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ORIGINAL PAPER

Tracking Time and Resources Associated with Systems Change and the Adoption of Evidence-Based Programs: The "Hidden Costs" of School-Based Coaching

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Abstract
This study leveraged data from a 40-school randomized controlled trial to understand the cost of coaching to support implementation of evidence-based programs (EBPs) through a multi-tiered system of supports for behavior (MTSS-B) model. Coach activity log data were utilized to generate the annual average, per school, costs of coaching of $8198. The cost of school personnel time for coaching was estimated to be $3028. Data on coach-rated administrator buy-in, school MTSS-B engagement, and implementation infrastructure and capacity were also collected and found to be associated with coaching activities. Notably, coaches did not spend significantly different amounts of time in schools using few EBPs relative to more EBPs, indicating some inefficiency in the use of coaches' time. These findings highlight the often-overlooked resources needed to support EBP implementation in schools.

Keywords Ingredients method · Systems coaching · Multi-tiered system of supports · Engagement

Introduction

Over the past nearly two decades, research has demonstrated the positive impact that preventive interventions have on a range of social, emotional, behavioral, and mental health outcomes for youth when optimally implemented (O'Connell et al. 2009). Given the enormous number of youth experiencing mental health, behavioral, and social emotional issues, there is a clear need to ensure that evidence-based programs (EBPs) are delivered to the population broadly and implemented with high fidelity (Fagan et al. 2019; O'Connell et al. 2009). Unfortunately, the current use of EBPs among school practitioners is quite low (Hicks et al. 2014; Stormont et al. 2011). Thus, a major challenge to adequately address the needs of youth in these settings is the scaling of EBPs in schools. For this to be accomplished, significant system changes are needed to provide professional development, resources to access and implement EBPs, and on-going support to implementers (Fagan et al. 2019). These system changes, however, may represent substantial costs to schools and districts.

A growing body of implementation research highlights the critical role of ensuring that adequate implementation supports are in place to promote the implementation of EBPs (Domitrovich et al. 2008; Wandersman et al. 2008). Within schools, implementation support is often provided by a coach or consultant in the form of professional development as well as problem-solving to optimize fidelity and address barriers to implementation (Kraft et al. 2018; Sprick et al. 2006). However, there has been limited examination of the costs associated with providing this type of implementation support and the opportunity costs borne by school staff who receive these types of coaching supports. Additional research is needed to better understand these often overlooked or "hidden" costs of coaching.

Select data (i.e., total coach hours, preliminary costs estimates for Years 1 and 2) have been presented at professional conferences. Final 3 year costs and the engagement and implementation fidelity data have not been presented.

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To address these gaps, the current paper aimed to (1) summarize the amount of time spent on coaching activities and the cost allocations for systems-level coaching activities aimed at supporting the implementation of multi-tiered systems of support for behavior (MTSS-B); (2) estimate the costs associated with school-based personnel time spent engaging with the coach; and (3) examine the total time and cost allocation in relation to school engagement in the coaching and MTSS-B process and the level of implementation of new EBPs. These data were collected within the context of a school-level randomized controlled trial (RCT) in which coaching was provided to support MTSS-B. MTSS-B was meant to be a transformative approach to meeting the needs of youth, identifying when behavioral needs were unmet, and providing EBPs to address identified needs. As such, the coaching provided to school-level teams and school staff extended beyond the typical individual-focused coaching (e.g., of teachers or clinicians) to examine systems-level coaching.

School-Based MTSS-B

MTSS-B has been identified as a service delivery framework that can facilitate schools' implementation of EBPs across the prevention continuum through the use of data-based decision making to address both school-wide intervention as well as students' needs for targeted and intensive supports (Strein et al. 2003). It is a complex process requiring transformative systemic change over 2 to 4 years (Eagle et al. 2015). MTSS-B has been widely adopted as Positive Behavioral Interventions and Supports (PBIS), which focuses on improving school-level systems and procedures to promote positive student and teacher behavior change (Sugai and Horner 2002, 2006). A growing body of school-based randomized trials and state-wide effectiveness studies indicate that the implementation of the universal (i.e., school-wide) elements of PBIS are associated with significant improvements in student behavioral, social emotional, and academic outcomes (Bradshaw et al. 2009a, b, 2012a, b; Horner et al. 2009, 2010); school climate (Bradshaw et al. 2008); decreased student need for additional behavioral supports (Bradshaw et al. 2012a, b); and improvements in student suspension, truancy, and academic proficiency rates (Lee and Gage 2020; Pas et al. 2019). Despite these successes, many states and schools struggle to integrate targeted and intensive EBPs within this three-tiered framework (Barrett et al. 2008, 2012; Pas et al. 2019) and require additional support and coaching to achieve high implementation fidelity (Fixsen and Blasé 2008). Importantly, building systems-level coaching capacity has been identified as a challenge to the scaling of PBIS and other such EBPs statewide (Fagan et al. 2019; Horner et al. 2014).

Systems Coaching

One important area for promoting the capacity of a school to successfully implement MTSS-B and adequately identify and address the needs of students (e.g., through EBP implementation) is consultation and coaching focused on systems change. Systems coaching within education has been defined as providing "dynamic support and facilitation to develop the capacity of school or district teams to implement [a multi-tiered system of support]" (March and Gaunt 2013, p. 4). Systems coaching often involves a mix of activities, including organizing resources and the logistics of implementation, data-based decision making to examine fidelity and outcomes, and providing training and technical assistance while being mindful of the school context, culture, and climate (March et al. 2016).

The limited study of systems coaching to promote MTSS-B efforts has indicated the need for continuous coaching as well as alignment of educator beliefs with the MTSS-B framework as key facilitators of its successful implementation. For example, a study involving more than 60 elementary schools indicated that educator beliefs about MTSS-B were associated with the implementation of MTSS-B practices. In addition, this study demonstrated that intervening with beliefs explicitly, by way of providing group professional development focused on supportive belief activities (e.g., watching video clips, having teachers reflect, sharing testimonials), both educator beliefs and MTSS-B implementation improved (Cook et al. 2015). Similarly, when focused on MTSS for academics, a study in 31 schools indicated that the continuity of the coach within the role (i.e., having the same coach for a long duration) and supportive educator beliefs about data-based decision making were also significant predictors of implementation fidelity (March et al. 2016).

Systems Coaching in the Current Study

Within the current study, systems coaching explicitly targeted the capacity of school staff to identify behavioral and social emotional needs and select and implement targeted interventions for students at-risk for behavioral and social emotional concerns using a staged problem-solving approach (e.g., see Meyers et al. 2012). In these schools, MTSS-B was achieved through the PBIS framework and thus the primary purpose of the coaching was to support the PBIS team in collecting data, ensuring post-training follow through, and helping to tailor the framework to the specific school context (e.g., see Horner et al. 2014). The systems coaching provided in this study was meant to ensure the execution of activities outlined for PBIS

coaching and to address implementation needs at every phase of implementation (i.e., from the initial exploration to program installation and implementation, with the ultimate goal of achieving full operation, innovation, and sustainability; Fixsen et al. 2005). As such, coaches sought to ensure that evidence-based programs were well implemented across all three prevention tiers (i.e., universal, targeted, intensive; Fixsen et al. 2005).

Estimating the Costs of Coaching

Understanding the costs of systems coaching has some unique challenges in terms of economic evaluation. Specifically, cost analysis is used to determine the units and resources needed to implement an intervention, which most often include personnel, training, facilities, materials, and equipment (Levin et al. 2017). The challenge for systems coaching is that it is not a direct intervention with students, but rather is an indirect intervention that shifts the behaviors of adults to provide services to students in need of support (i.e., in the economics field, this is referred to as a service mediation intervention; Bowden et al. 2017). Therefore, it is critical to understand the exact activities that coaches engage in to support the implementation of EBPs (Crowley et al. 2018). These represent obvious costs, but also can hint at induced costs, which represent the costs that are incurred as a result of engagement with the coach (e.g., school personnel time spent engaging in the coaching) and represent opportunity costs, or the value of a good if it was used at its most productive alternative (Levin et al. 2017). Previous studies have noted that opportunity costs for teachers are not inconsequential. For example, a study of the costs of instructional coaching provided estimates ranging from approximately $8000 to $28,000, depending on the number of teachers involved in coaching and their level of engagement (Knight 2012).

The accurate representation of cost is critical as it can dramatically affect the ratio of costs to benefits of the intervention (Bowden et al. 2017). Notably, improved implementation fidelity may result in more cost, but also improved benefits (Dane and Schneider 1998; Domitrovich et al. 2008; Scott et al. 2019). For example, a study of the cost of school-level PBIS suggested that higher fidelity implementation was associated with additional costs, primarily driven by additional PBIS team meetings and supports (Bradshaw et al. 2020a, b). Another study of the actual time spent by PBIS coaches providing support for schools found that less direct and indirect support of schools (i.e., less than 35 h a month) was associated with improved PBIS outcomes (McCamish et al. 2015). This may suggest a threshold effect, whereby costs increase in the earlier stages of implementation (e.g., Exploration, Installation as identified by Fixsen et al. 2005), but then decrease as systems are in place and proficiency is reached. In economic analysis, this is discussed as efficiency, or how effectively inputs (i.e., support from coaches) are turned into outputs (i.e., implementation). Similarly, this study suggested that inefficient schools use resources but do not produce outputs (McCamish et al. 2015).

Thus it becomes critical to both understand the "ingredients" of systems coaching that support the development and implementation of MTSS-B and how these ingredients and costs may differ depending on the level of buy-in, infrastructure, capacity, and school personnel engagement in the coaching and MTSS-B as well as the progress made (i.e., stage of) regarding EBP implementation. The primary cost driver in school-based interventions is often personnel (Belfield et al. 2015). Thus, methods such as time logs, which provide a detailed account for both intervention activities and time of coaches and school staff, represent best practices (Crowley et al. 2018). In this way, a cost analysis can both inform the resources needed to implement an intervention, as well as provide data relevant to the causal framework through which impacts on student social, emotional, and academic outcomes are obtained. Finally, this type of analysis can highlight opportunities for improved use of resources by suggesting school-level factors which relate to both the amount of resources used as well as the efficiency in which those resources translate to uptake of EBPs with fidelity.

The Current Study

Based on the gaps identified in the extant literature, our research aims were to: (1) summarize the amount of time spent on coaching activities and the cost allocations for systems-level coaching activities aimed at supporting the implementation of MTSS-B; (2) estimate the costs associated with school-based personnel time allocated to engaging with the coach; and (3) examine the total time and cost allocation in relation to school engagement in the coaching and MTSS-B process and the level of implementation of new EBPs. To address these aims, we leveraged two sources of data that are not commonly collected or reported in the literature regarding school interventions: coach time logs and salary data. To address the first two research questions, we calculated the costs of coaching provided to support improved implementation of MTSS-B, utilizing the ingredients method (Levin et al. 2017). Specifically, the coach activities were described, quantified, priced, and summed to create an aggregate school-level cost. As the focus of this paper was on the costs of coaching specifically, we examined the coaches' time allocation and the opportunity costs of the school, as calculated using coach time logs and coach and school personnel salary data. To address the third research question, we combined the coach time logs of school visits with the coach ratings of EBP implementation and school engagement (i.e., four scales of buy-in, infrastructure for and

capacity to implement, and school engagement with MTSS-B). Research on the link between cost and engagement and EBP implementation are absent in extant literature but has major implications for the scalability of EBPs (O'Connell et al. 2009).

Method

Participants

Data from this study were collected as part of a 3-year, group RCT of the "Maryland Safe and Supportive Schools" or "MDS3" initiative. There were 40 middle schools across four school districts included in this study. Of these, 20 were randomly assigned to the intervention condition, received coaching support to scale MTSS-B to three tiers, and were the focus of this study. The middle schools ranged in size from small to large ($M = 789.55$, $SD = 145.23$ students) and, on average, were comprised of a diverse student sample with regard to race/ethnicity (i.e., White students, on average, comprised 37.62% [$SD = 23.35\%$] of student enrollment) and socioeconomic status (i.e., $M = 40.30\%$ [$SD = 15.59\%$] students received free and reduced-price meals). These schools were experienced with school-wide PBIS, having been trained between 7 to 13 years prior to the study beginning; a measure of fidelity to the school-wide, Tier 1 features using the School-wide Evaluation Tool or SET (Sugai et al. 2001) reflected an average of high fidelity to the model, whereby only two schools scored below an 80% (i.e., high fidelity) on this measure at baseline. Despite this longevity with school-wide PBIS, schools were not trained in or implementing EBPs at Tiers 2 and 3, which was demonstrated by the fact that half of the schools scored below 80% (i.e., high fidelity) at baseline on Individual Student Systems Evaluation Tool (ISSET; Lewis-Palmer et al. 2005).

Each of these 20 schools received implementation coaching support one day per week from an external, research grant-funded systems coach; there were six coaches in total who were hired to support these schools (i.e., 4 full-time equivalent [FTE] positions designed to provide 1-day of coaching support a week per school). The six coaches were all female and were trained as educators or mental health providers (e.g., counseling, social work, school psychology); four had a master's degree and two had a doctoral degree.

Procedures

Districts were approached to participate in the project by project leadership; the district agreed to participate and then provided support in recruiting schools for voluntary participation in the RCT. District-specific meetings were held with all interested school-based administrators to provide information about the trial (e.g., RCT design and all data collection procedures) and then administrators provided written consent for participation, where study procedures were outlined in writing. Matching procedures employing baseline demographic data were utilized for the randomization, to ensure balance across conditions (i.e., "intervention" and "comparison") within the four districts.

All data reported here were collected prospectively from coaches (i.e., time logs and engagement ratings) or were administrative data (i.e., coach salaries). As this project did not include individual student- or staff-level identifiers, it was deemed exempt by the researchers' Institutional Review Board.

MTSS-B Intervention

Schools in both conditions were provided access to a school climate data system, which allowed for annual collection of student and staff self-reported climate data, and real-time reporting of the survey results to inform school-based decisions regarding school climate, MTSS-B, and the implementation of EBPs (for additional details on the data system, see Bradshaw et al. 2014). Only the schools randomly assigned to the intervention condition were provided with coaching to utilize these climate data to make data-based decisions regarding areas of need at Tiers 1, 2, and 3 as well as training in and materials and ongoing coaching for implementation of EBPs.

Broadly speaking, coaches engaged in seven types of activities, including (1) relationship building to promote buy-in and readiness and to get to know the school climate, (2) participation in school-level meetings to gain information about school priorities and to help with alignment in priorities across faculty, (3) individual meetings with key stakeholders to ensure that beliefs aligned to MTSS and to build individual capacity for implementation, (4) coaching of individual teachers utilizing the Classroom Check-Up (i.e., CCU, Reinke et al. 2011) to ensure that positive behavioral supports were being implemented in classrooms, (5) supporting EBP adoption and implementation, (6) support for data collection and completion (e.g., fidelity forms), and (7) preparation of materials and planning for important meetings. For example, the systems coaches compiled information about the offered EBPs in a consumer-friendly manner for presentation to administrators and team members; this was done to ensure that school staff were well-informed of their options prior to choosing any program and as a preparatory activity to optimize schools' EBP Exploration phase (i.e., the initial implementation phase, as defined by Fixsen et al. 2005). Wandersman and colleagues (2008) described this type of activity as distilling information. With regard to supporting all phases of implementation, when schools reached the phases of innovation or sustainability (i.e., the

most advanced phases of implementation, as defined by Fixsen et al. 2005), coaches helped the schools to archive all related materials (i.e., ensuring that implementation could persist in the face of turnover) and discussed new ways to tailor implementation and measures in future years (see Horner et al. 2014 for additional ways that coaching can support implementation at each stage).

Consistent with Fixsen and Blasé's (2008) model of implementation drivers, coaches were carefully selected and trained by the research team to target all drivers (i.e., competency, leadership, and organizational). All coaches were supervised on a weekly basis by the lead and last (senior) author to ensure that coaches provided this comprehensive, ongoing support to schools. Examples of how coaches addressed these implementation drivers include: (1) building competence of teams and individuals through their meetings with these groups, (2) modeling adaptive leadership by building consensus, assessing and addressing the motivation of key stakeholders, and identifying key personnel within the building to implement EBPs during meetings, and (3) improving the organizational systems through their support of the collection and use of data to make decisions. The engagement around consensus and motivation aligned closely to addressing educator beliefs, which has been shown to be effective for promoting MTSS implementation in prior research (Cook et al. 2015). Finally, each coach was embedded into their assigned intervention schools for the 3-year duration of the study, to maximize continuity and potentially impacts (March et al. 2016).

Measures

Daily Coach Time Log

After each school visit, coaches completed an online log documenting the time they spent on each of the main

Table 1 Coach log components and costing of coach, teacher, and administrator time

Coach activities in schools	Coach activities	Teacher activities	School admin. activities
Relationship building			
Systems	X		
Individuals	X	X	
School-level meetings and assistance			
PBIS meeting	X	X	
Pre-referral team meeting	X		
SIT meeting	X		
Faculty meeting	X		
Grade level meeting	X		
Other meeting	X		
Individual meetings			
PBIS lead	X	X	
Administrators	X		X
Other	X	X	
Classroom ch±eck-up work with individual teachers (CCU)	X	X (45%)	
Supporting evidence based programs (EBP)		X	
RP (restorative practices)	X		
Life Skills Training	X		
Check & Connect	X		
Coping Power	X		
Other EBP	X		
Data	X		
Prep and plan	X		
Other activity	X		

The coach log excludes coaches' activities outside of school sites (e.g., administrative work, team meetings, data entry and analysis, driving to and from schools). The full time logged for each of the activities is counted to cost coach time; for the teachers and administrators, the X's indicate the time that is also counted for their time. For coaching, 45% of the logged coach time is counted for teacher time, because research demonstrates that less than half of the time that a coach spends on a CCU case is also face-to-face time that a teacher dedicates (see Pas et al. 2016)

coaching activities in the school (see Table 1). This log was created based on the experience from previous research testing this systems-based coaching intervention in high schools (Bradshaw et al. 2014) and was designed to both understand the active ingredients of the intervention as well as to assess for coach and school time in a non-duplicated manner (Findorff et al. 2005). Throughout the study, logs were used to: (1) clearly articulate the expectations to coaches about how they would spend their time (i.e., to define the coaching intervention); (2) provide data-based formative feedback to coaches about how time was being spent, (3) estimate costs, and (4) examine in implementation analyses. A codebook was developed for this data collection tool and was provided to all coaches.

Coaches' activities outside of school sites (e.g., administrative work, research team meetings, research study data entry and analysis, and driving to and from schools) was not recorded in these logs. While these costs are a part of the total costs of the intervention and are reflected in the 40-h work week of the coach (see Tables 2 and 3 for the "all hours" cost for coaches), they are not relevant to the research questions in this study. Additionally, while coaches were expected to be in schools for the entire school day, there was not an expectation that every minute in schools could be leveraged for systems change.

There were eight broad categories of coaching activities captured in this log, which mapped to the above practice features: attendance and assistance provided at *school-level meetings* (i.e., providing the time spent at five distinctly-named meetings and a sixth entry for "other"; see Table 2), *individual meetings with key stakeholders* (i.e., the PBIS/MTSS-B Team leader, administrators, and other personnel), *coaching of individual teachers*, *supporting EBPs* with named programs and a section for "other" (see Table 2), *relationship building* (which included individually- and systems-based activities, parsed out into separate activities), *data collection and completion* (which was specific to the MTSS-B activities [e.g., fidelity forms] and not data collection for research purposes), *preparation and planning*, and *other* activities. For each activity, coaches were prompted to provide the number of minutes (rounded to the nearest 5 min; and only documented activities taking 5 min or more). Coaches were also trained that each activity could only be coded into one log category and were provided guidance on the hierarchy of this coding. This was to ensure that no time was duplicated and thus costed twice. All logged activities were counted as coach time and costs (see Table 1).

In addition, a designation was made for activities that involved teachers and school administrators that otherwise would not have occurred or were enhanced, due to the nature of the coaching. Specifically, although all schools across both conditions had received prior training in school-wide (Tier 1) positive behavioral supports, and thus should have been business as usual, school-wide Tier 1 team meetings were explicitly targeted by coaches as a time to promote systems changes. Further, there was an expectation and experience that the coaching increased the frequency of MTSS-B meetings and therefore was an induced cost; thus, teacher time was estimated as a cost for these meetings. Because of the importance of costing the personnel time, individual meetings were highest on the coding hierarchy, and were used for the estimation of teacher and administrator time. We were specifically interested in administrator time as a leadership cost. Therefore, if the coach met individually with an administrator, MTSS-B team lead, etc. about an EBP, they only coded the meeting and not the EBP support. This allowed for our estimate of school-personnel time but may have resulted in a slight underestimation of time spent on EBPs. Time logged as supporting EBPs, spent in individual relationship building, and a portion (i.e., 45%) of time spent in coaching individual teachers were also costed as teacher time. The latter was only a portion of estimated time because prior research has demonstrated that less than half of the time that a coach spends on a CCU case is also face-to-face time that a teacher dedicates (e.g., see Bradshaw et al. 2018; Pas et al. 2016). While teachers and school administrators were not paid extra for the time in these activities, it represents an opportunity cost of engagement with the MTSS initiative (Levin, et al. 2017).

Coach Ratings of Engagement

Beginning halfway through the first year of the trial, coaches rated engagement three times per year (i.e., fall, winter, and spring). This measure was also created based on the experience of a previous research study of systems coaching (Bradshaw et al. 2014) and was intended to measure four dimensions of engagement with the MTSS-B initiative and coaching supports. Specifically, the a priori scales included the: (1) school's PBIS/MTSS-B infrastructure and collaboration (7 items, e.g., "PBIS team demonstrates skills to independently own and direct the 3-tiered framework" and "PBIS team works collaboratively with me."; Cronbach's alpha or $\alpha = 0.88$), (2) school's capacity to implement EBPs (4 items, e.g., "School selected EBPs based on data" and "School personnel demonstrate capacity to implement EBPs soon after training"; $\alpha = 0.84$), (3) the administrator's buy-in and engagement (7 items, e.g., "An administrator actively supports the collaboration between me and the school staff" and "An administrator allocates time and resources to implement Tier 1/Tier 2 and 3 supports" as two questions; $\alpha = 0.94$), and (4) overall school engagement with the MTSS-B initiative (6 items, e.g., "School includes me in meetings and activities that are relevant to my work in the school" and "School is committed to ongoing data-driven decision-making"; $\alpha = 0.84$). Coaches responded to each

item on a 4-point Likert-type scale from *strongly disagree* to *strongly agree*. The items for each scale were averaged and higher scores reflected more engagement.

Coach Ratings of Implementation of Evidence-Based Programs

Beginning in the winter of 2015/2016 (i.e., halfway through the first year), coaches also rated the phase of implementation that the school had achieved for each of the offered EBPs including: whether schools implemented Tier 1 PBIS/MTSS-B, integrated restorative practices into MTSS-B, LifeSkills Training (Botvin et al. 2006; Tier 1, universal drug prevention curriculum), Check & Connect (Sinclair et al. 2005; Tier 2–3 student mentoring and engagement intervention), and Coping Power (Lochman and Wells 2002, 2003; a Tier 2–3 group counseling intervention to address externalizing behaviors). See Bradshaw et al. (2009a) for additional information and support for the phased rating of implementation status by the coach. The coaches provided a rating of each school's phases of implementation on a 7-point scale, which mapped onto the implementation stages outlined by Fixsen et al. (2005), including Exploration, Training, Installation, Initial Implementation, Full Implementation, Innovation, and Sustainability (also see Bradshaw et al. 2020a, b). Exploration and Training were collapsed into a "not implementing" category; installation and initial implementation were collapsed into an "initial implementation" category; and full implementation, innovation, and sustainability were collapsed into a "fully implementing" category. For this study, we focused on the final year of implementation (i.e., study year 3).

Analyses

Cost Estimation

Cost estimates correspond to the costing perspective of the coaches' time, as such only annual recurring labor costs are included (i.e. fixed or indirect costs associated with coaching such as start-up training costs, supplies, equipment, overhead, and non-school costs are excluded). Costs are the summation of the costs of personnel listed from $i=1$ to $i=\mathrm{I}$. For each personnel "i" we determined its unit price P_i and how many hours H_i were required for the intervention, using the following equation:

$$\text{Cost} = \sum_{i=1}^{I} P_i H_i \quad (1)$$

where P is the expenditure on salary and wages and fringe benefits and H is the number of hours that each staff member allocated to MTSS-B support activities. Equation 1 was repeated for each personnel category: coaches, classroom teachers, and school administrators and reported as annual estimates per school. All cost estimates were inflation adjusted to 2018 U.S. dollars using the Bureau of Labor Statistics' Consumer Price Index Inflation Calculator (U.S. Bureau of Labor Statistics 2018a). The source for hours allocated to coaching and coach labor costs were the daily time logs described earlier. Salary and fringe benefits data came from administrative records for coaches and from the Bureau of Labor Statistics for school staff (U.S. Bureau of Labor Statistics 2018b, c).

Engagement and Costs Associations

Correlational analyses were conducted in SPSS between the eight main categories of coach activities and the four engagement scales. Specifically, we examined how the final (i.e., third) year's coach logged time was associated with four coach-rated scales of engagement across all 3 years. This was intended to explore induced costs of the intervention, whereby working in schools that were more engaged would be associated with greater time and costs for the initiative. In addition, we examined the number of EBPs implemented in the final year of the study in relation to the amount of time the coaches logged in total during each year using one-way ANOVAs. These analyses allowed us to examine the mean differences between the number of hours coaches spent in schools over the course of the study in relation to final implementation status and were intended to explore efficiency by looking for threshold effects as well as both extremes (i.e., high efficiency or low inputs and high outputs and low efficiency/inefficiency as indicated by high inputs and low outputs). Because the goal was EBP adoption and implementation in the trial, final year implementation levels were of interest.

Results

Amount of Time Spent by Coaches and School Personnel

Based on the allocated distribution of time per school (i.e., 4 FTE for 20 schools), each school was allotted 402 possible hours of coach time (including summer). This was based on a 40-h work week for the coaches, considering paid vacation time and holidays. Of these hours, an average of 163 h ($SD=43$), or 41% of the total worked hours, were accounted for by logged activities of the coach. The range of coach hours spent within the school dedicated to the main eight activities' categories varied from a minimum of 85 to a maximum of 232 per year, per school (see Table 2).

The average number of hours that were logged as including school administrator and teacher time were 7 ($SD = 28$) and 59 ($SD = 19$) per school, respectively. As expected, out of the total school staff costs, most of the cost (83%) was attributed to teachers' time.

Cost of Time Spent by Coaches and School Personnel

Labor cost parameters are provided in the bottom of Table 2. Using these values as well as the hour estimates, the annual average cost per school for coaching was $20,138 and for school staff was $3028 (see Table 3). These values were obtained by multiplying the number of hours for the coach, teachers, and school administrators by their hourly wage including fringe benefits (see equation in Method section). Out of the total cost for coaching, the cost for the segment of coaching dedicated to school activities (i.e., logged hours) was, on average, $8198 per school. While the total cost was relatively constant over the years, the segment dedicated to school activities was slightly more expensive for year 2 than for years 1 and 3 (Table 3). In accordance with the variation in total hours logged by coaches over the 3 years, the cost for school staff in Year 2 was higher than in Years 1 and 3 (see Table 3).

Distribution of Coaching Activities

When examining the costs per school, per activity, in all years, the cost of building relationships within the school was the highest cost (i.e., total for all years is $8856) followed by the school-level meetings (total for all years is $5412; see Table 4). The total costs of school-level and individual meetings nearly matched the costs of the relationship building. The individual team meetings and preparation and planning each took about 12% of time and cost $2952 over all years of the project. There was expected fluctuation in the costs for each activity over time, as the role of the coach was expected to shift. For example, coaches appeared to gain additional access to meetings and individuals in the second and third year. Similarly, EBPs were expected to be implemented in Years 2–3 (i.e., not the first year), thus, the time spent on this changed from 2% and $158 in Year 1 to 8% and 7% in the next two years. The preparation time decreased from Year 1 to Years 2–3 (i.e., from 17% in Year 1 to 8% and 10% in the next years). See Table 4 for more details.

Table 2 Cost analysis parameters for coaches, teachers, and administrators

Personnel hours ($n = 60$ school observations; 20 school × 3 years)	*M* hours (annual)	*SD*	Min	Max
Principal/administrator hours	7	28	4	91
Teacher hours	59	19	30	94
Coach hours (activities with schools)	163	43	85	232
Coach hours (all activities)	402	–	–	–
Labor costs (2018 USD)	*M* cost (annual)	*SD*	Min	Max
Coach salary and wages	$75,402	$5080	$67,831	$81,856
Teacher salary and wages	$67,200	$10,655	$44,040	$101,340
School administrator salary and wages	$113,940	$16,305	$80,080	$155,180
Fringe benefits (% of salary and wages)	34%	0.3%	31%	38%

These estimates include all time logged on the daily coach time-logs at the school sites, but excludes time spent off-site (e.g., doing administrative work, team meetings, emails, data entry and analysis, driving to and from schools)

Table 3 Personnel annual cost per school and year (2018 U.S. dollars)

Personnel	Annual mean	Percent of cost	Yr. 1	Yr. 2	Yr. 3
Principal/administrator	$502	(17%)	$450	$588	$469
Teacher	$2526	(83%)	$1971	$3059	$2549
School staff	$3028	(100%)	$2420	$3647	$3018
Coach (activities with schools)[a]	$8198	(41%)	$7918	$9059	$7623
Coach (all other activities)	$11,940	(59%)	$12,328	$11,156	$12,330
Coach total	$20,138	(100%)	$20,246	$20,215	$19,954

[a]Cost estimates include fringe benefits (33.54% of salary and wages). The total cost for coaching decreases slightly over time due to annual salary increments being lower than the annual inflation rate)

Table 4 Cost and percent of time coaches spent in each of eight school activities

Coaching activities with schools	Mean	%	Yr. 1	%	Yr. 2	%	Yr. 3	%
Building relationships	$2924	36	$2851	36	$3261	36	$2668	35
School meetings	$1776	22	$1425	18	$1902	21	$1982	26
Prep and plan	$956	12	$1346	17	$725	8	$762	10
Individual meetings	$956	12	$713	9	$1178	13	$991	13
Coaching individual teachers	$738	9	$713	9	$1087	12	$457	6
Supporting EBPs	$465	6	$158	2	$725	8	$534	7
Data completion	$246	3	$317	4	$181	2	$229	3
Other	$137	2	$396	5	$0	0	$0	0

School Engagement and Costs

Correlational analyses utilizing the activity data from the third year and all years of the school engagement data (i.e., 3 years × four scales) indicated clear patterns in the associations between engagement and coach time (see Table 5). Better coach ratings of PBIS/MTSS-B infrastructure and EBPs capacity in the second and third years as well as administrator engagement in all years were associated with more time spent in relationship building in the final year. Better school engagement with the broader MTSS-B initiative was associated with more time spent in school-level and individual meetings. Less engagement on all four scales was related to increased coach time spent on data completion. Poorer

Table 5 Correlations between engagement (all years) and final (3rd) year coaching time

	Relationship building	School-level meetings	Individual meetings	Coaching teachers	Supporting EBPs	Data completion	Preparing and planning	Other activities
Y1 PBIS/MTSS-B infrastructure	0.428	0.436	0.160	−0.093	0.021	−.499*	−0.397	0.057
Y2 PBIS/MTSS-B infrastructure	.571**	.479*	0.288	−0.069	0.150	−.652**	−0.383	0.304
Y3 PBIS/MTSS-B infrastructure	.656**	0.418	0.110	−0.382	0.239	−0.302	−0.349	0.373
Y1 EBP capacity	0.214	0.347	0.134	0.018	0.102	−.537*	−0.364	0.127
Y2 EBP capacity	.471*	0.433	−0.059	−0.296	0.429	−0.326	−0.338	0.098
Y3 EBP capacity	.573**	0.276	−0.048	−0.409	.570**	−0.064	−0.298	0.224
Y1 admin engage	.450*	0.437	0.221	−0.251	0.129	−.617**	−0.272	0.054
Y2 admin engage	.474*	0.407	0.218	−0.227	0.215	−.462*	−0.137	−0.018
Y3 admin engage	.689**	0.127	0.218	−0.357	0.285	−0.310	−.461*	0.294
Y1 school engage	0.099	.473*	.466*	0.080	0.298	−.645**	0.035	0.168
Y2 school engage	0.144	0.347	.464*	0.087	0.368	−.460*	0.239	0.074
Y3 school engage	0.166	0.171	.511*	0.148	0.266	−0.264	0.106	0.126

Correlations are Spearman's rho. Columns represent the hours spent on each activity during the third (and final) year of the study

*$p < 0.05$

**$p < 0.01$

administrator engagement in the final year was associated with more coach preparation and planning time.

Coach Costs and EBP Implementation

Coach ratings during the winter of the first year of the study indicated that 20% ($n=4$ schools) of the schools were not implementing Tier 1 PBIS, 15% ($n=3$ schools) were in the initial stages of implementation, and 65% ($n=13$ schools) were fully implementing. The focus of this first year was to ensure full Tier 1 implementation, assess areas that new EBPs could address, and begin to introduce and select EBPs for the second year. Therefore, not surprisingly, no schools were yet fully integrating restorative practices with PBIS and just three began initial implementation. During the first year, just one school each were fully implementing Check & Connect and Coping Power. No schools had implemented LifeSkills during the first year.

With regard to end-of-study implementation, we examined the average of three ratings (i.e., fall, winter, and spring) of year 3 implementation for the four endorsed EBPs (i.e., Tier 1 PBIS, integration of PBIS with restorative practice, Check & Connect, and Coping Power). LifeSkills was the one EBP that no school ever adopted. ANOVAs were conducted for the count of EBPs that schools either did not, only initially, or fully implemented (i.e., in three ANOVAs) to determine whether there were statistically significantly different amounts of time logged by coaches among these groups. The data indicated that there were no schools that were rated by a coach as not implementing any of these remaining EBPs (i.e., no counts of 4 for the "non-implementing" category). Similarly, no school implemented all four of the EBPs. Counts of EBPs that were not, initially, or fully implemented ranged from 0 to 3. On the other hand, there were nine schools each that initially or fully implemented two or three EBPs simultaneously during the final study year.

Given that there were just 20 schools, as expected, there were a small number of schools in each cell and no statistically significant findings. In examining the means plots (see Fig. 1), there are some indications of high efficiency and inefficiency, but not threshold effects. For example, in Year 2, schools rated as not implementing 3 programs (i.e., non-implementers; see Fig. 1, upper left) had the highest number of coach hours (top left of Fig. 1). In other words, these were schools using the greatest amount of inputs (i.e., coaching resources) with no desired outputs (i.e., EBP implementation). Schools that were trying to initially implement three programs had the most logged hours in all years (top right of Fig. 1); these were schools with a lot of inputs (i.e., coaching) while trying to produce the most outputs (i.e., launching the maximum number of EBPs). The number of programs was also notably associated with time spent when examining the full implementation categorization, such that schools not fully implementing any programs appeared to have lower hours than those with multiple programs being fully

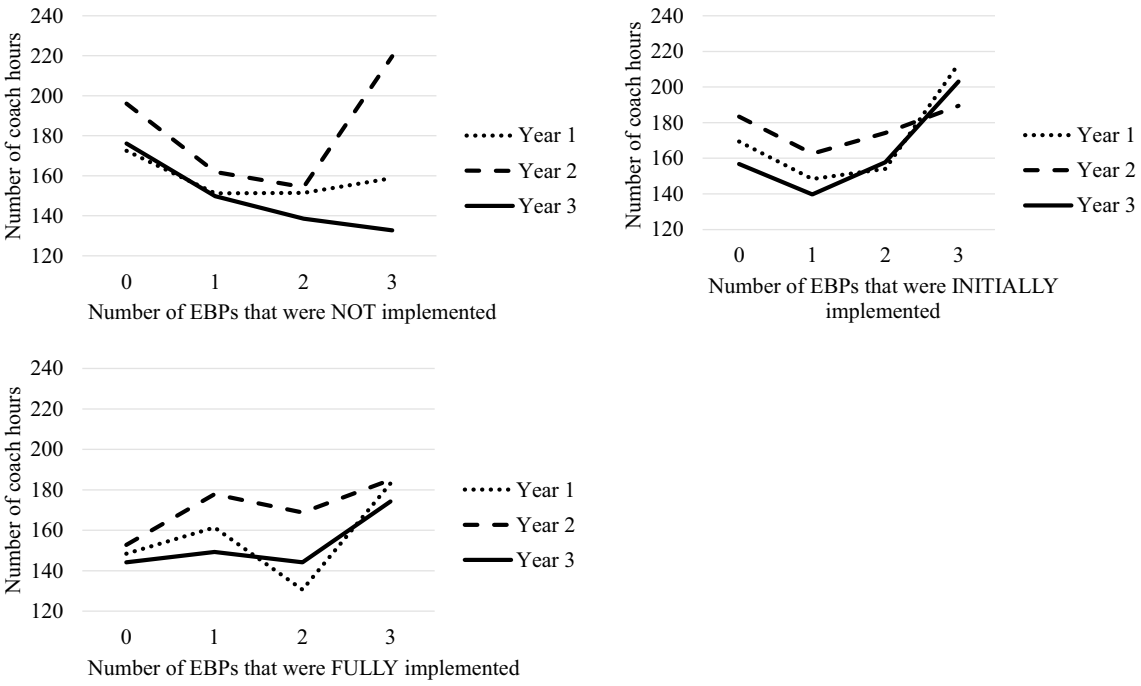

Fig. 1 Mean number of hours spent on coaching based on the number of EBPs that were not, were initially, and were fully implemented across 3 years

implemented (i.e., indicating a match between low inputs and outputs). A notable exception was in Year 1, where hours were lowest in schools fully implementing two programs, which was indicative of independent implementation of one, if not two, EBPs given that Year 1 predominantly focused on Tier 1 PBIS (bottom left of Fig. 1).

Discussion

This study prospectively examined the cost of systems coaching that included coaching activities and elements consistent with prior conceptual, theoretical (e.g., Erchul, 2011; Gutkin and Curtis 2009; Meyers et al. 2012), and empirical research (i.e., Cook et al. 2015; March et al. 2016). We used the ingredients method (Levin et al. 2017), which represents best practice in the field of economic evaluation, as it includes costs of all components of the intervention and allows for an understanding of the cost of replication. Importantly, we used time logs that allowed for the prospective and detailed accounting of time spent by the coaches (Crowley et al. 2018) and the associated costs as well as provided an understanding of the activities that the coach undertook during the 3 years including time spent with school personnel.

The results showed that the average annual cost of coaching activities in schools was $8198 for coach time. Overall, coaches recorded that nearly half of their time was dedicated to school-based activities. While this can be seen as inefficiency, it is important for intervention designers and practitioners to understand that a full-time coaching position does not equate to 40 h a week of school contact and systems change; coaches cannot access the key stakeholders or engage in system change activities during all hours of the day and then there are other challenges like rescheduled school meetings and administrative tasks (e.g., email, trainings, etc.) that also take time. Notably, coaches spent about one-third of their logged time in relationship building, which allowed for needs assessment by the coach as well as readiness and capacity building (Wandersman et al. 2008) and may represent a "hidden cost" of coaching. An area of further exploration is whether or how the time (and costs) of building relationships would differ for coaches that were hired by the school system. On the one hand, the need for time spent in getting to know people and the organization would be lower for school system employees, but the readiness and capacity building would likely still be needed in some other form. Further, some estimates of time allocation for job-embedded coaches indicates that most of their time is spent in other activities, outside of the coaching they were hired to do (Fullan and Knight 2011).

Other specific logged activities data indicated that the intervention was implemented as expected and suggested important components of systems coaching. For example, coaches were advised to garner buy-in not only from the top (systems) level down, but from the individual (teacher) level up, which is reflected in the fact that they spent about one-tenth of their time coaching individual teachers. The second largest proportion of time was spent in meetings. Team meetings were targeted as the vehicle for executing MTSS-B and individual meetings allowed for building of motivation, buy-in, and skill sets of key stakeholders (i.e., the competency drivers discussed by Fixsen and Blasé 2008). Meetings with administrators addressed the importance of supporting multiple levels and leadership (Aarons et al. 2016; Domitrovich et al. 2008). Finally, separate time only allocated to EBPs (i.e., outside of meetings) was a lower time and cost allocation but is also captured in some of these other categories (e.g., meetings).

Time logs also captured the important, but under-represented, cost in school-based interventions of school staff time, representing another "hidden" cost to coaching. It is common to assume this cost to be $0, as teachers and administrators do not receive any additional salary for these activities. However, it is important to capture the time they spend engaging with coaches as an opportunity cost (Levin et al. 2017). Specifically, this study suggests that nearly 60 h of teacher time and less than 10 h of administrator time were "induced" by the coaching, which cost a total of $3028 for school personnel time. As mentioned earlier, implementation science research not only highlights the importance of supporting personnel at multiple levels, including leadership, but leadership buy-in is also linked to sustainability (Aarons et al. 2016; Domitrovich et al. 2008).

Finally, we examined EBP implementation. Notably, our findings indicated the greatest interest of schools in EBPs focused on Tiers 2/3 (i.e., Check & Connect and Coping Power) as well as restorative practices, which has gained traction nationwide in recent years (Gregory et al. 2018). During the study, schools shared with coaches that they were less interested in LifeSkills because they were not looking for a universal curriculum; reflected by no schools adopting it. We also utilized coach ratings of engagement and EBP implementation to examine the relationship between schools' use of coach time and implementation success. Engagement was positively associated with coach time spent in relationship building and meetings and inversely associated with coach time spent on data completion and preparation and planning. This supports that MTSS-B operates through a service-mediation perspective (Bowden et al. 2017) and suggests that coach face time may be critical for engagement. More time was also spent in relationship building in schools where coaches rated that the school had greater MTSS-B infrastructure and EBP capacity; this may have been because MTSS-B served as a connection and a common interest between the school personnel and coach, whereas schools less committed to MTSS-B may have been

more reluctant to engage with the coach, due to avoidance, limited buy-in, or other work-related pressures precluding implementation.

Although there was no statistically significant difference between the amount of time coaches spent in the schools and the number of EBPs that a school implemented, these analyses were likely under-powered given the small number of school units (i.e., 20). Visual examinations of these data suggested some resource inefficiency whereby schools that were not implementing any EBPs (i.e., indicated by a count of 3) also had a high number of hours logged by coaches. In other words, the goal was that coaching time (inputs) would translate into capacity built for EBP implementation (outputs), and yet coaches spent a lot of time in schools that never adopted an EBP. Coaches likely spent more time in these non-implementing schools to increase their engagement and implementation likelihood. While face time may be critical for engagement overall, this inefficiency suggests that face time with a coach does not necessarily translate into improved EBP implementation, possibly indicating that the approach of bring fixed innovations into schools worked for some, but not all, schools (Real and Poole 2005), that alternative approaches may be needed altogether (Chorpita and Daleiden 2010), or that a broader range of factors that are known to support implementation of EBPs in schools were needing to be addressed (Lyon et al. 2018). On the other hand, coaches also spent more time in schools initially implementing three EBPs, demonstrating a more efficient use of the coaching inputs to promote EBP implementation. Some signs of schools achieving EBP implementation without additional coaching also emerged in examining the Year 1 data.

Limitations

This study focused on the specific activities of systems coaching and their associated costs. Given this focus on coaching, it does not represent the cost of the fully-implemented EBPs, which would have included additional administrative, staff time, and materials costs. It is important to consider this information in the context of the broader set of factors that support implementation of EBPs, such as leadership, the implementation climate, and commitment to implementation (Lyon et al. 2018). Unfortunately, we did not have data assessing engagement or implementation from teachers and administrators to minimize burden on school personnel. Additionally, due to the desire to ensure an accurate total cost and avoid double-counting time, the time spent on supporting EBPs may have been underestimated. An additional area that was not counted is email or brief and informal conversations (i.e., nothing less than 5 min was logged), which may have involved important relationship building or scheduling activities. Finally, it is important to understand a broader distribution of costs for school-based interventions, which might include support from the school district or state.

Conclusions and Implications

The systems coaching in this study sought to disrupt and improve school practices for service delivery to students at-risk of social, emotional, behavioral, and mental health concerns. Leveraging data from an RCT of MTSS-B, the findings indicated that the coach costs were a fraction of a full-time school personnel salary. Relationship building was a substantial portion of the logged coaching time, which is consistent with implementation research identifying buy-in as a key driver behind implementation (Cook et al. 2015; March et al. 2016) and is not a cost frequently identified in economic evaluations. There are additional "hidden" school personnel costs to engage with the coaching, albeit a fraction of the cost of the coach.

Costs, engagement, and EBP implementation are intricately related, and are of central interest in economic evaluations as it relates to cost efficiency. This becomes particularly relevant when considering a systems' desire for coaching, which may both be a source of efficiency or inefficiency, but also plays into decision making regarding the desire for these services (e.g., a cost utility analysis) as do many other areas (e.g., feasibility, buy-in, and alignment to values; Hollands et al. 2019). Future work may inform the extent to which various coaching activities are functionally most cost effective in relation to optimized outcomes for the scale-up of EBPs in systems. These findings also provide greater awareness and transparency regarding some of the hidden costs of coaching that are often overlooked in planning EBP implementation and need to be considered when planning for EBP scale-up (Fagan et al. 2019).

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval No identifying data were collected as part of this study and thus was not considered human subjects research.

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