Examining the Effects of a Brief, Group-Based Motivational Implementation Strategy on Mechanisms of Teacher Behavior Change

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Abstract

Training and consultation are core implementation strategies used to support the adoption and delivery of evidence-based prevention programs (EBPP), but are often insufficient alone to effect teacher behavior change. Group-based motivational interviewing (MI) and related behavior change techniques (BCTS; e.g., strategic education, social influence, implementation planning) offer promising adjuncts to training and consultation to improve EBPP implementation. Beliefs and Attitudes for Successful Implementation in Schools for Teachers (BASIS-T) is a theoretically-informed, group-based, motivational implementation strategy delivered prior to and immediately after EBPP training. The purpose of this study was to examine the proximal effects of BASIS-T on hypothesized mechanisms of behavior change (e.g., attitudes, subjective norms, intentions to implement) in the context of teachers receiving training and consultation for the Good Behavior Game. As part of a pilot trial, 83 elementary school teachers from 9 public elementary schools were randomly assigned to a BASIS-T (n = 44) or active comparison control (n = 39) condition, with both conditions receiving GBG training and consultation. Theorized mechanisms of behavior change were assessed at baseline and immediately post-training to examine the proximal effects of BASIS-T. A series of mixed effects models revealed meaningful effects favoring BASIS-T on a number of hypothesized mechanisms of behavior change leading to increased motivation to implement GBG. The implications, limitations, and directions for future research on the use of group-based MI and other BCTs to increase the yield of training and consultation are discussed.

Keywords: Individual determinants, Implementation strategy, Theory of planned behavior, Health Action Process Approach, Good Behavior Game, Behavioral intentions

Examining the Effects of a Brief, Group-Based Motivational Implementation Strategy on Mechanisms of Teacher Behavior Change

Training and consultation are cornerstone implementation strategies used to facilitate the implementation of evidence-based prevention programs (EBPP; Lyon Pullman, Walker, D'Angelo, 2017). While training and consultation can be effective for some implementers (Sanetti & Collier-Meek, 2015), these strategies alone are often insufficient to ensure adoption and delivery of EBPPs with adequate fidelity and reach (Beidas & Kendall, 2010; Weissman et al., 2006). There is a need for supplemental strategies that increase the yield of training and consultation (Beidas & Kendall, 2010; Lyon et al., 2019). Group-based motivational interviewing (MI) and related behavior change techniques (BCTs: e.g., strategic education, social influence, action and coping planning) offer promising and complementary adjuncts to training and consultation to improve the uptake and delivery of EBPPs as a way of preventing social, emotional, and behavioral (SEB) problems among children (Lyon et al., 2019; Sanetti, Kratochwill, & Long, 2013). The current paper describes the rationale and findings from a randomized controlled trial (RCT) of a group-based, theory-driven implementation strategy that targets malleable individual-level determinants of behavior change (e.g., motivation, intentions to implement) to increase implementation among teachers receiving support to adopt a universal EBPP (i.e., the Good Behavior Game [GBG]; Barrish, Saunders, & Wolf, 1969).

Implementation strategies, determinants, and mechanisms

One in five children experience SEB problems that impair academic performance, interpersonal relationships, and increase risk for negative outcomes in adulthood (Perou et al., 2013). Schools are the primary setting that children access services that aim to prevent and address SEB problems (Sanchez et al., 2018). A number of EBPPs are available for use in

schools to prevent and address SEB difficulties (Owens et al., 2014). However, research consistently demonstrates that these EBPPs are unevenly adopted and poorly implemented (Kretlow et al., 2013), which substantially limits potential public health benefits. To address persistent implementation gaps, implementation researchers have increasingly focused on developing and testing implementation strategies, defined as methods or techniques used to enhance the adoption, implementation, and sustainment of a program or practice (Powell et al., 2017; Proctor, Powell, & McMillen, 2013). Implementation strategies are categorized as discrete (i.e., involving one specific process or action), multifaceted (i.e., a combination of two or more discrete strategies), or blended (i.e., multifaceted strategies that follow a protocol) (Powell et al., 2012). To be optimally effective, strategies should be designed to address specific determinants (i.e., barriers and facilitators) that obstruct or enable implementation success (Lewis et al., 2018; Powell et al, 2017).

Although the importance of attending to and addressing determinants of the inner organizational setting where implementation happens (e.g., school building) is well-recognized (Aarons, Hulburt, & Horwitz, 2011; Beidas & Kendall, 2010), individual-level factors associated with those who are expected to implement EBPPs are also important (Brackett, Reyes, Rivers, Elbertson, & Salovey, 2012; Dart, Cook, Collins, Gresham, & Chenier, 2012). For example, some studies indicate that individual factors (e.g., attitudes, outcome expectancies, behavioral intentions, planning) may be more predictive of EBPP use than organizational factors (Locke et al., 2019). Further, while organizational strategies can yield encouraging results (Aarons, Ehrhart, Farahnak, & Hulburt, 2015), they are often time consuming and expensive (Glisson, 2002). Because implementation ultimately rests on the motivation, decisions, and behavior change of individuals within service delivery settings (Michie, Van Stralen, & West, 2011), it is

critical to develop pragmatic (i.e., low-resource and contextually-appropriate) implementation strategies that target specific individual-level determinants (i.e., barriers and facilitators) linked to improved adoption, delivery, and sustained use of EBPPs (Powell et al., 2018).

At the individual level, high-quality training is a cornerstone implementation strategy (Lyon, Pullmann, Walker, & D'Angelo, 2017) used to support adoption of EBPPs, yet many teachers still fail to adopt practices following training and others demonstrate significant reductions in fidelity within two weeks of training (Mouzakitis, Codding, & Tryon, 2015). Follow-up consultation typically includes a variety of BCTs (e.g., performance feedback, modeling, education) that are deployed to promote implementer use of EBPPs with fidelity (Cook, Lyon, Locke, Waltz, Powell, 2019). While research demonstrates that the use of consultation leads to improved implementation outcomes (Noell et al., 2005), this strategy is costly (e.g., time, money, and energy; Olmstead, Carroll, Canning-Ball, & Martino, 2011). Moreover, not all implementers are responsive to consultation, as they may be insufficiently motivated to change (Sanetti & Collier-Meek, 2015). Although training and consultation together may be effective in changing behavior for a subset of those who are expected to deliver an EBPP, they are insufficient when used in isolation to ensure that the majority of implementers who receive these supports eventually adopt and deliver EBPPs with adequate fidelity and reach (Beidas & Kendall, 2010; Sanetti, Kratochwill, & Long, 2013). Thus, there is a need for additional strategies that increase implementer responsiveness to training and consultation (Sanetti & Collier-Meek, 2015; Weissman et al., 2006). These complementary strategies must be practical, timely, and target precise individual-level mechanisms of behavior change that impact implementers' responsiveness to EBPP training and consultation (Powell et al., 2019).

Implementation strategies can be optimized by targeting precise, theory-informed

mechanisms of action (Lewis et al., 2018). However, explicit use of theory for implementation strategy development and evaluation is rare (Lewis et al., 2018). At the individual level, adult behavior change theory has increasingly been applied to conceptualize and influence implementation behavior (Eccles et al., 2007; Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008; Sanetti et al., 2013). The theory of planned behavior (TPB) is a widely used theory of adult behavior change, which explicates predictors of behavior; specifically, that a person's behavioral intention (i.e., conscious plans to exhibit particular behaviors; Ajzen, 1991) is one of the best predictors of their behavior. Within the TPB, behavioral intentions are a function of three preconditions: (1) an individual's attitudes (cognitive appraisals of the behavior in question), (2) subjective norms (an individual's own estimate of the social pressure to perform the behavior), and (3) perceived behavioral control or self-efficacy (the extent to which an individual feels confident about being able to perform the behavior).

While a number of studies have shown the predictive validity of the TPB's preconditions to behavioral intention, a major limitation of the model is the "intention-behavior" gap, which is characterized by individuals who are motivated to change but do not take action (Rhodes & de Bruijn, 2013). The Health Action Process Approach (HAPA; Schwarzer et al., 2011) addresses this limitation through the inclusion of both motivational and volitional phases. The motivational phase is essential to increase implementer intentions to implement, while the volitional phase is essential to ensure that implementers are able to take action based on their motivation. The main mechanisms of action identified in the volitional phase are the maintenance of motivation and the development of action (i.e., identifying the when, where, and how of intended behavior) and coping plans (i.e., the anticipation of barriers and the design of alternative actions that help to attain one's goal despite the impediments). Leveraging their strengths, the TPB and HAPA can

be used to develop more precise and potentially effective implementation strategies that target key mechanisms of individual behavior change.

Beliefs and Attitudes for Successful Implementation in Schools for Teachers (BASIS-T)

Grounded in the TPB and HAPA, Beliefs and Attitudes for Successful Implementation in Schools for Teachers (BASIS-T) is a group-based, blended implementation strategy developed to target individual-level determinants of behavior change. BASIS-T is EBPP agnostic and designed to be coupled with any EBPP that aims to prevent or address student SEB development. BASIS-T employs strategies targeting each TPB and HAPA component, using: (1) strategic education about EBP and intervention fidelity to improve attitudes toward EBP, (2) social influence techniques to alter perceptions of subjective norms, (3) group-based MI techniques to enhance implementer autonomy and perceived behavioral control, and (4) action and coping planning to enhance likelihood of movement from intention to behavior. Figure 1 displays the core BASIS-T components, as well as their respective mechanisms of change (described in more detail in "Methods" section).

BASIS-T is a facilitated group experience that convenes teachers to reflect on specific content, share ideas, and problem-solve issues with adopting new practices. Depending on their level of motivation to implement following EBPP training, teachers convene in smaller groups to either begin implementation planning or to explore the pros and cons of implementing small components of the EBPP. The facilitator uses group-based MI techniques to elicit change talk (e.g., open-ended questions, reflective listening, ruler questions, pros/cons), honor participants' autonomy, and promote their sense of collective and self-efficacy. Group-based MI has a growing but limited literature base (e.g., Tucker et al., 2017; Wagner & Ingersoll, 2012), with limited to no studies examining the use of it as an implementation strategy.

In practice, BASIS-T is a relatively brief (4-5 hour) interactive session delivered to teachers prior to (i.e., pre-training session) and immediately following EBPP training (post-training but pre-consultation session). Although most strategies tend to focus on the active implementation phase (Powell et al., 2015; Cook et al., 2019), BASIS-T is conceptualized as a pre-implementation strategy, delivered as at the transition between preparation and active implementation (Aarons, Hulburt, & Horwitz, 2011). BASIS-T is not intended to replace other implementation supports, such as high-quality training, coaching, and organizational factors (e.g., leadership, policy). Rather it is designed to be compatible with and facilitative of other organizational (e.g., improving leadership) and innovation-specific (e.g., ongoing professional development connected to professional learning communities) implementation supports.

Evaluation of previous version of BASIS-T

A previous version of BASIS-T, designed to support school mental health clinicians to deliver an evidence-based, trauma-focused intervention (i.e., Cognitive Behavior Intervention for Trauma in School [CBITS]; Jaycox, Kataoka, Stein, Langley, & Wong, 2012) was tested in a National Institute of Mental Health-funded RCT (Lyon et al., 2019). When delivered alongside high quality training and gold standard follow-up consultation, results of the RCT indicated that the blended implementation intervention had significant effects on the majority of its proximal outcomes, with intervention clinicians demonstrating higher levels on target mechanisms relative to the attention control at post-training. This included medium to large effect sizes for attitudes, descriptive social norms, self-efficacy, and intentions to implement. However, these changes did not persist over time and EBPP adoption rates remained low across both the intervention and control groups. Exit interviews indicated that implementers' behavioral regulation (i.e., behavioral, cognitive and/or emotional skills for managing or changing behavior; Michie et al.,

2017) constituted a major individual-level influence on implementation behavior (Larson, Merle, Cook, & Lyon, in preparation). Given findings, and the needs of teachers delivering EBPP in schools, the pre-implementation strategy was revised and refined for testing in this study.

Study aims

This study examined the proximal effects of BASIS-T on hypothesized mechanisms of behavior change (i.e., attitudes, perceptions of social norms, self-efficacy, and behavioral intentions to implement) in the context of supporting teacher implementation of a well-established universal EBPP (the Good Behavior Game; see Method for description; Barrish et al., 1969). This evaluation occurred as part of an Institute of Education Sciences-funded study designed to develop and experimentally test the revised BASIS-T implementation strategy as an augment to EBPP training and consultation. We hypothesized that teachers randomized to BASIS-T would demonstrate greater changes in target mechanisms (i.e., attitudes, social norms, perceived behavioral control) from pre-training to post-training (hypothesis 1), and would demonstrate higher intentions to implement (hypothesis 2).

Method

To address the study aims, we conducted a RCT of the effects of BASIS-T relative to an active control comparison condition on mechanisms of behavior change proximal to the adoption and delivery of GBG.

Setting and Participants

Teachers from nine schools from a school district in the Midwest region of the United States were recruited to participate in this study. The district was selected based on interest in improving the delivery of EBPP. The schools had an average enrollment of 422 students (range 323-520) and served a relatively racially (M = 26%, range: 44%-96% non-White) and

socioeconomically (*M*=44%; range: 14%-79%) diverse student population. All nine elementary schools were actively implementing the universal level of school-wide positive behavior interventions and supports, although no data were available on the extent to which it was being implemented with fidelity. Randomization to condition occurred at the school level to reduce contamination across participants. Out of all staff in the nine schools, 88 teachers consented to participate (see CONSORT diagram; Figure 2). Of these, 83 (94.3%) teachers attended the EBPP training. The primary reason teachers did not participate was that they were too busy. Of those attending the training, 81 teachers completed both pre- and post-training surveys. Chi-square and t-test analyses uncovered no statistically significant differences between post-survey completers and non-completers on gender, race, grade(s) taught, or any of the outcome variables collected at baseline. Table 1 displays participant demographics for the complete sample and stratified by condition, with χ^2 and t-test analyses to test for condition differences.

[Figure 2. CONSORT Diagram]

[Table 1. Demographic and descriptive information for completer sample]

Procedures

IRB approval was obtained by the university human subjects committee and the school district research department. Recruitment procedures began through communications with district leadership regarding the needs within elementary schools and GBG. This led to conversations with elementary principals regarding the nature of the project and providing opportunities to ask questions. Interested principals, met with their teaching staff to identify teachers who indicated an interest in receiving free training in an EBPP. Participating schools were randomly assigned to the BASIS-T condition or the active comparison (AC) control condition via a nearest neighbor analysis using variables related to enrollment size, percent of

students receiving free and reduced priced meals, and percent of non-White students. Pairs were identified via the best match as identified by nearest Euclidean metrics. Each school had a single best matching school with one exception, which was assigned to its second and third closest matching schools, as they were a match, in order to facilitate a three-way match with the smallest overall Euclidean distance. Within these pairs and the triple match, we randomly assigned to one of the two conditions. Post-assignment, the groups were very similar, with no statistically significant differences on any of the matching variables, no differences on several other student variables including percent of English language learners, qualified for special education, homeless, and no differences on percent of teachers with an advanced degree. Teachers were contacted via email to obtain consent and a link to the pre-training survey via Qualtrics. Online pre- and post-training surveys were collected from the AC condition and BASIS-T condition. Teachers received $140 for participating in training and $50 for each wave of data collection.

Study conditions

Active comparison control. Teachers randomly assigned to AC received a 3-hour pre-training session prior to GBG training, designed to control for dose and delivery of information. The AC facilitator defined, described, and advocated for EBPP implementation in schools and used an educational approach that emphasized didactic delivery of content with opportunities for teachers to reflect on the information that was shared. Teachers in the AC condition also participated in a 1-hour post-training, which involved them reviewing and discussing the importance of EBP implementation and reviewing the definition and dimensions of fidelity.

BASIS-T Condition. The BASIS-T condition consisted of pre- and post-training sessions bookending GBG training (see below). In this condition, teachers participated in a 3-hour group-based, interactive, motivationally focused session delivered by a member of the

research team, which bookends training by hosting a pre-training session prior to training and a post-training session immediately after training. Throughout BASIS-T, three components are embedded into a mixture of didactic information and interactive group-based activities, designed to target four theorized mechanisms of behavior change that lead to improved implementation outcomes (e.g., adoption, fidelity, and reach; see Figure 1 and Supplemental File 1). Components are described below per guidelines for implementation strategy reporting (Proctor, Powell, & McMillen, 2013).

Component 1: group-based motivational interviewing to enhance self-efficacy.

Group-based MI was used to help teachers explore their values, identify reasons to change when provided opportunities, resolve ambivalence to change, and problem-solve barriers to adopting and delivering new practices. MI shows significant effects on adult and youth health behaviors (Connell, Dishion, Yasui, & Kavanaugh, 2007) and EBP implementation among teachers and primary care providers (Frey et al., 2013; Reinke, Herman, & Sprick, 2011). Evidence for using group-based MI is still emerging (LaBrie, Thompson, Hutching, Lac, & Buckley, 2007). In this study, the BASIS-T facilitator utilized group-based MI by adopting an empathic, supportive, and nondirective style to elicit self-motivational statements, encourage elaboration of change talk among the group, and promote self-efficacy. Teachers engaged in a values clarification activity, shown to decrease defensiveness toward change and enhance motivation to engage in value-congruent behavior (Walton & Cohen, 2011). Teachers were asked to reflect on and share their values and encouraged to connect participating in training to their professional values. Teachers also complete a decisional balance activity by reflecting on the pros and cons of changing or not changing their classroom practices over time. Group-based activities were used to encourage the anticipation of barriers and engage in collaborative problem solving to brainstorm solutions to

barriers. Additionally, teachers were asked to recall other times they successfully made changes in their careers, highlighting their capability to take on and implement new practices. Throughout the session, the facilitator used standard MI techniques: elaborate on change talk, express empathy, roll with resistance, and emphasize autonomy.

Component 2: strategic education to improve attitudes toward EBP. BASIS-T uses strategic education to (1) support teachers to learn and reflect on the benefits of EBP for them professionally and for the students they serve, as well as (2) alter any previously held beliefs they may have had about negative outcomes associated with EBP (Aarons, 2005). For example, teachers learned about the importance of increasing the reach of EBPP and explored the challenges to reach when teachers do not adopt and deliver EBPPs. In addition, definitions and dimensions of fidelity (e.g., adherence, competency) were presented. Teachers were prompted to reflect on the critical importance of fidelity across a range of professions and encouraged to read and discuss a text discussing flexibility within fidelity and education as art and science. Moreover, teachers learned about the outcomes of popular but ineffective practices (e.g., diet fads, learning styles) and how to recognize cognitive "shortcuts" that enhance individual vulnerability to adopting non-EBPs.

Component 3: social influence techniques to alter perceptions of subjective norms. BASIS-T also relies on evidence-based social influence techniques. In particular, two strategies were used: (1) social proofing messages ("social proofs") that use data or testimonials to describe the behavior or attitudes of others, and (2) strategies to induce cognitive dissonance. Social proofs have been effectively used to reduce a range of problem behaviors (Perkins, Meilman, Leichliter, Cashin, & Presley, 1999). Evidence suggests that social proofs are most influential when people are given information about the current behavior of individuals with whom they

closely identify. In BASIS-T, normative data and testimonials are used to validate teacher experiences of EBPP implementation barriers (e.g., lack of time, low administrative support), and model commitments to problem-solving these barriers. In addition, expert testimonials address common myths about EBPPs (e.g., that they are inflexible). Moreover, strategies to induce cognitive dissonance operate on the premise that individuals strive for consistency between their attitudes and actions. Thus, desired behaviors can be increased by evoking commitments that are active (rather than passive), public (rather than private), and voluntary (rather than coerced; Petrova, Cialdani, & Sills, 2007). In BASIS-T, teachers set public goals for EBPP training and implementation, and collaboratively generated potential solutions to overcome common implementation barriers (e.g., time; lack of supervisor support). Teachers' ideas were compiled and they are told their ideas would be shared with other teachers who may encounter similar barriers. This activity was intended to position teachers to freely and publicly advocate for potential solutions to EBPP implementation.

Post-training session. The post-training session was a one-hour tailored experience based on classifying participants as intenders or pre-intenders using a measure of intentions to implement (see below) collected immediately post EBP training. Participants who endorsed they intended to implement GBG were classified as intenders and grouped together to receive an experience that emphasized implementation planning, while those participants who indicated they were uncertain about implementing GBG were classified as pre-intenders and received motivational enhancement experiences designed to increase their intentions to implement GBG. The intender group began by normalizing and validating experiences and feelings following participating in an EBPP training (e.g., exciting, overwhelmed, optimistic) and then transitioned into implementation planning (Schwarzer et al., 2011). Implementation planning involves

supporting implementers to develop action and coping plans that enable them to follow through with implementation. Action planning involved identifying the why (goals to be achieved through implementation), what (specific practices), how (details to integrate practices into classroom routines), by when (time frame), and reminders (cues and prompts in environment as reminders). Coping planning involved identifying obstacles that are likely to obstruct the action plan and solutions to overcome those obstacles when confronted. The solutions generated during the pre-training session were shared with participants as a resource. To end, participants in the intender group shared their action and coping plans with one another.

The pre-intender group incorporated several group-based MI strategies as a way of promoting motivation to implement GBG, even trying out or observing one or two of its core practices. First, the facilitator honored teachers' autonomy to make choices that are in their best interests or those of their students. Next, teachers completed the following ruler question: "*On a scale from 1 to 10, what number best reflects your perceptions about whether GBG practices provide an opportunity to improve student behavior? Why did you give it that number and not a lower one*?" After the ruler question, in small groups participants discussed the potential pros and cons of implementing or not implementing parts of GBG. Then participants discussed the idea of *test-driving* GBG as a no-strings-attached way of ensuring that perceptions of GBG tasks aligned with its actual performance to make a more informed decision. They were presented with ways of test-driving particular practices associated with GBG: (1) select one and try it out, (2) observe another person who is implementing GBG practices to see it in action, and (3) try the whole thing for a certain period of time, then make a decision. The session ended with developing a brief plan moving forward, including test-driving GBG or revisiting the idea of implementing GBG at a later time point during the school year.

GBG training and consultation

GBG is a universal EBPP selected for use in this project. GBG is an interdependent group contingency in which all members of a group (i.e., team) have access to the same consequence, based on the behavior of the collective group (Barrish et al., 1969). GBG encourages teacher use of social learning principles within a game-like context to reduce disruptive behavior and facilitate engagement. GBG has been evaluated for almost 50 years (e.g., Domitrovich et al., 2010) and endorsed as effective by numerous agencies (e.g., U.S. Center for Substance Abuse, NIDA, OJJDP), leading to its identification as a best practice and potential "universal behavioral vaccine" to reduce the incidence of adverse social problems (Embry, 2002). In the current study, all teachers participated in a standard, 1.5-day GBG training delivered by certified trainers, blinded to condition, after receiving BASIS-T or AC. GBG training included best practices for educational meetings: didactic content delivery, modeling, rehearsal activities, and performance-based feedback. Trainers also provided follow-up consultation to embedded coaches in each school who served as a resource to teachers in their building who may need additional support to adopt and deliver GBG with fidelity.

Measures

For the purposes of this study, pre- and post-intervention data were used, which were gathered prior to consultation. A detailed description of all study measures, including reliabilities in the current sample, is provided in Supplemental File 2.

Beliefs and attitudes. Teachers completed several measures assessing their beliefs and attitudes regarding the behavior management and EBPP. Eleven items from the school-adapted version of the Evidence-Based Practice Attitudes Scale (EBPAS; Cook et al., 2019) were used to assess the extent to which teachers' were open to using new EBPP, likely to adopt if the EBPP

were appealing, and the extent to which EBPP fit with current practice, philosophy or approach. Attitudes and beliefs were measured at baseline and post-intervention.

Perceived social norms. The modified Subjective Norms measure, used in previous studies and based on guidelines for developing reliable and valid measures of TPB constructs (Francis et al., 2004), was used to capture two types of EBPP implementation-related subjective norms: injunctive (what a social group would approve of) and descriptive (how a social group actually behaves).. Perceived social norms were measured at baseline and post-intervention.

Perceived behavioral control. The Perceived Behavioral Control measure, constructed based on guidelines for developing reliable and valid measures of TPB constructs (Francis et al., 2004), was used to capture teachers' confidence and self-efficacy regarding implementation of EBPP generally, as well as GBG-specific practices. Perceived behavioral control was measured at baseline and post-intervention.

Behavioral intentions to implement. The Intentions to Use measure, constructed based on guidelines for developing reliable and valid measures of TPB constructs (Francis et al., 2004), was used to capture teachers' intentions to implement EBPP generally and core GBG practices specifically. This scale was administered baseline and post-intervention.

Data analytic approach

Means and standard deviations were calculated for all scales and subscales at baseline and post-training. We computed a mixed effects model with a random effect term for school to control for nesting and random assignment by school. Data from three measures (i.e., Attitudes—Outcome Expectance, Attitudes—Ownership, and the Task and Practices Self Efficacy) had negligible school-level variance, and therefore the random effects for these variables were fixed to permit model convergence without Hessian errors. For variables derived

from measures collected at pre- and post-training, models predicted post-training score, using baseline score was as a covariate and condition as a predictor. Intent to implement GBG was not collected at baseline; therefore, we computed mixed effects models with condition as a predictor to compare conditions at post-training. There were very few missing data (n = 8), for which we used pairwise deletion. Due to the pilot nature of this study, we did not adjust for familywise error rate. Consistent with established guidelines for interpreting findings from inferential analyses (Lorah, 2018), interpretations were not based solely on statistical significance but also on effect size estimates in the form of standardized effect sizes, obtained by computing mixed effects models as described above using measure z-scores, and interpreted as the amount of standard deviation units in which BASIS-T differs from the control at post-training. Positive estimates were computed to indicate that effects favored BASIS-T over the AC.

Results

Table 2 depicts the estimated outcomes from mixed effects modeling, controlling for baseline score. Eight out of nine outcomes tested as part of Hypothesis 1 were in the predicted direction, all with BASIS-T scoring higher than the AC group, although only two were statistically significant. Testing for Hypothesis 2, teachers' intentions to implement GBG, was not statistically significant but strongly in the predicted direction (Est. M BASIS-T = 5.13, Est. M Control = 5.98, p = .023). Standardized coefficient effect size estimates for the nine outcomes in the predicted direction ranged for BASIS-T from.172 to .695. The largest estimates was for Task and Practices Self Efficacy (.695), which can be interpreted as the BASIS-T condition having an average score that is .695 standard deviation units higher than the AC condition. Intentions to Implement (.507), and Attitudes—Outcome Expectancy (.497), and the smallest for Attitudes—Ownership (-.188), EBPAS—Appeal (.172), and Practice-specific intentions (.173).

With regard to statistical significance, the Outcome Expectancy subscale of the Attitudes measure (Est. M BASIS-T = 6.23, Est. M Control = 5.76, p = .023) and the Task & Practices Self Efficacy measure (Est. M BASIS-T = 5.68, Est. M Control = 6.31, p = .023) were significant. [Table 2. Mixed effects model estimated mean outcome scores post-training]

Discussion

This study evaluated the effects of BASIS-T—a group-based, blended pre-implementation strategy—on theorized behavior change mechanisms immediately following training. Consistent with its underlying theory of change, BASIS-T had favorable effects on theorized mechanisms relative to an AC condition. Results extend implementation research and practice, as BASIS-T offers a potential adjunct increasing the yield of training and consultation. Further, findings suggest that pre-implementation strategies that are brief, pragmatic, and delivered in a group format increase theoretical precursors to efficient and effective implementation. Results elucidated a number of findings worthy of further discussion.

Mechanisms of behavior change

Within implementation science, there has been a push to isolate and measure mechanisms through which strategies have an effect by using theory (Lewis et al., 2018); however, research often fails to achieve this goal (Lewis et al., 2018). The current study indicates that BASIS-T may indeed exert its effect via TPB and HAPA mechanisms, with its largest effects on task self-efficacy and intentions to implement which are mechanisms explaining the largest amount of variance in behavior change (Schwarzer et al., 2011). Research on healthcare provider behavior indicated that interventions using theory-aligned BCTs, targeting attitudes, subjective norms, perceived behavioral control, outcome expectancies, and intentions, yielded immediate post-training changes (Tomasone, Martin Ginis, Estabrooks, & Domenicucci, 2014). Moreover,

research on prior versions of BASIS-T support this link, showing strikingly similar effects on mechanisms across trials, with a larger effect size found in this study for intentions to implement compared to the original evaluation study (Lyon et al., 2019). Aligning motivational and engagement strategies with mechanisms in behavior change theories (e.g., TPB, HAPA) could increase responsiveness to core strategies, like training and consultation.

Effectiveness of group-based motivational interviewing and other change BCTs

Although a wealth of strategies exists beyond those used in the current trial (Michie et al., 2013), techniques that can be used in a group format may yield an added benefit for efficiency and effectiveness. In the current study, MI provided the cornerstone approach and technique, with the group format offering numerous opportunities to cultivate change talk among participants. Offering opportunities to cultivate change talk among participants has been lauded as one of the benefits of MI within group contexts rather than with individuals (Wagner & Ingersoll, 2012). Moreover, the group format used post-EBPP training provided the opportunity for an adaptive experience based on teacher intentions to implement, allowing for tailored motivational or engagement strategies. This tailored group-based approach was both feasible and likely effective, adding a unique contribution to the literature on the potential effectiveness and efficiency of delivering tailored BCTs via a group format. The use of group-based MI to facilitate change talk, promote collaborative problem solving, and ultimately increase EBPP uptake and use should be explored further. Moreover, additional attention should be given to providing implementers with adaptive experiences following training.

Limitations and future research

This pilot study includes several limitations. First, by design, this study was unable to test hypotheses related to: (1) sustainment of change in mechanisms, (2) impact on implementation

(e.g., fidelity) and child outcomes, and (3) mediation models evaluating mechanisms. Due to power limitations, this study was also unable to control for relevant organizational context factors (e.g., implementation climate) when testing pre-post changes in mechanisms. A large scale RCT of BASIS-T is the next step, which could address these additional research questions via an effectiveness-implementation Hybrid Type 2 or Hybrid Type 3 design (Curran, Bauer, Mittman, Pyne, & Stetler, 2012). This study was also in the context of one EBPP; thus, it is unclear whether findings can generalize to other universal programs (e.g., social-emotional learning program). Considering the sample size, findings presented should be interpreted with caution. Future research with more schools and participants, different EBPPs, and more complex research designs could enable replication and nuanced understanding of the conditions and root causes that make strategies, like BASIS-T, effectively influence mechanisms and behavior.

Compliance with Ethical Standards

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

Ethical Approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (University of Minnesota Institutional Review Board, FWA00000312) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent: Informed consent was obtained from all individual participants included in the study.

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Table 1.

Demographic and descriptive information for pre- and post-survey completer sample.

	Total		Control		BASIS-T			
	N	*%*	*N*	*%*	*N*	*%*	χ^2	*p*
Total	81	100%	39	48.2	42	51.8		
Primary race							4.95	0.176
AI/AN	2	2.3	0	0	2	4.8		
Asian	1	1.1	0	0	1	2.4		
Latinx	2	2.3	0	0	2	4.8		
White	83	94.3	39	100	37	88.1		
Secondary race (multiracial)							2.94	0.229
White	2	66.7	0	0	2	4.8		
Other	1	33.3	1	2.6	0	0		
Gender							0.142	0.707
F	82	93.2	37	94.9	39	92.9		
M	6	6.8	2	5.1	3	7.1		
Highest ed							0.523	0.469
Bachelors	28	16.4	11	28.2	15	35.7		
Masters	60	68.2	28	71.8	27	64.3		
Grade taught							4.52	0.211
K & 1st	34	44.2	14	35.9	20	47.6		
2nd & 3rd	22	35.1	10	25.6	12	28.6		
4th & 5th	17	10.4	12	30.8	5	11.9		
Other (SPED, Art, music, reading)	8	3.9	3	7.7	5	11.9		
	M	*SD*	*M*	*SD*	*M*	*SD*	*t*	*p*
Years teaching	16	15.5	15.8	11.1	15.3	10.7	0.21	0.834

Table 3.

Mixed Effects Model Estimated Mean Outcome Scores Post-Training, Controlling for Pre-Training

		Estimated Mean	SE	95% CI Low	95% CI High	Beta[3]	*p*
Attitudes--Outcome Expectancy[1]	Control	5.77	0.14	5.48	6.06	.497	0.023
	BASIS-T	6.24	0.14	5.96	6.52		
Attitudes—Ownership[1]	Control	3.28	0.16	2.95	3.61	-.188	0.322
	BASIS-T	3.05	0.16	2.73	3.36		
EBPAS--Openness	Control	3.91	0.10	3.67	4.15	.398	0.126
	BASIS-T	4.15	0.09	3.92	4.37		
EBPAS--Appeal	Control	4.31	0.09	4.09	4.53	.172	0.511
	BASIS-T	4.39	0.09	4.19	4.60		
EBPAS--Fit	Control	4.31	0.09	4.08	4.54	.292	0.248
	BASIS-T	4.47	0.08	4.26	4.68		
Task & Practices Self Efficacy[1]	Control	5.68	0.13	5.42	5.95	.695	0.001
	BASIS-T	6.32	0.13	6.06	6.57		
Subjective Norms--Descriptive	Control	5.60	0.19	5.13	6.06	.222	0.428
	BASIS-T	5.82	0.18	5.39	6.24		
Subjective Norms--Injunctive	Control	5.38	0.18	4.92	5.84	.328	0.250
	BASIS-T	5.70	0.17	5.28	6.12		
Practice-specific Intentions	Control	6.24	0.16	5.88	6.61	.173	0.497
	BASIS-T	6.40	0.15	6.06	6.73		
Intent to implement GBG[2]	Control	5.13	0.39	4.22	6.05	.507	0.156
	BASIS-T	5.98	0.37	5.14	6.82		

[1] School-level variance neared zero, therefore random effect for school removed due to Hessian errors.
[2] Only collected post-training, therefore model does not include pre-training score as covariate.
[3] Partially standardized coefficient representing the standard deviation difference between BASIS-T and Control groups.

Figure 1. BASIS-T Theory & Intervention Components

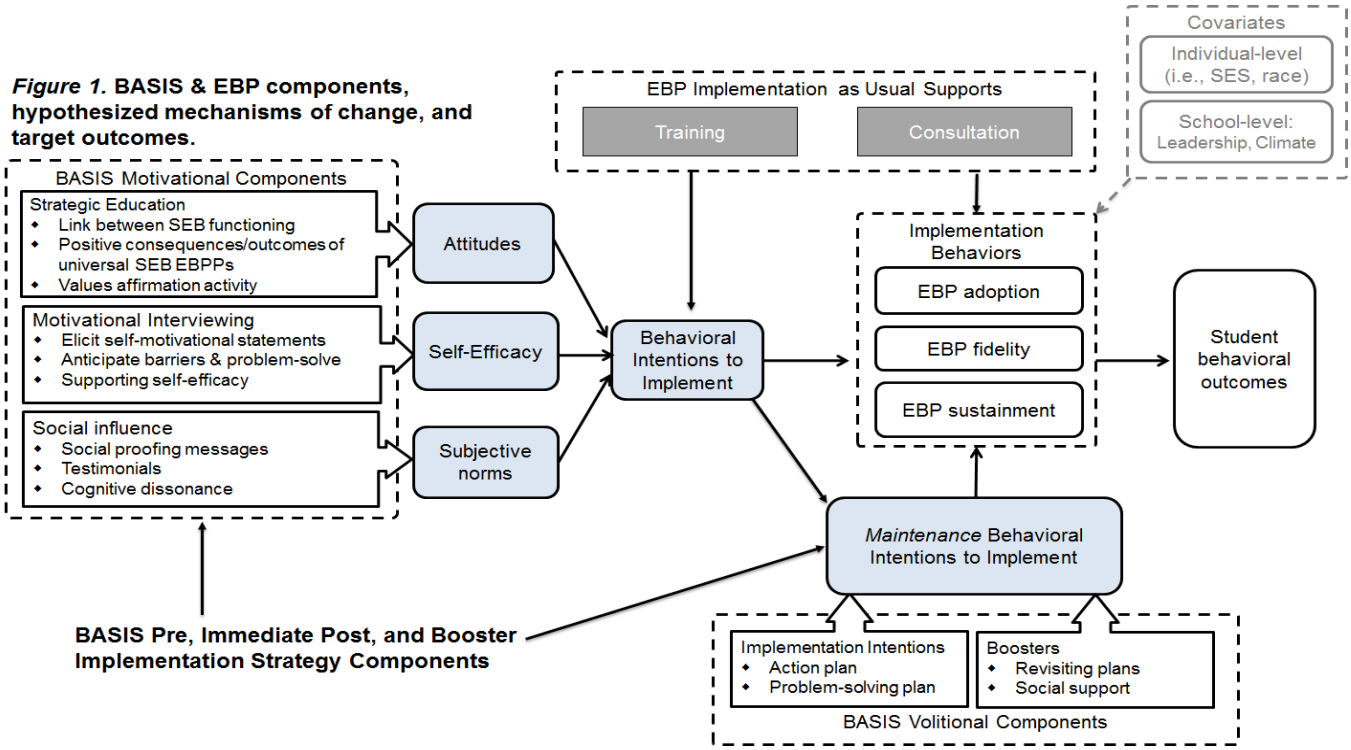
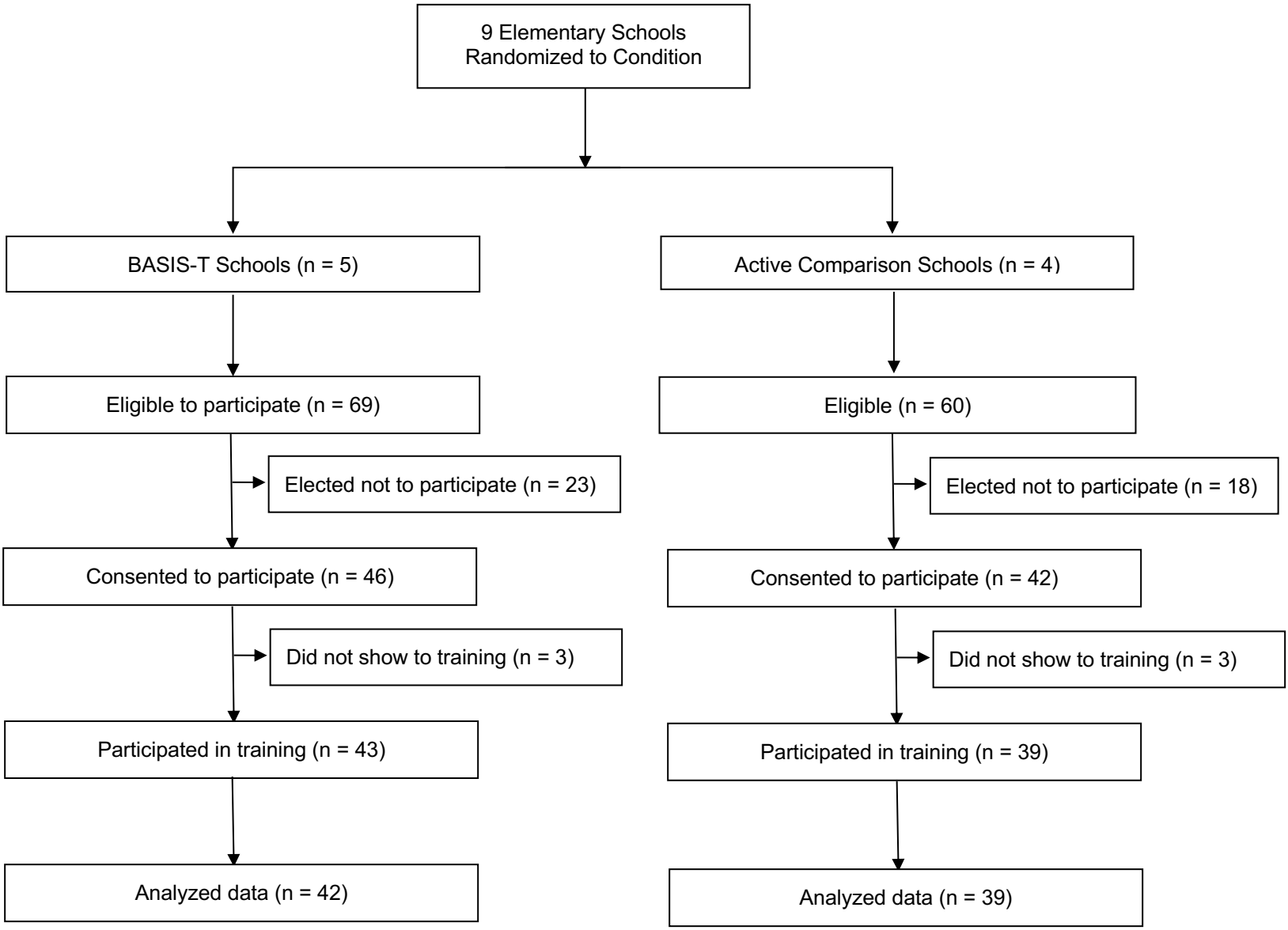


Figure 2. CONSORT diagram for study participation



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