Dissemination and beyond: A replication of dissemination and extension to providers' usage of an empirically supported treatment

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Abstract

Background: Implementation of empirically supported treatments (ESTs) is conceptualized to be on a continuum, yet there is limited empirical testing the transition from EST dissemination to adoption and implementation. Purpose: Study I) tested for replication of the effectiveness of a multimodal education to disseminate the Biobehavioral Intervention (BBI) for cancer patients to diverse oncology mental health providers (Brothers et al., 2015). Study II) described providers' implementation of BBI and tested possible mechanisms linking dissemination to implementation. Methods: For Study I, BBI was disseminated to oncology mental health providers (N=104; cohorts 3-6) by provision of treatment manuals, lectures, role play/group discussion, and small group practices. Using repeated measures ANOVA, pre to post changes in dissemination outcomes (attitudes toward ESTs/BBI, self-efficacy to deliver BBI/other therapies, and BBI knowledge) were tested. In Study II, providers (N=166; cohorts 1-6) reported usage of BBI with patients at 2- (adoption) and 4-months (implementation) post-dissemination. Regression-based path analyses tested change in dissemination outcomes as predictors of usage. Results: In Study I, increases from pre- to post-training was replicated with BBI knowledge ($p<.001$), but not with self-efficacy ($ps<.001$) or attitudes ($p=.523$). In Study II, the gains from dissemination in providers' self-efficacy ($ps<.05$) predicted greater usage during adoption and implementation, while the gains in attitudes ($p=.008$) predicted greater usage during implementation. Conclusions: This study is the only replication of dissemination of a psychological EST in cancer control. It also identified providers' self-efficacy and positive attitudes as key variables to change during dissemination to increase in EST usage.

Keywords: dissemination, implementation, self-efficacy, attitudes, empirically supported treatments, cancer control

Introduction

Dissemination of empirically supported treatments (ESTs) to providers using comprehensive education and training methods is the first step to achieve implementation [1]. Recognized decades ago in medicine [2], and more recently in clinical psychology [3] and behavioral medicine [4], the science-practice gap for EST remains. Clinical guidelines are helpful [5], yet they have not substantially affected the availability EST for patients with cancer. Implementation science is only now finding effective ways to disseminate ESTs [6; 7]. Dissemination of cancer prevention interventions is occurring [8; 9] whereas there are few examples in cancer control [9]. Thus, it is not surprising that search of the literature finds no replications of dissemination methods proposed or used for ESTs to help patients with cancer having difficulties with stress or psychological problems. Further, in the broader implementation science literature [10; 11], few studies empirically link the goals and endpoints of dissemination to any subsequent implementation of an EST by providers,

Achieving positive dissemination outcomes is not easy, as traditional efforts such as publications, workshops, and similar efforts that seek to enhance providers' knowledge of the EST are insufficient [9; 12]. To date, the most impactful documented dissemination efforts use intensive efforts such as using the Veterans Administration infrastructure to enact multisite policy change in a single network [13] or a centralized nationwide initiative [14]. Typical community sites do not have access to these resources, which has resulted in limited dissemination of health psychology ESTs to community therapists [5; 15].

The example of an effective dissemination studied here was that developed for oncology mental health providers to learn a well-studied cancer-specific EST, the Biobehavioral Intervention (BBI). As designed and manualized, the BBI is a multicomponent treatment [16],

i.e., stress conceptualization with progressive muscle relaxation, information about disease/treatment, problem solving, assertive communication, social support, sexuality, and health behaviors). When tested, it yielded robust improvements in psychological, behavioral, immune, health, and disease outcomes in patients with cancer [17; 18; 19]. The NIH/NCI funded 3-day training institutes for self-enrolling oncology mental health providers to learn the BBI. The multimodal training institutes used evidence-based learning activities and principles of adult learning such as active learning (i.e., learning activities that invite participation with the learning process such as therapist role plays of treatment components) that are effective for skill acquisition generally [20] and clinical skills in particular [21; 22]. Early data from the first cohorts (1-2; N=62) found improvements in knowledge but also gains across other variables hypothesized as important including more positive attitudes toward BBI [21]. Considering the increasing clinical and practical importance of replication, dissemination outcomes using a larger and similarly diverse sample of mental health providers in oncology is provided (cohorts 3-6; N=104; Study I).

The dissemination effort is a necessary condition, but it is not sufficient—as the goal is for providers to *implement* an EST in their institutions and communities. Presumably there is linkage between what occurs during dissemination and subsequent EST implementation [10; 11]. Unfortunately, few cancer control implementation studies have been conducted despite the increasing number of clinical guidelines calling for the delivery of ESTs into the community [5]. Research examining the effect of changes occurring in providers during dissemination (e.g., knowledge gains) on subsequent implementation remains limited. Thus, examination of the *mechanism* through which dissemination strategies affect later implementation would identify the important outcomes on which dissemination should focus to achieve implementation [23;

24]. Prior studies have sought to identify these variables. Data suggests that traditional disseminations primarily focused on knowledge building may be insufficient to yield implementation [25; 26; 27]. Other data support the importance of fostering of positive attitudes and confidence to use an EST in providers. Studies of providers in the midst of implementation suggest their positive attitudes [28; 29; 30] and self-efficacy (i.e., the perceived ease or confidence to deliver the EST) related to ESTs [31; 32] are positively associated with its usage. Conversely, when providers report low self-efficacy for using the EST, it is a barrier to implementation [33].

The multimodal education of the BBI sought to change these dimensions [21]. The studies cited above are cross-sectional, which is helpful know, but more relevant is discovering if high knowledge, positive attitudes, or high self-efficacy portend future implementations. The latter is tested by first determining if the change in variables such as attitudes from pre- to post-dissemination predicts implementation using the full sample of trained providers (N=166; Study II). This study would test if dissemination outcomes contribute to the next step of the continuum, i.e., implementation.

Usage of the EST by providers is a primary implementation outcome [34]. Rather than this, system measures are more often used, such as whether or not the program continues in a facility, a metric fundamentally different from the quantification of therapist use of the EBT. Aside from one time usage, repeated measures would mark if usage continues following dissemination. In the context of examining the effect of dissemination on implementation, having multiple time points for measuring usage can help differentiate the mechanisms for achieving providers initial adoption of an EST and those relevant to usage continuation. For instance, providers adopting an EST are readily viewed as “champions,” ones who may facilitate

others to learn of and adopt an EST [35]. Understanding how their colleagues achieved adoption and implementation may provide the stimulus for learning the EST and becoming adopters themselves [36].

Using the BBI, two studies of its dissemination and implementation by mental health providers practicing in diverse settings throughout the US are provided. Study I is a *replication* of the effect of dissemination on providers' dissemination outcomes reported by Brothers et al. [21]. Study II is an extension, studying providers' implementation of the EST but importantly, examining the *mechanisms* by which dissemination outcomes may affect implementation. This test if changes in EST knowledge, attitudes, and self-efficacy arising from dissemination are predictors to providers' adoption (2 months following dissemination) and implementation (4 month following dissemination) of the EST.

Study I: Replication test of Brothers et al. (2015)

Methods

Participants

Providers. Oncology mental health providers (N=104) attending BBI Institutes 3-6 (described below) were studied. The sample was predominantly female (n=95; 91.3%), middle-aged (M=41.1 years ± 9.4; range=25-62), and Caucasian (n=81; 77.9%). Providers came from 29 US states, Puerto Rico, and two foreign countries (Kenya and Mexico). Providers' disciplines were social work (n=42; 40.4%), clinical psychology (n=42; 40.4%), post-doctoral fellows in psychology (n=6; 5.8%), nursing (n=1; 1.0%), and other disciplines (n=13; 12.5%). They were full-time clinicians employed at academic medical centers or Veterans Administration Hospitals (n=47; 45.2%), community hospitals/centers (n=35; 33.7%), community supportive care facilities (n=12; 11.5%), private practice (n=8; 7.7%), and other settings (n=2; 1.9%). Employed

an average of 5.3 years (SD=5.8; range=0-30) in their current position, providers spent the majority of time with clinical services (69.5% ± 26.3; range=0-100%). The majority were licensed (n=91; 87.5%) and had been so for an average of 11.1 years (SD=8.5; range=1-36).

Supervisors. One supervisor of each provider was solicited to participate. If multiple providers with the same supervisor attended the institutes, the supervisor was only solicited once. Thus, requests were made to 92 supervisors. Of those, 67 supervisors responded (72.8%) and provided supporting data for 77 providers (74.0%). Supervisors' professions included: mental health (n=37; 55.2%), medicine (n=19; 28.4%), or business/administration (n=11, 16.4%).

Procedures

Compete descriptions of enrollment procedures have been provided [21]. Briefly, Institute announcements were placed on listservs (e.g., Society of Behavioral Medicine) and the Institute website. Applications were sought from licensed, full-time, oncology mental health providers. A letter of support from one's supervisor (i.e., the person who could authorize BBI implementation in the setting) and the supervisors' contact information were required. Six 3-day (18 hours) BBI training institutes were conducted from 2012-2016 with the last four cohorts studied here attending Institutes 3-6 from 2014-2016. Following informed consent and prior to attending, providers completed self-report measures using Qualtrics with retests (paper/pencil) on the last day of training. With the providers' permission, supervisors were notified one month later of their provider's completion of the Institute and asked to participate in a one-time self-report assessment on Qualtrics. Each supervisor received a $5 gift card for participation.

The goals of the BBI Institutes were provider-centered: 1) understand the conceptualization and empirical support for BBI; 2) obtain knowledge, clinical skills, positive attitudes, and confidence to use the BBI components; and, 3) formulate a plan for BBI

adaptation, if necessary, and implementation. The investigator (BLA) and six clinical psychologist BBI experts were trainers. Multimodal instruction provided the following: 1) therapist and patient manuals; 2) lecture presentations (40%; didactics of conceptual rationale, empirical support, and details of treatment components), 3) role play and group discussion (35%; additional instruction and BBI component practice amongst providers with monitoring, corrective feedback, and discussion), 4) small group (5-7 individuals) practice sessions with individualized feedback (25%); and, 5) 10-minute videotaped "session" with a patient confederate (see below).

Measures

Knowledge. A 32-item BBI Knowledge (BBI-Know) measure was developed [21], consisting of 32 multiple choice and true/false items to assess knowledge of the BBI component content. Percent correct was calculated. Internal consistency was α=0.542.

Clinical skill. The Clinical Analogue Assessment (BBI-Clin) consisted of 5 tasks to evaluate providers' conceptual and clinical skills using the BBI. Providers received a vignette of a patient and a specific concern which could be treated with a BBI component (e.g., stress conceptualization, problem solving). Five different audio/video taped vignette sessions were conducted and for each, the provider had 6-minutes to interact with a trained confederate. Recordings were rated for mastery on content delivery and skills. Ratings were adapted from the cognitive therapy rating scale [CTRS; 37; 38]. For each of the 5 vignettes, 19 items assessing content/skill delivery were rated from 0 to 6 (e.g., for problem solving: 0=only mentions brainstorming for generating solutions; 6=3 of 3 principles discussed with rationales included). A BBI-Clin score was computed by averaging items for a possible range from 0-6. BBI competence was defined as an individual score of $\geq$ 3.5 out of 6 (i.e., 60%), consistent with the

CTRS standard. Detail on the training of raters and inter-rater reliability >0.80 has been described [21]. BBI-Clin data is available Institutes 1-5 but not 6 (tapes available but not scored due to funding limitations).

Attitudes. Two measures were used. 1) The Evidence-Based Practice Attitudes Scale [EBPAS; 39] assessed general attitudes towards evidence-based practices and were operationalized as attitudes towards ESTs (EST-Att). The EBPAS consists of 15 items (e.g., "I am willing to try new types of therapy/interventions even if I have to follow a treatment manual") and are rated on a 5-point Likert scale (0 = not at all to 4 = to a very great extent). Items were summed, with scores ranging from 0-60; higher scores indicate more positive attitudes. Internal consistency was α=.736. 2) BBI-specific attitudes (BBI-Att) were assessed using a semantic differential [40]. Thirty pairs of bipolar adjectives descriptive of the BBI assessed the dimensions of evaluation (e.g., worthless/valuable), potency (e.g., complex/simple), and activity (e.g., dull/stimulating). Items were rated on 7-point Likert scale (-3 = worthless to +3 = valuable) and summed, with scores ranging from -90 to +90; negative scores reflect negative attitudes and positive scores reflect positive attitudes. Internal consistency was α=.895.

Self-efficacy. Two measures were used. 1) The Counselor Activity Self-Efficacy Scale [41] consists of 25 items assessing general self-efficacy of basic (e.g., performing helping skills) and advanced (e.g., handling challenging counseling situations) counseling skills (general SE). Items were rated on a 10-point Likert scale (0 = not at all confident to 9 = totally confident) and summed, with scores ranging from 0 to 225; higher scores indicate greater general counseling self-efficacy. Internal consistency was α=.952. 2) The BBI-specific self-efficacy scale (BBI-SE) used 8-items to assess providers' confidence to deliver BBI components (e.g., progressive muscle relaxation, problem solving). Items were rated on a 10-point Likert scale (0 = not at all

confident to 9 = totally confident) and summed for scores ranging from 0-72; higher scores indicate greater self-efficacy to deliver the BBI. Internal consistency was α=.852.

Supervisor measures. Two measures were used. 1) Attitudes: the EBPAS [39] as described above was adapted to assess supervisor attitudes toward ESTs (Supervisor EST-Att). For example, the item, "I like to use new types of therapy/interventions to help my clients" was revised to read, "I like for the trainee to use new types of therapy/interventions to help his/her clients." One item not applying to supervisors was omitted. Fourteen items were each rated on a 5-point Likert scale (0 = not at all to 4 = to a very great extent) and summed, with scores ranging from 0-56. Internal consistency was α=.717. 2) Implementation benefits/challenges: a visual analogue scaled was used for supervisors to rate the perceived ratio of challenges to benefits of BBI implementation by his/her provider. Anchors were 0 (the challenges will always outweigh the benefits) to 100 (the benefits will always outweigh the challenges). A rating of >50 indicated benefits outweighing challenges.

Analytic plan

Descriptive statistics were completed for measures. One-way analysis of variance (ANOVA) was used to identify potential covariates for the dissemination outcome analyses (knowledge, attitudes, and self-efficacy). ANOVAs contrasted the following groupings: institute attended (3-6), profession (psychologist vs other), and healthcare setting [hospital (university/Veterans Administration/community hospitals) vs. non-hospital]. Characteristics significantly different on an outcome were entered as a covariate in repeated measures analysis of variance (rANOVA) testing change from pre- to post-training on provider outcomes.

Results

Descriptive and Preliminary

See Table 1 for descriptive statistics of provider and supervisor measures. Relative to the possible range of the measures, providers received high scores on knowledge of the BBI (BBI-Know mean = 83.2 ± 8.9; potential range = 0-100) and high ratings on clinical skill use (BBI-Clin mean = 3.9 ± 0.9; competence defined as $\geq$ 3.5) with 74% (n=52) of those with completed ratings (N=70) achieving competence. Providers reported having positive attitudes towards ESTs (mean = 48.2 ± 5.9; potential range = 0-60) and BBI (mean = 60.6 ± 15.7; potential range = -90 - +90), and high self-efficacy (e.g., general SE mean = 199.2 ± 18.2; potential range = 0-225) post-training. Providers' supervisors reported positive attitudes towards ESTs (Supervisors' EST-Att mean = 43.0 ± 5.7; potential range = 0-56) with the majority reporting that the benefits of their providers implementing the BBI substantially outweighed the challenges (BBI implementation challenges vs. benefits mean = 74.8 ± 16.8; potential range 0-100).

Regarding covariate selection for post-training outcomes, only providers' profession was identified and only for two outcomes. Psychologists reported higher self-efficacy for providing ESTs [general SE mean = 203.5 vs 196.3; $F(1,101)=3.984$, $p=.049$] and the BBI [BBI-SE mean = 65.4 vs 62.3; $F(1,101)=5.265$, $p=.024$] than those in other professions.

Primary

Replicating Brothers et al., providers had similarly high knowledge (BBI-Know M=83.2% vs. 83.8%), clinical skill (BBI-CLIN M=4.0 vs. 3.5), self-efficacy (general SE M= 199.2 vs. 196.1; BBI SE M=63.6 vs. 62.1), and positive attitudes (EST-Att M= 48.2 vs. 47.6; BBI-Att M=60.6 vs. 56.2) at post-training. There were significant gains (pre- to post-training change) in BBI Knowledge [$F(1,102)=382.431$, $p<.001$, partial $\eta^2=.789$] and self-efficacy, both general [$F(1,101)=17.278$, $p<.001$, partial $\eta^2=.146$] and BBI-specific [$F(1,101)=35.921$, $p<.001$,

partial η^2=.262]. In contrast, the significant change in providers' attitudes toward ESTs found previously (Brothers et al, 2015) was not replicated (p=.523).

Study II: Mechanisms of dissemination effects on implementation

Methods

Participants

Providers. All providers (N=166; Cohorts 1-6) attending the six BBI Institutes were studied. The group was predominantly female (n=150; 90.4%), mid-aged (M=42.5 years ± 10.4; range=25-67), and Caucasian (n=136; 82.0%). Providers came from 35 US states, Puerto Rico, and three foreign countries (Kenya, Mexico, and Malaysia). Providers were employed at academic medical centers or Veterans Administration Hospitals (n=68; 41.0%), community hospitals/centers (n=62; 37.3%), community supportive care facilities (n=15; 9.0%), private practice (n=8; 4.8%), and other settings (=13; 7.8%). Providers had been employed an average of 5.8 years (SD=6.2; range=0-30) in their current position, spending most of their time providing clinical services (71.4% ± 24.8; range=0-100%). The majority were licensed (n=146; 88.0%) and had been so for an average of 12.5 years (SD=9.2; range=0-36). Providers' disciplines included social work (n=69; 41.6%), clinical psychology (n=65; 39.2%), clinical psychology post-doctoral fellows (n=9; 5.4%), nursing (n=4; 2.4%), and other disciplines (n=19; 11.4%).

Procedures

See above for general procedures. Providers reported BBI usage 2- and 4-months post-training using Qualtrics. Each received a $15 gift card for completing a report.

Measures

Predictors. See Study I for descriptions of knowledge (BBI-Knowledge), attitudes (EST-Att), and self-efficacy [general SE, BBI-specific (BBI-SE)] measures.

Outcomes. Prompted by a Qualtrics email to the provider, s/he reported, for the last two months, a) the total number of adult cancer patients treated, and b) the total number of adult cancer patients treated with the BBI. Usage was defined by the percentage of each provider's patients treated with the BBI out of the total number of patients treated in the past two months. Since providers worked full-time providing clinical services, we anticipated that they could readily report the number of patients treated, corresponding to billing hours for many. BBI usage at 2 months was regarded as "adoption" and that at 4 months as "implementation."

Analytic plan

Descriptive statistics of providers' BBI usage at 2 and 4 months were completed. Missing usage data were examined and one-way analyses of variance (ANOVA) examined differences in providers in attitudes, self-efficacy, and provider/setting characteristics based on missingness. Spearman correlations examined the relationship between usage and the following group characteristics: profession (psychologist vs other) and healthcare setting [hospital (university/Veterans Administration/community hospitals) vs. non-hospital]. For each dissemination outcome, regression-based path analyses tested change from pre- and post-training as a predictor of usage using a robust maximum likelihood estimation [42]. Characteristics significantly correlated with usage, pre-institute scores, and institute attended were entered as covariates for each model. Post-hoc analyses tested the models again using a conservative estimate of usage, replacing missing usage with 0% usage.

Results

Of the 166 providers, 47 providers (28.3%) and 52 providers (31.3%) did not provide usage data at 2 and 4 months, respectively. Of the non-reporting providers, 10 and 8 providers reported not having an opportunity to use the BBI (i.e., left the institution; needed more time to

implement; medical leave) at 2 and 4 months, respectively. Post hoc one-way analyses of variance found no difference in attitudes, self-efficacy, and provider/setting characteristics (ps>.295) between providers reporting usage data (n=114) and providers without usage data (n= 52). Only a minority of providers reported 0% usage at 2 (n=4; 2.4%) and 4 months (n=3; 1.8%).

On average, providers reported using the BBI with 58.4% ± 35.5% of their patients during adoption (2 months; N=119) before increasing to 66.2% ± 35.0% for implementation (4 months; N=114). Conservative estimates replacing missing usage values with 0% usage were 41.4% ± 38.9% at 2 months and 45.0% ± 41.4% at 4 months.

Adoption (2 months)

See Table 2 for summary of model estimates of usage. Health care setting and profession were not significantly correlated with usage (ps>.05) and not entered as covariates. The increase in providers' general SE (b=.004; z=2.078; p=.038) and BBI-SE (b=0.011; z=1.965; p=0.049) from dissemination predicted usage at 2 months after controlling for pre-institute scores and institute attended (cohort). Practically speaking, a provider reporting an increase of one standard deviation in general SE or BBI-SE at the end of training would then go on to use the BBI with an additional 9% of her/his patients during adoption. Changes EST-Att did not predict usage at 2 months (p=.879).

Implementation (4 months)

Health care setting and profession were not significantly correlated with usage (ps>.05) and not entered as covariates. Change in providers' EST-Att (b=.017; z=2.641; p=.008) and general SE (b=0.004; z=1.975; p=0.048) from the training institute predicted usage at 4 months, controlling for pre-institute scores and institute attended. This suggests a provider reporting a standard deviation increase in EST-Att (i.e., more positive attitude towards ESTs) or general SE

would result in use of the BBI with an additional 10% or 9%, respectively, of her/his patients during implementation. Changes in BBI-SE did not predict usage at 4 months (p=.073).

Post-hoc analyses

Analyses used imputed usage data. For adoption, greater change in general SE (b=.005; z=3.355; p=.001) and BBI-SE (b=.013; z=2.852; p=.004) predicted more usage at 2 months. For implementation, EST-Att did not predict usage at 4 months (p=.125). Instead, greater change in general SE (b=.005; z=2.833; p=.004) and BBI-SE (b=.013; z=2.716; p=.007) predicted more usage at 4 months.

Discussion

The present study represents the only replication study of dissemination of a cancer control EST and additionally, study of how dissemination may lead to implementation. With only a few examples in healthcare [43; 44], this replication provide evidence for the reliability of multimodal education to produce gains in dissemination outcomes, i.e., positive attitudes toward the EST, enhanced self-efficacy to deliver it, and of course, knowledge gains. Replication in research is fundamental to science [45], and particularly so for a new field such as implementation science. To date, EST implementation rates have been low [46; 47; 48]. The high rates found here are noteworthy but their coupling with dissemination data provided the means to examine dissemination outcomes as mechanisms for implementation. Additionally, the mechanisms could be tested twice, once during early adoption (2 months post dissemination) and again at 4 months. The data support the importance of providers' self-efficacy to deliver clinical services and BBI treatment as a key mechanism for their implementation of a newly learned EST.

Using a larger but similarly diverse sample, these data largely replicated the effect of multimodal dissemination education from Brothers et al. [21] that yielded providers with high

attitudes and self-efficacy and positive attitudes towards the EST. The reliability of these effects also points to the quality control of the instruction and content that also retained the same instructors from 2012-2016. Improvements in knowledge were again reflected in the very large effect size on the BBI knowledge (mean change=21.6; possible range=0-100; partial η^2=.789) with the majority of providers tested achieving competence with BBI clinical skills (BBI-Clin). Although Brothers et al. did not find a significant effect of training on self-efficacy, dissemination had large effect sizes for self-efficacy, both general (mean change=13.2; possible range=0-225; partial η^2=.146) and BBI-specific (mean change=7.4; possible range= 0-72; partial η^2=.262). Of note, there are similar pre- and post-training values of self-efficacy when comparing this replication sample with Brothers et al., and this difference in effect size may have been attributed to the covariates selected in the rANOVA (e.g., for general SE, Brothers et al. controlled for fixed effects of clinician type, facility type, and institute while clinician type was empirically selected to be controlled here as psychologists, on average, had greater self-efficacy in using psychological treatments most likely due to their history of formal training or experience). Similarly, the null effects of EST attitude changes with this new sample are not surprising, as the change was minimal (mean change=0.4). The change on EST attitudes found by Brothers et al. [21] was significant, but similarly small (mean change=1.7 on a possible range of 0-60). The components selected for the multimodal education (e.g., experientially-based training [20; 49; 50], additional planning and goal setting [51], actively selecting providers with supportive supervisors [52]) may have contributed to high knowledge and self-efficacy and positive attitudes for the EST in providers.

As implementation science is at a stage where it is concentrating on developing strategies to improve implementation at settings [15; 53], it is necessary for studies to examine a strategy's

effect across the continuum of dissemination including the changes in proximal (e.g., knowledge gains during dissemination) and distal (e.g., usage during implementation) outcomes. Implementation science has long recognized that the translation of research to be a continuum "from bench to bedside". This notion is reflected in the numerous implementation models and frameworks conceptualizing each step to implementation as foundational to the next [10; 11]. Without longitudinal empirical testing, it is unknown if changes during dissemination reap benefits for implementation.

Indeed, data show dissemination efforts fostering attitudes towards the EST and their self-efficacy to use the EST in providers were influential to usage. Providers that have developed confidence in the skills to implement a program that they believe in are more likely to do so [54]. The change in providers' self-efficacy significantly predicted usage during adoption and also implementation in both the main and post-hoc analyses—pointing to self-efficacy's role in adoption and implementation. Changing providers' EST attitudes, which was only significant in predicting implementation in the original analyses, most likely has an important role in influencing implementation as supported by theory [55]. Conversely, knowledge gains were not predictive of usage [e.g., 32; 56]. Dissemination focused on knowledge gains are necessary, but insufficient to influence implementation [57].

Settings preparing to adopt a new EST must consider how to best utilize their resources to optimize usage. Traditional dissemination (e.g., continuing education, publication of manuscripts) are popular due to their relative low costs and effort. The appeal of low cost dissemination efforts is reflected in greater interest in the field of implementation science examining the circumstances where passively disseminating guidelines/ESTs through published materials can be successful [58; 59]. However, data support that these lower cost dissemination

efforts focused on knowledge building have generally lower impact. Here, we outlined dissemination procedures affecting dissemination outcomes (self-efficacy and attitudes) predictive of usage. The provision of BBI institutes required a tremendous effort and substantial funding from the National Institutes of Health. Many settings do not have access to the support to facilitate implementation, which lead to limited vehicles and venues for training of professionals. Future studies in implementation science must not only investigate best practices for dissemination, but also explore the costs/benefits and long-term viability of these efforts.

Study strengths and limitations are considered. This study represents one of the few examples of dissemination and implementation research examining dissemination's effect on outcomes predictive of usage in cancer control [15].. Moreover, this study used *actual* EST usage as a primary outcome, whereas most studies of implementation do not [53; 60]. The studies that do typically do not provide *actual* usage, but rather an outcome proxy to usage (e.g., number of providers reporting continued EST use). The longitudinal design using providers from diverse experiences, professions, healthcare settings, and geographic locations strength the confidence in the findings. However, the self-selection and screening of providers motivated to use the BBI with supportive supervisors limit the generalizability of findings to circumstances with providers without the same interest. Since all providers received the same training, we were unable to make any causal inferences or identify the specific component of dissemination that led to the gains in training outcomes and usage. Likewise, the providers' high scores on BBI knowledge, self-efficacy, and attitudes—indicative successful dissemination—were limited in its variance to examine their effect of usage. Usage was self-reported and may have response bias, but no differences were found in characteristics between reporting and non-reporting providers.

Conclusion

Recent recognition of the importance of psychosocial care in oncology has led to an increasing number of related clinical guidelines with limited improvement of the availability of evidence-based psychosocial care [5]. This study replicated the effect of multimodal education leaving providers with high knowledge, clinical competence, self-efficacy, and positive attitudes for the EST. Although knowledge is necessary, it has limited influence beyond the threshold of attaining competency [57]. Self-efficacy and attitudes predictive of EST usage should be targeted during dissemination [27]. Selecting appropriate dissemination procedures is important to optimize early adaptation and later implementation. Taken together, this study exemplifies the need for implementation science to 1) replicate findings to inform evidence-based practices for dissemination and implementation and 2) empirically test dissemination's effect on a continuum to implementation.

Tables

Table 1. Pre- and post-training outcomes for providers (N=104) and their supervisors (N=67) attending institutes 3-6 and institutes 1-2 and comparison with pre/post change means and effect sizes with those of Brothers et al., 2015.

	Pre-institute		Post-institute			
Scale	Mean ± SD (Range)	Mean ± SD (Range) – *Brothers*	Mean ± SD (Range)	Mean ± SD (Range) – *Brothers*	Effect size of time (partial η^2)	Effect size of time (partial η^2) – *Brothers*
Education gains						
BBI knowledge (BBI-Know)	61.6 ± 12.8 (18.8-87.5)	63.3 ± 9.8 (38-88)	83.2 ± 8.9 (56.3-100)	83.8 ± 8.2 (63-97)	.789*	.73*
BBI clinical skill (BBI-CLIN)[b]	—[a]	—[a]	4.0 ± 0.8 (1.7-5.2)	3.5 ± 0.7 (1.8-4.7)		
Attitudes						
Attitudes toward ESTs (EST-Att)	47.8 ± 5.4 (34-60)	45.9 ± 6.9 (29-58)	48.2 ± 5.9 (29-60.0)	47.6 ± 7.0 (34-59)	.004	.11*
Attitudes towards BBI (BBI-Att)	—[a]	—[a]	60.6 ± 15.7 (4-86)	56.2 ± 14.3 (24-85)		
Self-efficacy						
Self-efficacy for counseling (general SE)	186.0 ± 21.6 (120-225)	183.6 ± 27.8 (103-225)	199.2 ± 18.2 (125-225)	196.1 ± 18.2 (156-225)	.146*	.02
Self-efficacy for BBI (BBI-SE)	56.2 ± 8.8 (30-72)	54.9 ± 9.8 (34-72)	63.6 ± 6.8 (40-72)	62.1 ± 6.1 (47-72)	.262*	.02
Supervisor attitudes						
Attitudes toward ESTs (EST-Att)	—[a]	—[a]	43.0 ± 5.7 (29-54)	42.7 ± 5.8 (31-54)		
BBI implementation challenges vs. benefits	—[a]	—[a]	74.8 ± 16.8 (40-100)	68.1 ± 19.4 (2-95)		

[a]Post-training measures only

[b]Score only calculated for providers with vignette scores available (n=70).

Note: If relevant, analyses included empirically selected covariates: clinician type, healthcare setting (community vs non-community), and/or institute attended; ESTs=empirically supported treatments

*p<.01

Table 2: Model estimates of usage

	Usage at 2 months			Usage at 4 months		
Scale	b	Z	p-value	b	Z	p-value
Attitudes toward ESTs (EST-Att)	-0.001	0.152	0.879	0.017	2.641	0.008
Self-efficacy for counseling (general SE)	0.004	2.078	0.038	0.004	1.975	0.048
Self-efficacy for BBI (BBI-SE)	0.011	1.965	0.049	0.011	1.791	0.073

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