when we compared the second year of implementation with the first. As noted earlier, on average, schools reached the 80% benchmark after the first year on the subscale for system for responding to behavioral violations; this may explain why no further improvements on this subscale occurred after the first year. The subscale for rewarding behavioral expectations only improved significantly after 2 years of implementation. The remaining three scales (i.e., monitoring and decision making, management, and district support) did not change significantly when the Bonferroni-corrected $p$ value was used.

Statistically significant improvements on I-SSET subscale scores were demonstrated on the targeted interventions subscale and the intensive individualized interventions subscale, as well as overall scale scores (i.e., but not on the foundations subscale or schoolwide interventions subscale). Pairwise comparisons indicated that significant improvements emerged on the targeted interventions subscale, as well as the intensive individualized interventions scale (i.e., in comparing baseline with Year 1), whereas the overall score on the scale improved later (i.e., from Year 1 to Year 2). Scores on the targeted interventions subscale also improved further between Year 1 and Year 2.

For efficiency, we focused the remaining statistical tests only on overall SET and I-SSET scores, which reflect Tier 1 and combined Tier 1, 2, and 3 scores, respectively. Although the averages on the SET and I-SSET were comparable and not statistically significantly different when contrasted to one another across time points, they were only significantly correlated with one another at the end of the first year of the trial ($r = .56$, $p < .01$). The change scores for the first year were also significantly correlated with one another ($r = .56$, $p < .01$). Correlations between the SET and I-SSET at baseline and after Year 2 approached significance at the $p < .10$ level. See Table 4 for additional details regarding the correlational findings.

## Correlations Between Implementation and School Variables

We also examined the correlations between the overall SET and I-SSET scores at baseline, Year 1, and Year 2, as well as the change scores from baseline to Year 1 and from baseline to Year 2, with bullying prevalence indicators and other school-level characteristics (see Table 5). Baseline bullying indicators were significantly associated with the Year 1 SET and I-SSET scores. Specifically, schools with a higher prevalence of student-reported verbal victimization ($r = .50$, $p <$

**Table 5. Correlations Between Implementation and School Characteristics among the 31 Intervention Schools**

| Baseline Characteristics | Baseline SET | Baseline I-SSET | Year 1 SET | Year 1 I-SSET | Year 2 SET | Year 2 I-SSET | SET 1-Year Change | SET 2-Year Change | I-SSET 1-Year Change | I-SSET 2-Year Change |
|---|---|---|---|---|---|---|---|---|---|---|
| Prevalence of verbal bullying | .164 | –.056 | .495** | .339 | .320 | .067 | .345 | .057 | .284 | .098 |
| Prevalence of being physical bullying | .242 | .047 | .464** | .534** | .495** | .207 | .228 | .099 | .338 | .098 |
| Suspension rate | .085 | –.142 | .102 | –.094 | .339 | .100 | .016 | .151 | .049 | .202 |
| Student–teacher ratio | .002 | .061 | .265 | .242 | .053 | .019 | .276 | .035 | .121 | –.044 |
| Percentage of certified teachers | –.059 | –.028 | –.097 | –.144 | –.372* | –.299 | –.039 | –.201 | –.078 | –.179 |
| Student mobility | .128 | .164 | –.083 | –.262 | .233 | .170 | –.224 | .033 | –.318 | –.037 |

*Note.* I-SSET = Individual Student Systems Evaluation Tool; SET = School-wide Evaluation Tool.
* $p < .05$. ** $p < .01$.

.05) and physical victimization ($r = .46$, $p < .05$) had significantly higher SET scores. Schools with a higher baseline prevalence of students reporting physical victimization had higher SET scores in Year 2 ($r = .50$, $p < .05$). A significant association was also observed between the baseline prevalence of physical victimization and I-SSET score in Year 1 ($r = .53$, $p < .05$). The only significant correlation between other baseline school-level indicators of disorder and implementation was the baseline percentage of certified teachers and the Year 2 SET scores ($r = –.37$, $p < .05$). None of the other baseline school characteristics were significantly associated with change scores on the overall SET and I-SSET.

### Multilevel Analyses

Four final HLMs were fit, including two models that incorporated all school-level characteristics on the intercept and on the slope of the time variable for each of the two outcomes (i.e., SET and I-SSET scores; see Table 6). The covariate-adjusted intercept estimates were generally consistent with the baseline means: 60.28 for the SET and 60.16 for the I-SSET. None of the variables were significantly associated with the SET intercept. The rate of physical victimization was associated with higher I-SSET intercepts when we adjusted for other indicators of school disorder. In addition, the suspension rate was inversely associated with the intercept of the I-SSET; specifically, the higher the suspension rate, the lower the overall I-SSET score.

Consistent with the ANOVA findings, schools significantly improved on both the SET and I-SSET measures over time. Specifically, SET scores improved by 10.95 percentage points (on a 100-point scale) across the 2 years, whereas I-SSET scores improved by 8.69 percentage points (also on a 100-point scale). Contrary to our hypothesis, schools with a higher baseline rate of verbal victimization experienced significantly greater increases in their SET scores over the three data points. The baseline percentage of certified teachers was inversely associated with growth in both SET and I-SSET scores over time. There were no other significant associations between the other indicators of school disorder and the changes in SET and I-SSET scores over the course of the three waves of data. Reductions in the ICCs and deviance indicated that the final models improved fit and explained a sizable amount of between-school variability in the outcomes (see Table 6).

## DISCUSSION

The purpose of this study was to examine the implementation of an MTSS frame-

## Table 6. HLM Results

| | SET | | | I-SSET | | |
|---|---|---|---|---|---|---|
| | Coefficient | *SE* | *p* | Coefficient | *SE* | *p* |
| HLM results for predicting SET and I-SSET intercept | | | | | | |
| Intercept | 60.28 | 3.97 | < .01 | 60.16 | 2.79 | < .01 |
| Physical bullying, γ01 | 1.26 | 0.92 | .19 | 2.02 | 0.68 | .01 |
| Verbal bullying, γ02 | 1.40 | 0.83 | .10 | –0.60 | 0.58 | .31 |
| Suspension, γ03 | 0.05 | 0.19 | .79 | –0.37 | 0.15 | .02 |
| Student–teacher ratio, γ04 | 0.47 | 0.98 | .64 | 0.95 | 0.55 | .10 |
| Teacher certification, γ05 | –1.19 | 0.90 | .20 | –1.26 | 0.68 | .07 |
| Mobility, γ06 | 0.24 | 0.41 | .56 | 0.27 | 0.25 | .28 |
| Time | 10.95 | 2.03 | < .01 | 8.69 | 1.84 | < .01 |
| Variance indicators | | | | | | |
| Reduction in ICC | 18.28% | | | 38.96% | | |
| Initial deviance | 802.07 | | | 802.07 | | |
| Final deviance | 784.06 | | | 793.79 | | |
| HLM results for predicting SET and I-SSET slope | | | | | | |
| Intercept | 60.28 | 4.20 | < .001 | 60.16 | 3.05 | < .001 |
| Time | 10.95 | 2.01 | < .001 | 8.69 | 1.85 | < .001 |
| Physical bullying, γ11 | 0.39 | 0.33 | .23 | 0.76 | 0.48 | .12 |
| Verbal bullying, γ12 | 0.70 | 0.22 | < .01 | 0.04 | 0.36 | .91 |
| Suspension, γ13 | 0.08 | 0.08 | .36 | –0.08 | 0.07 | .29 |
| Student–teacher ratio, γ14 | 0.37 | 0.45 | .41 | 0.34 | 0.39 | .39 |
| Teacher certification, γ15 | –0.96 | 0.29 | < .01 | –0.97 | 0.27 | < .001 |
| Mobility, γ16 | –0.03 | 0.13 | .81 | –0.05 | 0.14 | .71 |
| Variance indicators | | | | | | |
| Reduction in ICC | 22.19% | | | 36.40% | | |
| Initial deviance | 776.08 | | | 776.08 | | |
| Final deviance | 762.71 | | | 771.82 | | |

*Note.* Reductions in ICC reflect the proportion of change relative to initial variance components. HLM = hierarchical linear modeling; ICC = intraclass correlation coefficient; I-SSET = Individual Student Systems Evaluation Tool; SET = School-wide Evaluation Tool.

work in high schools. The MTSS model tested in this study included training in the multitiered PBIS model and access to data on school climate, which were used to guide the selection and implementation of one or more EBPs, with ongoing support from a coach. As has been seen in studies of PBIS in elementary and middle schools (Bradshaw & Pas, 2011; Bradshaw, Reinke, et al., 2008; Pas & Bradshaw, 2012), the current sample of high schools on average demonstrated increasing levels of implementation over the course of 2 years. Consistent with the MTSS framework, schools generally appeared to make greater gains in Tier 1 supports, as compared with advanced-tier supports. Specifically, SET scores 2 years after training demonstrated that 22 of the 31 schools (71%) met or exceeded 80% fidelity on the Tier 1 supports and, on average, scored 82.50%. During this same period, fewer than half of the schools implemented 80% of the advanced-tier components (as measured by the I-SSET), and the average I-SSET score was 77.62%. This rate of adoption of Tier 1 was roughly on par with Tier 1 supports previously observed in PBIS studies at the elementary school level (Bradshaw, Koth, et al., 2009; Bradshaw, Reinke, et al., 2008); however, the rate of adoption of advanced-tier supports in this sample of high

schools appeared to be a bit slower than that in PBIS studies at the elementary school level (Bradshaw, Pas, et al., 2012). These findings highlight the need for high schools to set realistic expectations for the period required for program adoption that meets high-fidelity implementation, particularly regarding the timeline for advanced-tier implementation.

Both the correlations and HLM analyses highlighted the importance of baseline prevalence of bully victimization regarding implementation of PBIS. Specifically, the prevalence of victimization by bullying was significantly related to Year 1 and Year 2 SET and I-SSET scores. The percentage of certified teachers was the only other variable that was significantly correlated with SET scores. These findings were replicated in the covariate-adjusted HLMs addressing our third research question regarding baseline factors that predict changes in fidelity of Tiers 1, 2, and 3 over time. The adjusted multilevel results demonstrated a significant association between the baseline rate of victimization by physical bullying and the intercept for the I-SSET. Additionally verbal bullying at baseline was related to the growth of SET scores over time. This finding was inconsistent with our hypothesis that greater disorder, as measured in this case by bullying prevalence, would inhibit implementation. It is possible that the baseline prevalence of bullying may have served as a motivating factor for schools to implement more Tier 1 positive behavioral approaches. An interesting finding was that verbal victimization was associated with SET changes, whereas physical bullying rates were associated with I-SSET intercept scores only. In contrast, a higher rate of baseline suspensions was associated with lower fidelity scores on the I-SSET, reflecting less school focus on advanced-tier implementation relative to the universal, Tier 1 supports. Additional research is needed to replicate and further examine these trends.

The baseline rate of certified teachers was inversely associated with Year 2 SET scores and with change in overall SET scores over time. This finding was unexpected because prior research suggested a significantly positive association between teacher certification and implementation (Bradshaw & Pas, 2011; Pas & Bradshaw, 2012). The difference in the school setting (high schools vs. elementary and middle schools) may account for these unexpected findings. No other baseline predictors were significantly associated with changes in SET or I-SSET scores over time. Taken together, these findings suggest that baseline indicators of disorder were generally not associated with PBIS implementation and thus do not appear to be barriers to adoption.

## Limitations

The sample size of 31 intervention schools may have limited the power to detect effects within the multilevel models. We focused most of the statistical analyses on the continuous SET and I-SSET scores to better understand the overall pattern and growth in findings and leverage statistical power (Murray, 1998); additional empirical work is needed to better understand the specific threshold at which PBIS implementation across all the three tiers translates into outcomes in high schools. Although there was randomization to intervention condition, as well as a set number of EBPs that schools had access to through the project, schools opted to implement the various EBPs at different rates. On average, the approach was to focus on Tier 1 in Year 1 and then layer on additional universal and advanced-tier EBPs in Year 2. The empirical findings regarding the rollout and implementation of the various tiers were generally consistent with recommended practice (Barrett et al., 2008). The school-level PBIS team members, with support from their MDS3 coach, served as the school-level trainers for the program elements. Although the coaches tracked their own coaching supports and time in the school, the amount of training time and supports provided to teachers and other school staff by the PBIS teams varied. Such variability in training and implementation support is common in effectiveness studies, such as this one (as compared to efficacy studies; Domitrovich et al., 2008; Gottfredson et al., 2015).

Nevertheless, there are a number of strengths of this study including our focus on high schools, the use of outside assessors to rate the fidelity of the PBIS elements, and the use of previously validated measures. Future research should further explore the psychometric properties of the SET and I-SSET at the high school level, given that the vast majority of the psychometric work on these instruments has been conducted at the elementary school level. For example, exploration of measurement invariance across grade levels may provide further insight into the extent to which these tools are truly measuring the same core features across grade levels. Such an exploration is beyond the scope of the current study but is certainly an area of increasing interest within the burgeoning field of implementation science in relation to school-based prevention programming (e.g., Polanin & Espelage, 2014; Schulte, Easton, & Parker, 2009). It is important to note that the internal consistency estimates for the SET and I-SSET were relatively high in this sample, suggesting that these tools are also appropriate for use in high schools.

## Conclusions and Implications

This study is novel in its focus on PBIS in high schools, as well as the attention to PBIS adoption and implementation across all 3 tiers of the MTSS. Similarly, although PBIS implementation research has examined associations with school characteristics (e.g., Bradshaw & Pas, 2011; Pas & Bradshaw, 2012), baseline rates of bullying have not been previously explored as a possible predictor of implementation. Specifically, by leveraging the MDS3 School Climate Survey, we explored the extent to which victimization by different forms of bullying was associated with subsequent implementation. Our findings suggest that victimization stands out as a stronger predictor than other more readily available data (e.g., suspension rate); this suggests that baseline rates of bullying may be a motivator for, but not an impediment to, PBIS adoption and implementation. Furthermore, it may be advantageous for PBIS schools to make use of data systems that assess and track bullying throughout the implementation process (Bradshaw, 2013). Given their expertise in data-based decision-making and consultation, school psychologists may play an important role in supporting schools' use of various types of data, including information on school climate and bullying. These findings also highlight the growing interest in and attention to issues related to implementation within the field of school psychology (Forman et al., 2013). Future studies based on the data from this trial will link these implementation findings with student outcomes and will explore changes in bullying and climate over time.

## REFERENCES


Barrett, S., Bradshaw, C. P., & Lewis-Palmer, T. (2008). Maryland state-wide PBIS initiative: Systems, evaluation, and next steps. *Journal of Positive Behavior Interventions, 10*, 105–114. doi:10.1177/1098300707312541

Beets, M. W., Flay, B. R., Vuchinich, S., Acock, A. C., Li, K.-K., & Allred, C. (2008). School climate and teachers' beliefs and attitudes associated with implementation of the positive action program: A diffusion of innovations model. *Prevention Science, 9*, 264–275. doi:10.1007/s11121-008-0100-2

Botvin, G. J., Griffin, K. W., & Nichols, T. R. (2006). Preventing youth violence and delinquency through a universal school-based prevention approach. *Prevention Science, 7*, 403–408.

Bradshaw, C. P. (2013). Preventing bullying through Positive Behavioral Interventions and Supports (PBIS): A multi-tiered approach to prevention and integration. *Theory Into Practice, 52*, 288–295. doi:10.1080/00405841.2013.829732

Bradshaw, C. P. (2015). Translating research to practice in bullying prevention. *American Psychologist, 70*(4), 322–332.

Bradshaw, C. P., Bottiani, J., Osher, D., & Sugai, G. (2014). Integrating Positive Behavioral Interventions and Supports (PBIS) and social emotional learning. In M. D. Weist, N. A. Lever, C. P. Bradshaw, & J. Owens (Eds.), *Handbook of school mental health: Advancing practice and research* (2nd ed., pp. 101–118). New York, NY: Springer.

Bradshaw, C. P., Debnam, K. J., Lindstrom Johnson, S., Pas, E., Hershfeldt, P., Alexander, A., . . . Leaf, P. J. (2014). Maryland's evolving system of social, emotional, and behavioral interventions in public schools: The Maryland Safe and Supportive Schools project. *Adolescent Psychiatry, 4*, 194–206. doi:10.2174/2210676604031409121631 20

Bradshaw, C. P., Koth, C. W., Bevans, K. B., Ialongo, N., & Leaf, P. J. (2008). The impact of school-wide Positive Behavioral Interventions and Supports (PBIS) on the organizational health of elementary schools. *School Psychology Quarterly, 23*, 462–473. doi:10.1037/a0012883

Bradshaw, C. P., Koth, C. W., Thornton, L. A., & Leaf, P. J. (2009). Altering school climate through school-

wide Positive Behavioral Interventions and Supports: Findings from a group-randomized effectiveness trial. *Prevention Science, 10*, 100–115. doi:10.1007/s11121-008-0114-9

Bradshaw, C. P., Mitchell, M. M., & Leaf, P. J. (2010). Examining the effects of School-Wide Positive Behavioral Interventions and Supports on student outcomes: Results from a randomized controlled effectiveness trial in elementary schools. *Journal of Positive Behavior Interventions, 12*, 133–148. doi:10.1177/1098300709334798

Bradshaw, C. P., & Pas, E. T. (2011). A state-wide scale-up of Positive Behavioral Interventions and Supports (PBIS): A description of the development of systems of support and analysis of adoption and implementation. *School Psychology Review, 40*, 530–548.

Bradshaw, C. P., Pas, E. T., Goldweber, A., Rosenberg, M., & Leaf, P. (2012). Integrating school-wide Positive Behavioral Interventions and Supports with tier 2 coaching to student support teams: The PBISplus model. *Advances in School Mental Health Promotion, 5*, 177–193. doi:10.1080/1754730x.2012.707429

Bradshaw, C. P., Reinke, W. M., Brown, L. D., Bevans, K. B., & Leaf, P. J. (2008). Implementation of School-Wide Positive Behavioral Interventions and Supports (PBIS) in elementary schools: Observations from a randomized trial. *Education & Treatment of Children, 31*, 1–26. doi:10.1353/etc.0.0025

Bradshaw, C. P., Sawyer, A. L., & O'Brennan, L. M. (2009). A social disorganization perspective on bullying-related attitudes and behaviors: The influence of school context. *American Journal of Community Psychology, 43*(3–4), 204–220. doi:10.1007/s10464-009-9240-1

Bradshaw, C. P., Waasdorp, T. E., Debnam, K. J., & Lindstrom Johnson, S. (2014). Measuring school climate: A focus on safety, engagement, and the environment. *Journal of School Health, 84*, 593–604. doi:10.1111/josh.12186

Bradshaw, C. P., Waasdorp, T. E., & Leaf, P. J. (2012). Effects of School-Wide Positive Behavioral Interventions and Supports on child behavior problems. *Pediatrics, 130*, e1136–e1145. doi:10.1542/peds.2012-0243

Bruhn, A. L., Hirsch, S. E., & Lloyd, J. W. (2015). Treatment integrity in school-wide programs: A review of the literature (1993–2012). *Journal of Primary Prevention, 36*, 335–349. doi:10.1007/s10935-015-0400-9

Caldarella, P., Shatzer, R. H., Gray, K., M., Young, R. K., & Young, E. L. (2011). The effects of school-wide positive behavior support on middle school climate and student outcomes in research in middle level education. *Research in Middle Level Education, 35*(4), 1–14.

Debnam, K. J., Pas, E., & Bradshaw, C. P. (2012). Secondary and tertiary support systems in schools implementing School-wide Positive Behavioral Interventions and Supports: A preliminary descriptive analysis. *Journal of Positive Behavior Interventions, 14*, 142–152. doi:10.1177/1098300712436844

Domitrovich, C. E., Bradshaw, C. P., Greenberg, M. T., Embry, D., Poduska, J., & Ialongo, N. S. (2010). Integrated models of school-based prevention: Theory and logic. *Psychology in the Schools, 47*, 71–88. doi:10.1002/pits.20452

Domitrovich, C. E., Bradshaw, C. P., Poduska, J. M., Hoagwood, K. E., Buckley, J. A., Olin, S., . . . Ialongo, N. S. (2008). Maximizing the implementation quality of evidence-based preventive interventions in schools: A conceptual framework. *Advances in School Mental Health Promotion, 1*, 6–28.

Fixsen, D., Naoom, S., Blasé, K., Friedman, R., & Wallace, F. (2005). *Implementation research: A synthesis of the literature* (FMHI Publication No. 231). Tampa, FL: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network.

Flannery, K. B., Sugai, G., & Anderson, C. M. (2009). School-Wide Positive Behavior Support in high school: Early lessons learned. *Journal of Positive Behavior Interventions, 11*, 177–185. doi:10.1177/1098300708316257

Forman, S. G., Shapiro, E. S., Codding, R. S., Gonzales, J. E., Reddy, L. A., Rosenfield, S. A., . . . Stoiber, K. C. (2013). Implementation science and school psychology. *School Psychology Quarterly, 28*, 77–100. doi:10.1037/spq0000019

Freeman, J., Simonsen, B., McCoach, D. B., Sugai, G., Lombardino, A., & Horner, R. (2016). An analysis of the relationship between school-wide Positive Behavior Interventions and Supports and academic, attendance, and behavior outcomes in high schools. *Journal of Positive Behavior Interventions,* 18(1) 41–51. doi:10.1177/1098300715580992

Glisson, C., & Green, P. (2006). The effects of organizational culture and climate on the access to mental health care in child welfare and juvenile justice systems. *Administration and Policy in Mental Health and Mental Health Services Research, 33*, 433–448.

Gottfredson, D. C., Cook, T. D., Gardner, F. E. M., Gorman-Smith, D., Howe, G. W., Sandler, I. N., & Zafft, K. M. (2015). Standards of evidence for efficacy, effectiveness, and scale-up research in prevention science: Next generation. *Prevention Science, 7*, 893–926. doi:10.1007/s11121-015-0555-x

Gottfredson, D. C., & Gottfredson, G. D. (2002). Quality of school-based prevention programs: Results from a national survey. *Journal of Research on Crime and Delinquency, 39*, 3–35.

Han, S., & Weiss, B. (2005). Sustainability of teacher implementation of school-based mental health programs. *Journal of Abnormal Child Psychology, 33*, 665–679.

Hawken, L. S., & Horner, R. H. (2003). Implementing a targeted group intervention within a school-wide system of behavior support. *Journal of Behavioral Education, 12*, 225–240.

Hawken, L. S., Vincent, C. G., & Schumann, J. (2008). Response to intervention for social behavior: Challenges and opportunities. *Journal of Emotional and Behavioral Disorders, 16*, 213–225.

Horner, R. H., Sugai, G., & Anderson, C. M. (2010). Examining the evidence base for schoolwide positive behavior support. *Focus on Exceptional Children, 42*(8), 1–14.

Horner, R. H., Sugai, G., Smolkowski, K., Eber, L., Nakasato, J., Todd, A. W., & Esperanza, J. (2009). A randomized, wait-list controlled effectiveness trial assessing school-wide Positive Behavior Support in elementary schools. *Journal of Positive Behavior Interventions, 11*, 133–144.

Horner, R. H., Todd, A. W., Lewis-Palmer, T., Irvin, L. K., Sugai, G., & Boland, J. (2004). The School-wide Evaluation Tool (SET): A research instrument for assessing school-wide positive behavior supports. *Journal of Positive Behavior Interventions, 6*, 3–12.

Hoy, W. K., & Feldman, J. (1987). Organizational health: The concept and its measure. *Journal of Research and Development in Education*, *20*, 30–38.

Irvin, L. K., Horner, R. H., Ingram, K., Todd, A. W., Sugai, G., Sampson, N. K., & Boland, J. B. (2006). Using office discipline referral data for decision making about student behavior in elementary and middle schools: An empirical evaluation of validity. *Journal of Positive Behavior Interventions, 8*, 10–23.

Kartub, D. T., Taylor-Greene, S., March, R. E., & Horner, R. H. (2000). Reducing hallway noise: A systems approach. *Journal of Positive Behavior Interventions, 2*, 179–182.

Knoff, H. M. (2000). Organizational development and strategic planning for the millennium: A blueprint toward effective school discipline, safety, and crisis prevention. *Psychology in the Schools, 37*, 17–32.

Kutash, K., Duchnowski, A. J., & Lynn, N. (2006). *School-based mental health: An empirical guide for decision-makers.* Tampa, FL: University of South Florida. The Louis de la Parte Florida mental Health Institute. Department of Child and Family Studies. Research and Training Center for Mental Health.

Lewis, T. J., Colvin, G., & Sugai, G. (2000). The effects of pre-correction and active supervision on the recess behavior of elementary students. *Education & Treatment of Children, 23*, 109–121.

Lewis, T. J., & Sugai, G. (1999). Effective behavior support: A systems approach to proactive school-wide management. *Focus on Exceptional Children, 31*, 1–24.

Lewis-Palmer, T., Todd, A., Horner, R., Sugai, G., & Sampson, N. (2005). *Individual student system systems evaluation tool (version 1.2)*. Eugene, OR: Educational and Community Supports, University of Oregon.

Lindsley, O. R. (1992). Why aren't effective teaching tools widely adopted? *Journal of Applied Behavior Analysis, 25*, 21–26.

Luke, D. (2004). *Multilevel modeling.* Thousand Oaks, CA: Sage.

Molloy, L. E., Moore, J. E., Trail, J., Van Epps, J. J., & Hopfer, S. (2013). Understanding real-world implementation quality and "active ingredients" of PBIS. *Prevention Science, 14*, 593–605.

Mrazek, P. G., & Haggerty, R. J. (Eds.) (1994). *Reducing risks for mental disorders: Frontiers for preventive intervention research.* Washington, DC: National Academies Press.

Murray, D. M. (1998). *Design and analysis of group-randomized trials.* New York, NY: Oxford Press.

Nersesian, M., Todd, A., Lehmann, J., & Watson, J. (2000). School-wide behavior support through district-level system change. *Journal of Positive Behavior Interventions, 2*, 244–246.

O'Connell, M. E., Boat, T., & Warner, K. E. (2009). *Preventing mental, emotional, and behavioral disorders among young people: Progress and possibilities.* Washington, DC: Committee on the Prevention of Mental Disorders and Substance Abuse Among Children, Youth and Young Adults: Research Advances and Promising Interventions; Institute of Medicine; National Research Council; The National Academies Press.

Olweus, D., Limber, S. P., Flerx, V. C., Mullin, N., Riese, J., & Snyder, M. (2007). *Olweus Bullying Prevention Program: Schoolwide guide.* Center City, MD: Hazelden.

Pas, E. T., & Bradshaw, C. P. (2012). Examining the association between implementation and outcomes: State-wide scale-up of School-Wide Positive Behavior Intervention and Supports. *Journal of Behavioral Health Services and Research, 39*, 417–433. doi: 10.1007/s11414-012-9290-2

Payne, A. A., Gottfredson, D. C., & Gottfredson, G. D. (2006). School predictors of the intensity of implementation of school-based prevention programs: Results from a national study. *Prevention Science, 7*, 225–237. doi:10.1007/s11121-006-0029-2

Polanin, J. R., & Espelage, D. L. (2014). Using a meta-analytic technique to assess the relationship between treatment intensity and program effects in a cluster-randomized trial. *Journal of Behavioral Education, 24*(1), 133–151.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods.* Thousand Oaks, CA: Sage.

Sawyer, A. L., Bradshaw, C. P., & O'Brennan, L. M. (2008). Examining ethnic, gender, and developmental differences in the way children report being a victim of 'bullying' on self-report measures. *Journal of Adolescent Health, 43*, 106–114. doi:10.1016/j.jadohealth.2007.12.011

Schoenwald, S. K., & Hoagwood, K. (2001). Effectiveness, transportability, and dissemination of interventions: What matters when? *Psychiatric Services, 52*, 1190–1197.

Schulte, A. C., Easton, J. E., & Parker, J. (2009). Advances in treatment integrity research: Interdisciplinary perspectives on the conceptualization, measurement, and enhancement of treatment integrity. *School Psychology Review, 39*, 460–475.

Sinclair, M. F., Christenson, S. L., & Thurlow, M. L. (2005). Promoting school completion of urban secondary youth with emotional or behavioral disabilities. *Exceptional Children, 71*, 465–482.

Solberg, M., & Olweus, D. (2003). Prevalence estimation of school bullying with the Olweus/Victim Questionnaire. *Aggressive Behavior, 29*, 239–268.

Stein, B. D., Jaycox, L. H., Kataoka, S., Wong, M., Tu, W., Elliott, M. N., & Fink, A. (2003). A mental health intervention for schoolchildren exposed to violence: A randomized controlled trial. *Journal of the American Medical Association, 290*, 603–611.

Sugai, G., & Horner, R. (2006). A promising approach for expanding and sustaining school-wide positive behavior support. *School Psychology Review, 35*, 245–259.

Sugai, G., Horner, R., & Gresham, F. (2002). Behaviorally effective school environments. In M. R. Shinn, H. M. Walker, & G. Stoner (Eds). *Interventions for academic and behavior problems II: Preventive and remedial approaches* (pp. 315–350). Washington, DC: National Association of School Psychologists.

Sugai, G., Lewis-Palmer, T., Todd, A., & Horner, R. H. (2001). *School-wide evaluation tool.* Eugene: University of Oregon.

Taylor-Greene, S., Brown, D., Nelson, L., Longton, J., Gassman, T., Cohen, J., . . . Hall, S. (1997). School-

wide behavioral support: Starting the year off right. *Journal of Behavioral Education, 7*, 99–112. doi: 10.1023/A:1022849722465

Taylor-Greene, S., & Kartub, D. T. (2000). Durable implementation of school-wide behavior support: The high five program. *Journal of Positive Behavior Interventions, 2*, 233–235.

Waasdorp, T. E., Bradshaw, C. P., & Leaf, P. J. (2012). The impact of School-wide Positive Behavioral Interventions and Supports (SWPBIS) on bullying and peer rejection: A randomized controlled effectiveness trial. *Archives of Pediatrics and Adolescent Medicine, 116*, 149–156. doi:10.1001/archpediatrics.2011.755

Walker, H. M., Horner, R. H., Sugai, G., Bullis, M., Sprague, J. R., Bricker, D., & Kaufman, M. J. (1996). Integrated approaches to preventing antisocial behavior patterns among school-age children and youth. *Journal of Emotional and Behavioral Disorders, 4*, 194–209.

Wandersman, A., Duffy, J., Flaspohler, P., Noonan, R., Lubell, K., Stillman, L., . . . Saul, J. (2008). Bridging the gap between prevention research and practice: The interactive systems framework for dissemination and implementation. *American Journal of Community Psychology, 41*, 171–181.

Date Submitted: September 11, 2015
Date Accepted: November 6, 2015
Guest Editor: Chad A. Rose ■

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