Within-year Fidelity Growth of SWPBIS during Installation and Initial Implementation

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Abstract

The purpose of this study was to document within-year fidelity growth during installation and initial implementation of School-Wide Positive Behavioral Interventions and Supports (SWPBIS). Participants included school teams from schools throughout the United States that were in years one to four of SWPBIS implementation and routinely evaluated their implementation fidelity. The fidelity outcome was assessed with the Team Implementation Checklist (TIC) and was completed multiple times per year by SWPBIS teams. Results from multilevel fidelity growth models documented within- and between-school variability and growth predictors. Years implementing, location, school type and enrollment size were significant predictors of beginning year fidelity scores (intercept), and years implementing and relative socio-economic status were significant predictors of the average rate of fidelity change per month of school (slope). These results add to the growing field of implementation science, and practice recommendations are outlined.

Keywords: Implementation science, fidelity, systems interventions, growth

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School-Wide Positive Behavioral Interventions and Supports (SWPBIS) is a systems intervention framework focused on creating healthy school environments by promoting pro-social behavior and supporting students with behavioral needs that is implemented in over 21,000 schools across the United States (Horner, 2014). The program focuses on universal behavioral expectations implemented in every classroom across schools, administrative functions to facilitate ongoing implementation, and data use to identify both students with behavioral needs and areas for programmatic improvement. In multiple effectiveness studies, SWPBIS has been documented to decrease office discipline referral and suspension rates, increase on-task academic behaviors, and improve academic performances (Algozzine & Algozzine, 2007; Bradshaw, Mitchell, & Leaf, 2010; Horner, Sugai, & Anderson, 2010). Documenting impact on valued outcomes is one piece of essential evidence for scaling educational innovations, and another is an understanding how to effectively put a practice into place. *Implementation science* provides a theoretic lens and practical steps for installing and sustaining research-based innovations within real-world organizations that can be monitored with accurate fidelity measures. Given its evidence of effectiveness and large-scale implementation, SWPBIS provides an excellent opportunity to explore implementation variables related to implementation fidelity.

Importance of SWPBIS Implementation Fidelity

Implementation fidelity provides an understanding of the implementation process that is useful for ensuring effective program outcomes as fidelity is related to valued school and student outcomes. A randomized control trial conducted by Horner and colleagues (2009) documented a functional relationship between improved SWPBIS implementation and improved perceptions of

school safety, third grade academic achievement, and decreased discipline referral and suspension rates. Another randomized trial showed that effective implementation was related to improvements on measures of organizational health, staff affiliation and academic emphasis (Bradshaw, Koth, Bevans, Ialongo, & Leaf, 2008). A recent study supports this claim by showing that increased SWPBIS fidelity resulted in significantly decreased office discipline referral rates in a high school trial (Flannery, Fenning, Kato, & McIntosh, 2014). These studies provide important evidence on the links between SWPBIS implementation fidelity and valued outcomes and indicate the need to examine the fidelity process of change.

Stages of Implementation

Implementation science provides a useful lens for understanding school functions that mediate successful use of evidence based programs by providing a framework to understand implementation processes in complex organizational ecosystems like schools (Odom, 2009). For example, research on a statewide SWPBIS initiative documented practical, organizational barriers such as dedicated meeting time inhibited implementing SWPBIS with high fidelity (Kincaid, Childs, Blase, & Wallace, 2007). Work in other fields such as research on the Teaching-Family model for rehabilitation of youth offenders has shown by reviewing hundreds of attempted replications that implementation variables related to treatment fidelity were related to effective program use (Fixsen, Blase, Timbers, & Wolf, 2001).

In a comprehensive synthesis of implementation research, Fixsen and colleagues (2005) provided an implementation framework that operationalized organizational capacities necessary for continued use of a program, and the stages of implementation. The *stages of implementation* involve six distinct phases of the implementation process highlighting that it "will not happen all at once or proceed smoothly, at least not at first" (Fixsen et al., 2005, p. 15). The six stages of

implementation provide research-based operationalized steps to aid the complicated process. The phases include an *exploration and adoption* phase where organizations evaluate their needs and find a program to meet their needs to *full operation* where the adopted program is being used with high levels of fidelity to *innovation* and *sustainability* phases where a program is adapted and maintained as part of day to day practice.

Two important phases that occur between the exploration and adoption phase and the full operation phase are the program installation and initial implementation phases. *Installation* involves the use of organizational resources to prepare before the program is used with clients/students. The activities during this phase for SWPBIS involve focusing on implementation drivers related to successful use such as providing training for data use (e.g., Todd et al., 2011). Further, resources need to be directed towards the creation of leadership teams comprised of administrators and teachers, self-assessments of current behavior norms and outcomes must be completed, and school-wide behavior expectations must be established. The *initial implementation* phase involves using a program with students in school settings for the first time with varied levels of success.

Fidelity Research

Science is moving beyond a simple binary (i.e., implementing or not implementing) view of fidelity to a dynamic one. This is in part due to documented fidelity decreases when moving interventions from laboratory to school settings and the mediation between fidelity and valued outcomes (Crawford, Carpenter, Wilson, Schmeister, & McDonald, 2012; Hulleman & Cordray, 2009; O'Donnell, 2008). Also, research has shown that fidelity is related to multiple school and teacher factors, including school size, teacher education, class size, and engagement during

training and coaching (Reinke, Herman, Stormont, Newcomer, & David, 2013; Zvoch, 2009, 2012).

Little research has examined fidelity change and factors influencing it. Flannery and colleagues (2014) showed the relation of SWPBIS fidelity to valued outcomes using growth methodology. In this research, the authors analyzed a discipline outcome using a latent growth model, and yearly fidelity scores were predictors of yearly office discipline referral rates. These results highlight that yearly fidelity levels relate to other longitudinal outcome changes, suggesting a hypothesis that fidelity change as a school-level outcome can be understood using growth methodology. Further, this study was conducted over three years and examined fidelity levels at the end of each year. Clearly, implementation fidelity also changes within each year as schools implement programmatic components as time and resources permit. Within-year fidelity growth can provide a valuable understanding of the implementation process.

To the authors' knowledge, only one study has focused explicitly on the longitudinal process of implementation fidelity. In a randomized trial of a class-wide peer tutoring program, Buzhardt, Greenwood, Abbot and Tapia (2006) developed a rate of implementation scale that measured the amount of time it took teachers to implement all of the intervention's components. Results showed that (a) the measure accurately and objectively measured rate of completing tasks necessary for implementation, (b) schools varied widely in their implementation rates, and (c) the metric allowed documentation of implementation barriers. These results suggested that a fidelity growth metric can be a useful tool for researchers and practitioners to document organizational change processes during installation and initial implementation.

Purpose of the Study

The goal of this study is to add to the empirical literature related to within-year fidelity growth during the installation and initial implementation of SWPBIS by exploring two research questions. First, to what extent does a repeated measure of SWPBIS fidelity document within-year fidelity growth within and between schools? Second, if the fidelity growth phenomenon exists as hypothesized, to what extent do contextual covariates used as typical controls in intervention trials (e.g., school size, relative socio-economic status) predict this growth?

Method

Participants

Participants included 353 SWPBIS school teams comprised of building leaders and district coaches from schools throughout the United States. School characteristics were collected by the Institute for Education Science (IES) during the 2009-10 school year (National Center for Education Statistics, 2011). The majority of schools were in California (n = 46), Minnesota (n = 116), Missouri (n = 107), and Wisconsin (n = 77). The majority of schools sampled were elementary schools (n = 223) and Title I eligible (n = 242). Ten schools were magnet schools, and five were charters. The smallest school enrolled 13 students, whereas the largest school enrolled 2,218 students.

Measures

Team Implementation Checklist (TIC). TIC Version 3.0 and 3.1 measures fidelity of SWPBIS during initial program implementation (Sugai, Horner, & Lewis-Palmer, 2009; Sugai, Horner, Lewis-Palmer, & Rossetto Dickey, 2011). As a fidelity measure, TIC measures adherence to the critical features of SWPBIS during the first few years of implementation. It is intended to be administered repeatedly (e.g., quarterly) throughout the first few years of SWPBIS to guide teams in the basic activities of initial implementation. SWPBIS teams and district

coaches self-administer the measure during SWPBIS team meetings to monitor and adapt formal implementation action plans. Research on TIC version 3.0 documented a high internal consistency (Cronbach α = .91), and concurrent validity (r = .59) with a validated SWPBIS fidelity and effectiveness evaluation measure, the Benchmarks of Quality (Tobin, Vincent, Horner, Rossetto Dickey, & May, 2012). Research on TIC version 3.1 resulted in high internal consistency (α = .93) for an overall measure of SWPBIS implementation (McIntosh, Mercer, Nese, Strickland-Cohen, & Hoselton, 2014). Scale scores were formed by adding the 22 consistent items representing the essential steps for initial and on-going implementation of SWPBIS that were reported on a three-point ordinal scale. Points were assigned to each position on the scale, with zero indicating not yet started, one for in progress responses, and two for achieved, with the highest score possible being 44.

School context variables. School context variables included years implementing SWPBIS, locality, school size, and relative socio-economic status. The number of years implementing was obtained from a SWPBIS database. Locality, school size, and relative socio-economic status were contextual variables for each school that were gathered directly or converting from the 2009-10 school census (National Center for Education Statistics, 2011). The *number of years implementing* SWPBIS was defined as the number of complete school years the school has been actively completing TICs before the measurement occasion. This variable was coded as one for schools in their first year of implementation (i.e., the year they completed their first TIC), two for schools that have completed one full year of implementation and were in their second year, and so on. *Locality* was truncated from twelve original categories to four defined as city, suburb, town, and rural, and then converted to a series of dummy variables with city as the reference. *School size* was defined as a binary indicator with a zero representing schools with

fewer than or equal to 500 students and a one otherwise. *Relative socio-economic status* (SES) was measured via proxy calculated by dividing the number of students eligible for free and reduced priced lunch (FRL) and the total number of students in the school.

Procedure

This study used secondary data collected between 2009-2013 by a national SWPBIS technical assistance center (i.e., the OSEP Technical Assistance Center on: Positive Behavioral Interventions and Supports, www.pbis.org) and two previous studies (McIntosh et al., 2013; Mercer, McIntosh, Strickland-Cohen, & Horner, 2014). School SWPBIS teams completed the outcome measure, the Team Implementation Checklist (TIC) during team meetings and entered the results into an online database. Schools were included if in any given school year they (a) completed two or more administrations of the outcome measure, the TIC; and (b) were in years one to four of SWPBIS implementation. This process resulted in 500 unique school and school year combinations to explore within-year fidelity growth.

Analytic Approach

All models were estimated using the lme4 package (Bates, Maechler, & Bolker, 2012) for the R program (R Core Team, 2012). Time was coded as months from a zero point that aligns with the beginning of a school year. Subsequently, a school's average slope represents the average fidelity change per month of school centered at the beginning of the school year. A multilevel growth model with varying intercepts and slopes was specified with the level-1 equation:

$$y_{tj} = \pi_{0j} + \pi_{1j} * time_t + e_{tj}, \quad (1)$$

where y_{tj} equals the TIC score for school j at time t, π_{0j} is the initial status that varies between schools (i.e., the intercept), π_{1j} is the rate of change that varies between schools (i.e., slope), $time_t$

is the time variable for each observation coded as months from the beginning of the school year, and e_{tj} is the random effect for school j at time t. The level-2 model was:

$$\pi_{0j} = XB_0 + u_{0j} \quad (2)$$

$$\pi_{1j} = XB_1 + u_{1j}. \quad (3)$$

X represents a matrix of variables hypothesized to predict fidelity growth with a leading column of ones to facilitate the estimation of an intercept. B_0 represents a vector of fixed effect parameters predicting the growth model intercept, π_{0j}, including the average fidelity score at time zero and average effects of years implementing and contextual covariates. B_1 represents a vector of fixed effect parameters predicting the growth model slope, π_{1j}, including an intercept and average effects for hypothesized predictors. Finally, u_{0j} and u_{1j} represent the growth parameter random effects for each school. The between-school variance/covariance was specified according to Tao matrix specified in Equation 4 and is assumed to be independent from the level-1 residual, e_{tj}:

$$T = \begin{bmatrix} \text{var}(u_{0j}) & - \\ \text{cov}(u_{0j}, u_{1j}) & \text{var}(u_{1j}) \end{bmatrix}. \quad (4)$$

Results

Preliminary Analysis

A descriptive analysis was conducted to describe the outcome and predictors (see Table 1). A close look at the time variable shows that on average schools completed TICs about five months into the school year, and observations were conducted at various points throughout the year. For the following descriptions, each unique school and school year combination will be described as schools. Given the exploratory nature of this study, schools provided varying numbers of waves of data with 291 schools having two waves, 140 schools having three, 64 having four, three schools having five, one school having six and one school having seven waves

of data. Most schools were in Year 2 of implementation (j = 181). The remaining schools were in Year 1 (j = 117), Year 3 (j = 143) and Year 4 (j = 57). Schools were located in all locality regions, with rural (j = 159) areas being the most represented and towns (j = 82) the least. The remainder of schools were roughly equally spread between cities (j = 136) and suburbs (j = 123). Slightly less than half of schools had more than 500 students (j = 215), ranged in proportions of FRL eligible students with about half of students eligible. A minority of schools were middle (j = 58) and high (j = 32) schools.

Analysis

Table 2 presents results of multilevel analyses to address the two main research objectives of this study. The middle columns documents results for an unconditional growth model used to assess the extent to which within-year fidelity growth can be analyzed with multilevel growth models. The second analysis highlighted in the rightmost columns shows results from of a model that added contextual covariates predicting fidelity growth.

The first research question assessed the extent to which variability existed within and between schools, basically determining if analyzing fidelity growth using a multilevel growth model was appropriate. A model building approach utilizing change in deviance testing at each step concluded that the model outlined in Equations 1 through 4 was appropriate. To this end, three nested models without between school predictors were compared and deviance decreased at each stage: The first had a randomly varying intercept only (deviance = 9203.1), the second had a randomly varying intercept and fixed slope (compared to model one, χ^2 = 430.7, df = 1, p < .001), and the third, and interpreted model, had a randomly varying intercept and slope (compared to model two, χ^2 = 113.0, df = 1, p < .001). Proportions of variance documented that 18.29% of variance was within schools and 81.71% was between schools. Given these

proportionalities, it was concluded that fidelity growth was a varying phenomenon at both levels of analysis.

The second research question builds on the first by assessing the extent to which between school contextual variables predicted within-year SWPBIS fidelity growth. In sum, 10 variables were entered into the analysis as predictors of both intercepts and slopes. Change in deviance tests showed that the inclusion of predictors significantly decreased deviance, indicating better model fit ($\chi^2 = 558.9$, $df = 20$, $p < .001$). An additional model with non-significant predictors removed was estimated, resulting in a slight increase in deviance and a non-significant change in deviance test ($\chi^2 = 5.1$, $df = 11$, $p = .93$). Subsequently, the larger model with both significant and non-significant growth predictors was reported (Table 2), and significant results are interpreted.

Intercept. Years implementing, a rural location, school size and being a high school all significantly predicted the average beginning of the year fidelity status (intercepts) across all schools. Table 2 shows the parameter estimates and standard errors, and Table 3 highlights average TIC scores and proportion of completed tasks for different types of schools based on significant effects. For each year implementing and controlling for all other variables, schools in cities, suburbs, and towns had equivalent average beginning year fidelity values, whereas rural schools scored three TIC points (or 10%) higher. High schools and large schools (i.e., more than 500 students) had lower initial fidelity scores on average equating to roughly 6% lower than comparison schools. During Years 1 and 2, small schools located outside of rural areas had beginning of year fidelity scores of 20.82 (47% of total points) for elementary and middle schools and 18.13 (41%) for high schools. Large schools located outside of rural areas had slightly lower scores in Years 1 and 2 indicating a completion rate of 42% for elementary and

middle schools and 36% for high schools of fidelity tasks. Year 1 results indicated that schools made fidelity progress prior to the first full year of implementation, implicitly suggesting a hypothesis that many implementation tasks were completed in the previous school year or during the summer months (i.e., in preparation for initial implementation). Interestingly, schools in Year 2 of implementation (i.e., who had completed a full year of implementation) had roughly the same fidelity score at the beginning of the school year as schools in Year 1. As could logically be expected, schools in Years 3 and 4 had on average higher fidelity scores at the beginning of their school years. Except for large high schools outside of rural areas, schools on average completed more than 80% of fidelity tasks (indicating implementation of SWPBIS at adequate fidelity) by the beginning of implementation Year 4.

Slope. Fidelity growth, documented here as the fidelity change per month of school, was significantly predicted by the year implementing and the proportion of students eligible for FRL. Schools gained 1.2 fidelity points per month of school on average and the rate varied most dramatically as a function of year implementing. No matter type or location, schools with an average SES (i.e., 48.7% of students eligible for FRL) gained 1.2 points per month during Year 1, 1.68 points during Year 2, 0.72 during Year 3, and 0.52 during Year 4. Put another way, per month of school: (a) Schools in Year 1 completed about half a fidelity task, (b)Year 2 schools completed a bit less than one fidelity task, and (c) schools in Years 3 and 4 completed much less than a half of a fidelity task. These results indicated that schools in Year 2 of implementation gained momentum and implemented more critical features per month of school than in Year 1. Further, fidelity growth slowed during Years 3 and 4. Given the high initial fidelity scores for these schools, decreased growth rates were logical because schools that are further along in implementation approach the ceiling of the fidelity measure. Finally, schools with a higher

proportion of students eligible for FRL had lower fidelity growth rates. To provide an interpretation of this variable, a 10% increase in the percentage of students eligible for FRL above the mean related to roughly a 0.06 decrease in fidelity growth per month of school.

Figure 1 graphically portrays the average numerical results for several significant factors in relation to the reference group of schools and controlling for other predictors. On the left, the varying intercepts and slopes of years implementing is shown with steeper slopes and lower intercepts for Years 1 and 2 and higher intercepts and less steep slopes for Years 3 and 4. As can be seen in the middle frame, small and large schools had different initial fidelity scores, but similar average within-year change. Elementary and middle schools had equivalent average growth patterns and high schools had lower intercepts and parallel slopes.

Discussion

This study showed that within-year fidelity growth, an implementation science construct, could be documented using a repeated SWPBIS fidelity measure, the TIC, and multilevel growth modeling methods. Building on this finding, school-level variables, including years implementing, location, and enrollment were found to be significant predictors of beginning of year fidelity scores. Further, years implementing and relative SES were significant predictors of growth rates. These results provide empiricism related to implementing evidence based programs at scale.

Rate of fidelity growth was evaluated using multilevel linear models to account for data dependencies associated with repeated measures and provide insight into the proportion of variance within and between schools. This design was a unique use of these methods as many uses of multilevel growth models are used in the context of student-level phenomenon (e.g., McIntosh, Sadler, & Brown, 2012), whereas this study used multilevel growth models to

examine a school-level phenomenon. Findings add to implementation empiricism by building on previous work conducted by Buzhardt and colleagues (2006) on implementation rates through the use of a reliable fidelity measure and aforementioned growth methodology to document the within-year fidelity growth phenomenon.

Interestingly, the strongest period of implementation growth was in Year 2 of implementation. The average initial fidelity estimate for Year 1 and Year 2 were statistically equivalent, whereas the growth rate significantly increased during Year 2. During the first year of implementation, schools completed approximately half of one program task per month, and during the second year of implementation, schools completed approximately one full implementation task. This result aligns with previous work on SWPBIS implementation in high schools that showed that significant advances in implementation outcomes were not realized until after the second year of implementation (Flannery, Frank, Kato, Doren, & Fenning, 2013).

This study also adds to the growing field of fidelity research. First, it aligns with the theory that fidelity of implementation is dynamic and should be assessed at multiple points in time, especially early in the implementation process (Cross et al., 2015). Second, by showing the fidelity growth is mediated by multiple school-level factors supports a hypothesis suggested by Zvoch (2012) that fidelity is multidimensional. Second, given that schools in Years 1 and 2 had similar average initial fidelity estimates suggests that schools complete fidelity tasks prior to their first full year of implementation, perhaps in preparation for organizational change during the program installation phase. Although this pattern most likely helps dissipate some of the burdens in implementing new programs, it still took schools in this study upwards of two years on average to reach fidelity rates associated with full implementation. Finally, this study provides evidence on contextual factors affecting fidelity growth.

The contextual factors that affected fidelity growth included size, type, and relative SES. School size was a significant predictor of initial status but not growth rate, showing that large schools implemented with lower initial fidelity, but the rate of implementation was not inhibited. Conversely, relative SES was a significant predictor of growth rate but not initial status, suggesting that schools with students with more pressing economic needs have lower than average within-year SWPBIS growth rates. However, the magnitude of differences was relatively minor. Compared to elementary and middle schools, high schools had lower initial fidelity but equivalent growth rates. Like size, this finding suggested that high school implementation was more difficult than other settings because high schools had fewer critical features in place prior to SWPBIS adoption (Bohanon, Flannery, Malloy, & Fenning, 2009).

Limitations

Several limitations to this study must be mentioned. First, this study was exploratory, and causal inferences cannot be drawn. Second, the multilevel modeling techniques utilized here use regression methods that implicitly assume perfect measurement. Third, the outcome measures were self-evaluations, and external measures result in more accurate measurement (McIntosh et al., 2015). Fourth, the majority of schools in this study were elementary schools with less than 20% of the sample being middle and high schools, consequentially results may not generalize as accurately to middle and high school populations. Despite these limitations, this study provides valuable insight into the implementation process.

Implications for Research and Practice

Future research should continue to explore within-year implementation fidelity growth in relation to student outcomes. A logical direction would be to examine the relation of organizational systems change to change in student outcomes using Bronfenbrenner's (1979)

ecological systems theory. Within this theory, meso-systems such as schools continually interact with children during development phases. Increases in SWPBIS fidelity have been previously shown to be associated with decreases in problem behaviors and improvements in student achievement outcomes, even though the approach does not focus directly on academic instruction (Horner et al., 2009; Luiselli, Putnam, Handler, & Feinberg, 2005), suggesting that improving the social settings of students provides more opportunity for instruction and therefore academic success. Future work should explore this finding using developmental theories to aid in explaining why programs focused on school functioning and student behavior mediate valued outcomes.

The findings also support practice recommendations for educational leaders implementing SWPBIS. School, district and state leadership teams can compare their within-year fidelity growth rates to average rates reported in Table 3 to compare their progress to a large national sample. Leaders should also expect slower fidelity growth rates (i.e., lower slopes) in the first year of implementing than the second. Concern and additional support should be given to schools who have not reached an adequate implementation criterion by the end of the third year of implementation (i.e., achieved a fidelity percentage above 80%). Finally, high schools may need additional support to establish foundational SWPBIS features (e.g., establishing a representative school team that meets regularly) as these schools have lower beginning year fidelity scores on average.

This examination of fidelity growth provided empirical documentation of the fidelity change process occurring during the installation and initial implementation stages (Fixsen et al., 2005). Once deciding to adopt SWPBIS, schools incorporate the essential components for programmatic effectiveness that are reflecting in the items on the TIC measure. During these

phases, school teams, administrators and teachers must face multiple adaptive challenges to ensure effectiveness ranging from tangible challenges, such as creating a uniform office referral system to pedagogical alignment with behavioral principles implicit to SWPBIS. The TIC is a useful tool during these phases because it not only allows documentation of fidelity change, but is also designed to be used to guide revisions to implementation action plans that may benefit from knowing average fidelity scores at various points in the school year. Future research should explicitly examine multiple facets of fidelity growth during the distinct implementation stages. Although not tested, results from this study suggest that growth in more procedural steps of initial implementation (e.g., forming a team, collecting and assessing discipline data), is higher during installation than initial implementation. However, more substantive changes (e.g., changing the quality of classroom instruction; O'Donnell, 2008), might have a distinctly opposite growth pattern because of adaptive challenges mentioned and have slower growth during the earlier implementation phases and increase towards the latter.

Conclusion

In sum, the fidelity of SWPBIS use provides an excellent opportunity to examine implementation science phenomenon. Although this field is emerging, it is much needed to understand the factors promoting and inhibiting effectiveness of evidence-based practices in the field and at the school-level. Noted school improvement scholar John I. Goodland said when interviewed about school reform, "it doesn't matter how many bills you pass and how many policies you lay down from on high – when it comes right down to it, the individual school has an incredible capacity for rejecting it passively or taking it on and doing something about it" (Novak, 1993). Implementation research provides an understanding for how schools can actively and effectively improve.

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Table 1

Descriptive Statistics

	n	*M*	*SD*	Min	Max
TIC score	1286	30.08 (68%)	9.33 (21%)	0	44
Initial TIC score*	132	19.61 (45%)	11.47 (26%)	0	42
Time	1286	4.75	2.94	0	10.97
% FRL**	498	48.68	23.21	0	98.07

Note. TIC score *M*'s and *SD*'s indicate raw implementation fidelity scores. Proportion of fidelity task completion (i.e., TIC total percentage) is in parentheses. Time was coded as months from the beginning of the school year. *Descriptive statistics for initial TIC scores were from observations taken at time = 0 to time = 0.5. **Two schools were missing data on the number of students eligible for FRL.

Table 2

Multilevel Growth Model Results for Within-Year Fidelity Growth

	Unconditional Model		Conditional Model	
	Est.	*SE*	Est.	*SE*
Fixed effects: Intercept	24.98***	0.52	20.82***	1.36
Year Imp 2			-0.26	1.22
Year Imp 3			10.72***	1.30
Year Imp 4			14.04***	1.68
Suburb			-0.16	1.33
Town			0.55	1.49
Rural			3.00**	1.28
> 500			-2.47**	0.97
Prop. FRL			3.02	2.10
Middle			0.55	1.26
High			-2.69*	1.56
Fixed effects: Slope	1.17***	0.06	1.20***	0.17
Year Imp 2			0.48**	0.16
Year Imp 3			-0.68***	0.17
Year Imp 4			-0.80**	0.22
Suburb			0.06	0.16
Town			0.11	0.19
Rural			-0.09	0.16
> 500			0.06	0.12
Prop. FRL			-0.55*	0.25
Middle			0.00	0.16
High			0.03	0.20
Random effects				
Level 1: var(e_{tj})	21.57		20.33	
Level 2: var(u_{0j})	96.27		60.28	
Level 2: var(u_{1j})	0.06		0.35	
Cor(u_{0j}, u_{1j})	-0.87		-0.83	
Proportion of variance				
Level 1	0.1829		0.2511	
Level 2	0.8171		0.7489	

Note. The models reported here are for 1286 fidelity observations for 500 unique school/ school year combinations. *$p < .05$. **$p < .01$. ***$p < .001$.

Table 3

Average Within-Year Fidelity Growth Estimates and Proportion of Fidelity Task Completion for Statistically Significant Effects Described by Implementation Year

	Elementary & Middle Schools				High Schools			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Beginning year fidelity status (intercept)								
Rural								
Small	23.8 (54%)	23.8 (54%)	34.5 (79%)	40.9 (93%)	21.1 (48%)	21.1 (48%)	31.9 (72%)	38.2 (87%)
Large	21.4 (49%)	21.4 (49%)	32.1 (73%)	38.4 (87%)	18.7 (42%)	18.7 (42%)	29.4 (67%)	35.7 (81%)
Large	18.4 (42%)	18.4 (42%)	29.1 (66%)	35.4 (80%)	15.7 (36%)	15.7 (36%)	26.4 (60%)	32.7 (74%)
All other schools	20.8 (47%)	20.8 (47%)	31.5 (72%)	37.9 (86%)	18.1 (41%)	18.1 (41%)	28.9 (66%)	35.2 (80%)
Fidelity growth per month (slope)								
Low SES*	1.3 (3%)	1.8 (4%)	0.6 (1%)	0.5 (1%)	1.3 (3%)	1.8 (4%)	0.6 (%1)	0.5 (1%)
Ave. SES*	1.2 (3%)	1.7 (4%)	0.5 (1%)	0.4 (1%)	1.2 (3%)	1.7 (4%)	0.5 (1%)	0.4 (1%)
High SES*	1.1 (3%)	1.6 (4%)	0.4 (1%)	0.3 (1%)	1.1 (3%)	1.6 (4%)	0.4 (1%)	0.3 (1%)
All other schools	1.2 (3%)	1.7 (4%)	0.5 (1%)	0.4 (1%)	1.2 (3%)	1.7 (4%)	0.5 (1%)	0.4 (1%)

Note. Numbers indicate raw TIC scores. Proportion of fidelity task completion (i.e., TIC total percentage) is in parentheses, and was calculated by dividing the average growth estimates by the total possible fidelity points (44). *Average SES denotes 48.7% of students eligible for FRL; low and high SES denotes -/+ 15% respectively.

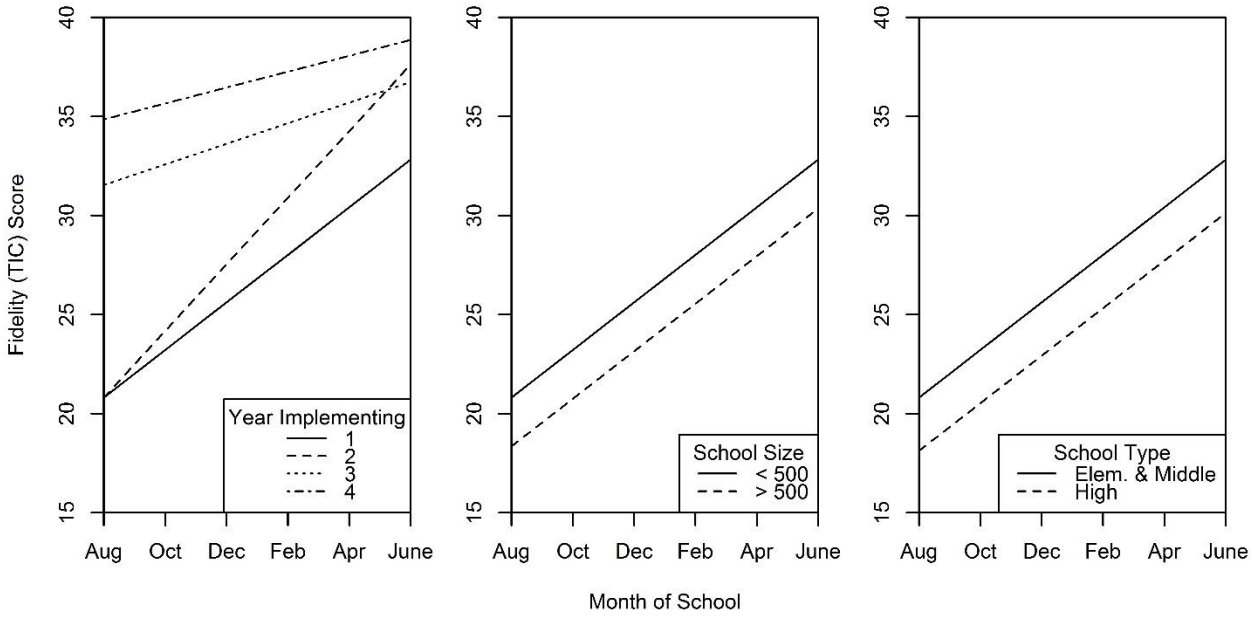

Figure 1. Average conditional growth model estimates of four factor covariates when controlling for other predictors.