Title: A Simple Matter of Time? School-Level Analysis of the Relationship between Time Allocation, Treatment Integrity, and Student Outcome

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Abstract

Treatment integrity is critical to realizing the effects of evidence-based programs and practices (EBPPs) that aim to promote student mental and behavioral health. Across disciplines, time is consistently referenced as one of the most significant barriers to successful implementation outcomes (e.g., treatment integrity) of EBPPs. However, there is limited to no research that has examined the relationship between time allocation, treatment integrity, and student outcomes, especially at the school organizational level. This study used data from 106 elementary schools implementing Tier 1 school-wide positive behavior interventions and supports to examine the associations among two types of time allocation (collaboration/planning and professional development), school-level treatment integrity, and suspension. Results supported significant associations between two types of time allocation and both implementation and student behavioral outcomes. Moreover, the mediation analysis suggested that treatment integrity mediated the relationship between both types of time allocation (collaboration/planning and professional development) and student behavioral outcomes at the school level. Limitations and implications for research and practice are discussed.

Keywords: treatment integrity, time allocation, evidence-based programs and practices (EBPPs), SW-PBIS, suspension, school-level analysis

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Literature Review

The delivery of universal supports to prevent social, emotional, and behavioral (SEB) difficulties is a critical element of our nation's agenda to promote the academic and life success of students. Several evidence-based programs and practices (EBPPs) exist to prevent SEB difficulties and promote success-enabling competencies (e.g., prosocial behaviors; Sutherland et al., 2019). However, students with SEB difficulties cannot benefit from universal EBPPs they do not receive. There is an implementation gap in education characterized by the insufficient delivery of EBPPs as part of routine practice in schools (Lyon & Bruns, 2019).

Critical to successful implementation is treatment integrity, which involves those who are expected implementers of an EBPP delivering it as planned and shown to be effective (McLeod et al., 2013). Individual-level characteristics of expected implementers influence treatment integrity (e.g., intentions to implement, stress; Larson et al., 2018). School organizational factors create the environmental conditions that implementers experience, which can enable or impede the delivery of EBPPs with high treatment integrity (Lyon et al., 2018). One organizational factor that appears to be an important determinant of treatment integrity is the allocation of time. Despite time being one of the most widely cited determinants of implementation success (Cook et al., 2009; Van Denise et al., 2019), limited research has examined whether time allocated to an implementation effort is associated with school-level treatment integrity and student outcomes. In light of this, the purpose of this study was to conduct a school-level analysis of time allocation and its association with treatment integrity and student outcomes.

Universal Social, Emotional, and Behavioral EBPPs

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Schools are under pressure to adopt EBPPs to prevent the negative impact of SEB difficulties on student academic and mental health outcomes (Adelman & Taylor, 2006). A series of federal reports (e.g., Federal Commission on School Safety, 2018; NRC, 2009) and landmark legislation (IDEA, 2004, 2006) have identified student SEB needs and well-being as a top priority for schools. SEB programs are frequently coordinated and delivered within the Multi-Tiered System of Support (MTSS), which is conceptualized as a three-tier framework that provides a continuum of intensifying supports (Cook et al., 2010). The foundation of MTSS is the universal level (Tier 1) in which EBPPs are delivered to all students to prevent SEB problems and enhance success-enabling factors (Greenberg et al., 2017).

Many SEB programs and practices have established evidence of effectiveness with randomized controlled trials, such as school-wide positive behavior interventions and support (SWPBIS; Horner et al., 2009), social-emotional learning curricula (SEL; Durlak et al., 2011), approaches to cultivate positive relationships (Cook et al., 2018), and proactive classroom management strategies (Simonsen et al., 2008). Many argue that the field is currently saturated with EBPPs (McHugh & Barlow, 2010) and that a “moratorium on efficacy research” is warranted (Kessler & Glasgow, 2011). There is a need to shift some of the focus away from the development and testing of new EBPPs to better understanding the factors and strategies that help translate existing EBPPs into routine practice in schools.

Implementation Gap and Importance of Treatment Integrity

Despite the established value of universal EBPPs to prevent SEB difficulties and promote student wellbeing and academic success, their routine adoption and delivery in typical education settings is limited, which reduces their large-scale effects on student outcomes (Evans & Weist, 2004). Even when EBPPs are adopted, they are frequently implemented with suboptimal levels

of treatment integrity (Locke et al., 2015, 2018; Stahmer et al., 2015; Suhrheinrich et al., 2013). Indeed, the literature suggests that inconsistent and low treatment integrity among implementers attenuates the impact of even the most efficacious programs (Durlak & DuPre, 2008; Gottfredson & Gottfredson, 2002). The consequence is the low return on the large public investment in EBPP development (NRC, 2009).

Many researchers and practitioners recognize that treatment integrity is a critical mechanism by which effective programs, practices, and curricula produce meaningful changes in student outcomes (Sanetti & Kratochwill, 2009). Treatment integrity is considered one of the main implementation outcomes (Proctor et al., 2011), which specifically reflects the degree to which a given EBPP is implemented as planned (McLeod et al., 2013). Treatment integrity captures implementers' behavior in ways that are aligned with the core features of an EBPP. Core features of an EBPP are the components, steps, and/or activities that are hypothesized to produce changes in outcomes of interest. While the broader prevention science reveals specific examples of the positive association between integrity and outcomes (Goense et al., 2016; Manges & Nickerson, 2020), other research has revealed mixed findings regarding the relationship between treatment integrity and client outcomes, especially in clinical settings (e.g., Collyer et al., 2019; Webb et al., 2010; Sanetti et al., 2011). The integrity-outcome link is dependent on the quality of the intervention being investigated, as ineffective interventions implemented well are unlikely to produce changes in outcomes. Once interventions have established evidence of effectiveness, there appears to be a clearer link between integrity and outcomes. For example, when examining the delivery of school-based universal EBPPs targeting students' SEB needs, there has been a consistent link between treatment integrity and school-level outcomes (e.g., Kam et al., 2003; Low et al., 2016; Pas & Bradshaw, 2012; Rimm-

Kauffman et al., 2014). Nonetheless, given the mixed yet promising findings of the *integrity-outcome* link, research needs to focus on the differential associations between types of integrity and outcomes depending on the strength of evidence supportive of the intervention and its implementation modality (e.g., school-based universal support versus individual therapy; Pas et al., 2019; Webb et al., 2010).

Organizational Factors that Influence Treatment Integrity

A growing body of research has transferred evidence from the broader implementation science literature to schools (e.g., Forman et al., 2013; Hoagwood & Johnson, 2003). This body of work demonstrates that organizational determinants are particularly critical to the successful delivery of EBPPs with high treatment integrity (Bonham et al., 2014). Organizational determinants reflect factors at the inner setting level (i.e., the immediate context in which implementation takes place) that influence people and opportunities for implementation within it. In particular, several organizational determinants have been identified as important predictors of EBPP implementation outcomes, especially treatment integrity, including implementation leadership, implementation climate, organizational incentives and rewards, and aspects of school culture (Aarons et al., 2014; Ehrhart et al., 2014).

Time Allocation as a Determinant of High Treatment Integrity

As a subset of organizational determinants connected to others, such as implementation leadership and climate, *resource allocation* is an important organizational determinant that inhibits or facilitates organizational change to influence treatment integrity (Cameron & Green, 2019). *Resource allocation* refers to the protected time and money dedicated to an implementation effort that serves to enable successful implementation (Daniels, 2016; Weiner et al., 2020). Ultimately, if time and money are not allocated to an EBPP, then initial adoption is

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likely to be low and subsequent implementation is likely to falter (Minugh et al., 2007). Across disciplines, *time* is consistently raised as one of the most significant barriers that impede successful implementation (Nilsen & Bernhardsson, 2019; Fan et al., 2018). Allocation of protected time to an EBPP provides opportunities for several activities that facilitate expected implementers' adoption and delivery of an EBPP with treatment integrity. *Time allocation* provides the opportunity for planning, reflection, and collaboration among implementers to continuously improve implementation (Cimdi, 2012). Moreover, there is the allocation of protected time for purposes of ongoing professional development, which provides implementers with learning opportunities to deepen their understanding of the core components of an EBPP.

Although time allocation alone is insufficient to drive the improvement of treatment integrity, it provides opportunities for work around EBPP to happen, as well as communicates to implementers what the broader leadership and school system value as priorities for implementation (Ehrhart et al., 2014). Indeed, with many competing initiatives occurring in schools, time allocation is a reflection of a school system's priorities for implementation as it determines the focus of people's discussions, reflections, and efforts to improve the delivery of EBPPs through reaching higher levels of treatment integrity (McIntosh et al., 2013). If there is insufficient time allocated for planning and learning, then implementers are likely to struggle with initiating EBPP delivery as part of their workflow and persisting toward high integrity (Han & Weiss, 2005). Moreover, when school organizations do not provide the time for implementation, it may produce unintended consequences such as higher levels of stress, burnout, and turnover intentions, all of which negatively impact implementation outcomes (e.g., fidelity, acceptability, and sustainment; Larson et al., 2018).

The quantity of time allocation is important and so is the quality of how the protected

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time is used to support a given implementation effort. For example, the quantity of time allocation captures the amount of time dedicated to specific implementation-relevant activities, while the quality of time allocation reflects the effectiveness of the experiences and activities within the protected time. Moreover, having sufficient financial resources and protected time available may create conditions conducive to implementation success, but there is a need for other organizational factors such as supportive leadership and psychological safety among implementers for implementation to succeed at high levels (Aarons et al., 2014; Edmondson et al., 2016). Without time allocated to an implementation effort, quality interactions and experiences among implementers cannot take place, and the potential for organizational factors to induce implementer changes are less likely to be realized (Harn et al., 2013). Therefore, time allocation appears as a necessary but insufficient condition for a high level of treatment integrity.

Gaps in the Literature and Study Aims

Despite the recognized importance of time allocation as an important organizational determinant of high treatment integrity, there is limited to no research that has examined the relationship between time allocation, treatment integrity, and student outcomes. Moreover, relative to studies that examine treatment integrity at the individual implementer level, fewer studies examine the determinants of treatment integrity at the school organizational level. Considering these gaps in the literature, the purpose of this study was to examine time allocation as a school-level predictor of treatment integrity of a universal EBP: Tier 1 SWPBIS. Further, this study aimed to examine whether treatment integrity served as a mediator of the relationship between time allocation and school-level student outcomes. To accomplish this, the study occurred in partnership with statewide initiatives involving the implementation of SWPBIS. In particular, schools in the second or third year of receiving external support to adopt and

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implement core components of the Tier 1 level of SWPBIS were recruited for participation.

This study was designed to address four research questions. (1) What is the variability in how schools allocate time for purposes of (a) collaboration and planning among staff and (b) professional development (PD)? (2) What are the bivariate correlations among variables included in this study (i.e., time allocation, treatment integrity, student outcome, and school-level demographics)? (3) Does time allocated to collaboration/planning or PD demonstrate significant associations with treatment integrity and a school-level student behavioral outcome (suspension rate)? (4) Does treatment integrity mediate the relationship between time allocation (for collaboration/planning or PD) and a school-level student behavioral outcome?

Method

Participating Schools

This study occurred in collaboration with elementary schools within the first 2-3 years of implementing Tier 1 SWPBIS. Initial recruitment started with a pool of 158 schools that were in the first 2-3 years of implementing Tier 1 SWPBIS and connected to existing implementation initiatives aimed at integrating a continuum of social, emotional, and behavioral supports with academics. For inclusion in this study, all schools needed to have treatment integrity data collected by external consultants using the Tiered Fidelity Inventory (see Measures section). In total, leadership teams from 106 (response rate = 67%) elementary schools agreed to participate and provided data as part of this study. Once data from at-least 100 schools were gathered, recruitment efforts were stopped because an adequate sample was obtained for purposes of addressing the proposed research questions. These schools were located across different geographic regions of the Western Region of the United States. The demographic characteristics of the participating schools are displayed in Table 1. The sample of schools was diverse with

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regard to school size ($M = 511$, range = 249 to 976), race/ethnicity (% non-white $M = 60.31$; range = 18 to 99.9), percent of English Language Learners ($M = 16.81$; range = 2.7 to 49.0), and percent of students receiving special education services ($M = 14.96$; range = 3 to 47.1).

Procedure

Human subject approval was obtained from the UNIVERSITY MASKED human subjects Internal Review Board (IRB) and partnering school systems research and evaluation departments. Schools were recruited if they were in the first two to three years of implementing Tier 1 SWPBIS. Recruitment of specific schools involved working with purveyor groups who provided external consultation to school systems on the implementation of SWPBIS. Initial communication began with researchers and partners from the purveyor organizations discussing the project's benefits for schools and the data collection procedures. The purveyor group then generated a list of schools that expressed an interest in partnering in this study, including the names and emails of school administrators.

To facilitate data collection, a web-based survey about school demographics and time allocation was constructed using the Qualtrics system and administered at one time-point in the Spring of 2019. An initial email was sent to the school administrators to share with their respective school's leadership team in March to provide them with an overview of the project and a link to the online survey. Each school was given one month to complete the survey upon receiving the initial email. Reminders were emailed weekly to increase the participation rate and data completeness. After the survey administration stage, treatment integrity data were gathered by external consultants from the partner purveyor groups in late Spring during the same academic year using an instrument with established evidence of technical adequacy and validity (see Measures section below). The aggregated school-level suspension rate was obtained from

school administrative records at the end of Spring for the academic year of 2018-2019.

Tier 1 School-wide Positive Behavior Intervention and Supports (SW-PBIS)

SWPBIS is an evidence-based, multi-tiered system of support (MTSS; Cook et al., 2010) designed to improve social and educational outcomes for students (Horner et al., 2015). Tier 1 SWPBIS targets the entire school population by promoting positive, proactive, and predictable environments through (a) defining and teaching a set of agreed-upon behavioral expectations, (b) establishing a system to acknowledge and recognize students who exhibit behavioral expectations, (c) developing a system to progressively respond to behaviors that are inconsistent with expectations, and (d) gathering data on office discipline referrals to develop precision statements that inform continuous improvement (Horner et al., 2015). SWPBIS is currently supported by numerous state and local governments across the country through dedicated funding, strategic training, and provision of technical assistance (Horner et al., 2014). Randomized waitlist control trials of Tier 1 PBIS have demonstrated that it is effective in reducing office discipline referrals (ODRs) and suspensions, as well as improving academic achievement and school climate (e.g., Bradshaw et al., 2010). Currently, more than 25,000 schools across the United States are engaged in efforts to implement PBIS (Horner et al., 2015).

Measures

School-Level Administrative Data

School-level data was collected from the administrative database including school size, race/ethnicity, the percent of English Language Learners and Special Education students (Table 1). As an indicator of school-level student behavioral outcome, a suspension rate per student was calculated by dividing the total number of suspensions by the enrollment for the academic year of 2018-19. We further standardized the suspension rate based on its dispersion (standard

deviation) in the sample. This remedial approach for normality not only transformed the count data of suspension into a ratio scale with flexible statistical properties for subsequent analysis but also conditioned the frequency of suspension on both the variance and enrollment size of a given school to prevent potential confounding effects. Suspension rate (i.e., a disciplinary sanction that requires the student to be excluded from the school building for a specified period) is one of the most common disciplinary consequences used in schools for student problem behaviors and a reliable indicator on the school level (Christle et al., 2003). Suspension rate is an ideal indicator of school-level student behavioral outcome for this study, considering (a) the implementation of SWPBIS focuses on minimizing the use of suspension, and (b) its associations with disciplinary disparities and negative student outcomes are well documented in the literature (e.g., Mendez et al., 2002).

Time Allocation

To capture time allocated to Tier 1 SWPBIS, a two-item survey was designed for completion by leadership teams within each of the participating schools. One of the items was developed to measure time allocated for staff to reflect on, collaborate with one another, and plan changes around the delivery of Tier 1 SWPBIS. This item (“time for planning/collaboration”) was on a 6-point Likert-type scale ranging from 0 “No time protected for reflection, collaboration, and planning among staff” to 5 “Abundant amount of time (at least one hour per week) protected for reflection, collaboration, and planning among staff.” The other item measured the extent to which time was allocated for professional development to deepen learning about Tier 1 SWPBIS. This item (“time for PD”) was on a 6-point Likert-type scale ranging from 0 “No professional development time allocated to Tier 1 SWPBIS” to 5 “Abundant amount of professional development time (at least one hour per week) allocated to Tier 1

SWPBIS”. The two items were summed to create an overall score representing total time allocated to Tier 1 SWPBIS, with scores ranging from 0 to 10.

Treatment Integrity of SWPBIS.

To measure treatment integrity of Tier 1 SWPBIS, the Tiered Fidelity Inventory (TFI) was used, which is a comprehensive and efficient tool to determine the extent to which a school is implementing SWPBIS (Algozzine et al., 2014). TFI data are gathered by trained raters who gather information through walkthroughs, interviews with staff and students, and review of existing artifacts related to SWPBIS. While the TFI is designed to evaluate SWPBIS at each tier of a multi-tiered framework, only the Tier 1 data were gathered and used for this study. The Tier 1 ratings occur across 15 different dimensions, capturing implementation related to teaching behavioral expectations, responding to well-defined problem behaviors, and providing feedback and acknowledgment, as well as other implementation components such as teaming and data collection. Each of the dimensions is rated on a scale from “0” to “2” with “0” reflecting not implemented and “2” reflecting fully implemented. The TFI Tier 1 has a total possible score of 30 and scores are reflected as a percent of total possible points. The TFI demonstrated acceptable to great level of psychometrics (e.g., interrater reliability = .99, test-retest reliability = .99, internal consistency = .96, and significant correlation with existing measures of implementation fidelity; McIntosh et al., 2017)

Analytic Approach

Descriptive statistics (e.g., measures of central tendency and variability, percentage of missingness, correlation matrix, and distribution statistics) were calculated for all key variables and covariates to address research questions 1 and 2 while preparing for the mediation analysis (Table 1). The dataset consisted of complete data for the main independent and dependent

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variables. The few missing values in covariates did not have systemic associations with those covariates themselves (% of missingness = 3.54%). Therefore, the missing pattern was deemed as Missing at Random and the list-wise deletion method was used in subsequent analyses because (a) it is less biased as compared to pair-wise deletion; (b) the degree of missingness is trivial (Baraldi & Enders, 2010). Considering their ordinal scales, Spearman correlation coefficients (Table 2) were used to examine the size and direction of associations among predictors (time for collaboration/planning and time for PD), mediator and outcomes (treatment integrity and suspension rate), as well as covariates (e.g., teacher experience).

Statistical assumptions were tested and generally met (e.g., normality homoscedasticity, and absence of multicollinearity; Osborne & Waters, 2003). This study integrated the causal steps approach by Baron and Kenny (1986; for an intuitive demonstration of the mediation process) and the nonparametric bootstrapping analysis of mediation effects (Preacher & Hayes, 2004; for accurate estimates of the mediation effect size with confidence intervals). The analyses were to determine whether treatment integrity significantly mediates the effect of time allocation on student behavioral outcome (i.e., suspension rate).

Given the size of the sample and exploratory nature of the mediation research question, the mediation analysis involved the use of the bootstrapping method and interpretation of the results largely focused on the effect size estimate. To address research question 3, two series of multiple linear regression models were built with “time for planning/collaboration” or “time for PD” as the focal predictor sequentially (Table 3 and Figure 1). A nonparametric bootstrapping mediation analysis was performed to address research question 4. Specifically, a robust bootstrap estimation with standard errors with 5,000 bootstrapped samples was conducted (Preacher & Hayes, 2004; Table 4). Direct, indirect, and total effects were estimated to systemically quantify

the mediation effect. Based on the 95% bias-corrected bootstrap confidence intervals, if indirect and direct effects are both significant, a partial mediation is indicated. A significant indirect effect with a non-significant direct effect indicates complete mediation.

Results

Research Question 1: Descriptive Analysis

The descriptive statistics (measures of central tendency and variability, percentage of missingness, distribution statistics, and histograms; Table 1 and Figure 1) revealed that (a) key variables were generally normally distributed (e.g., skewness between -1.96 and 1.96; kurtosis between 2 and 3), (b) they also demonstrated relatively sizable variability (i.e., proportional values of standard deviations/variances and means), (c) the range of two predictors, *time allocated for PD* (TPD) or *planning/collaboration* (TPC), covered all possible extreme values on the original Likert Scale (i.e., 0 to 5); and (d) the two outcomes (*treatment integrity* and *suspension rate*) and demographics varied considerably across schools. Overall, the statistical assumptions for regression and mediation analyses were generally met and the sizable variance in *time allocation* warranted follow-ups to explain their between-school variabilities.

Research Question 2: Correlation Analysis

Results from the bivariate correlation matrix (Spearman's rho; 1961) indicated significant associations (weak or moderate) across most key variables to be entered into the mediation analysis, which also demonstrated theoretically plausible directionalities (Table 2). For example, the magnitudes of correlations among TPD or TPC, *treatment integrity*, and school-level *suspension rate* are the largest overall (r ranges from .455 to -.115). Only three covariates (average years of educational experience, percentages of white students, and English Language Learners) significantly correlated with outcomes (*treatment integrity* and *suspension rate*) while

showing non-significant correlations with times allocation. Therefore, they are retained to preserve the parsimony of subsequent modeling. Of particular note, the associations between staff average years of experience and the two outcomes were significant (for *treatment integrity*, $r = -.414$, for *suspension rate*, $r = -.294$, both $p < .01$), while it demonstrated a non-significant small correlation with the two types of *time allocation*.

Research Question 3: Casual Step Approach for Mediation Analysis

Step 1: Time Allocation Predicting Suspension Rate

Models 1.1 and 2.1 entered the TPD and TPC separately to predict school level *suspension rate* while controlling for covariates (i.e. average staff educational experience, percent of white students in school and English Language Learners; Table 3). The regression effect sizes (e.g., f^2 and R^2) suggested that both types of strategic time allocation explained a meaningful amount of variance in the *suspension rate* (TPD: $R^2 = .16$, $f^2 = .19$; TPC: $R^2 = .2$, $f^2 = .25$). Similar to the model fit index, regression coefficients (i.e., beta weights β) of the two predictors were of small to moderate sizes while demonstrating the expected directionality (TPD: $\beta = -.08$, $t(96) = -.82$, $p = .42$, R^2 change = .01; TPC: $\beta = -.21$, $t(96) = -2.23$, $p = .03$, R^2 change = .04), although the effect of *time for PD* on suspension rate is non-significant.

Step 2: Time Allocation Predicting Treatment Integrity

The TPD (Model 1.2) or TPC (Model 2.2; Table 3) were entered separately to predict SWPBIS *treatment integrity*, while controlling for school-level covariates. The regression effect sizes collectively suggested that strategic time allocation explained a sizable amount of the variance in *treatment integrity* (TPD: $R^2 = .32$, $f^2 = .46$; TPC: $R^2 = .32$, $f^2 = .47$). As expected, regression coefficients (i.e., beta weights β) of both types of time allocation were significant and of small to moderate sizes while demonstrating the expected directionality (TPD: $\beta = .29$, $t(96) =$

.3.42, $p = .001$, R^2 change = .08; TPC: $\beta = .3$, $t(96) = 3.54$, $p = .001$, R^2 change = .09).

Step 3: Treatment Integrity Predicting Suspension Rate While Controlling for Time Allocation

Models 1.3 and 2.3 (Table 3) entered the *treatment integrity* to predict *suspension rate* while accounting for and TPC, respectively. Again, the regression effect sizes collectively suggested that *treatment integrity* and strategic time allocation synergistically explained a sizable amount of the variance in *suspension rate* (TPD: $R^2 = .25$, $f^2 = .33$; TPC: $R^2 = .26$, $f^2 = .35$). Regression coefficients (i.e., beta weights β) showed a consistent pattern, where the entry of *treatment integrity* drives the coefficient of TPD and TPC non-significant. For instance, the significant beta weight of TPC ($\beta = -.21$, $t(96) = -2.23$, $p = .03$, R^2 change = .042) changed into non-significant when the *treatment integrity* entered the model (TPC: $\beta = -.11$, $t(96) = -1.2$, $p = .23$; *treatment integrity*: $\beta = .31$, $t(96) = -2.867$, $p = .005$, R^2 change = .064).

Research Question 4: Nonparametric Bootstrapping Mediation Effect Estimation

Although the diagnostic indexes (e.g., VIF and tolerance of each predictor and covariates in the models) revealed that assumptions were met (e.g., no issues with multicollinearity), the sample size limited power for the multiple regression models. To obtain more accurate estimates of mediation effect size with robust standard errors, nonparametric bootstrapping analyses were performed. The first mediational model included *treatment integrity* as the mediator, and TPD as the predictor, and *suspension rate* as the outcome (Figure 1A and Table 4). Results based on 5000 bootstrapped samples indicated that TPD was associated with non-significant total effect (TE) (TE = -.078, $p = .416$) and non-significant direct effect (DE) on *suspension rate* (DE = .028, $p = .767$). However, *treatment integrity* significantly mediated the relationship between TPD and *suspension rate* (indirect effect = -.106, 95% CI = [-.214, -.032]). The opposite signs of the direct versus indirect effects led to an unusual case of inconsistent mediation (MacKinnon et al., 2000).

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The second model used TPC as the predictor (Figure 1B and Table 4). TPC showed significant total effect ($TE = -.207, p = .028$) but non-significant direct effect ($DE = -.114, p = .233$) on *suspension rate*. Results indicated that *integrity* completely mediated the relationship between TPC and *suspension rate* (indirect effect = $-.093$, 95% CI = $[-.184, -.028]$).

Discussion

The delivery of a continuum of EBPPs with high treatment integrity as part of routine practice in schools is critical to realizing the promise of school mental health research. Without a doubt, organizational factors in the school context create the conditions that facilitate high levels of treatment integrity among implementers. Despite longstanding recognition among researchers and practitioners that time is an important determinant to implementation success, limited to no educational research exists that has examined associations between time allocation, treatment integrity, and student outcomes (Lyon et al., 2013). Using a school-level approach, this study aimed to add to the growing body of implementation-focused school mental health literature by examining associations among two types of time allocation (planning/collaboration and professional development), school-level treatment integrity of a widely adopted universal EBPP (Tier I SWPBIS), and a school-wide student behavioral outcome (suspension rate).

Variability in Strategic Time Allocation across Schools

The time allocated for PD or planning/collaboration varied greatly across the 106 schools sampled, with some schools allocating a significant amount of time while others allocating no time at all. This is a commonly observed phenomenon in the field where school leadership differs vastly in their support of policies and articulation of job responsibilities regarding how time is allocated across different EBPP implementation activities (Spear-Swerling et al., 2014). Without time allocated for planning, collaboration, and learning, staff experience constraints that

limit their ability to adopt and deliver EBPPs with adequate treatment integrity (Stahmer et al., 2015). Indeed, in addition to funding, quality training and follow up coaching, and administrative support, strategic allocation of time is a frequently reported barrier by end-users of EBPPs (e.g., staff, teachers, and school mental health professionals; Swain-Bradway et al., 2013). The results of this study indicated that the variability across schools in time allocation was meaningfully associated with important implementation and student outcomes.

Associations between Time Allocation, Treatment Integrity and Student Outcome

Results provide preliminary evidence for the widely acknowledged yet unsubstantiated association between school-level time allocation and treatment integrity of EBPPs (Nilsen & Bernhardsson, 2019). Moreover, time allocated for purposes of staff reflection, collaboration, and planning demonstrated the strongest associations with school-level suspension rates, with increases in time allocation associated with reductions in school-level suspension rates. Time allocated for PD had a similar negative correlation but was non-significant. One plausible explanation is that the time protected for PD may be important for learning but may not be sufficient for behavior change if time is not protected for reflection, collaboration, and planning. This finding is consistent with established theories of behavior change that suggest the time for planning/collaboration is essential to support individuals to enact behaviors they are motivated to exhibit (Schwarzer et al., 2011). There is a need to further investigate the specific mechanism of how time allocation leads to changes in implementation behavior that corresponds to improvements in student outcomes. Additionally, treatment integrity consistently demonstrated significant associations with reduced suspension rate across the correlation and causal steps mediation analyses. But caution should be taken in interpreting the results due to (a) this cross-sectional study does not warrant causal inference between integrity and outcome; and (b) the

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limited incremental variance in suspension rate (i.e., R square change) explained by adding treatment integrity to the models suggests the existence of unknown factors influencing suspension. Overall, the findings supported our hypothesis that time allocation is significantly associated with treatment integrity and student outcomes in the expected directions.

Additionally, the correlation analysis revealed noteworthy findings regarding the associations between school-level demographics and treatment integrity. Unexpectedly, the average years of educational experience among staff in a given school demonstrated a significant and sizable negative correlation with treatment integrity ($r = -.41$) and a positive correlation with suspension rate ($r = .29$). Specifically, the directions of the correlations indicated that the more senior staff were as a whole, the lower the level of treatment integrity, and the higher the rate of suspension. After reviewing the literature, this finding was not too surprising in light of other research showing that older staff tend to have lower levels of treatment integrity and worse student outcomes than younger staff (e.g., Tweed, 2013; Saborit et al., 2016). This may be the case because older and more experienced teachers on average tend to hold unsupportive beliefs toward new practices as compared to junior teachers who are more open to and have received training on newly developed EBPPs (Gutshall, 2013).

Moreover, the percentage of white students in a school was correlated positively with treatment integrity ($r = .21$) but negatively with suspension rate ($r = -.32$). This is consistent with the literature of racial disparity in terms of school resources and exclusionary discipline (Vincent et al., 2015). However, this finding raises some concern as SWPBIS is supposed to create equity both within a given school as well as between schools with different racial and ethnic profiles of students (McIntosh et al., 2018). Some plausible explanations for this finding are: (a) schools serving more diverse populations of students may have other competing demands that undermine

treatment integrity and (b) staff in these schools may have cultural backgrounds that do not match that of their students, creating a cultural mismatch and an increase in situations where implicit bias influences adult decisions around student behavior (La Salle et al, 2020). Studies that examine the extent to which SWPBIS moderates the relationships between building demographics and suspension rates would be particularly valuable. Such research could inform ways of better supporting schools serving diverse student populations to promote greater equity.

Time Allocation as a Necessary but Insufficient Condition for Student Outcome

Time allocation alone is not sufficient to improve school-level student behavioral outcomes (e.g., suspension rate). Time allocation must work synergistically and through other mechanisms, such as educator implementation behaviors as captured via treatment integrity, to promote meaningful changes in student outcomes. Consistent with this, the relationship between time allocation for planning and collaboration was found to be mediated by *treatment integrity*. The identified inconsistent mediation for *time allocation for PD* also supported the significant indirect effect of *treatment integrity* (MacKinnon et al., 2000). Specifically, the negative indirect effect (i.e., increased *time for PD* predicts increased *integrity*, which in turn predicts reduced *suspension rate*) canceled out the positive direct effect (i.e., increased *time for PD* predicted elevated *suspension rate*), which resulted in the non-significant total effect between *time allocation for PD* and *suspension rate* at the upfront. Interested readers are referred to some seminal work about inconsistent mediation (e.g., Paulhus et al. 2004, Sheets & Braver 1999).

Overall, the consistent findings from the two distinct yet complementary statistical approaches (Hayes, 2009) further supported the hypothesized theorized from existing literature that treatment integrity as a crucial mediator through which implementation strategies work to improve student outcomes (e.g., Lane et al., 2004). As a promising micro-strategy (Johnson et

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al., 2003), time provides opportunities for educators to engage (e.g., reflection, collaboration, planning) in activities that enable them to follow through with and continuously improve specific behaviors associated with a given EBPP. Time protected for purposes of ongoing professional development offers implementers (e.g., teachers) opportunities to deepen or refine their knowledge and abilities to implement particular practices associated with an EBPP like Tier 1 SWPBIS. However, the indirect relationship with student outcomes is unclear. Instead, time allocated for planning was found to have an indirect effect on student outcomes via treatment integrity. This finding highlights the need for school leaders to avoid the common pitfall of dedicating excessive time for PD but failing to protect time for staff to reflect on, collaborate with others, and action plan how they intend to deliver an EBPP as planned and shown to be effective. Therefore, school leadership should consider diverse ways in which allocated time is used to support their staff's delivery of universal EBPPs with high treatment integrity.

It is also important to note that this study did not examine the quality of time allocation. A conjoint analysis of both the quantity and quality of experiences during a specific time allocation (e.g., behavioral rehearsal opportunities, developing plans during PD) may produce more nuanced findings of the underlying mechanisms between time allocation, treatment integrity, and student outcomes. With a more sophisticated assessment of time allocation, future research should examine both the quantity and quality of time allocated for certain activities related to EBP implementation efforts in consideration of specific school contextual factors.

Finally, readers should cautiously consult additional studies (ideally with experimental or meta-analytic designs) when interpreting or generalizing our findings for real-world application (e.g., to guide PBIS implementation planning). The descriptive and correlational nature of the study cannot fully justify a causal inference about the mediational relationship among time

allocation, treatment integrity, and suspension rate (Pearl, 2013). To establish a causal relationship, evidence is needed for three jointly necessary and sufficient conditions, including temporal sequencing, covariation, and non-spuriousness (Imbens & Rubin, 2015). Given the cross-sectional design, we were only able to establish some evidence for non-spuriousness (e.g., conditioning the models on theoretical covariates) and covariation (e.g., correlation analysis). Moreover, the complete mediation effect suggests that the path of indirect effect has sufficiently explained the association between the time allocation and suspension rate, which statistically precluded the possibility of third variables or alternative paths (Antonakis et al., 2010). But for causal inference in mediation analysis, a specific temporal order of data generation/observation is required for predictor, mediator, then outcome. Although treatment integrity was generated after the survey of time allocation, it is difficult to specify the time-order for the suspension rate as a school-level aggregate of the entire year.

Limitations and Future Directions

Despite the promising findings, this study has several limitations that are meaningful to inform future research and practice. As aforementioned, the cross-sectional nature of the measurement-of-mediation design utilized in our study can only establish a statistical mediational relationship among time allocation, treatment integrity, and suspension rate. But it cannot warrant causal inferences due to the lack of the experimental manipulation of variables and specification of the temporal sequence of the variables (Maxwell & Cole, 2007). Hence, more sophisticated designs should be adopted for rigorous causal inference. For instance, the experimental-causal-chain design with randomized controlled trials can enable manipulation of predictor/s and mediator/s with specific temporal sequencing for mediation analysis (Spencer et al., 2005). Given the heterogeneous variation of time allocation and treatment integrity within and

across schools, robust analytics are needed such as the instrumental variable estimators for complier average causal effect parameter (to estimate efficacy in trials with imperfect compliance/fidelity; Peugh et al, 2017) and longitudinal structural mediation (to establish specific temporal sequence and control for alternative paths; Goldsmith et al., 2018).

Second, the measurement approach for some of the variables in this study could be improved in future research. For instance, time allocation was assessed with an ordinal, Likert-type scale consisting of only two items. Furthermore, time allocation was reported solely by the leadership teams, which may be a biased estimator of the actual time allocation perceived or experienced by individual implementers (e.g., staff and educators) in the buildings. Nonetheless, positive associations were found between leadership team-reported time allocation and an objective treatment fidelity measure completed by an independent rater. Future studies should develop and validate a more in-depth and objective assessment for multiple informants about the quantity of time allocation devoted to implementation-relevant activities, as well as the quality of experiences within time allocation. Individual responses can then be aggregated to the school/district level for multilevel analyses (Dixon & Cunningham, 2006). Also, using suspension rate as the school-level student behavioral outcome may introduce systemic errors due to the inconsistent ways to document suspension, suspension types (e.g., in-school and out-school), the political/social pressures to intentionally limit suspensions (Noltemeyer et al., 2015).

Third, this study used a school-level unit of analysis because the majority of existing literature about determinants of treatment integrity is at the individual implementer level. Implementation of EBPPs is a complicated dynamic process that involves determinants, activities, and interactions across all levels in an organization. Future research should extend our findings with multilevel models that examine cross-level interactions regarding how time

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allocation (within and across schools) is associated with integrity and student outcomes at both the school and individual implementer levels. Moreover, the relatively small sample of schools in our study may lead to misestimated coefficients and mixed results of significance tests (Fritz & MacKinnon, 2007). To power more sophisticated models (e.g., multilevel models), a larger and more diverse sample of schools is needed to replicate the findings in this study. Also, future research should assess factors influencing the response rate to account for potential bias in the results due to systematic differences between responders and non-responders (Kypri et al., 2011).

Last, this study only focused on Tier I SWPBIS. It remains unclear whether findings will hold for different types of EBPPs. Tier 1 SWPBIS is unique in the sense of the integration of implementation strategies as part of monitoring treatment integrity (e.g., teaming). Further, services delivered at different levels of a multi-tiered framework (e.g., Tier 3 interventions for youth with elevated mental health symptoms) may be differentially impacted. Thus, the associations between time allocation to planning/collaboration and PD may differ depending on the type of EBPP and treatment integrity instruments used.

Implications for School Mental Health Research and Practice

This research has several implications for school mental health research and practice. First, this study's findings are consistent with prior research and have implications for highlighting the important role of the integrity-outcome link of universal, Tier 1 EBPPs that target social, emotional, and behavioral outcomes. Second, this study has implications for developing an understanding of the factors that facilitate or impede time allocation decisions within school systems. Factors such as building leadership, competing priorities for time, and contract agreements between unions and districts are likely to influence what time is protected for a given implementation effort and how it is used to support implementation. Third, indeed,

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time is a finite and precious commodity in schools. When a school system explicitly dedicates time protected to given EBPP, it communicates to everyone within it that the EBPP is essential and a priority. This implies that both researchers and practitioners need to focus on time allocation as a critical yet malleable factor for creating a positive implementation climate that involves educators' shared perceptions that the implementation of a given EBPP is prioritized, supported, and rewarded in their schools (Lyon et al., 2018).

Conclusion

EBPP implementation may not be as simple as time alone, but time allocation appears to be an important marker of successfully delivering universal EBPPs with integrity. Allocation of protected time creates opportunities for practitioners to engage in meaningful activities that enable them to make incremental steps towards delivering a given EBPP as planned. We hope the results of this study stimulate future work that continues to examine how the quantity and quality of time allocation lead to improvements in treatment integrity and student outcomes. We also hope that school mental health researchers continue to examine organizational factors that influence treatment integrity because students ultimately cannot benefit from universal EBPPs that are poorly implemented.

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Table 1

Descriptive Statistics of Variables In the Study

Variable	N		Mean	Median	SD	Skewness	Kurtosis	Min	Max
	Valid	Missing							
Time allocation for collaboration/planning	106	0	2.35	2	1.31	.16	-.34	0	5
Time Allocation of whole staff PD	106	0	2.22	2	1.22	.18	0	0	5
Treatment Integrity of SWPBIS	106	0	52.25	5.5	18.76	.03	-1.25	16	84
Suspension per student	102	4	.01	.01	.01	1.86	5.13	0	.06
Suspension total	106	0	5.16	4	4.5	1.35	2.58	0	24
Average years of educational experience among staff	106	0	12.24	13	3.09	-.42	-.55	6	18
Enrollment	101	5	51.19	499	169.57	.65	.17	249	976
Percent of male students	106	0	.5	.5	.02	.09	-.95	.46	.55
Percent white students in school	101	5	39.69	45.7	22.26	-.22	-.95	.1	82
Percent English Language Learners	101	5	16.81	12.5	12.5	.9	-.1	2.7	49
Percent special education students	101	5	14.96	14	7.24	2.13	6.90	3	47.1

Note. SD = Standard Deviation. N = 106.

Table 2

Spearman's Rho Correlation Matrix of Key Variables (N = 106)

Variable	Time for plan	Time for PD	SWPBIS integrity	Suspension per student	Years of experience	Enrollment	%male	%white	%ELL	%SpEd
Time for planning	106									
Time for PD	.455**	106								
SWPBIS integrity	.388**	.349**	106							
Suspension per student	-.229*	-.115	-.469**	102						
Years of experience	-.178	-.141	-.414**	.294**	106					
Enrollment	.024	-.189	-.172	-.313**	.135	101				
%male	-.057	-.239*	-.107	-.112	.133	.199*	106			
%white	.043	.044	.211*	-.316**	-.073	.047	.159	101		
%ELL	-.042	-.096	-.209*	.046	.082	.396**	.005	-.310**	101	
%SpEd	-.032	.138	-.096	.124	.089	-.152	-.031	.012	-.334**	101

Note. * $p < .05$ ** $p < .01$, *** $p < .001$. Values in the diagonal line represents valid n used for correlation estimation.

Table 3

Coefficient Estimates of Multiple Regression Models (N = 106)

Focal Predictor	Model #	Path in mediation diagram	Y	X	β	t	p	R ²	R ² change	p for F change	R ² _{Adjusted}	f ²
Time for PD (TPD)	1.1	c	Suspension rate	TPD	-.078	-.817	.416	.161	.006	.416	.126	.192
	1.2	a	Treatment integrity	TPD	.293***	3.422	.001	.316	.083	.001	.288	.463
	1.3	d	Suspension rate	TPD	.028	.297	.767	.161	.006	.416	.126	.192
		b	Treatment integrity		-.361***	-3.362	.001	.25	.089	.001	.211	.333
Time for Planning (TPC)	2.1	c	Suspension rate	TPC	-.207*	-2.228	.028	.196	.042	.028	.163	.245
	2.2	a	Treatment integrity	TPC	.302***	3.54	.001	.322	.089	.001	.293	.474
	2.3	d	Suspension rate	TPC	-.114	-1.199	.234	.196	.042	.028	.163	.245
		b	Treatment integrity		-.307**	-2.867	.005	.26	.064	.005	.222	.352

Note. * $p < .05$ ** $p < .01$, *** $p < .001$. R² change indicates the amount of change in R² from the covariate only model (i.e., baseline model).

Table 4.

Mediation Effect Size Estimates (N = 106)

Predictors	Mediator	Outcome	Direct Effect, <i>p</i>	Indirect Effect, (95% bootstrapped CI)	Total Effect, <i>p</i>	Mediation type
Time for PD	Treatment integrity	Suspension rate	.028, <i>p</i> = .767	-.106, (-.214, -.032)	-.078, <i>p</i> = .416	Inconsistent and complete
Time for planning/ collaboration			-.114, <i>p</i> = .233	-.093, (-.184, -.028)	-.207, <i>p</i> = .028	Complete

Note. All the effects coefficients are completely standardized. If the 95% confidence interval of the indirect effect does not contain zero while the direct effect is significant, there is a partial mediation effect. A significant indirect effect with a non-significant direct effect indicates a complete mediation effect. If the directions of indirect and direct effects are opposite, a significant indirect effect with non-significant total effect indicates inconsistent mediation.

Figure 1. * $p < .05$ ** $p < .01$, *** $p < .001$. $N = 106$. Model (A) uses “time allocated for PD” as the predictor, Model (B) uses “Time allocated for Planning” as the predictor. All beta weights are bootstrapping estimations. β_a is the beta weight of the Predictor regressing on the Mediator, β_b is the beta weight for the Mediator regression on the Outcome. β_c is the beta weight for the Predictor when the Mediator is not controlled, while β_d is the beta weight for the Predictor when the Mediator is controlled.