

Practice-driven research for statewide scale up: Implementation outcomes of the California Autism Professional Training and Information Network

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Abstract

Scaling up the use of evidence-based practice (EBP) for autism across service sectors and regions has presented a considerable challenge indicating a clear need for continued development. The California Autism Professional Training and Information Network (CAPTAIN) integrates implementation drivers into specific procedures and methodology as an implementation strategy to support statewide scale up. The current study was designed to evaluate the impact of CAPTAIN on provider-level outcomes including attitude toward, and knowledge, fidelity and use of autism EBPs, and overall classroom quality. Overall, results indicated variability across measures, with some significant differences between CAPTAIN-trained and non-CAPTAIN-trained providers. CAPTAIN-trained providers reported more openness to EBP. Significantly more CAPTAIN-trained direct service providers reported collecting fidelity of implementation data ($\chi^2(2, N = 1515) = 10.95, p = 0.004$), collecting student data ($\chi^2(2, N = 1509) = 14.19, p = 0.001$), and reported using their primary EBP with “most or all students” ($\chi^2(2, N = 1514) = 11.41, p = 0.003$) than providers not trained by CAPTAIN. In summary, these preliminary findings show promise for the efficacy of the CAPTAIN model to increase dissemination and implementation of EBP at the classroom level.

Lay abstract

Supporting use of evidence-based practice in public service programs for autistic individuals is critical. The California Autism Professional Training and Information Network (CAPTAIN) brings together best practices from intervention and implementation research to support scale up of autism services. The current study was designed to evaluate the impact of CAPTAIN on provider-level outcomes including attitude toward, knowledge, fidelity, and use of autism EBPs and overall classroom quality. Overall, results indicated variability across measures, with some significant differences between CAPTAIN-trained and non-CAPTAIN-trained providers. These preliminary findings show promise for the efficacy of the CAPTAIN model to increase dissemination and implementation of EBP at the classroom level.

Keywords

education services, implementation science, professional development, scale up

Access to high-quality school services for students with autism is critical, as over 90% of children with autism are primarily served in public schools (Brookman-Frazee et al., 2009; Snyder et al., 2019). In California’s public schools, autism is now the third largest qualifying disability for special education services, with over 132,359 students (16% of the total population of students with disabilities) receiving services (California Department of Education, n.d.). Federal legislation specifies that school practices must be supported by scientifically based

evidence and professional wisdom (Every Student Succeeds Act [ESSA], 2015; Individuals With Disabilities

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Education Act [IDEA], 2004). Systematic literature reviews identify several evidence-based practices (EBPs) for students with autism (Steinbrenner et al., 2020). Unfortunately, these interventions have not historically been incorporated into classroom practice (e.g. Hess et al., 2008; Morrier et al., 2010; Stahmer & Ingersoll, 2004; Suhrheinrich, 2011). In recent studies, 50%–97% of teachers self-reported using at least one EBP (Brock et al., 2020; Dynia et al., 2020). However, even when teachers are attempting to use EBP for autism, they often have low levels of fidelity, or adherence to the intervention procedures (Suhrheinrich et al., 2007, 2013).

The field of implementation science has developed with a focus on identifying methods to promote the adoption and integration of EBPs into routine care (Eccles & Mittman, 2006). In contrast to intervention research, which focuses on how specific EBPs improve student outcomes, targets of implementation research include acceptability, adoption, appropriateness, feasibility, fidelity, implementation cost, penetration (spread or access within the organization), and sustainability of the practice (Proctor et al., 2011). Individual provider-level factors have been indicated as key indicators in implementation of EBP and are highlighted as inner context factors within multiple implementation science frameworks (Aarons et al., 2011; Beidas et al., 2014). Within autism implementation research, there is some evidence of specific factors linked to teacher EBP use, including teacher knowledge and perceived “social validity” (McNeill, 2019) and teacher ratings of training quality and “ease of use” of the practice (Suhrheinrich Rieth, et al., 2020).

Scaling up the use of EBP across educators, schools, districts, and regions presents an additional challenge. At a system level, education programs targeting implementation strategies or drivers at both the organizational and the individual provider level report greater success than those who do not have implementation plans (Fixsen et al., 2007). For example, intentionally targeting competency drivers such as staff selection, effective training and coaching, and leadership support will support the success of the implementation efforts and EBP fidelity. However, most statewide systems have very limited capacity for monitoring these drivers and scaling up interventions in ways that lead to meaningful improvements in student outcomes (Fixsen et al., 2013) indicating a clear need for continued development. States have rarely scaled up EBP successfully indicating additional tools and processes are needed to support effective implementation.

We have employed implementation frameworks to describe factors related to the initial development and continued growth of the California Autism Professional Training and Information Network (CAPTAIN; Suhrheinrich, Schotter et al. et al., 2020). Although multiple discrete implementation strategies (Powell et al., 2015) are incorporated within CAPTAIN activities, we have directly targeted

interagency collaboration, use of evidence-based training and coaching practices, leader engagement, and data-driven continuous improvement cycles (Suhrheinrich et al., 2020). Here we extend the work to provide preliminary evaluation of CAPTAIN model as a potential implementation strategy to support statewide scale up.

The CAPTAIN model

In 2008, the California Inter-agency Autism Planning Group (IAPG) was created to align efforts and develop a common training curriculum for autism EBPs. The IAPG participated in a school-based technical assistance project through the National Professional Development Center on Autism Spectrum Disorder (NPDC-ASD; Odom et al., 2013). In California, fidelity to the target EBP increased by 63% on average (44%–85%) and exceeded 80% for four EBP. In addition, all participating students ($n=18$) made progress on annual goals based on Goal Attainment Scaling (Ruble et al., 2012) with 44% exceeding expected progress (Suhrheinrich, Schotter et al., 2020). Overall program quality, measured by the Autism Program Environmental Rating Scales (APERS) (Odom et al., 2018) also increased. Based on these positive outcomes, the IAPG expanded to include additional service sectors, and was renamed the California Autism Professional Training and Information Network (CAPTAIN, www.captain.ca.gov), with a focus on disseminating and implementing EBP for individuals impacted by autism.

CAPTAIN is organized into 17 regional teams across the state, that develop regional plans for information dissemination about autism and EBPs, promoting effective EBP implementation and cross-agency regional collaboration and coordination. CAPTAIN currently has over 400 members (called Cadre) representing special education, developmental disabilities and family support service sectors, and university programs. All CAPTAIN Cadre are required to provide training to increase awareness of autism and knowledge of EBP, and CAPTAIN Cadre representing special education services have the additional expectation of providing EBP-specific training and implementation coaching to at least three providers or programs per year.

In California, special education services are funded through regional special education local plan areas (SELPA). SELPAs provide special education compliance monitoring as well as training and technical assistance to the over 1100 local education agencies within their respective catchment areas serving students from ages 3 to 22 years. Each of the 132 SELPAs was offered a designated number of CAPTAIN cadre positions based on the number of students they served who were qualified for special education services for Autism (1 cadre member per every 500 identified students with autism). Selected cadre are individuals within the special education system who

possess a strong base of knowledge about autism spectrum disorder and have the capacity to train and coach others from within their SELPA catchment area. During the 2018–2019 academic year, 92% of the SELPAs participated in CAPTAIN, with a total of over 200 school-based Cadre actively participating in the required training and coaching activities.

Based on recent data collected for CAPTAIN monitoring and quality improvement purposes, we can estimate the impact of CAPTAIN cadre in terms of reach (see Suhrehrich et al., 2020 for a methodological description of the annual survey). The majority of the 223 school-based CAPTAIN Cadre reported they met or exceeded expectations during 2018–2019. Overall, Cadre reported completing over 1500 trainings and over 350 hours of coaching. On average, they trained 88.21 ($SD=96.32$) providers (including special educators, paraeducators, general educators, and other direct service providers) and coached 30.32 ($SD=58.54$) providers. Given these self-reported data, we estimate annual totals of 19,495 providers receiving training and 6701 receiving EBP coaching (Brookman-Fraze et al., in press).

Preliminary data on CAPTAIN impact are encouraging and suggest further exploration of implementation outcomes associated with the CAPTAIN model. Specifically, we are interested in potential impacts of CAPTAIN at the provider level. The current study aims to (1) evaluate differences in attitudes toward EBP and use of EBP between direct service providers who had, or had not, been trained by CAPTAIN members, and (2) evaluate differences in EBP knowledge, EBP fidelity, and overall classroom quality between teachers who had, or had not, been trained by CAPTAIN members.

Community involvement

This study was conducted with the CAPTAIN as a community partner. All participants were community-based service providers within school programs. In addition, co-author P.S. is a certified behavior analyst and community service provider.

Methods

This work aimed to evaluate differences in implementation outcomes related to EBPs for autism by comparing providers who received training from CAPTAIN members and providers who had not received training from CAPTAIN. Survey data were collected from providers statewide, across two phases, with unique aims.

Participants

Phase 1 data were drawn from a statewide survey of administrators and providers serving autistic students in public

schools (early intervention to post-secondary) throughout California. The subsample of data analyzed for this study included only direct services providers ($n=1543$). As seen in Table 1, the majority of participants were Special Education teachers ($n=838$; 54%) and paraprofessionals ($n=252$; 16%). The majority of the sample held a master's degree ($n=874$; 57%), followed by a bachelor's degree ($n=461$; 30%). Most participants reported extensive hands-on experience working with students with autism ($n=836$; 54%). A portion of the sample had received EBP training from a CAPTAIN member ($n=326$; CAPTAIN-trained providers), while the majority of participants had not received training from a CAPTAIN member or were unsure if they had received training ($n=1217$; non-CAPTAIN-trained providers).

Phase 2 participants included only teacher participants. Teachers who agreed to be contacted for further research received a follow-up survey that asked specifically about classroom characteristics/quality, EBP fidelity, and EBP knowledge. The Phase 2 sample included 224 teachers, including some who had received training by a CAPTAIN member ($n=55$; CAPTAIN-trained teachers) and some who had not or were unsure ($n=169$; non-CAPTAIN-trained teachers). The majority were female ($n=179$, 80%), White ($n=162$, 72%), special education teachers ($n=220$; 98%), held a master's degree ($n=142$; 63%), and reported extensive hands-on experience working with students with autism ($n=145$; 65%) (see Table 1).

Procedures

This study was approved by the University of California Davis, Institutional Review Board. During Phase 1, a survey was administered via Qualtrics and distributed through CAPTAIN social media (Facebook and Instagram), email and recruitment postcards ($n=4500$). CAPTAIN Cadre were asked to distribute the email invitation and recruitment postcards to their school sites, professional organizations, and to teachers and other service providers they worked with directly. Average survey completion was 30 to 45 min. Participants were entered in a 1 in 20 opportunity drawing to win a \$50 gift card upon completion of the statewide survey. Recruitment began in May 2018 and ended in March 2020.

A Phase 2 follow-up online survey was sent out to participants who selected “teacher” as their job title (e.g. special education teacher, general education teacher, itinerant teacher) on the statewide survey and indicated they were willing to be contacted for future research. This survey asked teachers to report on their classroom practices/quality, knowledge of EBP, and fidelity of EBP implementation for the EBPs they primarily used in their classroom. Average survey completion was 60 min. All participants who completed the follow-up survey received a \$50 gift card. Recruitment began in November 2019 and ended in March 2020.

Table 1. Demographics of survey participants.

	Statewide survey n (%)	Follow-up survey n (%)
Job title		
Special education teacher (serving on single school site)	823 (53.3)	220 (98.2)
Paraprofessional	252 (16.3)	0 (0)
SLP/SLPA	152 (9.9)	0 (0)
Psychologist	150 (9.7)	0 (0)
Itinerant special education teacher (serving on multiple school sites)	34 (2.2)	2 (0.9)
General education teacher	33 (2.1)	2 (0.9)
OT/OTA	32 (2.1)	0 (0)
Mental health counselor/social worker	18 (1.2)	0 (0)
Special education teacher (serving on multiple school sites)	15 (1.0)	0 (0)
Specialist (e.g. behavior specialist, autism specialist)	4 (0.3)	0 (0)
Physical therapist	3 (0.2)	0 (0)
Case manager	1 (0.1)	0 (0)
Teacher on special assignment (TOSA)	2 (0.1)	0 (0)
Not reported	24 (1.6)	0 (0)
Education		
High school	32 (2.1)	0 (0)
Associate degree	118 (7.6)	0 (0)
Bachelor's degree	461 (29.9)	82 (36.6)
Master's degree	874 (56.6)	142 (63.4)
Doctorate	34 (2.2)	0 (0)
Not reported	24 (1.6)	0 (0)
ASD experience		
Extensive	836 (54.2)	145 (64.7)
Moderate	428 (27.7)	55 (24.6)
Some recent	221 (14.3)	204 (8.9)
Some distant	20 (1.3)	4 (1.8)
Little to none	14 (.9)	0 (0)
Not reported	24 (1.6)	0 (0)

ASD: autism spectrum disorder ; SLP: Speech language pathologist; SLPA: Speech language pathology assistant; OT: Occupational therapist; OTA: Occupational therapy assistant..

Measures

Phase 1—statewide survey measures

EBP attitude. Respondents completed the Evidence-Based Practice Attitude Scale (EBPAS) (Aarons, 2004), a 15-item measure that assesses four general attitudes toward adoption of EBPs: appeal, requirements, openness, and divergence. The EBPAS assesses provider attitudes toward adoption of EBP in public sector service settings and has been used in mental health, medical, school, and social service settings. Items are scored on a 5-point Likert-type scale (0–4) with answers ranging from “Not at all” to “Very great extent.” Domain scores were calculated by averaging the item scores in each domain. The EBPAS demonstrates good internal consistency reliability ($\alpha=0.76$) and concurrent and predictive validity.

Report of EBP use. Participants were asked to select all the EBPs they used (out of 27 EBPs; Wong et al., 2015) in the past week as well as the *primary* EBP they used in the past week with an autistic student. They reported (1) number of days the EBP was used in the past week (0–5 days); (2) whether they

collected fidelity data on their EBP use (Yes, I meant to but didn't have time, No); (3) whether they collected student outcome data (Yes, I meant to but didn't have time, No); and (4) the number of students with autism with whom they used the EBP (One student, Some students, Most or all students). The report of use measure was developed by members of the research team.

Implementation outcomes. Participants completed an adapted version of the Evidence-Based Practice Outcomes Scale (Ehrhart et al., 2015) which asked them the extent to which they (1) use all components of their primary EBP, (2) have adapted their primary EBP, (3) feel competent implementing their primary EBP, and (4) feel knowledgeable explaining their primary EBP. Participants self-rated on a 5-point Likert-type scale (0–4) with answers ranging from “Not at all” to “Very great extent.”

Phase 2—follow-up survey measures

Fidelity of EBP implementation. Participants reported their fidelity to the components of their primary EBP by

completing an implementation checklist. Implementation checklists were pulled from the Autism Focused Intervention Resources & Modules (AFIRM) on the NPDC website (National Professional Development Center on Autism Spectrum Disorder, n.d.). The total number of items on the implementation checklists varied by EBP, but all were divided in to three stages of implementation: Planning, Using, and Monitoring. Participants were asked to check off whether they completed each component on the checklist for their primary EBP. Fidelity was calculated as a percentage of the total number of components completed.

EBP knowledge. Participants answered true or false and multiple-choice questions assessing their knowledge of their primary EBP. Knowledge surveys were pulled from the Autism Focused Intervention Resources & Modules (AFIRM) on the NPDC website (<https://afirm.fpg.unc.edu/afirm-modules>, National Professional Development Center on Autism Spectrum Disorder, 2011). The total number of knowledge survey items varied across specific EBP. The percent of correct responses was used for analysis.

Classroom quality. Participants completed a self-report version of the Autism Program Environmental Rating Scale (APERS) designed to assess the overall quality of program environments for students with autism. The APERS Self-Assessment Tool (National Professional Development Center on Autism Spectrum Disorder, 2011) consists of 64 items across 11 domains for the preschool/elementary form and 66 items across 11 domains for the middle school/high school form. Participants completed the version that aligned with the primary age group they taught. Domains include Learning Environments, Classroom Structure and Schedule, Positive Learning Climate, Assessment, Curriculum and instruction, Communication, Social Competence, Personal Independence and Competence, Functional Behavior, Family Involvement, and Teaming. Items are scored on a 3-point Likert-type scale with answers ranging from “1=This is a challenge for our program” to “3=This element is consistently in place, but we still have some work to do” to “5=This is a real strength for our program.” Classroom quality was calculated based on the average score for each domain.

Data analysis

Data were analyzed using IBM SPSS Statistics. Statistical analysis varied depending upon the data form. Data were examined for normality and appropriate transformations were applied for highly skewed and kurtotic data based on the recommendations of Tabachnick and Fidell (2018). Means, standard deviations, and frequencies were calculated to describe the data. Independent *t* tests and chi-square analyses were used to examine group differences between CAPTAIN-trained providers and non-CAPTAIN-trained providers in report of use. Independent *t* tests were used to

examine group differences between CAPTAIN-trained providers and non-CAPTAIN-trained providers in EBP attitude, implementation outcomes, classroom outcomes, fidelity of EBP implementation, and knowledge of EBP.

Results

Overall, results indicated variability across measures, with some significant differences between CAPTAIN-trained and non-CAPTAIN-trained providers.

Phase I—statewide survey results

EBP attitude. Overall, participants reported moderate scores on the Openness ($M=3.13$, $SD=0.76$), Appeal ($M=3.32$, $SD=0.72$), and Requirements ($M=2.99$, $SD=0.96$) subscales of the EBPAS, and relatively lower scores on the Divergence subscale ($M=2.30$, $SD=0.67$). There was a significant group difference in EBP Openness between CAPTAIN-trained providers versus non-CAPTAIN-trained providers, $t(579)=-3.29$, $p=0.001$. Specifically, CAPTAIN-trained providers reported significantly higher levels of EBP Openness ($M=3.24$, $SD=0.68$) than non-CAPTAIN-trained providers ($M=3.09$, $SD=0.77$). No significant associations were found for the Appeal, Divergence, and Requirement subscales ($p > 0.05$) (see Table 2).

Report of EBP use. Regarding the total number of EBPs used, CAPTAIN-trained providers reported on average using 9.29 EBPs ($SD=5.02$) and non-CAPTAIN-trained providers reported 9.02 EBPs ($SD=5.05$), with no significant difference between the two groups, $t(1541)=0.87$, $p=0.38$. The most frequently used primary EBP reported by CAPTAIN-trained providers was Visual Supports (22%), followed by Reinforcement (20%), and Prompting (10%); whereas the most frequently used primary EBP reported by providers not trained by CAPTAIN was Reinforcement (20%), followed by Prompting (16%), and Visual Supports (14%).

The majority of the providers reported using their primary EBP 4–5 days in the past week (75%) while about 12% reported 3 days, 7% reported 2 days, about 5% reported 1 day, and 1% reported 0 days in the last week. About a third (36%) of the providers reported collecting fidelity data. Close to half of the providers (46%) reported collecting student data, and 62% reported using their primary EBP with most or all students.

When investigating the impact of being trained by CAPTAIN, results indicated that a larger proportion of CAPTAIN-trained providers reported collecting fidelity data ($\chi^2(2, N=1191)=10.95$, $p=0.004$), collecting student data ($\chi^2(2, N=1185)=14.19$, $p=0.001$), and reported using their primary EBP with “most or all students” ($\chi^2(2, N=1514)=11.41$, $p=0.003$) than providers not trained by CAPTAIN. Frequency of primary EBP use did not differ

Table 2. Outcomes in CAPTAIN-trained and Non-CAPTAIN-trained providers.

Provider outcomes	CAPTAIN trained		Statistics	p
	Yes	No		
Direct service providers and teachers				
Report of use				
Use primary EBP with most or all students	69.4%	62.0%	$\chi^2(2) = 11.4$	0.003
Days/week use of primary EBP	Mean 3.6	Mean 3.5	$t(570) = 1.8$	0.078
Collect fidelity data on primary EBP	42.6%	35.6%	$\chi^2(2) = 10.9$	0.004
Collect student data on EBP response	55.2%	44.3%	$\chi^2(2) = 14.2$	0.001
Implementation Outcomes Scale				
Use all components of primary EBP (max 4)	Mean 2.8	Mean 2.6	$t(555) = -2.9$	0.004
Competence implementing primary EBP (max 4)	Mean 2.9	Mean 2.7	$t(527) = -3.7$	<0.001
Knowledge explaining primary EBP (max 4)	Mean 2.6	Mean 2.4	$t(533) = -3.6$	<0.001
Adapted primary EBP (max 4)	Mean 2.4	Mean 2.3	$t(1443) = 1.6$	0.111
EBPAS				
Openness (max 4)	Mean 3.2	Mean 3.1	$t(579) = -3.3$	0.001
Appeal (max 4)	Mean 3.4	Mean 3.3	$t(563) = -1.6$	0.118
Divergence (max 4)	Mean 2.3	Mean 2.3	$t(548) = -1.6$	0.114
Required (max 4)	Mean 3.0	Mean 3.0	$t(1282) = -0.7$	0.486
Teachers				
NPDC EBP Knowledge Assessments % correct for primary EBP	67.2%	56.9%	$t(222) = -2.5$	0.012
Self-report fidelity of implementation checklist % fidelity for primary EBP	88.9%	86.3%	$t(219) = 0.5$	0.583
APERS Learning Environment (max 5)	Mean 3.9	Mean 3.7	$t(202) = -2.1$	0.041

CAPTAIN: California Autism Professional Training and Information Network; EBP: evidence-based practice; EBPAS: Evidence-Based Practice Attitude Scale; NPDC: National Professional Development Center on Autism Spectrum Disorder; APERS: Autism Program Environmental Rating Scale.

significantly between CAPTAIN and non-CAPTAIN providers ($t(570) = -1.76, p = 0.08$) (see Table 2).

Implementation outcomes. The implementation outcomes associated with providers' primary EBP were moderate across all items: use of all components of EBP ($M = 2.63, SD = 0.97$), adaptation of EBP ($M = 2.34, SD = 1.06$), feeling competent in implementing EBP ($M = 2.70, SD = 0.97$), and feeling knowledgeable explaining EBP ($M = 2.45, SD = 1.07$).

There were significant group differences between CAPTAIN-trained providers and non-CAPTAIN-trained providers for several implementation outcomes. Specifically, CAPTAIN-trained providers reported higher levels of using all components of the primary EBP ($M = 2.76, SD = 0.88$) than non-CAPTAIN-trained providers ($M = 2.59, SD = 0.98, t(555) = -2.91, p = 0.004$); CAPTAIN-trained providers reported higher levels of feeling competent implementing EBPs ($M = 2.88, SD = 0.92$) than non-CAPTAIN-trained providers ($M = 2.65, SD = 0.98, t(527) = -3.75, p < 0.001$); CAPTAIN-trained providers reported higher levels of feeling knowledgeable explaining their primary EBP ($M = 2.63, SD = 1.01$) than providers not trained by CAPTAIN ($M = 2.40, SD = 1.08, t(533) = -3.60, p < 0.001$) (see Table 2).

No significant differences were found between CAPTAIN-trained providers and non-CAPTAIN-trained providers on the adaptation of EBP item ($p > 0.05$).

Follow-up survey results

Fidelity of EBP implementation. The mean percentage of specific EBP fidelity for teachers' primary EBP was 87% ($N = 221; SD = 15.31\%$). There was no significant group difference in the self-reported fidelity of teachers' primary EBP between CAPTAIN-trained and non-CAPTAIN-trained teachers, $t(219) = 0.55, p = 0.583$ (see Table 2).

EBP knowledge. The mean percentage of correct responses on specific EBP knowledge for teachers' primary EBP was 59.42% ($N = 224; SD = 26.26\%$). CAPTAIN-trained teachers had significantly higher EBP knowledge ($M = 67.15\%, SD = 25.53\%$) than teachers not trained by CAPTAIN ($M = 56.90\%, SD = 26.08\%$), $t(222) = -2.54, p = 0.012$.

Classroom quality. There was a significant group difference between CAPTAIN-trained teachers versus non-CAPTAIN-trained teachers regarding the learning environment subscale. Specifically, CAPTAIN-trained teachers reported higher levels in learning environment ($mean_{CAPTAIN} = 3.92, SD_{CAPTAIN} = 0.77; mean_{NonCAPTAIN} = 3.65, SD_{NonCAPTAIN} = 0.82$), $t(202) = -2.05, p = 0.041$. No significant associations were found for all other APERS subscales or the overall score ($p > 0.05$).

Discussion

The use of research-based practices is mandated by IDEA and ESSA and has been linked to best outcomes for students with autism, which highlights effective implementation and scale up of EBPs in schools as a critical priority. The growing literature on factors that support the implementation process indicates key drivers which can be considered targets of implementation interventions to improve implementation outcomes. In this study, we explored implementation outcomes at the direct service provider level and evaluated differences between CAPTAIN-trained and non-CAPTAIN-trained providers using one of the first large-scale statewide examinations across multiple levels of the special education service system. Overall outcomes indicate CAPTAIN-trained providers and teachers report more favorable attitudes toward EBP, better implementation outcomes related to data collection, and use with students, higher knowledge of their primary EBP, and better ratings of learning environment. These findings show great promise for CAPTAIN as a model to support statewide scale up if EBP for autism and are discussed in more detail below.

One factor that has been linked to positive implementation outcomes is individual provider attitudes toward EBPs (Aarons, 2004; Aarons et al., 2011; Reding et al., 2013). This intuitively makes sense, as it is important that providers are open to learning about and using these EBPs prior to adoption and effective implementation. Multiple studies have found that provider attitudes before training, especially openness to the use of evidence-based practice and perceptions of the appeal of the practice, are linked to fidelity to the intervention after training (Aarons et al., 2011; Beidas et al., 2014). Furthermore, attitudes toward a specific practice have been linked to reported use of that practice (Reding et al., 2013) and negative beliefs about a practice may be a barrier to adoption (e.g. Harned et al., 2013). In addition, it has been suggested that measures of provider attitude, such as the EBPAS, could be applied in the education sector to examine the impact of implementation interventions (Cook et al., 2018). Our findings reveal that CAPTAIN-trained providers were much more open to EBP use than those who were not CAPTAIN trained. This may be a result of their interaction with a CAPTAIN trainer, or it may be that those who were more open initially sought out the type of training being offered by CAPTAIN. Openness to EBPs may lead to these teachers seeking out additional EBP trainings in their future professional development, thus further expanding their use of effective practices. Determining if openness can be impacted by interactions like those with CAPTAIN trainers is an area for further study.

One of the primary goals of CAPTAIN is to increase provider knowledge of EBPs as an initial step toward implementation. It is encouraging that CAPTAIN-trained

teachers not only scored significantly higher on EBP knowledge assessments, but also felt confident explaining the EBPs to others. Passing on EBP knowledge to other team members who may have limited access to professional development, such as paraeducators, is essential and can help to promote the spread and scale up of EBP. EBP use can be conceptualized as adherence to protocol (fidelity) as well as dosage (frequency of use) and reach (number of students receiving the intervention). Using EBPs with high fidelity, with moderate to high dosage across many students will likely maximize student impact, so these are important measures to consider. CAPTAIN-trained providers reported using fidelity checklists to monitor their own implementation at higher rates than the other providers and also reported greater use of all components of their primary EBPs. Self-monitoring of implementation fidelity could be an effective way to prevent implementation drift that often occurs following an initial period of high integrity to an EBP. Because using EBP checklists to monitor fidelity is an essential component of the CAPTAIN model of coaching, perhaps this influenced providers to self-monitor their fidelity after coaching ended. There is some research to suggest that self-monitoring of fidelity provides a practical and effective approach to maintaining EBP fidelity over time (e.g. Nelson et al., 2015). However, additional research is needed to examine the validity and accuracy of self-recorded EBP fidelity as well as the role of this process in sustainment. A greater proportion of CAPTAIN-trained providers reported using their primary EBP with most or all students, thus suggesting that they may generalize use of EBPs classroom wide, across students. In addition, their report of the learning environment classroom quality indicator from the APERS was also significantly higher.

This study suggests that the CAPTAIN model can support scale of EBP in special education and meet the significant needs of teachers supporting autistic students. Next steps to improving scale up efforts to meet state needs will involve better understanding the mechanisms by which CAPTAIN improves EBP fidelity and use for educators. For example, data indicate that participating with CAPTAIN trainers may provide important social support networks for educators attempting to implement EBP (McGhee Hassrick et al., 2020). In addition, it may be helpful to better understand how training in EBP fidelity tools may support EBP fidelity. While all educators had access to the AFIRM fidelity tools, those trained by CAPTAIN received explicit instruction on how to use the tools, which may have increased their understanding and expectations for use.

These promising findings support the potential use of the CAPTAIN model for successful EBP scale up; however, there are several limitations to the current study. One limitation of the study is related to characterizing the reach of recruitment efforts and representativeness of the sample

participants. Our primary recruitment strategies involved social media distribution and broad distribution through email with requests that the recruitment information be forwarded to others within the educational sector. Therefore, accurate measurement of the rate of response to recruitment request and the representativeness of the sample are not feasible. Related to the sample, our current data set did not allow for analysis of specific outcomes at the individual practice level. That is, there was no sufficient power to compare results between individual EBP. Another primary limitation of this study is that data were collected through provider self-report. This may contribute to the lack of significant difference on specific EBP fidelity measures, in that self-report scores were overall very high. Future studies should assess fidelity using more objective measures, and could potentially examine whether self-monitoring of EBP is accurate and helps to sustain EBP use over time. Additional objective measures, such as independent program evaluation, would be helpful in further evaluating the impact of CAPTAIN on EBP use and overall classroom quality. Finally, the associations presented should be interpreted cautiously and with the understanding that there are no available provider measures prior to CAPTAIN training.

In summary, these preliminary findings show promise for the efficacy of the CAPTAIN model to increase dissemination and implementation of EBP at the classroom level. Future research will involve objective assessment of teacher and student outcomes that result from CAPTAIN participation.

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