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Optimal Timing for Launching Installation of Tiers 2 and 3 Systems of School-Wide Positive Behavioral Interventions and Supports

Angus Kittelman, PhD[1], Sterett H. Mercer, PhD[2], Kent McIntosh, PhD[1], and Robert Hoselton, BS[1]

Abstract

The purpose of this longitudinal study was to examine patterns in implementation of Tiers 2 and 3 school-wide positive behavioral interventions and supports (SWPBIS) systems to identify timings of installation that led to higher implementation of advanced tiers. Extant data from 776 schools in 27 states reporting on the first 3 years of Tier 2 implementation and 359 schools in 23 states reporting on the first year of Tier 3 implementation were analyzed. Using structural equation modeling, we found that higher Tier 1 implementation predicted subsequent Tier 2 and Tier 3 implementation. In addition, waiting 2 or 3 years after initial Tier 1 implementation to launch Tier 2 systems predicted higher initial Tier 2 implementation (compared with implementing the next year). Finally, we found that launching Tier 3 systems after Tier 2 systems, compared with launching both tiers simultaneously, predicted higher Tier 2 implementation in the second and third year, so long as Tier 3 systems were launched within 3 years of Tier 2 systems. These findings provide empirical guidance for when to launch Tiers 2 and 3 systems; however, we emphasize that delays in launching advanced systems should not equate to delays in more intensive supports for students.

Keywords

school-wide positive behavioral interventions and supports, SWPBIS, Tier 2, Tier 3, initial implementation, fidelity

School-wide positive behavioral interventions and supports (SWPBIS) is an evidence-based framework designed to improve student social behavioral and academic outcomes (Horner & Sugai, 2015; McIntosh & Goodman, 2016). Several systematic literature reviews and meta-analyses have been published in recent years synthesizing the effects of SWPBIS on student behavior outcomes (office discipline referrals, rates of problem behaviors), academic outcomes (reading and math scores), and perceptions of school functioning (organizational health; Lee & Gage, 2020; McDaniel et al., 2020; Noltemeyer et al., 2019; Solomon et al., 2012).

A hallmark of SWPBIS is the organization of practices into multiple tiers of support (Horner & Sugai, 2015; Loman et al., 2018; McDaniel et al., 2015). Tier 1 practices are for all students and designed to prevent challenging behaviors by defining, teaching, and reinforcing prosocial behaviors. Tier 2 practices are for students who engage in frequent, minor-to-moderate challenging behaviors and are designed to decrease and prevent challenging behaviors by teaching self-management and regulation skills. Tier 3 practices are for students with serious challenging behaviors who need intensive and individualized support (Horner & Sugai, 2015).

Another hallmark of SWPBIS is its focus on *systems* for implementing the various *practices*. Across tiers (i.e., Tier 1, Tier 2, and Tier 3), organizational systems (e.g., data systems, screening systems, teaming systems; McIntosh & Goodman, 2016) are implemented to support educators in implementing evidence-based practices (e.g., teaching school-wide expectations, social-emotional small groups, function-based behavior support plans) with fidelity. Teams should not wait until Tiers 2 and 3 systems are implemented to implement Tiers 2 and 3 practices, as there are federal legal requirements that schools use effective practices to support students with significant needs (e.g.,

[1]University of Oregon, Eugene, USA
[2]University of British Columbia, Vancouver, Canada

Corresponding Author:
Kent McIntosh, University of Oregon, 1235 University of Oregon, Eugene, OR 97403, USA.
Email: kentm@uoregon.edu

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functional behavior assessments and behavior support plans; Collins & Zirkel, 2017). For example, even during the initial implementation of Tier 1 systems, some students will need individualized and intensive Tier 3 supports prior to the implementation of Tier 3 systems (e.g., function-based interventions). However, to ensure adequate systems fidelity, school teams are generally recommended to focus on installing one system at a time (i.e., Tier 1, Tier 2, or Tier 3) instead of all three tiers at once (Algozzine et al., 2014).

Importance of Identifying How to Increase Implementation

SWPBIS is among the most widely implemented evidence-based innovations in the United States. According to the Center on PBIS (www.pbis.org), more than 27,000 schools were implementing SWPBIS during the 2018 to 2019 school year. This is nearly an 80% increase from 2010, when approximately 15,000 schools were reported to be implementing. Over the last decade, a number of studies have identified variables that predict higher SWPBIS implementation (Bambara et al., 2012; McIntosh et al., 2018; Pas & Bradshaw, 2012; Schaper et al., 2016). A majority of these studies have focused on identifying predictors of Tier 1 systems implementation (McIntosh et al., 2018; Molloy et al., 2013; Nese et al., 2018; Pas & Bradshaw, 2012; Schaper et al., 2016), with substantially less research focused on identifying predictors of Tiers 2 and 3 systems implementation (Debnam et al., 2013; Robertson et al., 2020).

Predictors of Tier 1 Implementation. Many of the studies that have examined predictors of Tier 1 systems implementation have been large-scale, longitudinal studies that identified predictors at different implementation stages (initial implementation, full implementation, sustained implementation; Kittelman et al., 2019; McIntosh et al., 2016, 2018; Nese et al., 2018; Schaper et al., 2016). For example, Nese et al. (2018) conducted a 5-year longitudinal study of 708 schools to identify variables predicting the length of time to reach adequate Tier 1 systems implementation after initial training. Using ordinal regression analyses, the authors found that elementary schools (compared with middle and high schools), non-Title I schools (compared with Title I schools), and suburban schools (compared with city schools) were significantly more likely to reach adequate Tier 1 systems implementation in the first 5 years. In addition, Schaper et al. (2016) conducted a large-scale, longitudinal study to identify predictors of the rate of within-year growth in Tier 1 implementation. The sample included 353 schools that reported on Tier 1 systems implementation during their first 4 years of implementation. Using multilevel linear regression models, the authors found that schools in Year 2 of implementation had higher increases in Tier 1 implementation fidelity compared with schools in Years 1, 3, or 4, and schools with more students eligible for free and reduced lunch had significantly lower within-year growth in Tier 1 systems implementation (Schaper et al., 2016).

McIntosh et al. (2018) also conducted a 3-year study of 860 schools to identify variables predicting sustained Tier 1 systems implementation with fidelity in the third year. Using multigroup structural equation modeling (SEM), the authors identified several significant predictors, including SWPBIS Tier 1 implementation fidelity scores, teams using data for decision-making, and the proportion of schools in the district implementing SWPBIS. The only school characteristic found to be predictive of sustained Tier 1 systems implementation was grade level, not school enrollment, school locale (i.e., city, suburb, town, or rural), proportion of students eligible for free and reduced lunch, or proportion of non-White students (McIntosh et al., 2018).

Predictors of Tiers 2 and 3 Implementation. To our knowledge, there have been no large-scale, longitudinal studies identifying variables predicting implementation of Tiers 2 and 3 *systems*. However, research, mostly based on interviews and surveys, has identified variables perceived to be associated with implementation of specific Tiers 2 and 3 *practices* (Bambara et al., 2009, 2012; Loman et al., 2010; Robertson et al., 2020). For example, Loman et al. (2010) conducted structured interviews with school personnel from 29 elementary schools that implemented the Tier 2 practice First Step to Success to examine its sustained implementation and identify variables perceived to have facilitated sustained implementation. These variables included dedicated resources (i.e., materials, funds), training, coaching, and parent participation (Loman et al., 2010). Related to Tier 3 practices, Robertson et al. (2020) recently conducted a survey of more than 602 school personnel (94% special education teachers) to identify perceived barriers to implementing Tier 3 individualized behavior support plans. Commonly endorsed barriers included inconsistent implementation, inadequate resources, and lack of training (Robertson et al., 2020). Finally, Debnam et al. (2013) examined predictors of administrator support for Tiers 2 and 3 practices across 45 elementary schools (n = 2,717 school personnel). The authors found that general education teachers perceived lower administrator support for Tiers 2 and 3 practices than special education/support staff and that higher perceptions of school organizational health were associated with higher perceptions of administrator support for Tiers 2 and 3 practices.

Practice-Based Guidelines for Launching Implementation of Tiers 2 and 3 Systems

Although these studies identified potential variables that may be related to implementation of Tiers 2 and 3 practices, it is unclear how long after installing Tier 1 systems schools should launch implementation of Tiers 2 and 3 systems. In addition, it is also unclear what variables predict higher implementation fidelity of Tiers 2 and 3 systems.

Technical assistance providers recommend that teams wait to launch implementation of advanced tier systems until Tier 1 systems are implemented with fidelity (Lane et al., 2014; Stormont & Reinke, 2012). For example, in an implementation guide on Tier 2 systems readiness, Freeman et al. (2016) noted that one of the key elements for determining when to implement Tier 2 systems is having Tier 1 systems in place and implemented with high fidelity. Similarly, in an installation brief on Tier 3 systems, Eber et al. (2019) discussed that implementation of Tier 3 systems will be most effective when Tiers 1 and 2 systems are already installed with high fidelity. Based on these recommendations, there are at least two factors that are likely to affect the implementation quality of these advanced systems. The first includes the quality that Tier 1 systems were implemented prior to launching Tiers 2 and 3 systems. In their longitudinal study, McIntosh et al. (2018) demonstrated that quality (fidelity) that Tier 1 systems were implemented prior was predictive of better quality of Tier 1 systems several years afterwards. As Tier 1 systems are theorized as foundational for establishing Tiers 2 and 3 systems, the quality that Tier 1 systems are implemented (Tier 1 fidelity) is likely to affect the quality that Tiers 2 and 3 systems are implemented (Tiers 2 and 3 fidelity; Kim et al., 2014).

The second includes the timing of when to launch Tiers 2 and 3 systems after Tier 1 systems. Implementation guides suggest that these advanced systems should be implemented over a multiyear timeframe. For example, practitioners and researchers recommend staggering the implementation of Tiers 2 and 3 systems as part of a 5-year district professional development plan (e.g., Years 2 or 3 launch Tier 2 systems and Years 4 or 5 launch Tier 3 systems; Lewis et al., 2016). However, there is little evidence to indicate whether implementing these advanced systems in a staggered timeframe (Tier 1 before Tier 2 and Tier 3, Tier 2 before Tier 3) results in improved implementation of these advanced systems. Research is needed to guide school teams in the most effective and efficient timing for launching installation of advanced SWPBIS tiers.

Purpose of the Study

The objective of this study was to identify the extent to which Tier 1 fidelity and years between implementing Tier 1, Tier 2, and 3 systems predicted better launch of Tiers 2 and 3 systems. We used available extant data from schools implementing SWPBIS to track implementation fidelity for the initial years of Tiers 2 and 3 systems implementation. At each year, we tested the predictive power of Tier 1 fidelity and the relative timing of initial Tiers 2 and 3 launch on fidelity of Tiers 2 and 3 systems implementation. Specifically, we asked the following research questions about the first 3 years of Tier 2 and the first year of Tier 3 systems implementation after controlling for school characteristics:

Research Question 1: Does higher Tier 1 systems implementation fidelity predict higher Tiers 2 and 3 systems implementation fidelity?
Research Question 2: Does Tier 2 systems implementation differ for schools with more years between Tier 1 and Tier 2 systems launch?
Research Question 3: Does Tier 3 systems implementation differ for schools with more years between Tier 1 and Tier 3 systems launch?
Research Question 4: Do Tier 2 and Tier 3 systems implementation differ for schools with more years between Tier 2 and Tier 3 systems launch?

Method

Participants and Settings

Participants consisted of two different cohorts of schools reporting on Tier 2 ($n = 776$) or Tier 3 ($n = 359$) implementation fidelity. The schools in the Tier 2 cohorts were located in 244 school districts within 27 U.S. states. The majority of schools were elementary (68%), located in suburban areas (47%), and were Title I (78%). The schools in the Tier 3 cohorts were located in 150 school districts within 23 U.S. states. The majority were also elementary (69%), located in suburban areas (45%), and were Title I (78%). Additional school characteristics (from the National Center for Education Statistics [NCES]) are included in Table 1. Schools meeting the following criteria were included in the study: (a) schools initially launching Tier 1 in 2014 to 2015 or 2015 to 2016, as evidenced by a first-year report of Tier 1 implementation fidelity with the SWPBIS Tiered Fidelity Inventory (TFI; Algozzine et al., 2014) in these years (the first two years the TFI was made available through PBIS Assessment [www.pbisapps.org]) with no prior reported Tier 1 fidelity data on any other assessment in PBIS Assessment, (b) schools reported only on Tier 1 (no Tier 2 or 3 data) in their launch year of 2014 to 2015 or 2015 to 2016, (c) schools launched Tier 2 or Tier 3 systems before 2018 to 2019, as indicated by reporting fidelity data on the TFI in these years with no prior reported fidelity data for these tiers on other tools in PBIS Assessment, and (d) schools had demographic data available from the NCES.

Table 1. School Characteristics for the Tier 2 and Tier 3 Cohorts.

Characteristic	Tier 2 cohorts	Tier 3 cohorts
Number of schools	776	359
Number of districts	244	150
Number of states	27	23
Student enrollment, *M* (*SD*)	628 (451)	637 (473)
% Non-White students, *M* (*SD*)	64 (32)	61 (32)
% Not eligible for FARMs, *M* (*SD*)	37 (26)	38 (26)
% Critical mass year 0, *M* (*SD*)	62 (28)	70 (29)
Grade levels		
% Elementary schools	68	69
% Middle schools	15	15
% High schools	14	14
% Other school types	2	2
Locale		
% Schools in rural areas	11	13
% Schools in towns	9	13
% Schools in suburbs	47	45
% Schools in cities	33	30
% Title I status	78	78
Time between Tier 1 and Tier 2 or 3 launch		
1 year	58%	30%
2 years	31%	45%
3 years	11%	25%
Time between Tier 2 and Tier 3 launch		
0 years	23%	51%
1 year	19%	40%
2 or 3 years[a]	5%	10%
Did not launch Tier 3	52%	—
% Completed TFI with external coach	74%	68%
% Completed TFI with walkthrough	97%	94%

Note. Fidelity of implementation data are TFI scores in the 2018 to 2019 school year. Missing NCES data were less than 4% across all variables. FARMs = free and reduced-price meals; TFI = Tiered Fidelity Inventory; NCES = National Center for Education Statistics.
[a]For the Tier 3 cohort, no schools had a lag of 3 years between Tier 2 and Tier 3 launch.

Requiring completion of the TFI at Tier 1 only in the first year allowed us to clearly identify the first year of measuring implementation at Tiers 2 or 3, our indicator for the first year of implementing Tier 2 or 3 systems. Small numbers of schools were excluded from analyses due to rare implementation patterns: four schools were excluded from the Tier 2 analyses because they implemented Tier 3 systems before Tier 2 systems, one school was excluded from the Tier 3 analyses due to not implementing Tier 2 systems, and three schools were excluded due to implementing Tier 3 systems before Tier 2. Figure 1 provides a summary of the Tier 2 and Tier 3 sample sizes by cohort (2014–2015 or 2015–2016) and implementation year. We use the following terms to describe the relative year of implementation: Year 0 (the year before Tier 2 or 3 was launched), Year 1 (the year Tier 2 or 3 was launched), and Years 2 or 3 (the second and third year of Tier 2 or 3 implementation). If a school launched Tiers 2 and 3 systems simultaneously, then these years would be the same year across tiers, for example, Year 1 could be 2016 to 2017 for both Tiers 2 and 3; however, when Tier 3 was launched after Tier 2, then Year 1 and other years would refer to different academic years for the same school across Tiers 2 and 3.

Measures

SWPBIS implementation. The TFI (Algozzine et al., 2014) is an SWPBIS implementation fidelity measure that can be completed with facilitation by an external coach or as a self-assessment, with or without a walkthrough including more direct assessment of critical features (e.g., staff and student knowledge of school-wide expectations and use of systems to acknowledge prosocial behavior). It includes separate scales for systems at Tiers 1 (15 items), 2 (13 items), and 3 (17 items). Each item is scored 0 (*not implemented*), 1 (*partially implemented*), or 2 (*fully implemented*), in accordance with a detailed rubric. The validation of the TFI's three tiers as stand-alone scales allows for teams to complete one, two,

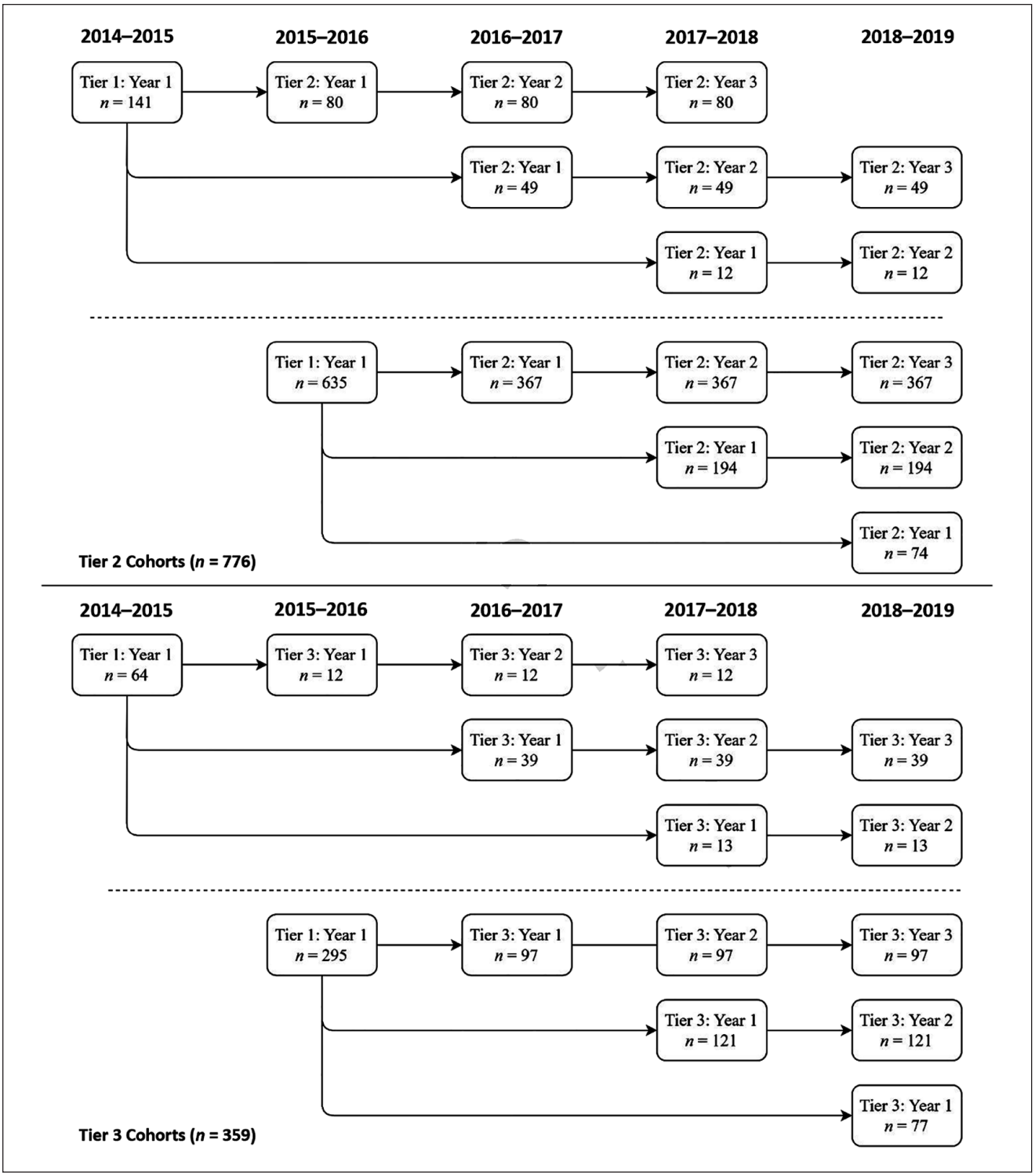

Figure 1. Sample size and year of implementation by cohort year and tier.

or all three tiers at any time during the year (Massar et al., 2019), and the small number of items of the TFI has made it possible to assess all three tiers using common response formats and scoring under an hour of time (Kittelman et al., 2018). A Tier 1 fidelity criterion of 70% is needed for reaching adequate implementation fidelity; however, a fidelity criterion for Tiers 2 and 3 has not been established at this time. Across multiple studies, the TFI has been found

Table 2. Tiered Fidelity Inventory (TFI) Scores by Implementation Year for the Tier 2 and Tier 3 Cohorts.

	Tier 2 cohorts		Tier 3 cohorts	
TFI tier (year)	*M* (*SD*)	*n*	*M* (*SD*)	*n*
Tier 1 (Year 0)	16.33 (8.11)	776	18.29 (8.86)	359
Tier 2 (Year 1)	12.74 (7.05)	776	—	—
Tier 2 (Year 2)	12.90 (9.13)	672	—	—
Tier 2 (Year 3)	10.63 (10.26)	496	—	—
Tier 3 (Year 1)	—	—	14.34 (9.66)	359

Note. Year indicates the year of the tier being implemented, with Year 1 representing the year the tier was launched; — indicates that these scores were not included in data analyses.

to have a strong factor structure, evidence of reliability (internal consistency = .96, test–retest reliability = .99), strong content validity for assessing fidelity (content validity index = .92), and strong concurrent validity with other measures of SWPBIS fidelity at all three tiers (Massar et al., 2019; McIntosh et al., 2017; Mercer et al., 2017).

Predictors of Tier 2 and Tier 3 implementation. TFI fidelity scores in Year 1, 2, and 3 of Tier 2 implementation and Year 1 of Tier 3 implementation were used as outcome variables. Predictors of Tier 2 implementation included (a) Tier 1 fidelity scores in Year 0, (b) the time between initial Tier 1 and 2 implementation (0 = 1-year lag, 1 = 2- to 3-year lag), and (c) time between initial Tiers 2 and 3 implementation, as represented by three dummy coded variables (1-year lag, 2- to 3-year lag, or did not implement Tier 3) with simultaneous launch of Tiers 2 and 3 serving as the reference group.

Predictors of Tier 3 implementation included (a) Tier 1 fidelity scores in Year 0, (b) time between initial Tier 1 and 3 implementation (0 = 1-year lag, 1 = 2- to 3-year lag), and (c) time between initial Tiers 2 and 3 implementation, as represented by two dummy coded variables (1-year lag or 2- to 3-year lag) with a simultaneous launch of Tiers 2 and 3 serving as the reference group. Table 2 includes a summary of the TFI fidelity scores by the implementation year, including the percent of schools with TFIs completed with an external coach and walkthroughs completed.

District and school covariates. We also included variables examined in previous research on SWPBIS implementation. Critical mass was the only district covariate and was operationalized as the proportion of schools in the district reporting SWPBIS Tier 1 fidelity in Year 0 (thus, each school could have a different value for critical mass depending on their start year). Cohort year (2014–2015 or 2015–2016) was a school-level covariate and was operationalized as the year schools launched Tier 1. Other school covariates included grade level (middle, high, or other school types, with elementary as the reference group), locale (city, town, or rural with suburban as the reference group), Title I eligibility (1 = yes, 0 = no), total student enrollment, proportion of non-White students, and proportion of students not eligible for free or reduced-price meals.

Procedure

We extracted district and school data from NCES and PBIS Assessment (www.pbisapps.org), a web application for school personnel to enter and review SWPBIS fidelity of implementation data. The application is free to the public and requires only an individual to serve as a district or regional coordinator. The database is maintained by Educational and Community Supports, a research unit in the University of Oregon. When school teams completed multiple fidelity measures during the year, we retained the last score of the year completed with facilitation from an external coach (74% and 68%). Data on Tiers 2 and 3 implementation fidelity (outcome variables), the predictors of Tiers 2 and 3 implementation fidelity, and two of the covariates (i.e., critical mass in Year 0 and cohort year) were obtained from PBIS Assessment. Data on the other covariates were obtained from the NCES database.

Data Analysis

We fit a series of structural equation models by tier (Tier 2 or Tier 3) and implementation year (Years 1–3 for Tier 2; Year 1 for Tier 3) to address our research questions. The model for Year 1 of Tier 2 implementation is depicted in Figure 2. In the figure, fidelity of Tier 1 implementation in Year 0 is represented by a latent variable, with the 15 Tier 1 TFI items specified as ordered, categorical indicators. Similarly, Tier 2 fidelity is represented by a latent variable, with the 13 Tier 2 TFI items as categorical indicators. The regression path from Tier 1 fidelity to Tier 2 fidelity partially addresses Research Question 1 regarding the importance of Tier 1 fidelity for subsequent Tiers 2 and 3 launch. For the Tier 3 portion of Research Question 1, Tier 3 fidelity was the primary latent outcome variable (replacing Tier 2 fidelity in Figure 2), with the 17 Tier 3 TFI items as categorical indicators, and Tier 3 fidelity regressed on Tier 1 fidelity. To address Research Question 2 on whether there are

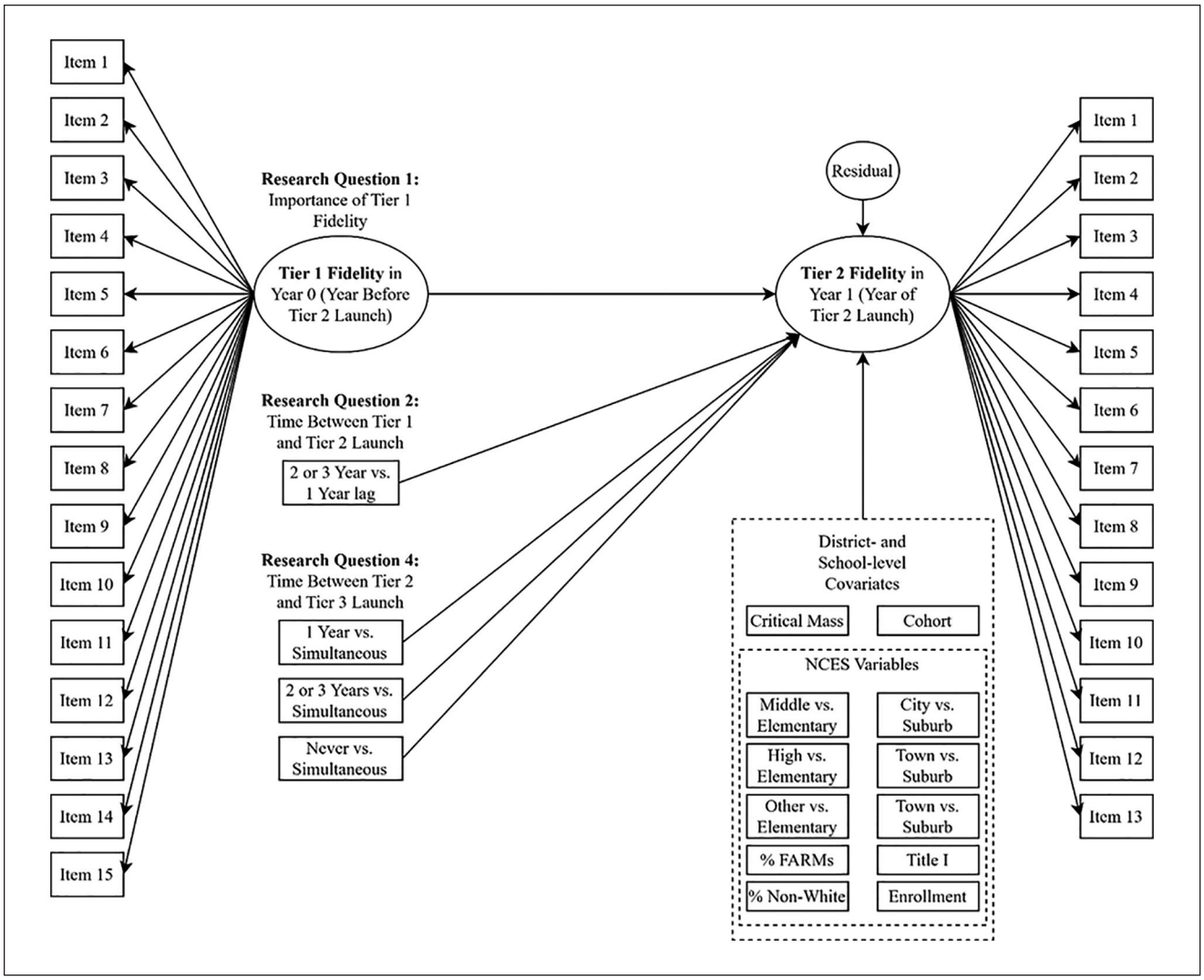

Figure 2. Specification and research questions in model for Tier 2 (Year 1).
Note. Critical mass is the proportion of schools in the district implementing PBIS in Year 0. Cohort is the year that Tier 1 was launched (0 = 2014–2015, 1 = 2015–2016). NCES variables are covariates calculated from variables in the NCES's Common Core of Data, as detailed in the method. % FARMs is the proportion of students not eligible for free and reduced-price meals. % Non-White is the proportion of non-White students. Research Question 3 is not included because it addresses Tier 3 fidelity. NCES = National Center for Education Statistics; PBIS = positive behavioral interventions and supports.

differences in Tier 2 fidelity depending on the number of years between initial Tier 1 and Tier 2 launch, Tier 2 fidelity was regressed on time between Tier 1 and 2 launch (0 = 1 year; 1 = 2 or 3 years). For Research Question 3, Tier 3 fidelity was regressed on time between Tiers 1 and 3 launch (0 = 1 year; 1 = 2 or 3 years). To address Research Question 4 on time between initial Tiers 2 and 3 launch, Tier 2 fidelity was regressed on three binary variables indicating whether schools (a) had 1 year between Tiers 2 and 3 launch, (b) had 2 or 3 years between Tiers 2 and 3 launch, or (c) did not launch Tier 3, with simultaneous Tiers 2 and 3 launch serving as the reference group. Also for Research Question 4, we regressed Tier 3 fidelity on two binary predictors (1-year lag vs. simultaneous; 2-year lag vs. simultaneous) because all schools launched Tier 3, by definition, and no schools had a 3-year lag between Tiers 2 and 3 launch.

We fit all models in M*plus* 8.4 (Muthén & Muthén, 2017) using the robust weighted least squares estimator to account for the categorical item format of the TFI. To account for the nesting of schools in districts, we used the COMPLEX command to adjust standard errors and the chi-square model. We used multiple imputation to handle missing data—final results are pooled estimates across 1,000 imputed data sets. We analyzed these many data sets because imputation standard errors decrease as the number of imputed data sets approaches infinity (Enders, 2010). The primary source of

Table 3. Summary of Model Fit Statistics Across the Four Predictive Models of Tier 2 or 3 Implementation.

Model fit statistics	Tier 2 Year 1	Tier 2 Year 2	Tier 2 Year 3	Tier 3 Year 1
χ^2 statistic	1,275	1,183	1,153	1,293
df	781	781	781	928
CFI	.967	.984	.993	.965
TLI	.965	.983	.993	.964
SRMR	.071	.068	.066	.102
RMSEA	.029	.026	.025	.033

Note. Year indicates the year of the tier being implemented, with Year 1 representing the year the tier was launched. CFI = comparative fit index; TLI = Tucker–Lewis index; SRMR = standardized root mean square residual; RMSEA = root mean square error of approximation.

missing data was our cohort design, as displayed in Figure 1. In the Tier 2 Year 2 analyses, 74 schools (9.5%) did not have enough time (in our study window) to reach Year 2 of Tier 2 implementation, and an additional 30 schools (3.9%), despite reporting TFI data in Year 3, did not report data in Year 2 for a total of 104 (13.4%) with missing data. In the Tier 2 Year 3 analyses, 280 schools (36.1%) did not have enough time to reach Year 3 of Tier 2 implementation. All schools had TFI data on Tier 1 implementation the year before initial Tier 2 ($n = 776$) and initial Tier 3 ($n = 359$) implementation, and all schools had TFI data during the initial year of Tier 2 or Tier 3 implementation. The proportions of variance explained (R^2) in the Tier 2 and Tier 3 latent fidelity variables are presented as indicators of effect size.

Results

Model fit across the four models assessing predictors of the first 3 years of Tier 2 systems implementation and first year of Tier 3 systems implementation was strong (see Table 3) based on commonly cited guidelines (Hu & Bentler, 1999); comparative fit index (CFI) and Tucker–Lewis index (TLI) values across the models were greater than .95, three of the four models had standardized root mean square residual (SRMR) values less than .08, and all root mean square error of approximation (RMSEA) values were less than .06. Table 4 provides a summary of the regression coefficients in the models. The proportion of variance explained ranged from 15% to 27% across the Tier 2 models and 17% for Tier 3 model. As indicated in Table 4, the only significant school-level covariates included Title I status ($\beta = .12$, $p = .023$) in the Tier 2 Year 2 model, enrollment ($\beta = .16$, $p = .005$) and high versus elementary schools ($\beta = -.17$, $p = .002$) in the Tier 3 Year 3 model, and other school types versus elementary schools ($\beta = .11$, $p = .041$) in the Tier 3 Year 1 model. The more substantive regression coefficients in Table 4 are discussed by the research question below.

Tier 1 Implementation

In reference to Research Question 1, higher Tier 1 implementation in the year prior to Tier 2 and Tier 3 systems launch predicted higher Tier 2 ($\beta = .32$, $p < .001$) and Tier 3 ($\beta = .17$, $p \leq .001$) implementation in Year 1. In contrast, higher Tier 1 implementation was not found to predict Tier 2 implementation in Year 2 ($\beta = .05$, $p = .317$) or Year 3 ($\beta = .00$, $p = .982$). These findings indicate that schools with higher Tier 1 fidelity the year before Tier 2 and Tier 3 launch were more likely to have higher Tier 2 and Tier 3 implementation, but only in their launch year.

Time Between Tier 1 and Tier 2 Launch

Research Question 2 asked whether more years between Tier 1 and Tier 2 launch predicted higher fidelity of Tier 2 systems implementation. Findings from the Tier 2 models showed that schools with a 2- or 3-year lag between initial Tier 1 and Tier 2 launch, compared with a 1-year lag, had significantly higher fidelity of Tier 2 implementation in Year 1 ($\beta = .13$, $p = .026$), but not in Years 2 ($\beta = -.05$, $p = .454$) or 3 ($\beta = .02$, $p = .798$) of Tier 2 implementation.

Time Between Tier 1 and Tier 3 Launch

Research Question 3 asked whether more years between Tier 1 and Tier 3 launch predicted higher Tier 3 systems implementation. There were no differences in the first year of Tier 3 implementation for schools with a 2- or 3-year lag between initial Tier 1 and Tier 3 launch, compared with a 1-year lag ($\beta = .10$, $p = .175$).

Time Between Tier 2 and Tier 3 Launch

Findings showed that launching Tier 3 at least 1 year after Tier 2, compared with launching both advanced tiers simultaneously, was predictive of higher Tier 2 systems implementation (Research Question 4). Specifically, schools that launched Tier 3 one year after launching Tier 2 had significantly higher Tier 2 implementation in Years 2 ($\beta = .25$, $p < .001$) and 3 ($\beta = .23$, $p < .001$) of Tier 2 implementation. Likewise, schools that launched Tier 3 multiple years after Tier 2 had significantly higher fidelity of Tier 2 implementation in Years 2 ($\beta = .11$, $p = .015$) and 3 ($\beta = .15$, $p = .001$) of Tier 2 launch. Findings also showed that schools

Table 4. Summary of the Coefficients for the Models Predicting Tier 2 or 3 Implementation by Year.

	Tier 2 Year 1		Tier 2 Year 2		Tier 2 Year 3		Tier 3 Year 1	
Variable	β	*p* value	β	*p* value	β	*p* value	β	*p* value
Research Question 1								
Tier 1 fidelity in Year 0	**.32**	**<.001**	.05	.317	.00	.982	**.17**	**<.001**
Research Question 2								
2–3 years between Tiers 1 and 2	**.13**	**.026**	−.05	.454	.02	.798		
Research Question 3								
2–3 years between Tiers 1 and 3							−.10	.175
Research Question 4								
1 year between Tiers 2 and 3	−.05	.372	**.25**	**<.001**	**.23**	**<.001**	.12	.120
2–3 years between Tiers 2 and 3	−.03	.504	**.11**	**.015**	**.15**	**.001**	.10	.096
Never implemented Tier 3	−.10	.108	−.09	.144	**−.22**	**<.001**		
District and school-level covariates								
Cohort year	.01	.900	−.08	.121	.03	.608	−.01	.934
Middle	−.03	.419	−.01	.787	−.04	.302	−.11	.071
High	−.02	.773	−.07	.299	**−.17**	**.002**	−.08	.312
Other school types	−.02	.686	−.03	.455	−.04	.403	**.11**	**.041**
City	.10	.204	−.03	.612	−.08	.319	.09	.202
Town	.07	.167	−.02	.710	.01	.909	−.11	.140
Rural	.05	.346	−.10	.056	−.05	.355	−.04	.529
Title I status	−.08	.152	**.12**	**.023**	.07	.252	<.01	.961
Critical mass	.06	.340	.01	.812	.09	.212	.04	.504
Enrollment	−.03	.614	.04	.399	**.16**	**.005**	−.10	.169
Prop. Non-White students	−.01	.934	−.09	.196	−.07	.505	−.08	.432
Prop. not eligible for FARMs	−.07	.377	−.08	.276	−.06	.550	.04	.625
R^2 fidelity	**.15**	**<.001**	**.16**	**<.001**	**.27**	**<.001**	**.17**	**.001**

Note. Year 0 is the year before the first year of Tier 2 or 3 implementation (Year 1). Coefficients with $p < .05$ are in bold. Prop = proportion, FARMs = free and reduced-price meals.

that did not launch Tier 3 within the first 3 years of launching Tier 2, compared with launching Tiers 2 and 3 simultaneously, had significantly lower Tier 2 implementation scores for schools 3 years after launching Tier 2 ($\beta = -.22$, $p < .001$). In contrast, time between Tier 2 and Tier 3 launch was unrelated to Tier 3 implementation in the first year of Tier 3 launch.

Discussion

Given the limited research examining the implementation of advanced SWPBIS tier systems, the purpose of this large-scale longitudinal study was to identify empirical guidance for the timing for launching Tiers 2 and 3 systems. Specifically, results indicated that higher Tier 1 implementation in the year prior to launching the advanced tiers was predictive of higher Tiers 2 and 3 implementation in Year 1, but not Years 2 or 3. Second, a longer lag between Tier 1 and Tier 2 launch (2–3 years vs. 1 year) was predictive of higher Tier 2 implementation in Year 1, and a longer lag between Tiers 2 and 3 launch (1 year and 2–3 years vs. simultaneous Tiers 2 and 3 implementation) was predictive of higher Tier 2 implementation in Years 2 and 3; in contrast, a longer lag between Tiers 1 and 3 and Tiers 2 and 3 launch did not predict higher fidelity of Tier 3 implementation in Year 1. In addition, schools that did not launch Tier 3 within 3 years of launching Tier 2 (compared with schools that launched Tiers 2 and 3 simultaneously) had significantly lower Tier 2 implementation in Year 3.

This study provides several meaningful contributions to the existing research on SWPBIS implementation. First, although large-scale longitudinal studies have examined predictors of Tier 1 systems implementation (McIntosh et al., 2018; Nese et al., 2018; Schaper et al., 2016), this line of research has not extended to Tiers 2 and 3. Similar to the previous Tier 1 implementation research, schools with higher Tier 1 implementation before Tiers 2 and 3 launch had better Tiers 2 and 3 fidelity during the launch year.

Second, previous research has primarily focused on identifying variables perceived to be related to implementation of specific Tiers 2 and 3 interventions rather than overall Tiers 2 and 3 systems implementation (practices and systems; Loman et al., 2010; Robertson et al., 2020). For example, Loman et al. (2010) examined variables associated with the sustained implementation of a Tier 2 practice, and Robertson et al. (2020) identified barriers to

implementing Tier 3 function-based support practices. To complement previous research, we examined variables associated with implementation of Tiers 1, 2, and 3 systems and practices using a psychometrically sound and widely used fidelity measure in the field of SWPBIS. Third, previous research has largely been cross-sectional and utilized interview and survey methods for identifying variables perceived to be important (i.e., inadequate resources, poor implementation consisency; Bambara et al., 2009, 2012; Robertson et al., 2020). This study builds on these prior studies by predicting fidelity of Tiers 2 and 3 systems implementation.

Limitations

There are several limitations of this study worth discussing. One limitation is our use of first measurement of Tiers 2 and 3 fidelity as a proxy for schools' first year of implementation at Tiers 2 and 3. It is possible that school teams measured fidelity one or more years before actual implementation. For example, it is possible that schools were measuring Tier 2 and Tier 3 implementation because of a district requirement and not because they were actively implementing. Conversely, it is also possible that school teams implemented Tier 2 or 3 systems before measuring them, although this phenomenon is unlikely because the TFI includes items for all three tiers in each administration. Hence, teams would have had to skip items at Tiers 2 and 3 when completing the measure in 2014 to 2015 or 2015 to 2016. In addition, we were able to examine predictors of Tier 3 implementation in Year 1 only. Unlike Tier 2 analyses, we had smaller numbers of schools that launched Tier 1 implementation in 2014 to 2015 or 2015 to 2016 and measured Tier 3 implementation in Years 2 or 3 by 2018 to 2019. Another limitation includes the use of the TFI as a measure of Tiers 2 and 3 systems fidelity. Although the TFI has strong psychometric properties (Massar et al., 2019; McIntosh et al., 2017; Mercer et al., 2017) and was most often completed with an external SWPBIS coach and a walkthrough (Algozzine et al., 2014), many items are subjective and could be subject to bias. Also, due to the multiple cohort design, some schools did not have time to reach Tier 2 implementation within the study window (13.4%–36.1%), and we used multiple imputation to handle missing data. It is possible multiple imputation could have biased estimates; however, simulation study results indicate good performance for latent variable multiple imputation with percentages of missing ordinal data as large as 50% (Wu et al., 2015).

Next, it is also worth noting that the variance accounted for in the four regression models was generally small. This suggests that there are other school, district, and practice variables that could explain more of the variance in Tiers 2 and 3 fidelity scores. Unfortunately, because this research was exploratory and extant data were used to answer the research questions, we were limited to district and school demographic and practice variables available in the research database. Finally, it is worth noting that 68% and 69% of the schools used in this study to examine predictors of Tier 2 and Tier 3 implementation were elementary schools, respectively, and results may not generalize to the general population of schools.

Implications for Research

Although the findings from this study provide insights into initial Tiers 2 and 3 systems implementation, more research is needed. One approach would be to extend the current research by examining variables predictive of initial implementation of Tier 3 in Years 2 and 3, like how we examined variables predictive of initial Tier 2 implementation in Years 1 through 3. This study would be possible if more schools continue to use the TFI to measure Tier 3 implementation in future years. Although the number of years between launching Tiers 1 and 3 and Tiers 2 and 3 was found not to predict fidelity of Tier 3 implementation in Year 1, these variables could become significant in Year 2 and 3 of implementation. For example, the number of years between launch of Tiers 2 and 3 was found to be a significant predictor of fidelity of Tier 2 implementation in Years 2 and 3 of Tier 2 implementation, but not in Year 1. Second, based on the relatively small-to-moderate proportion of variance explained in Tier 2 and Tier 3 implementation fidelity across the four SEM models, there is clearly a need to identify other variables predictive of Tiers 2 and 3 initial implementation. Future research could examine whether variables predictive of administrator support for Tiers 2 and 3 interventions (i.e., school organizational health; Debnam et al., 2013) and variables perceived to be barriers to implementing Tier 2 and Tier 3 practices (i.e., inconsistent implementation, resources, training and coaching, district-level coordinatation; Loman et al., 2010; Robertson et al., 2020) also predict fidelity of Tiers 2 and 3 implementation. In addition, it would be particularly useful to understand whether schools at different stages of implementation (e.g., initial implementation vs. full implementation) sustain Tiers 2 and 3 systems over time (McIntosh et al., 2018) and identify predictors of growth in Tiers 2 and 3 implementation over time (Schaper et al., 2016).

Finally, future research is needed to ultimately evaluate whether higher fidelity of Tiers 2 and 3 systems leads to better school and student outcomes. Although there is a body of research documenting the positive effects between the implementation of specific Tiers 2 and 3 interventions and improved student outcomes (Loman et al., 2010; Robertson et al., 2020), future research is needed to document the relation between the implementation of Tiers 2

and 3 systems and student outcomes (i.e., improved behavior and academic outcomes for students receiving Tiers 2 and 3 interventions). Relatedly, future research could also examine the extent that student outcomes improve across different stages of implementation of these Tiers 2 and 3 systems.

Implications for Practice

The most common guidance is to wait to launch installation of systems at Tiers 2 and 3 until Tier 1 is implemented with adequate fidelity. This study provides empirical support for this recommendation, as higher fidelity of Tier 1 implementation predicted higher Tiers 2 and 3 implementation in the first year. Because higher Tier 1 implementation did not predict higher Tier 2 implementation in Years 2 and 3, it is likely that other variables are more influential of Tier 2 implementation in Years 2 and 3. Beyond the importance of reaching adequate fidelity of Tier 1 implementation, our findings provide some support for the recommendation to launch advanced tiers as soon as Tier 1 is implemented with fidelity by showing that a 2- to 3-year lag between launch of Tiers 1 and 2 and a 1-year lag before launching Tier 3 (compared with simultaneous) was predictive of higher fidelity of Tier 2 implementation. However, waiting too long to implement Tier 3 (not launching Tier 3 within 3 years of implementing Tier 2) was predictive of lower Tier 2 implementation fidelity. This finding suggests that leadership teams may need to have a professional development plan in place to be ready to launch Tier 3 within the first 3 years of launching Tier 2.

Finally, we underscore that the guidance for staggering implementation of Tiers 2 and 3 systems to improve implementation fidelity does not equate to delaying implementation of Tiers 2 and 3 interventions. Leadership teams will need to plan for both scaling up implementation of advanced tier systems while simultaneously supporting students' needs. For example, teams can focus on implementing their Tier 1 classroom systems and practices while also identifying and responding early to students needing more intensive and immediate supports in the classroom.

Conclusion

Collectively, this study provides an important first step toward identifying variables predicting implementation of Tiers 2 and 3 systems. The results highlight the importance of having strong Tier 1 systems in place prior to Tiers 2 and 3 systems implementation and the importance of staggered implementation of Tiers 2 and 3 systems. These findings are important for leadership teams because they provide empirical guidance for when to launch advanced tiers and when to stagger launch of these tiers in long-term professional development plans.

Authors' Note

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ORCID iDs

Sterett H. Mercer https://orcid.org/0000-0002-7940-4221

Kent McIntosh https://orcid.org/0000-0002-7765-2993

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