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A Randomized Waitlist Controlled Analysis of Team-Initiated Problem Solving Professional Development and Use

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Abstract

Data-based problem solving is a hallmark of research-supported practices such as positive behavioral interventions and supports. In this study, we provided members of positive behavioral interventions and supports (PBIS) teams from 38 elementary schools with professional development focused on a research-supported problem-solving model (Team-Initiated Problem Solving). We used direct observations to document procedures, practices, and outcomes before and after participating in the professional development workshop. Within the context of a randomized waitlist controlled trial, team members in the Immediate Group demonstrated greater improvement in (a) problem-solving procedures, (b) decision-making practices, and (c) meeting outcomes than did members of PBIS teams in the Waitlist Group. Our findings extend what is known about team-based problem solving and provide a framework for future research and improved practice related to decision making by school teams.

Keywords

problem solving, team decision making, data-based decision making, positive behavioral interventions and supports

Team-based problem solving (i.e., multidisciplinary groups meeting to use data to identify and address school-based concerns) is an integral part of general education, special education, and school psychology (Boudett, City, & Murnane, 2013; Coffey & Horner, 2012; Tilly, 2008). The expectation that teams of teachers, administrators, and related services professionals will meet regularly to use data to identify and solve academic and behavior problems is a foundation of ongoing efforts to meet the needs of and improve outcomes for all students (Coburn & Turner, 2012; Coffey & Horner, 2012; Newton et al., 2014; Spillane, 2012; Tilly, 2008).

A repeated area of interest related to school-based problem solving has been the need to give teams the right information at the right time and in the right format to bring about functional change (Bahr, Whitten, Dieker, Kocarek, & Manson, 1999; Burns & Symington, 2002; Chafouleas, Volpe, Gresham, & Cook, 2010; Nellis, 2012). There has also been a focus on defining "problem-solving rubrics" that teams can and should use to be effective (Crone et al., 2015; Newton, Horner, Algozzine, Todd, & Algozzine, 2009, 2012; Newton et al., 2014) and on documenting the extent to which teams use these rubrics in authentic settings to plan, implement, and evaluate interventions (Burns, Peters, & Noell, 2008). As we enter a point in history where educators have more information available (Coburn & Turner, 2012; Little, 2012) and are expected to teach more diverse groups of students than ever before (Cruz, 2015; Ellerbrock & Cruz, 2014), it is incumbent on the field to support not only their data-related needs, but also the ways that that information is used to improve school, classroom, and individual student supports.

A variety of problem-solving models have been proposed (cf. Boudett, City, & Murnane, 2005, 2013; Bransford & Stein, 1984; Tilly, 2008). Common across them is a set of steps that, despite being represented with varying terminology or being partitioned into slightly different phases, reflect a consistent, iterative process (e.g., problem identification, problem analysis, and action plan/intervention development, implementation, and evaluation). The promise is that adherence to the process will lead to better outcomes. Yet,

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researchers (Burns et al., 2008; Burns & Symington, 2002; Burns, Vanderwood, & Ruby, 2005; Newton, Horner, et al., 2009) provide a less than encouraging picture of the extent to which systematic or effective problem-solving processes are being used by teams in schools.

What We Know About Team-Based Problem Solving

While team-based decision making in schools is widely recommended and applied, many professionals (cf. Bahr et al., 1999; Burns, Wiley, & Viglietta, 2008; Osterloh, Siemers, & Pray, 2005; Stone, 2001) agree that there is limited research documenting effective practices or valued outcomes. For example, Burns et al. (2008) hypothesized that providing feedback would enhance the procedural integrity of problem-solving processes used by teams in three elementary schools. They found improvements in the use of forms to request and document meeting processes and future meetings as well as in the use of data to develop interventions. They did not document changes in the extent to which the teams measured the integrity with which interventions were implemented, assessed effectiveness of the interventions, or monitored student progress. Similarly, McDougal, Clonan, and Martens (2000) observed four school teams during problem-solving meetings that included discussion of newly identified problems and those to which solutions had already been applied. Across the span of several meetings, independent observers noted ill-defined behavioral definitions of targeted problems, scant baseline or comparison data depicting current levels of targeted behaviors, limited instances where data were shared, and incomplete action plans that would define how solutions would be implemented. More recently, Meyer and Behar-Horenstein (2015) used teacher and principal interviews, observations of team meetings, artifacts, and researcher field notes and memos to describe the challenges faced by a first-grade teacher team in a "Title I rural school" during its second year of response to intervention (RTI) implementation (p. 355). The researchers found that collaborative data-based decision making was no more successful than that carried out by an individual teacher if no one knew how to analyze data. Observers noted that the team lacked collaborative knowledge on how to analyze grade-level data and were more inclined to share generic teaching strategies during collaboration. Recent research with middle school teams by Crone et al. (2015) also expands what is known about team data-based decision making as practiced in schools. While teams identified problems, they tended *not* to move past that step to other critical steps of the problem-solving process (i.e., analyzing the cause of a problem, identifying a goal, designing a goal-directed intervention, implementing the intervention as planned, monitoring student progress, modifying the intervention as needed, and evaluating its effectiveness and planning future actions). Crone et al. also found a strong disconnect between self-reports and observed team practices and concluded that their research underscored " . . . the strong need for effective professional development and capacity building in the area of school-based team decision-making practices" as well as for research examining " . . . the impact of those practices on important student outcomes" (p. 91, 92).

While most research does not provide strong support that teams are using effective and efficient problem-solving practices, extant evidence indicates that the Team-Initiated Problem Solving (TIPS) model with initial professional development and follow-up technical assistance/coaching results in improved team problem solving (Algozzine et al., 2016; Newton, Horner, Todd, Algozzine, & Algozzine, 2012; Todd et al., 2012; Todd et al., 2011). The TIPS approach guides teams to use data to define *precise* problem statements (e.g., not only what problem behavior is occurring, but where it is occurring, when it is most and least likely, who is engaging in the behavior, and the behavioral function maintaining the behavior) and accompanying goals. Next, it leads teams to use these precision elements and desired outcomes to select contextually appropriate solutions. With an action plan for solutions developed, teams then identify avenues to gather fidelity and outcome data to monitor the progress of implementation and outcomes of their efforts. After solutions have been implemented for a specified duration of time, teams are prompted to use fidelity and outcome data to examine the impact of their solutions on the targeted problem. Analysis of the impact is used to refine and improve action plans.

What We Wanted to Know About Team-Based Problem Solving

Across these and other studies is a common theme—the goal of school-based problem-solving teams is finding and implementing effective solutions to school-based problems. Teams are more likely to have access to high-quality data, yet lack the knowledge or skills to accomplish effective problem solving. Highlighted here is the continuing need to implement, evaluate, and disseminate a problem-solving model that can be used and sustained in schools. In the present study, we were interested in extending what is known about TIPS by (a) replicating the effects of TIPS professional development on team problem solving, (b) extending analysis to team implementation of solutions, and (c) assessing impact on student outcomes. We addressed the following research questions:

Research Question 1: To what extent are meeting foundations (e.g., start time, end time, participant roles) similar for teams following TIPS professional development compared with those for Waitlist Group teams?

Research Question 2: To what extent are the meeting problem-solving process (e.g., identify problems with precision, plan, and implement solutions) and outcomes

similar for teams following TIPS professional development compared with those for Waitlist Group teams?

Research Question 3: To what extent are participant perceptions of implementation similar before and after TIPS professional development?

Research Question 4: To what extent are school outcomes (i.e., office discipline referrals [ODRs], out-of-school suspensions [OSSs], end-of-grade achievement) similar for teams following TIPS professional development compared with those for Waitlist Group teams?

Research Question 5: To what extent are team members supportive of professional development in systematic problem solving?

Method

Participants and Settings

Participants were members of 38 positive behavior support teams, 20 teams from schools in North Carolina ($n = 2$ local education agencies) and 18 teams from Oregon ($n = 8$ local education agencies). All participating schools met the following criteria for inclusion in the project: (a) is an elementary school; (b) has been implementing positive behavioral interventions and supports (PBIS) for at least 1 year, as documented by district records (note: 47% of all schools in North Carolina and 50% of all schools in Oregon meet this criterion); (c) has been a user of the School-Wide Information System (SWIS; Horner et al., 2008) during at least the most recent 6-month period (to ensure similar procedures were in place for reporting student behavior); and (d) has a PBIS team that meets at least once a month. Based on these selection criteria, schools were recruited by District PBIS Coaches employed by the local education agency with responsibility for providing PBIS-related professional development and technical assistance to school teams. The PBIS Coaches sent school principals a recruitment letter, provided by the researchers, describing the research and asking principals about their interest in participating. The first schools with a documented interest were selected for inclusion in the project, and all participating team members provided Institutional Review Board (IRB) informed consent prior to their participation in the research study.

Within the context of a 2.5-year, randomized controlled study, we reasoned that the schools were similar on key variables with potential influence on outcomes. To verify equivalence across teams and eliminate concerns about moderator variables, we completed baseline comparisons to document similarities of Immediate (IM) and Waitlist (WL) schools and teams (see Table 1). No statistically significant differences were evident with regard to total school enrollment, percent student enrollment for kindergarten through fifth grade, classroom teachers (commonly known as full-time equivalent [FTE]), teacher–pupil ratio, student ethnicity, and student gender. There was also no statistically significant difference between the two groups with regard to the percent of students participating in federal free and reduced-price lunch programs, or years using SWIS; third-, fourth-, and fifth-grade proficiency scores in reading and math were also statistically undifferentiated across participating schools. No statistically significant differences ($p = .87$) were found with regard to number of team members ($M_{WL} = 9.16$, $SD = 3.17$; $M_{IM} = 9.32$, $SD = 2.56$). The teams also were comprised of similar numbers of male and female members, $\chi^2 = 0.75$, $df = 1$, $p = .39$, and the average age of the members, $t = 1.12$, $df = 329$, $p = .27$; average professional experience (i.e., months at the school), $t = 1.55$, $df = 329$, $p = .12$; average months in current PBIS role, $t = 1.66$, $df = 329$, $p = .10$; average months on the PBIS team, $t = 0.89$, $df = 329$, $p = .93$; total count of ODRs, $t = 0.97$, $df = 36$, $p = .34$; and average number of OSSs, $t = 0.39$, $df = 35$, $p = .70$, were also not statistically different across groups.

During the final year of the study, teams in both groups experienced turnover in team membership; however, the size of the teams did not differ statistically, $t = –1.54$, $df = 35$, $p = .13$, across both years of the project (i.e., 9 vs. 10) and the average number of new team members during the final year was not statistically different, $t = –0.11$, $df = 34$, $p = .91$, for the IM ($M = 4.61$, $SD = 2.43$) and WL groups ($M = 3.56$, $SD = 1.65$). While no data were gathered describing the reasons for changes in team composition, on average, four new team members (approximately 40%) replaced existing members from the first year to the second year of analysis. Shifts in administrators at the participating schools were also examined. We documented higher rates (31.58% new administrators) of turnover in IM than in WL schools (15.79%). The difference was not statistically significant ($\chi^2 = 1.31$, $df = 1$, $p = .25$), and the level of coaching support was comparable (e.g., each school had an assigned coach who met regularly with the team to support PBIS implementation).

Coaching roles were filled by 21 district-or-regional staff (11 in NC and 10 in Oregon) with preexisting responsibility for assisting school teams and faculty in implementation of PBIS. Although there were some changes over the 2 years in the specific individuals filling the roles, the primary responsibilities for those serving as coaches stayed consistent. The largest subset of coaches was comprised of school psychologists ($n = 10$; 48%) followed by district-based PBIS coaches ($n = 6$; 29%). More defined roles also were reported with five (24%) of the individuals employed as PBIS/RTI or Multitiered Systems of Support (MTSS) coordinators in their districts. Finally, one coach was a behavior specialist.

Procedure

We observed teams that met at least monthly to review data and identify and address social and academic problems.

Table 1. Characteristics of Teams and Schools in Immediate and Waitlist Groups.

	Group				
	Immediate (n = 19)		Waitlist (n = 19)		
Characteristic	*M*	*SD*	*M*	*SD*	*ES*
School enrollment (*n*)	493.53	205.99	477.16	195.89	.08
School enrollment (%)					
Kindergarten	16.30	5.86	16.64	2.33	.15
First	15.67	5.73	15.53	2.40	.06
Second	17.29	4.07	15.19	2.48	.85
Third	14.93	4.18	15.06	2.04	.06
Fourth	14.95	3.95	15.69	1.84	.40
Fifth	16.33	5.22	16.03	2.04	.15
Classroom teachers (FTE)	30.10	15.66	30.67	15.55	.04
School teacher–pupil ratio[a]	17.66	3.99	16.89	4.27	.18
Student ethnicity (%)					
African American	22.03	23.68	24.43	26.05	.09
American Indian	0.75	0.62	0.61	0.55	.25
Asian	1.64	1.38	1.76	1.33	.09
Hispanic	23.40	14.55	22.25	13.35	.09
Caucasian	47.68	25.32	46.87	32.04	.03
Multirace	4.46	1.90	4.12	2.03	.17
Student gender (%)					
Male	50.57	2.36	50.85	3.14	.09
Lunch status (%)					
Free	55.52	17.66	61.77	20.27	.31
Reduced-price	9.16	9.58	8.91	10.23	.02
PBIS team size	9.32	2.56	9.16	3.17	.05
Years using SWIS	6.89	3.65	6.37	2.63	.20

Note. No statistically significant differences ($p < .05$) were found between groups. *ES* = mean difference between the Immediate and Waitlist groups divided by the standard deviation of the Waitlist Group; PBIS = behavioral interventions and supports; SWIS = School-Wide Information System; FTE = full-time equivalent.
[a]Average of number of students in school, divided by number of teachers in school, as reported on state education department websites.

Following an initial baseline observation, teams in the IM Group participated in a 1-day professional development workshop and follow-up technical assistance from their district PBIS coach focused on use of the TIPS Model. WL Group teams participated as a "business-as-usual" comparison group until receiving professional development prior to the final research observation.

Intervention. TIPS professional development involved a 6-hr workshop coupled with two coached meetings that teach teams to use evidence-based and effective *meeting foundations* (e.g., assigning roles and responsibilities, using a meeting minute format that guides the agenda, is accessible during the meeting, and documents decisions and impact on student outcomes) and *processes* (using data to identify "problems" with precision, developing actionable goal-oriented solutions, defining action plans to guide implementation of the solutions, assessing implementation fidelity, and assessing impact). The elements of this model and the specific curriculum, research and observation protocols, and other materials (Newton, Todd, Algozzine, Horner, & Algozzine, 2009) are available for review and download at www.pbis.org/training/tips.

While not delivered in a scripted format, the presentations for each workshop were similar and delivered consistently to ensure that participants acquired essential skills. For example, TIPS trainers presented content for a session (e.g., how to identify behavior problems using data from SWIS), interspersed similar questions and activities to assess participants' understanding (e.g., response cards, nonverbal signals), and provided the same modeling or examples of skills in use (e.g., video clips of teams engaged in TIPS problem solving). Participants also completed the same activities, with technical assistance from their PBIS coach, which allowed them to practice and receive feedback related to application of skills within simulated scenarios (e.g., reviewing graphs and reports of data to identify student problems within a hypothetical school). Finally, participants demonstrated acquisition of the skills in applied activities (e.g., taking meeting minutes on a laptop

computer each team brought to the workshop, accessing their school's database, or "drilling down" to determine precise problem statements) and self-assessed the extent to which they were able to implement TIPS protocols. At the end of the session, participants were asked to evaluate the workshop. Depending on local directives, some participants were required to respond to district-based evaluation forms. When this happened, directions were provided to answer the project evaluation form first.

TIPS trainers used a six-item form to gather feedback about the TIPS workshops. Four items were represented as 5-point Likert-type scales (i.e., 1 = *strongly disagree*, 3 = *neutral*, and 5 = *strongly agree*) with statements targeting the clarity of session objective, usefulness of the content presented, amount of practice opportunities provided, and the belief of how the content will help the overall data-based decision making by teams. Two additional items were open-ended and prompted feedback about the most helpful aspects of the professional development and areas for improvement. Open-ended responses were analyzed qualitatively with categories created initially to capture common themes from feedback provided. Next, individual responses were coded to reflect the category represented. Two researchers completed this task with interrater reliability at 95%. Results confirmed that team members provided positive ratings of the workshop content and its value in improving their competence with Meeting Foundations and Problem Solving.

Prior to the TIPS workshop, additional preparation was provided for district coaches assigned to support school-based PBIS teams. The 3-hr TIPS coaching session included an overview of the rationale, objectives, and content for each workshop session, as well as a description of and applied practice with workshop activities. Performance feedback was delivered throughout the session until coaches expressed confidence that they could provide technical assistance during the workshop and before, during, and after successive PBIS meetings at their schools.

Following their professional development workshop, coaches were reminded about the levels of technical assistance that they were asked to provide before, during, and after their respective PBIS team's first two post-TIPS meetings. Given coaches substantial experience at providing PBIS-related support, the TIPS trainers described these responsibilities in general terms: (a) providing the least amount of prompting required to ensure team members progressed through the components of the TIPS model as time allowed; (b) providing corrective feedback and assistance, as needed, if team members omitted component processes or were unable to complete them; (c) providing praise as team members independently completed component processes; and (d) answering team members' questions. We reasoned this additional support was valuable, given the importance of follow-up coaching and the results of previous studies demonstrating the effectiveness of performance feedback for increasing treatment and implementation integrity (Burns et al., 2008; Burns & Symington, 2002).

Measurement. We observed how teams organized and functioned before and after participating in TIPS professional development (Research Questions 1 and 2). We also documented participants' perceptions of team meetings (Research Question 3), general school outcomes (Research Question 4), and social validity (Research Question 5).

Organization and functions of team meetings. We collected data at team meetings using the *Decision Observation, Recording, and Analysis–II* (DORA-II; Algozzine et al., 2016). The DORA-II is a two-part direct observation tool with demonstrated validity and acceptable interobserver agreement (97% for Foundations and 90% for Problem Solving). Critical features of the meeting foundations for effective problem solving that should be in place at the start, during, and at the end of meetings are recorded on the first part of the instrument, and the six steps comprising the TIPS process (e.g., identify problem with precision, identify goal for change, identify solution, and create implementation plan with contextual fit) are documented on the second part. Each record included information about the problem being addressed by the team (e.g., who, what, where, when, why), the data used to illustrate the level of the problem, the solution identified and the implementation plan created to address it, the extent to which the solution was implemented with fidelity, and the impact of the solution. Based on previous research (cf. Algozzine et al., 2012; Newton, Algozzine, Algozzine, Horner, & Todd, 2011; Newton, Horner, et al., 2012), DORA-II provides a useful in vivo measure (i.e., item-by-item count with anecdotal support) of what happened during school-based meetings, and has the advantage of being based on direct observation by trained observers rather than team-member self-reflection.

Once observers met the DORA-II professional development criterion (i.e., interrater reliability with video vignettes of 85% or above) and began collecting research data for the study, we documented interobserver agreement for DORA-II measures by having two observers independently complete a DORA at 34 of the 96 (35%) team meetings (proportionally distributed across schools, data collectors, and the two groups [IM and WL]). In calculating observers' agreement concerning the Foundations variable, we examined the 10 Meeting Foundations items on the observers' DORA-II instruments and compared the content on a discrete trial (item-by-item) basis by (a) adding the number of items both observers agreed the team demonstrated at the meeting (e.g., agenda was available) to the number of items both observers agreed the team did not demonstrate (e.g., previous meeting minutes [were not] available), (b) dividing that total by 10, and (c) multiplying the quotient by 100%. The average interobserver agreement for the Meeting Foundations

variable across the 34 DORAs was 95% (range, 70%–100%) for baseline, 99% (range, 90%–100%) for intervention, and 100% for follow-up observations. The average interobserver agreement for problems identified across the 34 DORAs was 98% (range, 75%–100%) for baseline, 94% (range, 50%–100%) for intervention, and 97% (range, 67%–100%) for follow-up observations. The average interobserver agreement for the problem-solving process variables was as follows: Problem Precision, 88% (range, 40%–100%); Use of Quantitative Data, 98% (range, 0%–100%); Goal for Change Identified, 94% (range, 0%–100%); Solution Implementation Plan, 100%; Solution Integrity Plan, 97% (range, 33%–100%), and Solution Implementation Integrity, 83% (range, 0%–100%); Status of Problem Reported, 82% (range, 0%–100%); and Summative Evaluation Decision, 86% (range, 33%–100%).

We recorded the foundations and problem-solving processes at PBIS team meetings (N = 149) during baseline (O_1: n_{IM} = 19; n_{WL} = 19), after IM Group professional development (O_2: n_{IM} = 19; n_{WL} = 18), and at follow-up (O_3: n_{IM} = 19; n_{WL} = 18). We also collected data after WL Group professional development (O_4: n_{IM} = 18; n_{WL} = 19). Planned observations were not completed at three meetings due to unexpected school-based events (e.g., observer was not notified of rescheduled meeting). No problems were documented during 37 (25%) meetings, and 196 old (n = 139, 71%) and new (n = 57, 29%) problems were documented at the 112 other meetings. The 233 completed observation forms (146 primary observer and 87 reliability observer) were similarly distributed (χ^3 = 1.52, df = 3, p = .68) across O_1 (66, 28%), O_2 (58, 25%), O_3 (55, 24%), and O_4 (54, 23%) phases of the study. Data collection was completed during the spring (O_1, O_3) and fall (O_2, O_4) of consecutive school years, and the distribution of documented problems was also similar (χ^2 = 0.90, df = 3, p = .82) across phases of the study.

Perceptions of team meetings. We developed the *TIPS Fidelity Checklist* (TIPS-FC) to provide school teams with a way to assess whether practices taught as part of TIPS professional development were being used as intended and as a base for actionable plans for improving implementation. Initially, the TIPS-FC was used following each meeting, and when a criterion score of 85% on both Meeting Foundations and Problem Solving was achieved, teams used it less frequently (after 3–5 meetings) to monitor their implementation.

The TIPS-FC is comprised of 18 items representing the content taught as part of the TIPS professional development. The first nine items target effective meeting foundations (e.g., participants have the authority to develop and implement problem-solving solutions; started/ended on time; agenda available), and the remaining nine items assess the core features of problem-solving process depicted within the TIPS model (e.g., Status of all previous solutions was reviewed. Quantitative data were available and reviewed. At least one problem is defined with precision . . .). Items are rated along an implementation scale from *full* (with a score of 2) to *partial* (reflected by a score of 1) to *not yet started* (as noted by a score of 0). Scoring rubrics and data sources for all items are embedded in the measure. Points obtained are converted to a percentage of implementation across the nine items in each category, which results in two scores: (a) Meeting Foundations and (b) Problem Solving.

We also administered an eight-item survey, the *TIPS Coaches Perception Survey*, before and after TIPS professional development (after second coached meeting) to coaches serving teams in the Waitlist Control Group. Initial items on the survey asked coaches to identify their roles, number of teams to which they were providing coaching support, frequency of these meetings, the type of coaching support (e.g., in person, email), and the approximate time dedicated to coaching teams to use TIPS each meeting. Additional items asked coaches to rate their skill acquisition with regard to being able to support teams in implementing TIPS. Each item was ranked on a 3-point scale with a score of 1 reflecting *acquiring* (i.e., in the process of developing skills in the area), a score of 2 to represent being *fluent* (i.e., have skills for coaching in the targeted area), and a score of 3 indicating *proficient* (i.e., an automatic coaching response in this area). Coaches were asked to rank their coaching skills in all six components of the problem-solving process.

School outcomes. To assess the impact of team efforts on student outcomes, we monitored team self-assessment of summative impact scored on DORA-II, and collected annual school summaries of (a) major (e.g., severe incident requiring administrative intervention) ODRs per month as assessed using the SWIS (Irvin et al., 2006; May et al., 2016), (b) rate of OSSs per month as reported using SWIS, and (c) proportion of students meeting state reading and math standards as reported annually to the respective state departments of education.

Social validity. After collecting final DORA-II data, PBIS team members in IM and WL schools were asked to respond via email to a seven-item, online survey about the acceptability of the TIPS model. The first two demographic questions inquired how the team members learned about TIPS (i.e., TIPS trainers; school personnel; state, conference, or other workshop; no preparation; other professional development) and within which year (i.e., 2013–2014, 2014–2015). The subsequent four questions focused on application and outcomes of using TIPS and were rated on a 4-point Likert-type scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *agree*, 4 = *strongly agree*). These four questions asked whether (a) using TIPS improved the efficiency and effectiveness of the PBIS team meetings at my school, (b) using TIPS improved

our school's implementation of interventions with fidelity, (c) using TIPS improved student outcomes, and (d) using TIPS was worth the time and energy required for school teams because of the projected long-term benefits. The final item required participants to type a response to an open-ended question, "How can we improve the professional development and school-based implementation of TIPS?" Participation in the survey was voluntary, and data were gathered from all team members in schools in both Oregon and North Carolina.

Design and Data Analysis

The unit of analysis in our study was PBIS teams from different states participating in a randomized, waitlist controlled trial (Horner et al., 2009; Myers & Dynarski, 2003) that reduced threats to internal validity related to history, maturation, testing, instrumentation, statistical regression, differential selection, experimental mortality, and selection-maturation interaction (Shadish, Cook, & Campbell, 2002). We were primarily interested in differences between teams assigned to either the IM or the WL Group, and we were interested in reducing the potential contribution to experimental error of geography. We employed blocked randomization (Torgerson & Torgerson, 2008) using the six possible sequences of a block size of four (e.g., ABAB, AABB) to achieve balanced assignment of teams from each state. This resulted in nearly equal representation across the two states of PBIS teams with similar demographics being randomly assigned to the IM (n = 19) and WL (n = 19) groups.

The independent variable was professional development in TIPS (6-hr workshop and two follow-up meetings supported by coaches). Baseline observation (O_1) occurred for all 38 teams in the spring of the first year of the study. A second observation (O_2) of all participating teams occurred after TIPS workshop plus two coached meetings were delivered to the IM Group in the subsequent fall. The third observation (O_3) was conducted in the spring of the second year of the project. The final observation of all participating teams (O_4) occurred after the professional development followed by two coached meetings was delivered to the WL Group the next fall.

We used descriptive (e.g., chi-square) and inferential (i.e., t test and analysis of variance with repeated measures) statistics to document and compare DORA scores with α set at the .05 level for determining statistical significance, and we calculated effect sizes (*ES*s) to document practical significance (i.e., .10 for a small ES, .30 for a moderate ES, and .50 for a large ES) (cf. Cohen, 1988). To obtain *ES*s when comparing differences between groups, we calculated Glass's delta by dividing the difference between means by the standard deviation of the control group. To correct for the correlation between scores (r_{xy}) when obtaining ESs for changes within groups, we divided the difference between means by the pooled *SD* of improvement divided by the square root of $2(1 - r_{xy})$. To obtain ESs when comparing associations between categorical variables in nonparametric analyses, we calculated Cramér's V as the square root of the obtained chi-square statistic divided by the sample size times the degrees of freedom.

Results

Our purpose was to assess the impact of systematic professional development in an evidence-based problem-solving model on selected aspects of school-based team meetings: (a) meeting foundations, (b) problem-solving process and outcomes, (c) perceptions of implementation, (d) general school outcomes, and (e) perceptions of social validity. Our findings related to each of these areas extend what is known about TIPS in schools.

Meeting Foundations

Means and standard deviations for meeting foundations and overall problem solving for IM and WL groups over time are in Table 2. We assessed similarities and differences in these scores with a two-factor (Group × Observation) repeated-measures analysis of variance. Mauchly's test indicated that the assumption of sphericity was not violated, $\chi^2 = 5.14$, $df = 5$, $p = .399$. The results indicated that the group by observation interaction effect, $F(3, 99) = 0.48$, $p = .699$, was not statistically significant; however, the main effect for group, $F(1, 33) = 5.14$, $p = .030$, and the main effect for observation, $F(3, 99) = 2.90$, $p = .039$, were significant. Follow-up analyses indicated that Meeting Foundation scores were statistically different for IM ($M = 0.88$) and WL ($M = 0.81$) teams when averaged across the observations and the O_4 scores ($M = 0.89$) were statistically higher than the O_1 ($M = 0.83$), O_2, ($M = 0.85$), or O_3 ($M = 0.80$) scores when averaged across groups. To provide additional information, we compared IM and WL scores separately across each observation. These analyses revealed that DORA Meeting Foundation scores were similar before TIPS professional development at O_1 for the IM ($M = 0.85$) and the WL ($M = 0.79$) teams ($t_{O1} = 1.31$, $df = 36$, $p = .20$, $ES = .38$); similar at O_2 after the TIPS workshop for the IM ($M = 0.87$) and WL ($M = 0.83$) ($t_{O2} = 0.93$, $df = 35$, $p = .36$, $ES = .24$) teams; higher at the O_3 follow-up observation for the IM ($M = 0.87$) than for the WL ($M = 0.74$) teams ($t_{O3} = 2.42$, $df = 35$, $p = .02$, $ES = .68$); and similar at O_4 for the IM ($M = 0.92$) and WL ($M = 0.87$) teams after the WL had also received the TIPS workshop ($t_{O4} = 1.33$, $df = 35$, $p = .193$, $ES = .38$). Taken together, the data indicate that the IM and WL teams entered the study with relatively high Meeting Foundation scores. Both the IM and WL improved their team meeting foundations after professional development, but unlike our prior TIPS research (Newton, Horner, et al.,

Table 2. Means and Standard Deviations for Meeting Foundations and Overall Problem Solving Across Immediate and Waitlist Groups.

	Observation							
	O_1		O_2		O_3		O_4	
Measure/group	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Meeting Foundations								
Immediate	0.85	0.11	0.87	0.13	0.87	0.12	0.92	0.11
Waitlist	0.79	.16	0.83	0.17	0.74	0.19	0.87	0.13
Overall Problem Solving								
Immediate	0.58	0.13	0.74	0.14	0.75	0.16	0.83	0.12
Waitlist	0.65	0.17	0.51	0.30	0.66	0.18	0.79	0.12

Note. O_1 = Baseline; O_2 = Intervention$_1$; O_3 = Follow-up; O_4 = Intervention$_2$.

2012), the teams in both groups had comparatively good meeting foundation elements in place before the study was initiated.

Problem-Solving Process and Outcomes

We assessed the extent to which TIPS professional development was related to improved team problem solving with a two-factor (Group × Observation) repeated-measures analysis of variance. Mauchly's test indicated that the assumption of sphericity was not violated, $\chi^2 = 5.76$, $df = 5$, $p = .331$. The results indicated that main effect for group, $F(1, 34) = 3.14$, $p = .085$, was not statistically significant; however, both the main effect for observation $F(3, 102) = 13.40$, $p < .001$, and interaction effect, $F(1, 33) = 7.70$, $p < .001$, were statistically significant indicating that similarity of the team problem-solving scores for the groups varied across observations. To provide additional information, we compared IM and WL scores separately across each observation. Overall problem-solving scores were similar ($t_{O1} = -1.40$, $df = 36$, $p = .17$, $ES = .45$) for the IM ($M = 0.58$) and WL ($M = 0.65$) teams before the TIPS workshop (O_1); they were statistically significantly higher ($t_{O2} = 3.03$, $df = 36$, $p = .005$, $ES = .96$) for the IM ($M = 0.74$) than the WL ($M = 0.51$) teams after the first TIPS workshop (O_2); and although not statistically different ($t_{O3} = 1.59$, $df = 35$, $p = .12$, $ES = .52$), the IM teams ($M = 0.75$) remained higher than the WL teams ($M = 0.66$) at the follow-up observation (O_3). After the WL teams received training (O_4), IM scores ($M = 0.82$) and WL scores ($M = 0.79$) were similarly high ($t_{O4} = 0.83$, $df = 35$, $p = 42$, $ES = .25$). Taken together, the findings reflect immediate and continuing improvements in team problem solving following participation in TIPS professional development with a large ES at O_2.

We also documented similarities and differences in number and type of problems identified by the teams, how they were "processed," and the extent to which solutions were perceived as resulting in improved outcomes for students. These nonparametric analyses provided targeted information beyond that summarized in the overall DORA-II scores.

Number and type of problems. Over the four observations, we documented 196 problems that were considered by participating teams. IM teams reviewed 85 "old" problems and 31 "new" problems. WL teams considered 54 "old" problems and 26 "new" problems. The number of problems considered by teams was not statistically significantly different ($\chi^2 = 0.77$, $p = .38$, Cramer's $V = 0.06$).

How problems were processed. Key aspects of the problem-solving process were more likely to be used after TIPS professional development. For example, following the TIPS professional development, problems were more likely to (a) be defined with precision ($\chi^2 = 13.18$, $p = .001$, $V = .48$), (b) be developed with implementation goals ($\chi^2 = 23.46$, $p = .001$, $V = .68$), (c) have solution implementation integrity documented ($\chi^2 = 4.96$, $p = .03$, $V = .30$), (d) have summative evaluation decisions documented ($\chi^2 = 4.15$, $p = .04$, $V = .30$), and (e) at follow-up observations, problems identified by IM teams were more likely than those identified by WL teams to have solution implementation integrity ($\chi^2 = 6.21$, $p = .01$, $V = .34$) and status of problems ($\chi^2 = 5.27$, $p = .02$, $V = .28$) documented. In addition, solution implementation integrity was more likely ($\chi^2 = 6.17$, $p = .01$, $V = .41$) to be documented for the IM teams after TIPS professional development (O_2), and solution implementation integrity ($\chi^2 = 3.88$, $p = .04$, $V = .35$) and summative evaluation decisions ($\chi^2 = 5.39$, $p = .02$, $V = .42$) were more likely to be documented for the WL teams at O_4, after they participated in the TIPS professional development.

Perceived benefits for students. To determine the extent to which TIPS professional development was related to benefits for students, we compared the number of problems self-assessed by IM and WL teams as "improved" or "improved to criterion" at each of the four observations. The

distribution of problems documented to benefit students was similar across groups at O_1 ($\chi^2 = 0.00$, $p = 1.00$, $V = .00$) and O_2 ($\chi^2 = 0.03$, $p = .86$, $V = .20$) observations. Of the problems discussed at O_3 ($n = 30$), there were more ($\chi^2 = 4.40$, $p = .04$, $V = .28$) with solutions perceived as benefiting students for the IM teams ($n = 16$, 53%) than for the WL teams ($n = 4$, 53%), and although not statistically significant ($\chi^2 = 3.12$, $p = .08$, $V = .24$), perceived benefits for students were also documented for the WL teams after they participated in the TIPS workshop (O_4).

Participant Perceptions

We also documented perceptions of key participants in our study. Findings related to team members' perceptions of participating in TIPS professional development and implementing the TIPS model as well as coaches' perceptions of implementation are described in the following sections.

TIPS-FC. Means, standard deviations, and analysis of variance summary statistics for team members' perceptions of their decision making before and after TIPS professional development indicate differences consistent with the DORA-II patterns. Statistically significant effects were indicated for team members' perceptions of Meeting Foundations, $F(3,54) = 12.91$, $p = .001$; Problem Solving, $F(3, 54) = 49.14$, $p = .001$; and Overall Implementation, $F(3, 54) = 49.74$, $p = .001$, scores. Follow-up tests indicated that even though teams were at criterion (i.e., greater than 80% on Meeting Foundations), their perceptions of their decision making improved significantly after the workshop and remained positive at the follow-up observation.

Means, standard deviations, and summary statistics for perceptions of six core features of problem solving indicate changes after participating in TIPS professional development. Specifically, ratings were statistically significantly higher reflecting improvements in the extent to which problems were defined with precision ($t = 6.51$, $df = 18$, $p = .001$), goals were identified for problems ($t = 7.51$, $df = 18$, $p = .001$), solutions were documented for problems ($t = 5.88$, $df = 35$, $p = .001$), action plans were identified for problems ($t = 8.32$, $df = 18$, $p = .001$), implementation fidelity was documented ($t = 7.39$, $df = 18$, $p = .001$), and outcome measures were documented ($t = 5.27$, $df = 18$, $p = .001$). ESs ranged from 1.22 to 2.18 reflecting large practical differences for these comparisons.

TIPS coaches' perception of implementation. On average, coaches provided support to one to two PBIS/TIPS teams following the TIPS professional development workshop. A change in time dedicated to coaching was noted with an average of 60 min a month dedicated to coaching PBIS teams before TIPS professional development to an average of 90 min per month after TIPS professional development. On average, they rated their coaching (i.e., helping their teams to implement TIPS with fidelity) as having a more positive impact ($M = 4.14$, on a scale of 1 to 5) after the workshop than before ($M = 3.44$). Their reported confidence with coaching TIPS was also higher ($M = 4.14$) after the workshop than before it ($M = 3.89$). In general and consistent with our other findings, coaches reported increases in all areas of problem-solving following their participation in and use of information in the TIPS professional development workshop.

School Outcomes

Our logic model included both proximal and distal effects. Our primary emphases were (a) documenting changes on team problem solving as assessed by the main features of DORA-II and (b) assessing whether improved problem solving affected student outcomes. We also considered several distal outcomes (i.e., schoolwide behavior and achievement).

Means and standard deviations for monthly levels of ODRs and OSSs were examined for IM and WL schools at three points in time (a) before either group received TIPS professional development (O_1), (b) after the IM had received TIPS professional development (O_2 and O_3), and (c) after both groups had received TIPS professional development (O_4). The total count of ODRs was statistically similar across schools before ($t = 0.97$, $df = 36$, $p = .34$), during ($t = –0.19$, $df = 36$, $p = .85$), and after ($t = –0.05$, $df = 34$, $p = .96$) participating in the project; however, 16 of 19 (84%) IM teams documented a reduction in ODRs per 100 students compared with 10 of 19 (53%) WL teams documenting a reduction in ODRs per 100 students at O_3, and the difference was statistically significant ($\chi^2 = 4.39$, $df = 1$, $p = .04$). No difference between groups in reduction of ODRs was evident for the final year of participation (O_4: $\chi^2 = 0.11$, $df = 1$, $p = .74$).

The average number of OSSs was statistically similar before TIPS professional development (O_1: $t = 0.39$, $df = 35$, $p = .70$) and after initial TIPS professional development (O_2: $t = –0.40$, $df = 33$, $p = .69$), but statistically different ($t = –2.59$, $df = 34$, $p = .01$) at O_3 after the WL teams received TIPS professional development. At O_3, a total of 13 of 18 (72%) IM teams documented a reduction in OSS per 100 students while only six of 18 (33%) WL teams documented a reduction in OSS per 100 students. The difference was statistically significant ($\chi^2 = 5.46$, $df = 1$, $p = .02$), and no additional change was evident for the final year of participation (O_4: $\chi^2 = 1.50$, $df = 1$, $p = .22$) after both groups had received professional development.

We also compared the proportion of students who met reading and/or math state standards on End-of-Grade assessments. No statistically significant differences were identified between the third-, fourth-, and fifth-grade performances in IM and WL schools over the course of the study.

Social Validity

Forty-two percent of respondents (IM) received TIPS professional development in the first year, and the rest (WL) received the TIPS professional development in the final school year. We were interested in participants' perceptions of TIPS at the conclusion of the study. In general, respondents agreed that TIPS (a) helped them conduct efficient and effective meetings (n = 43, M = 3.77), (b) improved implementation of interventions with fidelity (n = 42, M = 3.67), (c) improved student outcomes (n = 43, M = 3.70), and (d) was worth the time and energy required to train a school team in TIPS (n = 43, M = 3.67). No statistical significant difference was found between respondents in Oregon with respondents in North Carolina. Suggestions for improvements (n = 24) included providing more updates and check-ins with teams, scheduling more follow-up workshops and refresher professional development sessions, and simplifying the forms. Overall, based on the Likert-type scale scores, participants found the TIPS process beneficial for running efficient and effective meetings, implementing interventions with fidelity, and improving student outcomes. Participants also indicated the need for continuing professional development and follow-up workshops despite the access to coaches.

Discussion

Schoolwide positive behavior support is " . . . a research-proven strategy to reduce overall levels of problem behavior in schools . . . " (Lewis, Hudson, Richter, & Johnson, 2004, p. 253). Holding regular, focused meetings is among the strongest predictors of initial PBIS adoption and sustainability of positive behavior support in schools (Coffey & Horner, 2012; McIntosh et al., 2013). In the present research, we delivered TIPS professional development to teams tasked with identifying and addressing academic and social behavior problems. The teams were comprised of experienced teachers and other professionals, and all team members had received prior professional development in core features of PBIS. The extent to which practices taught as part of TIPS workshop were being used as intended and as a base for actionable plans for improving implementation was documented. The use of a randomized waitlist controlled design allowed analysis of the impact of TIPS professional development both on the behavior of team members (e.g., use of TIPS process) and outcomes for students.

We found consistent and positive evidence that teams used recommended "meeting foundations" (e.g., agenda, meeting minutes, and assigned roles) before, during, and after participating in TIPS professional development. Three months following TIPS professional development, the use of meeting foundations was statistically significantly higher for the IM Group than the WL Group, but the absolute levels of meeting foundations remained near or above 80% for both groups throughout the study. This is different from the baseline levels of around 60% for meeting foundations we have observed in prior research (Newton, Horner, Algozzine, et al., 2012), and may be related to the active professional development in meeting foundations provided by PBIS trainers in both Oregon and North Carolina during the 3 years prior to initiating this study. Both the IM and the WL groups were engaging in meeting foundation practices that are recommended by the field; however after the TIPS professional development workshop, the IM Group was more observant of these practices than the WL Group.

A central consideration for this research was the ability of typical school teams to identify academic and social behavior problems, build practical data-driven solutions, and embed these solutions in functional action plans. At Baseline (O_1), teams from the IM and WL groups were not statistically significantly different, and were operating at a modest level of about .60 in use of effective problem-solving practices. Following TIPS professional development, there was a statistically significant difference between the two groups with trained teams engaged in problem-solving practices at between 75% and 85%. Teams that received TIPS professional development were more likely to (a) identify a goal, (b) identify a solution, (c) define a goal, (c) implement a solution, (d) assess fidelity of solution implementation, and (e) assess the extent to which the identified problem improved.

When TIPS was implemented, we saw teams that functioned differently than during baseline. Meetings began with a central focus and operated with minimal side conversations. Data were reviewed within the first 5 min of the meetings. Academic and behavior problems were identified with greater precision. Solutions focused more on altering the environment around the student(s) and less on internal change of the student. Solutions selected also transitioned away from global strategies (improve social/emotional competence) to strategies that were targeted, precise, and linked directly to the local context. The improved problem-solving performance of teams following TIPS professional development is consistent with our prior experience (Newton, Horner, Algozzine, et al., 2012; Todd et al., 2011).

While the primary focus of this study was on the impact of TIPS professional development to improve the problem-solving practices of school teams, we would be remiss to not assess whether the solutions resulting from improved problem solving (a) were implemented and (b) improved student outcomes. Answering these questions requires caution given that teams were less likely to produce solutions prior to professional development. Comparison of team meetings where both a problem and a solution were identified indicates that following TIPS, professional development teams were more likely to perceive their solutions as being implemented, and more likely to perceive their solutions as producing desired change in student behavior.

Limitations

Our results should be viewed in the context of limitations. Participants were members of elementary school teams that were implementing PBIS and using SWIS to collect data and produce reports about student ODR rates. The schools were recruited by PBIS District Coaches from a sample of convenience; the first North Carolina schools and the first Oregon schools that expressed interest were selected for participation. Given the selection criteria, the fact that teams were randomly assigned but not randomly selected, and the relatively small number of teams, the question of generalizability of the findings must be a concern.

The teams we observed sometimes served different purposes depending on when we observed them. For example, while the focus of the October meeting at one school was documenting and addressing the problem behavior of two students on the playground, the focus at another school was redesign of a whole-school PBIS curriculum. While this uncontrolled variation in the level of "problems" addressed at each meeting was distributed across IM and WL group teams, its effects are unknown and represent a potential limiting factor for our findings.

Implications for Future Research and Practice

Our focus in this study was on the "team" as the unit of analysis, and we did not assess performance of individual team members. Future research that addresses the consistency of team member perceptions or the value of building team agreements and team purpose before attempting problem solving would be warranted. There are also directions for continuing research examining the effects of the TIPS procedures when implemented with (a) a larger and randomly selected sample of school teams, including teams in middle schools and high schools; (b) problem-solving teams in schools that use behavior support systems and data management systems other than PBIS and SWIS; (c) problem-solving teams in schools that focus more on academic student problems; and (d) district-level teams that problem solve at the administrative level. Future research will also benefit from implementation with teams that meet more frequently (e.g., weekly) and attend to a more consistent array of problems. We also encourage future researchers to formally measure the impact of team-implemented solutions rather than just recording the impression of team members on student outcomes (although our formal assessment of the covariation of team assessment and permanent product data was encouraging).

Although the average interobserver agreement for all of the DORA-II variables exceeded 80%, some of the lower range values suggest a need to improve the procedures whereby observers are trained. One improvement for practice would be to revise the DORA-II professional development workshop so that observers use DORA-II to record data (a) when reviewing a greater number of written vignettes that sample the range of problem-solving processes and (b) when viewing one or more videotapes of actual PBIS team meetings. These changes have been made in DORA-II professional development materials produced since completion of data collection.

Conclusion

As education embraces the revolution in information technology, a growing consideration will be the extent to which school personnel are trained to use the wealth of new data for active problem solving. Information will help guide school improvement *only* if educators have the skills and knowledge to transform information into action. The present study suggests that the meetings being conducted by teams in U.S. schools are not currently applying effective problem-solving protocols, but that with a modest investment in professional development and coaching, these same teams can become more effective agents for improving the educational effectiveness of schools. For those preparing to further this line of research, we encourage the use of direct observation of teams via measurement tools like the DORA-II. Much more is needed, however, to help guide the design of effective and efficient educational solutions. We are encouraged by the finding that after TIPS professional development, teams were able to build action plans, implement solutions, and perceived their solutions as benefiting students. More is needed to guide the support that school teams receive from trainers, coaches, and related services personnel. We believe that the present results offer a constructive start.

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