Factors Predicting Sustained Implementation of a Universal Behavior Support Framework

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Abstract

In this 3-year prospective study, we tested the extent to which school-, practice-, and district-level variables predicted sustained implementation for schools in various stages of implementation of school-wide positive behavioral interventions and supports (SWPBIS) Tier 1 (universal) systems. Staff from 860 schools in 14 U.S. states completed a research-validated measure of factors associated with sustained implementation of school interventions during Year 1 of this study. Analyses included multi-group structural equation modeling of school and district implementation fidelity data. Results indicated that adequate implementation fidelity and better Team Use of Data for decision making in Study Year 1 were the strongest predictors of sustained implementation in Year 3. In addition, the number of other schools in the district adopting SWPBIS was a similarly strong predictor. A critical mass of schools implementing was also predictive, especially for schools earlier in implementation. School characteristics were not predictive, except for grade levels served, which was an inconsistent predictor by stage.

Keywords: Positive behavior support, behavior intervention, implementation science, positive behavioral interventions and supports

Factors Predicting Sustained Implementation of a Universal Behavior Support Framework

For over 40 years, researchers have stressed the importance of sustaining evidence-based practices (EBPs), those with demonstrated evidence of effectiveness, for improving outcomes for students (Berman & McLaughlin, 1976). Yet until recently, few large-scale studies had examined factors influencing the implementation and sustainability of EBPs in schools (Fixsen, Blase, & Fixsen, 2017). One prominent EBP is school-wide positive behavioral interventions and supports (SWPBIS; Horner et al., 2014), an evidence-based, multi-tiered framework for implementing school interventions to improve school climate and social and emotional competence that is currently being implemented in over 25,000 schools in the U.S. (Center on Positive Behavioral Interventions and Supports, 2018). The multi-tiered component of SWPBIS maps onto a public health model. Tier 1, or universal supports, and interventions and strategies delivered to all students in the school. These practices are preventative in nature and easy to implement, such as defining, teaching, and rewarding use of a set of school-wide behavior expectations and using clear guidelines for addressing behavior concerns instructionally. Tier 2, or targeted supports, include interventions delivered to a smaller number of students who need strategic supports in addition to those delivered at Tier 1. In contrast to the standardized interventions at Tiers 1 and 2, Tier 3, or intensive supports, are individualized to student need. Research has shown a range of positive effects of implementing SWPBIS, including increased student emotional regulation, decreased use of exclusionary discipline, decreased racial/ethnic disproportionality in exclusionary discipline, and substantial fiscal benefits compared to costs (Bradshaw, Waasdorp, & Leaf, 2012; McIntosh, Gion, & Bastable, 2018; Swain-Bradway, Lindstrom Johnson, Bradshaw, & McIntosh, 2017).

Although it is widely accepted that implementing SWPBIS or any other practice with adequate fidelity often requires a certain amount of resources, research has documented that sustaining EBPs, regardless of effectiveness, is the exception and not the rule (Coburn, Russell, Kaufman, & Stein, 2012; Sindelar, Shearer, Yendol-Hoppey, & Liebert, 2006). Therefore, there remains a need to examine how practices can be sustained by addressing both malleable (e.g., provision of coaching) and nonmalleable barriers (e.g., community poverty; Hume & McIntosh, 2013). Several studies have identified practice, school, and district-level variables that increase the likelihood that school-level practices will sustain over time.

Variables Related to Sustained Implementation

School-level variables. Influences at the school level, most specifically school demographic characteristics, have been noted as important to the sustainability of EBPs (Bradshaw & Pas, 2011; Forman et al., 2013). However, research findings in this area are mixed. Some studies have found school characteristics, such as serving a large population of students that qualify for free or reduced lunch (i.e., community poverty), to be associated with greater risk of schools abandoning EBPs (Bradshaw & Pas, 2011; Gottfredson, Jones, & Gore, 2002). Others found that the abandonment risks associated with community poverty were no longer significant when practice-level factors, such as providing standardized materials for ease of implementation, were in place (Payne & Eckert, 2010). More consistency is found amongst studies that examined the specific nonmalleable characteristics of grade levels served and school locale (e.g., city, suburb, town, and rural) in schools implementing SWPBIS. These studies have identified adequate implementation is reached more quickly in elementary schools than middle and high schools (potentially due to the size and complexity of high schools) and in suburban

neighborhoods than cities (potentially due to higher rates of turnover; Bradshaw & Pas, 2011; McIntosh et al., 2013; Nese et al., 2016; Schaper, McIntosh, & Hoselton, 2016).

Practice-level variables. Practice-level variables are specific aspects of the practice itself or activities related its implementation. One practice-level variable identified in the literature is the use of data for decision making by intervention teams (Fixsen, Blase, Duda, Naoom, & Van Dyke, 2010; Johnson, Collins, Shamblen, Kenworthy, & Wandersman, 2017). Using a measure to assess factors critical to the sustainability of behavior practices in schools, the *School-wide Universal Behavior Sustainability Index: School Teams* (SUBSIST; McIntosh, Doolittle, Vincent, Horner, & Ervin, 2009), McIntosh and colleagues (2013) found that teams who were able to collect, disaggregate, and share data with their staff were more likely to implement SWPBIS with adequate fidelity, or as intended by developers. These findings illustrate the importance of teams and how their use of data can enhance implementation of SWPBIS (McIntosh et al., 2013). Another practice-level variable found to be important for sustained implementation is the speed at which practices can be installed with fidelity. Schaper, McIntosh, and Hoselton (2016) found that reaching adequate levels of fidelity quickly was important for sustained implementation. These findings also align with community health research by Saldana and colleagues (2012), who found that the proportion of implementation activities completed and the duration of time completing them predicted future implementation.

District-level variables. District-level variables, either contextual variables (e.g., community need) or professional development (i.e., training and coaching) provided to help schools implement EBPs, have been documented as important to sustainability. In a study of 5331 schools implementing Tier 1 SWPBIS, McIntosh, Mercer, Nese, and Ghemraoui (2016) found that elementary schools, larger schools, schools in districts with more schools already

implementing, and those starting within a larger initial district cohort were more likely to be in the sustaining groups. Similarly, two randomized controlled effectiveness trials of school-wide practices found faster implementation among schools with strong organizational health and district support (Bradshaw, Koth, Thornton, & Leaf, 2009; Horner et al., 2009). It is important to note that district supports are likely to vary depending on available resources and the extent to which the practice is used by nearby professionals (examined in community health by Klest, 2014). District teams may be more likely to invest in professional development for an initiative if it is perceived to be effective, implemented longer, and embedded within existing leadership, organizational, and training and coaching systems to support its implementation (Fixsen, Naoom, Blase, Friedman, & Wallace, 2005).

Differential Importance by Stage of Implementation

Adelman and Taylor (1997) identified a series of stages of implementation (i.e., Creating Readiness, Initial Implementation, Institutionalization, and Ongoing Evolution) that describe how teams can implement new initiatives in ways that are durable and scalable. In the Creating Readiness stage, school staff work to build interest and support for the incoming initiative before implementation. Initiatives then move into the Initial Implementation stage as the school leadership team prepares for and begins to install the new initiative. The Institutionalization stage occurs once school teams have fully implemented the initiative for an extended period, developed long-term ownership, and overcome barriers to their continued use of the initiative. Ongoing Evolution occurs when initiatives experience contextual shifts and renewal from school teams based on continual evaluation and improvement in quality and support (Adelman & Taylor, 1997). Because initiatives are carried through these stages of implementation (sometime recursively), schools may have different needs depending on the stage of implementation

(Saldana et al., 2012). For example, Fixsen and colleagues (2005) hypothesized that school implementers in the Ongoing Evolution stage need support to buffer the initiative against the effects of turnover, which may increase after an extended period of time beyond Initial Installation and school team training. This type of support is likely to vary considerably from the support needed in Initial Implementation (Fixsen et al., 2005).

The Present Study

Much of the research examining the sustainability of EBPs has been short term, retrospective, or focused on variables associated with sustained implementation (i.e., concurrent association), but not malleable and nonmalleable factors that predict sustained implementation (Fixsen et al., 2010; Han & Weiss, 2005). Furthermore, much of the research has examined sustained implementation shortly after initial implementation, but not at various stages after implementation (e.g., 3 to 5 years after initial implementation).

The following study addresses these gaps in the research by examining 3 years of prospective longitudinal data from 860 schools in the U.S. to answer the following research questions:

1. What school-level, practice-level, and district-level variables predict sustained implementation of SWPBIS Tier 1 systems after 3 years?
2. To what extent does stage of implementation (i.e., Initial Implementation, Institutionalization, and Ongoing Evolution) affect the prediction of sustained implementation?

Method

Participants and Settings

The sample included 860 schools across 14 states implementing SWPBIS as part of their respective state or district initiatives, with natural variations in levels of training and coaching as could be expected in large-scale implementation. Of the 686 schools that provided data on training in the first year of the study, 93% received formal SWPBIS training, and of the 638 schools that reported on coaching received, 79% reported receiving at least some coaching. One individual familiar with each school's SWPBIS systems (e.g., School SWPBIS team member, district coach) participated. Participant roles were the following: SWPBIS team leaders (61%), school administrators (24%), other faculty or staff (8%), or district coaches (5%). The self-reported number of years implementing SWPBIS was used as a proxy to categorize schools into three stages of implementation: Initial Implementation (0 to 1 years), Institutionalization (2 to 4 years), and Ongoing Evolution (5 or more years) as defined by Adelman and Taylor (1997). Table 1 presents National Center for Education Statistics (NCES) data (available for 98%, n = 847, of the sample) for schools in the first year of the study (not necessarily their first year of implementation).

Measures

School-level variables. School characteristics were used to assess each schools' relation with sustained implementation. These data, obtained from the NCES database, included grade levels served (coded dichotomously as elementary or secondary), school enrollment, urbanicity (on a scale of 1 to 4, using the federal categories of rural, town, suburb, and city), proportion of non-white students, and proportion of students receiving free and/or reduced price lunch.

Practice-level variables. Practice-level variables included measures of fidelity of implementation of SWPBIS and a validated measure of factors predicting sustained implementation of universal behavior support interventions. These measures are described

briefly below, with more psychometric details regarding the linking of fidelity criterion scores available from Mercer, McIntosh, and Hoselton (2017).

Fidelity of Implementation. One of five research-validated Tier 1 SWPBIS fidelity of implementation measures was used to quantify percent implementation in Study Years 1 (as a predictor variable) and 3 (as an outcome variable).

School-wide Evaluation Tool. For schools using the School-wide Evaluation Tool (SET; Sugai, Lewis-Palmer, Todd, & Horner, 2001), the SET fidelity criterion for adequate implementation of SWPBIS at Tier 1 (80% on all school-wide expectations taught and 80% overall implementation) was used. The SET is a 28-item measure with strong psychometric properties, including internal consistency of .96, mean interrater reliability between 98.4% and 100%, and mean test-retest reliability between 89.9% and 100% (Horner, Todd, Lewis-Palmer, Irvin, & Sugai, 2004).

Tiered Fidelity Inventory. If schools did not complete the SET, scores from the Tier 1 scale of the Tiered Fidelity Inventory (TFI; Algozzine et al., 2014) were used. The TFI is used as a self-assessment measure for each of the SWPBIS tiers (i.e., Tier 1, Tier 2, and Tier 3). The Tier 1 scale is comprised of three subscales measuring school teams, implementation, and evaluation of SWPBIS. The TFI Tier 1 fidelity criterion is 70%. The TFI has strong psychometric properties for content validity (means across tiers rated by an expert panel of reviewers = 91% to 93% for reliability agreement, 96% for item validity, 95% for factor structure, and 89% for item scoring), internal consistency (α = .87 to .98 across tiers and .96 overall), test-retest reliability (r = .99), and interrater reliability across raters, tiers, and items (r = .99), and evidence of a strong factor structure (Massar, McIntosh, Mercer, & Hoselton, in press; McIntosh et al., 2017).

Benchmarks of Quality. If schools did not complete the SET or the TFI, the School-wide Benchmarks of Quality (BoQ; Kincaid, Childs, & George, 2005) was used, with a 70% fidelity criterion. The BoQ is a 53-item measure comprised of 10 subscales of elements important for Tier 1 SWPBIS implementation (e.g., data entry and analysis established, faculty commitment). It has strong psychometric properties, including internal consistency of .96, test-retest of .94, interrater reliability .87, and concurrent validity of .63, when total scores on the BoQ were correlated with total scores on the SET (Cohen, Kincaid, & Childs, 2007; Mercer et al., 2017).

PBIS Self Assessment Survey. If schools did not complete the SET, TFI, or BoQ, the PBIS Self-Assessment Survey (SAS; Sugai, Horner, & Todd, 2000) was used, with an 80% fidelity criterion. The 43-item survey is used by school staff to guide the implementation of SWPBIS at Tier 1 across multiple school systems (i.e., school-wide, non-classroom, classroom, and individual student intensive support). Internal consistency reported across two studies (Hagan-Burke et al., 2005; Safran, 2006) was high (α range = .85 to .94), with strong construct validity (r = .75) when correlated with the SET (Horner et al., 2004).

Team Implementation Checklist. For schools who did not complete the SET, TFI, BoQ, or SAS, fidelity scores from the Team Implementation Checklist (TIC; Sugai, Horner, & Lewis-Palmer, 2001) were used, with an 80% fidelity criterion. The TIC is used by teams for progress monitoring and action planning during implementation of specific features (e.g., establish commitment, establish and maintain a team) to assess overall SWPBIS implementation at Tier 1. Teams are encouraged to complete the TIC quarterly to re-evaluate progress for reaching adequate implementation. Both versions of the TIC have strong internal consistency, with ordinal alphas of .93 to .94 for overall implementation (McIntosh, Mercer, Nese, Strickland-Cohen, & Hoselton, 2016).

Coding of fidelity. Schools were categorized dichotomously as either at or below adequate fidelity of implementation based on published criteria using one of the measures. If schools completed more than one, the measure with the strongest psychometric properties was used in a cascading logic, in the order presented above (McIntosh et al., 2013). Additional support for this decision comes from a linking study showing moderate to strong concurrent validity among these measures (Mercer et al., 2017). At Year 1, most schools completed a SET (59%), followed by the BoQ (27%), SAS (13%), and TIC (2%). At Year 3, most schools completed a BoQ (49%), followed by the SET (32%), TFI (10%), SAS (8%), and TIC (1%).

Practice sustainability. The SUBSIST is a research instrument used to assess features predicting sustained implementation of SWPBIS. School personnel rate the extent to which school and district-level variables (39 total) are in place in their school using a 4-point Likert-type scale (from 1 = not true to 4 = true). The SUBSIST displays evidence of strong content validity, with an expert panel content validity index of .95, internal consistency of .87, interrater reliability of .95, and two-week test-retest reliability of .96 (McIntosh et al., 2011). Further validation through several factor analytic studies demonstrated strong prediction of sustained SWPBIS implementation (r = .45 to .68), and indicated a four-factor structure, including two school-level factors (School Priority, α = .94 and Team Use of Data, α = .94) and two district-level factors (District Priority, α = .71 and Capacity Building, α = .74) across multiple samples (McIntosh et al., 2011; McIntosh et al., 2013; Mercer, McIntosh, Strickland-Cohen, & Horner, 2014; Runge, Gorlaski, & Wagner, 2014). As an example, the Team Use of Data factor contains 11 items and assesses items related to the frequency (e.g., “Data are presented to all school personnel at least four times per year”) and extent to which school teams use data to improve implementation (e.g., “Data are used for problem solving, decision making, and action planning

[to make SWPBIS more effective and/or efficient]"). The factor structure has been shown to be invariant across stage of implementation (Mercer et al., 2014).

District-level variables. Two variables were calculated to represent the implementation context of the school district: Critical Mass and Initiative Health.

Critical Mass. Critical Mass was operationalized as the proportion of schools in the district implementing SWPBIS in the year before Study Year 1 (i.e., Year 0). Schools reporting data to the OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports (PBIS) on one or more fidelity assessments, regardless of the specific fidelity scores obtained, were considered to be implementing SWPBIS.

Initiative Health. Initiative Health is defined as the extent to which the initiative was increasing or decreasing in use across the district. For analyses, Initiative Health was operationalized as the change in the proportion of schools in the district newly adopting or abandoning SWPBIS in Year 1. Specifically, the number of schools implementing SWPBIS in Year 0 was subtracted from the number implementing in Year 1, with the difference divided by the number of schools in the district. Positive scores indicate that more schools were adopting SWPBIS (i.e., expansion of the initiative), whereas negative scores indicate that schools were abandoning SWPBIS (i.e., contraction of the initiative).

Procedure

Data for the current study came from a 3-year, federally-funded project examining implementation and sustainability of SWPBIS. For recruitment, state SWPBIS teams shared details at training events or sent emails to schools either implementing or preparing to implement SWPBIS through state or district training events. One member of each school team participated by completing the SUBSIST online. Extant SWPBIS fidelity of implementation data were

obtained from school teams' submission of scores to the Center on PBIS. School characteristic data were obtained through the NCES website.

Data Analyses

We used multi-group structural equation modeling in M*plus* 7.4 (Muthén & Muthén, 1998-2017) to determine the extent to which school-, practice-, and district-level variables predicted adequate implementation in Year 3, using the robust weighted least squares (WLSMV) estimator to address the ordered, categorical response format of the SUBSIST. We used the M*plus* COMPLEX command (Asparouhov, 2005) to adjust standard errors for non-independence due to nesting of schools in districts. We evaluated model fit with the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) considering recommendations that CFI ~$\geq$ .95, TLI ~$\geq$ .95, and RMSEA ~$\leq$ .06 indicate acceptable fit (Hu & Bentler, 1999). We used multiple imputation (1,000 datasets) to avoid additional, restrictive assumptions of WLS estimation in the presence of missing data (Asparouhov & Muthén, 2010).

To evaluate the research questions, we regressed the binary Year 3 fidelity variable on school-level predictors, practice-level predictors, and district-level predictors. We entered most predictors as observed variables; we specified School Priority, Team Use of Data, District Priority, and Capacity Building as latent variables with categorical indicators, given that respondents completed multiple items per SUBSIST factor. A prior study with Year 1 data from the same sample (Mercer et al., 2014) reported evidence of strong measurement invariance (i.e., equal loadings and thresholds) for the Team Use of Data, District Priority, and Capacity Building factors across SWPBIS implementation stages. For School Priority, the factor loadings and

thresholds differed across groups for one item; thus, we allowed them to vary for that item in the current analyses with all others constrained to equality across groups.

The planned multi-group model with all practice-level variables entered as predictors exhibited strong multicollinearity among two SUBSIST factors (r = .80 to .86 across groups). To reduce multicollinearity, we entered the SUBSIST factor with the strongest zero-order correlation with Year 3 fidelity as a predictor, allowing the remaining factors to covary with Year 3 fidelity. To facilitate interpretation, we present odds ratios (ORs), comparing values of 1 vs. 0 for binary predictors or a 1 *SD* change for continuous predictors. In addition, we present R^2 values, representing proportions of variance in the continuous latent response variable underlying the binary Year 3 fidelity criterion variable (McKelvey & Zavoina, 1975).

Results

Means, by implementation group, for the criterion and predictor variables are presented in Table 2. Although similar percentages of schools met or exceeded the criterion for adequate implementation in Year 3 of the study across implementation groups (60 to 64%), greater percentages of schools were adequately implementing in Year 1 for groups implementing longer. In the Initial Implementation group, 46% of schools were adequately implementing in Year 1, compared to 65% in the Institutionalization and 78% in the Ongoing Evolution groups.

Overall fit for the multi-group predictive structural equation model was good based on the RMSEA and near the recommended targets for acceptable fit on the CFI and TLI (Hu & Bentler, 1999), χ^2 (3231) = 4048.61, $p < .001$; CFI = .943, TLI = .940, RMSEA = .030. To maximize generalizability, no post-hoc model modifications were explored. Detailed results for the multi-group predictive structural equation model are presented in Table 3 and represented in Figure 1. Only one school-level variable, school level (i.e., being an elementary school) was a

statistically significant predictor of Year 3 fidelity and in only the Institutionalization stage ($p <$ .001, OR = 2.22). Two practice-level variables were predictors of Year 3 fidelity across implementation stages: fidelity in Year 1 (Initial Implementation: $p < .001$, OR = 3.64; Institutionalization: $p < .001$, OR = 3.77; Ongoing Evolution: $p = .004$, OR = 4.41) and greater SWPBIS Team Use of Data (Initial Implementation: $p = .004$, OR = 1.73; Institutionalization: $p = .018$, OR = 1.36; Ongoing Evolution: $p < .001$, OR = 1.82). No other practice-level variables had statistically significant associations with Year 3 fidelity after accounting for the other predictors. Both district-level variables were statistically significant predictors of Year 3 fidelity, but with some differences across SWPBIS implementation stages. Critical Mass predicted Year 3 fidelity in Initial Implementation ($p = .006$, OR = 2.25) and Institutionalization ($p < .001$, OR = 2.42), but not in Ongoing Evolution ($p = .158$). By contrast, Initiative Health predicted Year 3 fidelity across all implementation stages (Initial Implementation: $p < .001$, OR = 4.18; Institutionalization: $p < .001$, OR = 2.17; Ongoing Evolution: $p = .027$, OR = 1.71). Collectively, the predictors explained similar proportions of variance in Year 3 fidelity (Initial Implementation: $R^2 = .45$; Institutionalization: $R^2 = .46$; Ongoing Evolution: $R^2 = .42$).

Discussion

The purpose of this prospective study was to identify the strongest school, practice, and district predictors of sustained implementation of a school-wide universal behavior framework after 3 years. We also sought to test whether predictors varied by years implementing, as a proxy for stage of implementation. Results showed that the practice-level variables of fidelity of implementation in Study Year 1 and Team Use of Data were the strongest predictors of sustained implementation for schools in all three stages of implementation; these findings are notable given the prospective design and large, multi-state sample of schools in this study.

The findings were encouraging. Across all groups, nearly two-thirds of schools were still implementing SWPBIS after three years, which was unique for educational initiatives, especially because implementation occurred in typical school systems, outside of university-supported trials. Moreover, the predictors in the model accounted for a significant and substantial degree of variance in sustained outcomes, indicating that they represent important targets for enhancing sustainability.

One key finding was that non-malleable school characteristics (e.g., poverty, enrollment) were not strong predictors of sustained implementation. Building on previous SWPBIS research using cross-sectional and retrospective designs (McIntosh et al., 2013; McIntosh, Mercer, Nese, Strickland-Cohen, et al., 2016), grade level was the only school characteristic found to be a significant predictor (elementary schools were more likely to sustain), and only at the Institutionalization stage of implementation (i.e., schools implementing from 2 to 4 years). Notably, grade level was not predictive for schools that had been implementing for 5 or more years, indicating that once secondary schools have been implementing for some time, they were as likely to sustain as elementary schools (Bohanon et al., 2006).

In contrast, practice-level variables—implementing with fidelity in Year 1 and SWPBIS Team Use of Data—were stronger predictors of sustained implementation at Year 3. The finding regarding fidelity is unsurprising, given that it is the same variable as the outcome, but measured at the outset of the study. At the same time, it confirms retrospective research showing schools that reaching the fidelity criterion early in implementation are more likely to sustain (McIntosh, Mercer, Nese, Strickland-Cohen, et al., 2016). It highlights a key mechanism of sustainability: adequate implementation of critical features of SWPBIS improve student outcomes, which

reinforces the implementation behaviors of school personnel (Andreou, McIntosh, Ross, & Kahn, 2015; McIntosh, Kelm, & Canizal Delabra, 2016).

The next strongest predictors were at the district level. Initiative Health was a consistently significant predictor of sustained implementation. Consistent with community health research (Klest, 2014), Critical Mass (i.e., the proportion of schools implementing SWPBIS before Year 1 of the study) predicted sustained implementation for schools implementing under 5 years, but not for 5 or more, a novel finding.

Regarding differences across stage of implementation, district-level predictors were strongly influential for schools early in implementation but less so for schools that had been implementing for more than 5 years. For these schools, the strongest predictor was Team Use of Data, which may have allowed a level of continuous regeneration (McIntosh, Filter, Bennett, Ryan, & Sugai, 2010), wherein school teams adapt their implementation to fit more strongly with changed contexts and student populations. A unique finding of the current study is that the district context (e.g., the proportion of other schools) appeared to have a stronger influence early in the implementation process (i.e., starting to implement with a community of peers), but for schools that had been implementing for longer time periods, their within-school practice activities were stronger predictors.

Limitations and Future Research

There were several limitations to the current study that should be considered when interpreting the results. First, because the purpose of the study was to identify predictors of sustained SWPBIS Tier 1 systems, it is unclear whether these results can be generalized to other models of behavior support or even SWPBIS at Tiers 2 and 3. Second, participating schools do not represent a random sample. Participating districts were recruited through established state-

level PBIS training networks and may not reflect patterns of implementation from districts and schools outside of state network support. Third, years implementing SWPBIS was used as a proxy for implementation stage, whereas implementation science literature describes the speed of progress through these stages as variable and even recursive (Saldana et al., 2012). Finally, we measured fidelity of implementation through self-report instruments. Although these measures have been validated for the study purposes, future investigations might extend these results by including more direct measures of various factors related to both fidelity of implementation (e.g., direct observation of practices) and district support (e.g., staffing, dosage of coaching).

One interesting outcome that warrants further research is that grade level became less predictive in later stages of implementation. This finding confirms previous research that SWPBIS takes more time to fully implement in secondary school settings (Nese, Nese, McIntosh, Mercer, & Kittelman, 2017). More research is needed to understand how SWPBIS is implemented and sustained in high schools.

Implications for Practice

Outcomes showing district-level variables to be the strongest predictors of sustained implementation of Tier 1 SWPBIS, along with the data showing non-malleable school-level factors to be much less important, indicate that focusing on establishing district capacity may be more promising than taking a school-by-school approach, particularly during installation and initial implementation. These findings also have important implications for SWPBIS trainers and coaches working with newly-implementing schools. Our results indicate that districts can best support initial and sustained implementation of behavior support practices by providing training and ongoing coaching in critical features of Tier 1 practices to increase the likelihood of implementing with fidelity as early after initial training as possible (and thus provide visibly

improved student outcomes that reinforce implementation). As schools achieve adequate fidelity, it appears key to provide training and coaching on establishing efficient systems to collect, review, and use fidelity and student discipline data for continuous improvement. To ensure maximal use of data for decision-making, district teams can focus training and coaching on supporting in school-level team functioning, such as conducting team meetings with consistent agendas, efficient decision-making processes, and an ongoing action plan (Newton, Horner, Algozzine, Todd, & Algozzine, 2012). Such efforts appear to be the most promising avenues for sustaining effective practices in schools.

References

Adelman, H. S., & Taylor, L. (1997). Toward a scale-up model for replicating new approaches to schooling. *Journal of Educational and Psychological Consultation, 8*, 197-230.

Algozzine, R. F., Barrett, S., Eber, L., George, H., Horner, R. H., Lewis, T. J., . . . Sugai, G. (2014). *SWPBIS Tiered Fidelity Inventory*. Eugene, OR: OSEP Technical Assistance Center on Positive Behavioral Interventions and Supports. Available at http://www.pbis.org.

Andreou, T. E., McIntosh, K., Ross, S. W., & Kahn, J. D. (2015). Critical incidents in the sustainability of school-wide positive behavioral interventions and supports. *Journal of Special Education, 49*, 157-167. doi:10.1177/0022466914554298

Asparouhov, T. (2005). Sampling weights in latent variable modeling. *Structural Equation Modeling, 12*(3), 411-434. doi:10.1207/s15328007sem1203_4

Asparouhov, T., & Muthén, B. O. (2010). *Weighted least squares estimation with missing data*. Retrieved from http://www.statmodel.com.

Berman, P., & McLaughlin, M. W. (1976). Implementation of educational innovations. *Educational Forum, 40*, 345-370.

Bohanon, H., Fenning, P., Carney, K. L., Minnis-Kim, M. J., Anderson-Harriss, S., Moroz, K. B., . . . Sailor, W. (2006). Schoolwide application of positive behavior support in an urban high school: A case study. *Journal of Positive Behavior Interventions, 8*, 131-145.

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.

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

Center on Positive Behavioral Interventions and Supports. (2018). "Schools that are implementing SWPBIS." Retrieved from www.pbis.org.

Coburn, C. E., Russell, J. L., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education, 1*, 137-182. doi:10.1086/667699

Cohen, R., Kincaid, D., & Childs, K. E. (2007). Measuring school-wide positive behavior support implementation: Development and validation of the Benchmarks of Quality. *Journal of Positive Behavior Interventions, 9*, 203-213.

Fixsen, D. L., Blase, K. A., Duda, M. A., Naoom, S. F., & Van Dyke, M. (2010). Implementation of evidence-based treatments for children and adolescents. In J. R. Weisz & A. E. Kazdin (Eds.), *Evidence-based psychotherapies for children and adolescents* (pp. 435-450). New York: Guilford.

Fixsen, D. L., Blase, K. A., & Fixsen, A. A. M. (2017). Scaling effective innovations. *Criminology & Public Policy, 16*, 487-499. doi:10.1111/1745-9133.12288

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M., & Wallace, F. (2005). *Implementation research: Synthesis of the literature*. Tampa, FL: University of South

Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231).

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.

Gottfredson, G. D., Jones, E. M., & Gore, T. W. (2002). Implementation and evaluation of a cognitive–behavioral intervention to prevent problem behavior in a disorganized school. *Prevention Science, 3*, 43-56.

Hagan-Burke, S., Burke, M. D., Martin, E., Boon, R. T., Fore III, C., & Kirkendoll, D. (2005). The internal consistency of the school-wide subscales of the effective behavioral support survey. *Journal of Positive Behavior Interventions, 8*, 3-9.

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

Horner, R. H., Kincaid, D., Sugai, G., Lewis, T., Eber, L., Barrett, S., . . . Johnson, N. (2014). Scaling up school-wide positive behavioral interventions and supports: Experiences of seven states with documented success. *Journal of Positive Behavior Interventions, 16*, 197-208. doi:10.1177/1098300713503685

Horner, R. H., Sugai, G., Smolkowski, K., Eber, L., Nakasato, J., Todd, A. W., & Esparanza, 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. L., Irvin, L. K., & Sugai, G. (2004). The school-wide evaluation tool (SET): A research instrument for assessing school-wide positive behavior support. *Journal of Positive Behavior Interventions, 6*, 3-12.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

Hume, A. E., & McIntosh, K. (2013). Construct validation of a measure to assess sustainability of school-wide behavior interventions. *Psychology in the Schools, 50*, 1003-1014. doi:10.1002/pits.21722

Johnson, K., Collins, D., Shamblen, S., Kenworthy, T., & Wandersman, A. (2017). Long-term sustainability of evidence-based prevention interventions and community coalitions survival: A five and one-half year follow-up study. *Prevention Science, 18*, 610-621. doi:10.1007/s11121-017-0784-2

Kincaid, D., Childs, K., & George, H. (2005). *School-wide benchmarks of quality.* Unpublished instrument. University of South Florida.

Klest, S. K. (2014). Clustering practitioners within service organizations may improve implementation outcomes for evidence-based programs. *Zeitschrift fur Psychologie, 222*, 30-36. doi:10.1027/2151-2604/a000163

Massar, M., McIntosh, K., Mercer, S. H., & Hoselton, R. (in press). Factor validation of a fidelity of implementation measure for social behavior systems. *Remedial and Special Education*.

McIntosh, K., Doolittle, J., Vincent, C. G., Horner, R. H., & Ervin, R. A. (2009). *School-wide universal behavior sustainability index: School teams*. Vancouver, BC: University of British Columbia.

McIntosh, K., Filter, K. J., Bennett, J. L., Ryan, C., & Sugai, G. (2010). Principles of sustainable prevention: Designing scale-up of school-wide positive behavior support to promote durable systems. *Psychology in the Schools, 47*, 5-21. doi:10.1002/pits.20448

McIntosh, K., Gion, C., & Bastable, E. (2018). *Do schools implementing SWPBIS have decreased racial disproportionality in school discipline?* PBIS evaluation brief. OSEP TA Center on Positive Behavioral Interventions and Supports. Eugene, OR.

McIntosh, K., Kelm, J. L., & Canizal Delabra, A. (2016). In search of how principals change: A qualitative study of events that help and hinder administrator support for school-wide PBIS. *Journal of Positive Behavior Interventions, 18*, 100-110. doi:10.1177/1098300715599960

McIntosh, K., MacKay, L. D., Hume, A. E., Doolittle, J., Vincent, C. G., Horner, R. H., & Ervin, R. A. (2011). Development and initial validation of a measure to assess factors related to sustainability of school-wide positive behavior support. *Journal of Positive Behavior Interventions, 13*, 208-218. doi:10.1177/1098300710385348

McIntosh, K., Massar, M., Algozzine, R. F., George, H. P., Horner, R. H., Lewis, T. J., & Swain-Bradway, J. (2017). Technical adequacy of the SWPBIS Tiered Fidelity Inventory. *Journal of Positive Behavior Interventions, 19*, 3-13.

McIntosh, K., Mercer, S. H., Hume, A. E., Frank, J. L., Turri, M. G., & Mathews, S. (2013). Factors related to sustained implementation of schoolwide positive behavior support. *Exceptional Children, 79*, 293-311.

McIntosh, K., Mercer, S. H., Nese, R. N. T., & Ghemraoui, A. (2016). Patterns of implementation of a scaled-up school-based prevention model over a five-year period. *Prevention Science, 17*, 992-1001.

McIntosh, K., Mercer, S. H., Nese, R. N. T., Strickland-Cohen, M. K., & Hoselton, R. (2016). Predictors of sustained implementation of school-wide positive behavioral interventions and supports. *Journal of Positive Behavior Interventions, 18*, 209-218.

McKelvey, R. D., & Zavoina, W. (1975). A statistical model for the analysis of ordinal level dependent variables. *Journal of mathematical sociology, 4*(1), 103-120.

Mercer, S. H., McIntosh, K., & Hoselton, R. (2017). Comparability of fidelity measures for assessing tier 1 school-wide positive behavioral interventions and supports. *Journal of Positive Behavior Interventions, 19*, 195-204.

Mercer, S. H., McIntosh, K., Strickland-Cohen, M. K., & Horner, R. H. (2014). Measurement invariance of an instrument assessing sustainability of school-based universal behavior practices. *School Psychology Quarterly, 29*, 125-137.

Muthén, L. K., & Muthén, B. O. (1998-2017). Mplus User's Guide. Eighth Edition. Los Angeles, CA: Muthén & Muthén.

Nese, R. N. T., McIntosh, K., Nese, J. F. T., Bloom, J., Johnson, N. W., Phillips, D., . . . Hoselton, R. (2016). Predicting abandonment of school-wide behavior interventions. *Behavioral Disorders, 42*, 261-270.

Nese, R. N. T., Nese, J. F. T., McIntosh, K., Mercer, S. H., & Kittelman, A. (2017). Predicting latency of reaching adequate implementation of school-wide positive behavioral interventions and supports. *Manuscript submitted for publication*.

Newton, J. S., Horner, R. H., Algozzine, B., Todd, A. W., & Algozzine, K. (2012). A randomized wait-list controlled analysis of the implementation integrity of team-initiated problem solving processes. *Journal of School Psychology, 50*, 421-441.

Payne, A. A., & Eckert, R. (2010). The relative importance of provider, program, school, and community predictors of the implementation quality of school-based prevention programs. *Prevention Science, 11*, 126-141.

Runge, T. J., Gorlaski, A. M., & Wagner, H. D. (2014). It's about leaders leading: Critical features of sustained school-wide positive behavioral interventions and supports. *Pennsylvania Educational Leadership*.

Safran, S. P. (2006). Using the effective behavior supports survey to guide development of schoolwide positive behavior support. *Journal of Positive Behavior Interventions, 8*, 3-9.

Saldana, L., Chamberlain, P., Wang, W., & Brown, C. H. (2012). Predicting program start-up using the stages of implementation measure. *Administration and Policy in Mental Health and Mental Health Services Research, 39*, 419-425.

Schaper, A., McIntosh, K., & Hoselton, R. (2016). Within-year fidelity growth of SWPBIS during installation and initial implementation. *School Psychology Quarterly, 31*(3), 358-368. doi:10.1037/spq0000125

Sindelar, P. T., Shearer, D. K., Yendol-Hoppey, D., & Liebert, T. W. (2006). The sustainability of inclusive school reform. *Exceptional Children, 72*, 317-331.

Sugai, G., Horner, R. H., & Lewis-Palmer, T. L. (2001). *Team Implementation Checklist (TIC).* Eugene, OR: Educational and Community Supports. Retrieved from http://www.pbis.org.

Sugai, G., Horner, R. H., & Todd, A. W. (2000). *PBIS Self-Assessment Survey 2.0.* Eugene, OR: Educational and Community Supports. Available at http://www.pbisapps.org.

Sugai, G., Lewis-Palmer, T. L., Todd, A. W., & Horner, R. H. (2001). *School-wide Evaluation Tool (SET)*. Eugene, OR: Educational and Community Supports. Available at http://www.pbis.org.

Swain-Bradway, J., Lindstrom Johnson, S., Bradshaw, C., & McIntosh, K. (2017). *What are the economic costs of implementing SWPBIS in comparison to the benefits from reducing suspensions?* PBIS evaluation brief. OSEP TA Center on Positive Behavioral Interventions and Supports. Eugene, OR.

Table 1

School Demographic Data

Demographic Variable	*n* *(N =860)*	*Mean* or % (SD)
Enrollment	847	540.14 (336.92)
% of Students Receiving FRL	847	52.0% (24.4%)
% of Non-white Students	847	41.6% (30.8%)
Grade Level	844	
Primary	559	66.2%
Middle	168	19.9%
High	96	11.4%
Other	21	2.5%
Urbanicity	847	
Rural	186	22.0%
Town	119	14.0%
Suburb	280	33.1%
City	262	30.9%
Years Implementing SWPBIS	860	
0 to 1 Years	212	24.7%
2 to 4 Years	411	47.8%
5 or more	237	27.6%

Note. School demographic data obtained from National Center for Education Statistics for 98% of schools. * FRL = free and/or reduced lunches.

Table 2

Means and Proportions of Missing Data by Implementation Stage

	Initial Implementation (n = 212)		Institutionalization (n = 411)		Ongoing Evolution (n = 237)	
Variable	*M*	Prop. Missing	*M*	Prop. Missing	*M*	Prop. Missing
Criterion						
Fidelity: Y3	0.60	.009	0.63	.024	0.64	.034
School Characteristics						
Elementary School	0.59	.024	0.69	.017	0.67	.017
Urbanicity	2.47	.014	2.86	.015	2.74	.017
Enrollment	516.50	.014	535.10	.015	568.20	.017
Prop. Non-White students	0.37	.014	0.45	.015	0.42	.017
Prop. Eligible for Free or Reduced Lunch	0.53	.014	0.53	.015	0.51	.017
Practice Characteristics						
Fidelity: Y1	0.46	.005	0.65	.019	0.78	.017
School Priority	--	.132	0.02	.085	0.33	.025
Team Use of Data	--	.148	0.13	.042	0.47	.041
District Priority	--	.107	0.02	.085	0.09	.089
Capacity Building	--	.096	-0.06	.044	0.02	.021
District Characteristics						
Critical Mass	0.36	.014	0.48	.015	0.56	.017
Initiative Health	0.16	.014	0.04	.015	0.00	.017

Note. Y1 = Study Year 1, Y3 = Study Year 3, Prop. = Proportion. -- = Latent means were constrained to zero because Initial Implementation was the reference group. Proportion of missing data for latent variables was based on the average proportion of missing data for the items in the factor.

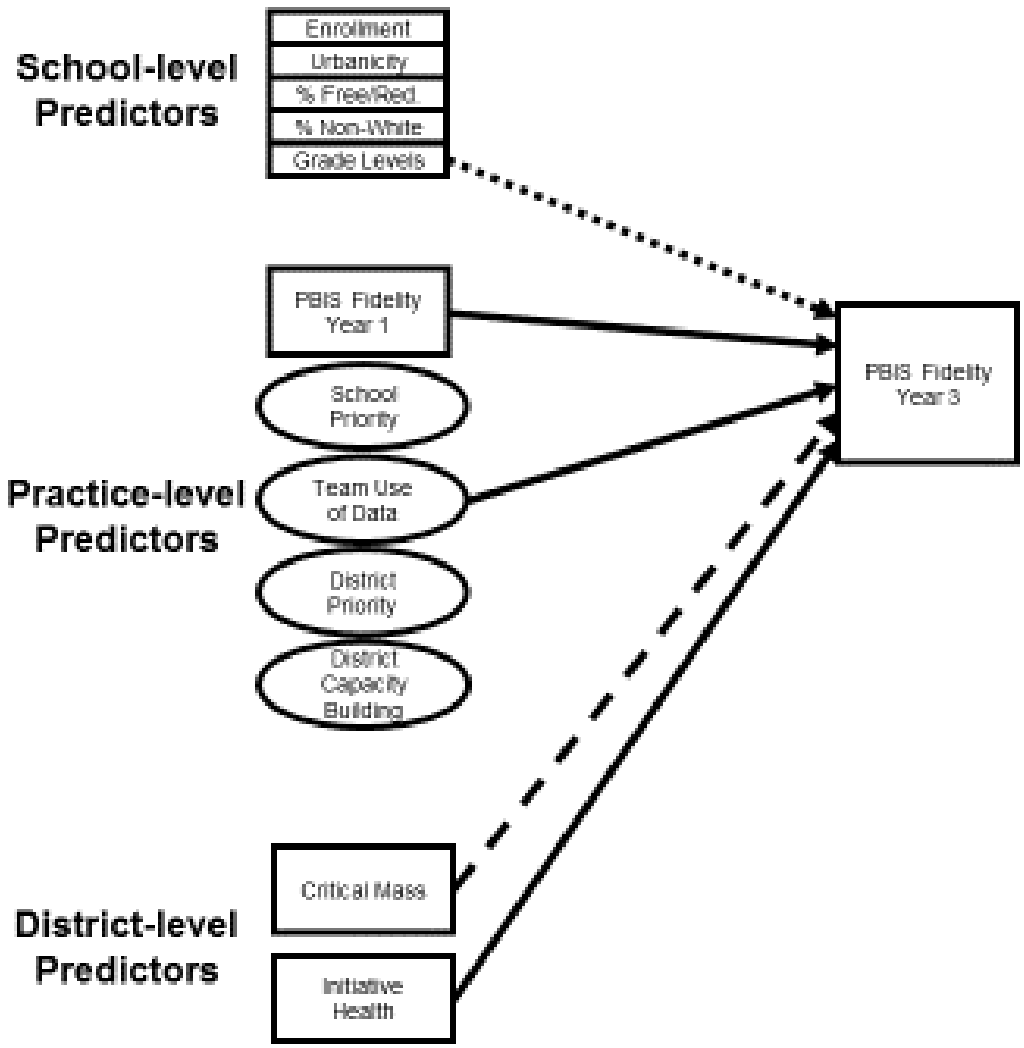
Table 3

Results of Multi-Group Predictive Structural Equation Model

	Initial Implementation (n = 212)		Institutionalization (n = 411)		Ongoing Evolution (n = 237)	
	Coefficient	*p*	Coefficient	*p*	Coefficient	*p*
School-Level Predictors[1]						
Elementary School	.10	.177	.17	.001**	.04	.734
Urbanicity	.04	.233	-.01	.910	-.08	.410
Enrollment	-.05	.623	-.05	.433	-.17	.121
Prop. Non-White students	-.09	.564	.03	.761	.21	.112
Prop. Eligible for Free or Reduced Lunch	-.08	.479	-.09	.233	-.17	.196
Practice-Level Predictors[1]						
Fidelity: Y1	.28	<.001***	.29	<.001***	.29	.004**
Team Use of Data	.23	.004**	.14	.018*	.27	<.001***
District-Level Predictors[1]						
Critical Mass	.34	.006**	.38	<.001***	.17	.158
Initiative Health	.58	<.001***	.34	<.001***	.24	.027*
School-Level Covariates[2]						
School Priority	-.05	.426	-.01	.831	-.03	.643
District Priority	-.15	.075	-.05	.442	.03	.778
Capacity Building	-.05	.701	-.02	.881	.13	.195
R^2: Fidelity Y3	.45	<.001***	.46	<.001***	.42	<.001***

Note. [1]Reported coefficients are standardized beta weights. [2]Reported coefficients are partial correlations with Year 3 Fidelity. Y1 = Study Year 1, Y3 = Study Year 3. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 1. Model predicting sustained fidelity of implementation in Year 3 of the study.



Note. Solid line = path statistically significant for all 3 implementation groups. Dashed line = path statistically significant for Initial Implementation and Institutionalization groups. Dotted line = path statistically significant for Institutionalization group only. Non-significant paths and residuals removed for clarity.