Prevention Science (2018) 19:894–903
https://doi.org/10.1007/s11121-018-0894-5

Novel Methods for Screening: Contributions from Attachment and Biobehavioral Catch-up

EB Caron[1] · Caroline K. P. Roben[2] · Heather A. Yarger[2] · Mary Dozier[2]

Published online: 18 April 2018

Abstract
Preventative interventions are needed across the lifespan, including for children who have experienced maltreatment. However, interventions' effect sizes are typically smaller in real-world settings than in clinical trials. Identifying providers who are likely to implement interventions with fidelity could promote implementation outcomes through targeted allocation of training resources. This study tested two pre-training screening measures as predictors of provider fidelity to Attachment and Biobehavioral Catch-up (ABC), a preventative intervention for maltreated infants. One measure assessed valuing of attachment/openness, and the other used vignettes to assess initial skill in a key intervention component. In a sample of 42 providers across 197 sessions, both screening measures predicted future ABC fidelity, even when controlling for experience and education. These results support the development of screening measures for other interventions, suggesting approaches that target specific qualities and behaviors are likely to predict implementation fidelity.

Keywords Provider characteristics · Screening interviews · Fidelity · Training · Implementation science

Introduction

Child maltreatment places children at risk for a number of long-term problematic outcomes, highlighting the need for preventative interventions to alter these developmental pathways. However, disseminating and implementing evidence-based interventions while maintaining intervention effectiveness remains a challenge for the field of prevention science. Researchers have searched for characteristics of implementation sites, processes, and providers that predict successful implementation outcomes (Durlak and DuPre 2008). Research on characteristics of providers that can be measured prior to training could inform hiring and training decisions. Provider characteristics can be divided into two subtypes: attribute measures (i.e., stable characteristics of the provider, such as education or personality traits) and process measures (i.e., variables that characterize how the provider interacts with clients and implements an intervention, such as fidelity; Project MATCH Research Group 1998). Associations between provider attributes and implementation outcomes have been inconsistent, possibly due to the way that attributes are typically measured (i.e., overly general and not specific to a particular intervention). Thus, identifying specific attribute measures that are critical to implementation of a particular intervention may be more successful than assessing more general attributes. Alternatively, process measures may yield more robust prediction of implementation outcomes than attribute measures. Though process measures have been used rarely in pre-training contexts, video-based vignettes could measure aptitude prior to training.

Public Health Impact of Child Abuse and Neglect

In 2016, over 670,000 American children were reported victims of child maltreatment (USDHHS 2018). Maltreatment places children at increased risk for disorganized attachment (van Ijzendoorn et al. 1999), disruptions in hypothalamic-pituitary-adrenal (HPA) axis functioning (Bernard et al. 2010), and behavioral dysregulation (Frost et al. 2017), as

We presented portions of this research in two poster presentations at the 2013 and 2015 biennial meetings of the Society for Research in Child Development.

✉ Mary Dozier
mdozier@psych.udel.edu

[1] Department of Psychiatry, University of Connecticut Health Center, Farmington, CT, USA

[2] Department of Psychological and Brain Sciences, University of Delaware, 108 Wolf Hall, Newark, DE 19716, USA

well as mental health disorders (e.g., LeTendre and Reed 2017) and death due to chronic disease (Miller et al. 2011) in adulthood. The psychological and physical burden of exposure to maltreatment highlights the need for early interventions to prevent maltreatment and alter developmental pathways to poor outcomes. However, the interventions used in child welfare settings often lack research support and documented effectiveness (Barth et al. 2005).

Attachment and Biobehavioral Catch-up

Attachment and Biobehavioral Catch-up (ABC) is a ten-session, home-based, preventative intervention for child protective services-involved infants and their biological or foster parents. ABC has been found to increase rates of secure and organized child attachment (Bernard et al. 2012), normalize levels of the stress hormone cortisol (Bernard et al. 2015), and promote executive functioning (Lewis-Morrarty et al. 2012). ABC focuses on the parenting targets of nurturance (i.e., providing nurturing care to distressed infants), following the lead (i.e., contingent responding) and non-frightening behavior (i.e., avoiding behavior that may frighten or over-stimulate children). Providers called "parent coaches" implement ABC primarily through "in the moment" comments, providing live coaching to parents as they interact with children. For example, after a parent comforts a crying child, a parent coach might say, "What a nice example of nurturance. He bumped his head and you asked him if he was okay." Coaches' comment frequency and quality predict parent behavior change, suggesting that in the moment commenting is an active ingredient of ABC (Caron et al. 2016).

Effectiveness is often far lower in community implementation than in laboratories (e.g., Hulleman and Cordray 2009). However, community-based ABC parenting outcomes have been comparable to those in the laboratory (Roben et al. 2017). In order to promote ABC's implementation efforts and translate success to other interventions, it is critical to understand the factors involved in bringing an intervention to the community.

Provider Screening in the Context of Implementation

Frameworks facilitate the understanding of factors that can challenge implementation (Tabak et al. 2012). Similar to implementation frameworks in other fields (Damschroder and Hagedorn 2011; Tabak et al. 2012), the conceptual model of implementation in the public service sector includes different levels and phases (Aarons et al. 2011). The multi-level aspect of the model locates factors along a continuum of scale, including sociopolitical and funding climates, organizational characteristics, and individual provider characteristics (Aarons et al. 2011). The model also identifies four phases of implementation: exploration, adoption/preparation, implementation, and sustainment, and proposes that factors may differentially impact implementation during different phases.

The current paper focuses on factors at the level of the individual provider that can be measured during the adoption/preparation stage and which may then impact implementation during later stages. Currently, there is little consensus on which provider characteristics matter, and systematic evaluation of provider variables during staff selection has been rare (Aarons et al. 2011; Fixsen et al. 2005). Understanding which providers will implement an intervention well is critical for positive intervention outcomes, effective allocation of resources, and long-term sustainability of implementation efforts.

Attribute Measures as Predictors of Provider Success

Various attributes, including experience and education, have been examined as predictors of providers' success at intervention implementation, but results have been inconsistent (Beidas and Kendall 2010). For example, associations between education and implementation outcomes have varied from positive (e.g., Campbell et al. 2013) to negative (e.g., Project MATCH Research Group 1998), with most small and non-significant (e.g., Kallestad and Olweus 2003; Klimes-Dougan et al. 2009). Similarly, experience has been associated positively with outcomes in several studies (e.g., Taylor et al. 2015), negatively in others (e.g., Campbell et al. 2013; Project MATCH Research Group 1998), and has failed to predict outcomes in others (e.g., Klimes-Dougan et al. 2009; Project MATCH Research Group 1998).

Providers' personality characteristics have also been explored as predictors of implementation outcomes. For example, the Project MATCH Research Group (1998) found that providers' needs for nurturance (i.e., to assist others) and aggression (i.e., to be critical of others) predicted client outcomes, but associations depended on treatment type. Specifically, providers with lower nurturance and higher aggression needs produced the best client outcomes in 12-step facilitation, but providers with higher nurturance and lower aggression needs generated the best outcomes in motivational enhancement therapy. These findings suggest that specific characteristics related to an intervention might predict outcomes better than broad traits. In support of this idea, Kallestad and Olweus (2003) found that teachers' implementation of the Olweus Bullying Prevention Program was predicted by the intensity of negative emotion teachers felt about students being bullied.

Provider Attachment Representations as a Predictor of Provider Success

One attribute potentially predictive of implementation outcomes is providers' state of mind with regard to attachment. Previous attachment experiences and relationships influence behavior in future relationships, making clients' and providers' internal working models of relationships (i.e., state of mind) important for intervention outcomes (Bowlby 1988; Tyrrell et al. 1999). These internal working models have been labeled as "autonomous" versus "non-autonomous" (i.e., dismissing and preoccupied) (Main and Goldwyn 1998). People with an autonomous state of mind with regard to attachment value attachment relationships and experiences and exhibit attentional flexibility during conversations about attachment experiences (Hesse 2008). Autonomous providers have been found to better regulate their own emotions, develop stronger therapeutic alliances with clients, and demonstrate greater treatment fidelity, than providers with non-autonomous states of mind (Wittenborn 2012).

Attachment state of mind may be especially important for providers who are implementing early childhood parenting interventions, particularly those that involve in the moment coaching of parent-child interaction. State of mind is hypothesized to relate to the ability to identify and respond to an infant's needs (Main and Goldwyn 1998) and therefore may predict providers' ability to help parents recognize and respond to infants' needs. Autonomous adults are more sensitive parents than non-autonomous adults (e.g., van IJzendoorn 1995), suggesting that autonomous providers may find interventions targeting parental sensitivity concordant with their personal beliefs, which may lead them to value and put effort into implementing an intervention. Conversely, the tendency of dismissing individuals to minimize infants' needs (Crowell and Feldman 1991) may lead dismissing providers to struggle to recognize infant signals. Additionally, dismissing individuals tend to lack attentional flexibility in attachment-related conversations (Hesse 2008), which may make it difficult to interrupt conversations with parents in order to coach parent-child interaction. Non-autonomous providers may also experience physiological and emotional reactions to infants that interfere with their ability to coach parental responding (e.g., Riem et al. 2012). In sum, providers' attachment state of mind may make their task of implementing parent coaching interventions either easier or more difficult.

Process Measures as Predictors of Provider Success

Providers' skill is theorized to influence implementation (Durlak and DuPre 2008); however, little research has measured this construct prior to training. Process measures coded from sessions taped prior to training can predict post-training skill (e.g., Carpenter et al. 2012). However, recorded sessions may not be practical to obtain and code, and providers may select sessions that positively represent themselves (Rosengren et al. 2005).

These concerns have led to the development of standardized process measures that present vignettes about clients and ask providers how they would respond to the clients, using multiple choice or open response format. In the motivational interviewing domain, vignette measures have been particularly well developed (e.g., Baer et al. 2012; Miller et al. 1991; Rosengren et al. 2005), have distinguished providers who become proficient from those that do not (Baer et al. 2004), and as a result, have been used in hiring decisions (Stein et al. 2015).

The developmental history of motivational interviewing skill assessments can provide guidance for construction of pre-training skill assessments for other interventions. Over time, the realism of vignette stimuli and response formats has increased. Text-based vignettes and written responses (Miller et al. 1991) have been replaced by video-based vignettes and voice-recorded responses (Baer et al. 2012). These adaptations are thought to yield stronger predictive validity than written versions (Lievens and Sackett 2006). Video-based stimuli reduce demands on reading proficiency and may better approximate real life therapeutic situations, in which providers must process multiple cues in the environment, including verbal statements, body language, facial expression, and vocal tone (Lievens and Sackett 2006). Recording verbal responses not only eliminates demands on writing proficiency but can also capture nuances not present in written responses, such as the provider's tone of voice (Baer et al. 2012) and automaticity of responding.

Developing a Screening Interview for Attachment and Biobehavioral Catch-up

In summary, domain-general attributes have not yielded robust prediction of providers' implementation outcomes, but more specific attribute measures may better predict future implementation. Process measures, in contrast, are thought to be likely to predict outcomes (Fixsen et al. 2005; Project MATCH Research Group 1998) but are rarely measured prior to training. In designing a screening interview for ABC, we sought to ask three questions: First, could either an attribute measure or a process measure successfully predict future implementation? Second, how would these measures compare to education and experience in predicting outcomes? And third, if both measures predicted outcomes, which would be more important? In asking this last question, we sought to explore the impact of stable aptitude versus malleable skill. That is, since attributes are unlikely to change, if attributes were stronger predictors of implementation than process measures,

which measure a theoretically teachable skill, this would suggest that training and consultation would have limited impact on providers' ability to implement ABC with fidelity. Alternatively, if process measures predicted future implementation better than attributes, this would suggest that skills were more important than internal personality characteristics and that process measures could be used to identify the level of training providers need to achieve acceptable fidelity.

Thus, in the ABC screening interview, we included an attribute measure and a process measure. We hypothesized that the attribute of providers' valuing of attachment and openness would affect their ability to recognize infants' signals, assess the quality of parents' responses, and provide accurate, helpful feedback about parents' behavior. We also hypothesized that the process of making in the moment comments about parent behavior, the critical active ingredient of ABC, could be assessed through video-based vignettes. In addition to examining the measures' ability to predict implementation outcomes in separate regression models, we compared their relative contributions to outcomes using relative weight analyses.

Method

Participants

This study used archived program effectiveness data from 42 ABC parent coaches from around 20 agencies in 5 US states. Nearly all ($n = 41$, 98%) of the parent coaches were female. Demographic data were available for 83% of the sample. Coaches were 60% European American; 17% African American; 11% Asian American, Native Hawaiian, or Pacific Islander; 6% Hispanic; and 6% more than one race. The average age of coaches was 38 ($SD = 9$) with 11 ($SD = 6$) years of experience in the field. The majority (74%) had masters' degrees, with 23% with a BA or less, and 3% with a Ph.D.

Procedure

Potential parent coaches were identified by organizations interested in implementing ABC. If providers were interested in pursuing ABC training, they were asked to participate in the screening interview. As shown in Fig. 1, the 42 participants were selected from a larger pool of 47 providers. Two sites selected all screened providers, whereas three sites screened more providers than they were able to train and selected the best providers using screening scores. The screening interview was conducted remotely using video conferencing software for 12 participants and in person by organization staff for 30 participants. The interview was audio recorded and sent to the University of Delaware to be coded. Providers were then trained in six cohorts. Parent coaches participated in a 2- or 3-day training workshop led by the second and fourth authors and received weekly consultation for one year. Consultation included general/clinical group consultation, using session video and focusing on issues such as case conceptualization and integration of in the moment comments with manual content. Consultation also included individual fidelity-focused sessions, in which parent coaches coded fidelity from their own session videos, and then met with fidelity coders who had independently coded the coaches' fidelity to receive feedback focused on improving fidelity.

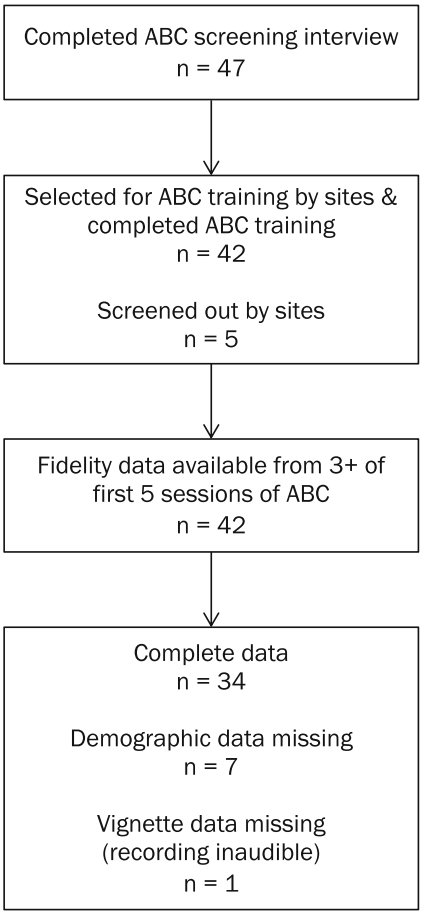

Fig. 1 Participant flowchart

In this study, we examined parent coaches' fidelity over their first five ABC sessions. Archived fidelity data coded by fidelity consultants were used; 197 sessions were available, and 13 were missing. The University's IRB considered the research exempt because it used archived data that were collected for clinical consultation and which were subsequently de-identified.

Measures

Demographics Parent coaches' gender, race, ethnicity, highest level of education, and years of experience were collected via a Qualtrics questionnaire e-mailed to coaches.

ABC Screening Interview

Attribute Measure The attribute measure used four questions from the Adult Attachment Interview (AAI; George et al. 1985) about early life experiences with the provider's primary caregiver, which led us to call it the "mini-AAI." The mini-AAI was not designed to be a shorter, but equivalent, version of the original AAI, which has an extensive scoring system. Instead, the mini-AAI questions were selected to briefly estimate the provider's valuing of attachment and openness. The mini-AAI used a five-point Likert scale reflecting responses similar to those with an autonomous state of mind versus those with a dismissing state of mind. A score of 5 would reflect a provider who valued attachment, was open about his or her attachment influences, and was able to provide believable, internally consistent episodic memories about the caregiver's responsiveness to distress. A score of 1 would reflect a provider who was closed about his or her attachment influences, was unable to identify memories of the caregiver's responsiveness, and may have insisted on an ideal presentation of the caregiver.

Process Measure The process measure introduced a core component of ABC, in the moment comments, and measured the degree to which the provider could identify the ABC targets (nurturance and following the lead) and make comments naturally. First, the interviewer provided a definition of what in the moment comments were and how they were used. Next, two sample video vignettes were played, one showing a parent nurturing her child and the second showing a parent following her child's lead, both followed by an ABC parent coach making an in the moment comment. These initial vignettes served to model the process of commenting and introduce the provider to the ABC targets. Next, four videos of targeted parent behaviors were presented. Each video was played twice before the provider was asked to make an in the moment comment. A five-point scale captured the degree to which a provider correctly identified the targeted parent behaviors and commented on them clearly and naturally. A provider with a score of 5 would describe the target behaviors clearly and accurately in parent-directed comments (e.g., "Beautiful job nurturing your child. She cried and you picked her up!"), whereas a provider with a score of 1 would not identify the intervention targets and would make vague, uncomfortable comments (e.g., "I think this child is just tired. I'd tell the mother that he might need a nap.").

The attribute and process measures were scored by ABC trainers (second and fourth authors) prior to training. The fourth author, a trained and reliable AAI coder, created the coding system and trained the second author. Half-point score designations (e.g., 3.5) were allowed. To assess interrater reliability, 15% of interviews were double-coded by two impartial raters who were not involved with training or consultation in the current sample. Two-way mixed effects single measures intraclass correlation coefficients (ICCs) were .80 for the mini-AAI scores and .81 for the vignette scores, reflecting excellent concordance.

ABC Fidelity

In ABC, fidelity is defined as making frequent, high quality in the moment comments. The in the moment fidelity measure assessed each opportunity for a parent coach to comment (i.e., each relevant parent behavior) and the coach's response to each opportunity. Several aspects of parent coach responses were coded.

Missed Opportunities An occurrence of an ABC-targeted parent behavior was coded as a missed opportunity if the parent coach failed to respond with an in the moment comment.

On-/Off-Target Each in the moment comment was coded as on-target or off-target. On-target comments were accurate and appropriate to the parent behavior. Off-target comments may have included inaccurate information or described parent behaviors not relevant to ABC.

Number of Components Comments could include 0 to 3 components of information: (1) specifically describing the parent behavior (e.g., "He started fussing, and you picked him up"), (2) labeling the target (e.g., "Beautiful nurturance"), and (3) describing long-term outcomes (e.g., "He's learning he can count on you").

Fidelity was coded on an Excel spreadsheet that calculated summary statistics, including frequency of on-target comments, percentage of missed opportunities, percentage of comments that were on-target, and average number of components included in comments. In the current study, fidelity consultants selected 5-min clips for coding using random number generators. Video clips of 5 min have measured ABC fidelity effectively in previous work (Caron et al. 2016). Thirty-two clips (16% of the sample) were double-coded by additional fidelity consultants. Interrater reliability was excellent, as measured by one-way single-measures ICCs: .88 for frequency of on-target comments, .77 for percentage of missed opportunities, .75 for percentage of on-target comments, and .77 for average number of components. Session-level data were averaged to create one data point per provider for each fidelity outcome.

Results

Preliminary Analyses: Correlations

The first set of analyses tested whether the mini-AAI and vignette assessments independently predicted providers'

Table 1 Means, standard deviations, and bivariate correlations between screening variables and fidelity scores

	Mean (SD)	Education	Experience	Mini-AAI	Vignettes	Percent on-target comments	Percent missed opportunities	On-target comment frequency
Education	1.8 (0.5)	–						
Experience	11.3 (6.4)	0.04	–					
Mini-AAI	3.9 (0.9)	0.20	0.11	–				
Vignettes	3.9 (0.9)	0.17	0.15	0.37*	–			
Percent on-target comments	73.6 (19.1)	0.26	− 0.12	0.48**	0.39*	–		
Percent missed opportunities	65.7 (15.5)	− 0.20	− 0.07	− 0.35*	− 0.38*	− 0.41**	–	
On-target comments/-minute	1.0 (0.6)	0.20	0.16	0.27	0.31***	0.53**	− 0.76**	–
Number of components	1.2 (0.3)	0.10	− 0.17	0.07	0.17	0.05	− 0.15	0.16

Note. Education ranged from 0 to 3 (0 = lower than B.A.; 1 = B.A.; 2 = M.A.; 3 = Ph.D.). Experience was measured by reported years of experience in the field. Missing data reduced *N* for correlations with vignettes to 41 and with education and experience to 34–35

*$p < .05$; **$p < .01$; ***$p = .05$

future fidelity to ABC. As shown in Table 1, higher scores on both measures were associated with stronger ABC fidelity in parent coaches' first five sessions, specifically, higher percentages of on-target comments and lower percentages of missed opportunities. Higher vignette scores also trended toward association with higher future on-target comment frequency ($p = .05$). Means, standard deviations, and correlations between variables are found in Table 1.

Primary Analyses: Regressions and Relative Weight Analyses

Next, we examined whether associations between screening scores and fidelity outcomes would hold after accounting for characteristics previously linked to future implementation, specifically, experience and education. We conducted a series of multiple regression analyses in which experience, education, and either the vignette score or the mini-AAI score were included. As shown in Table 2, after controlling for parent coaches' educational attainment and years of experience, mini-AAI scores continued to significantly predict coaches' future percentage of on-target comments ($\beta = 0.42$, $p < .05$) and percentage of missed opportunities ($\beta = -0.37$, $p < .05$). Coaches' vignette scores also significantly predicted their future percentage of on-target comments ($\beta = 0.51$, $p < .01$), percentage of missed opportunities ($\beta = -0.42$, $p < .05$), and on-target comment frequency ($\beta = 0.47$, $p < .01$), after accounting for experience and education.

In our final set of analyses, we explored the relative contributions of the mini-AAI and vignette assessments on future fidelity by supplementing each of our multiple regressions with a relative weight analysis (RWA; Johnson 2000). RWA provides the proportionate contribution that each predictor

Table 2 Regression analyses: mini-AAI and vignette assessment scores predicting fidelity outcomes, controlling for experience and education

Predictor	*B*	Std. error	Beta	*p* value
Percent On-Target Comments				
Education	5.70	5.11	0.18	.27
Experience	− 0.47	0.43	− 0.17	.28
Mini-AAI	7.81*	2.95	0.42	.013
Education	5.84	4.88	0.18	.24
Experience	− 0.55	0.41	− 0.20	.20
Vignettes	11.37**	3.40	0.51	.002
Percent Missed Opportunities				
Education	− 3.50	4.59	− 0.13	.45
Experience	− 0.06	0.38	− 0.03	.88
Mini-AAI	− 5.85*	2.65	− 0.37	.035
Education	− 4.31	4.38	− 0.16	.33
Experience	− 0.05	0.37	− 0.02	.90
Vignettes	− 7.47*	3.05	− 0.41	.02
On-Target Comment Frequency (Comments per Minute)				
Education	0.15	0.19	0.14	.42
Experience	0.01	0.02	0.73	.47
Mini-AAI	0.15	0.11	0.25	.17
Education	0.14	0.17	0.13	.41
Experience	0.01	0.01	0.09	.55
Vignettes	0.34**	0.12	0.47	.006

Note. Education ranged from 0 to 3 (0 = lower than B.A.; 1 = B.A.; 2 = M.A.; 3 = Ph.D.). Experience was measured by reported years of experience in the field. *N* for these analyses is reduced to 34–35 due to missing data

*$p < .05$; **$p < .01$

makes to the overall R^2, which allows for estimates of relative importance among highly interrelated predictor variables. We used an approach and SPSS syntax provided by Lundby and Johnson (2006) to account for intercorrelation among variables when estimating their relative importance. As shown in Table 3, we calculated the percentage of variance (R^2) accounted for by our predictor variables (mini-AAI and vignette screening scores) and covariates (education and experience) in predicting future percentage of missed opportunities, percentage of on-target comments, and on-target comment frequency. Both the mini-AAI and vignette screening scores accounted for a percentage of the variance in each of the predictor variables, but the mini-AAI was a stronger predictor of percentage of on-target comments than the vignette score, whereas the vignette score was a stronger predictor of percentage of missed opportunities and frequency of commenting that the mini-AAI.

Discussion

Evidence-based interventions are needed across the field of prevention practice. However, transporting interventions from labs to community settings has proven challenging, and strategies to predict and improve implementation success are needed. A key step is measuring fidelity and precursors to it. In the current study, we found that two aspects of a screening interview, a mini-AAI assessing valuing of attachment and openness and video-based vignettes assessing initial commenting skill, predicted parent coaches' fidelity in their first five sessions implementing ABC. These associations remained after controlling for the effects of education and experience, two characteristics often examined as predictors of implementation.

Table 3 Relative weight analysis: proportion of variance accounted for by mini-AAI scores, vignette scores, experience, and education

Predictor	Relative weight (%)	R^2
Percent on-target comments		0.342
Education	11.9	
Experience	8.1	
Mini-AAI	49.4	
Vignettes	30.7	
Percent missed opportunities		0.204
Education	12.1	
Experience	0.9	
Mini-AAI	37.7	
Vignettes	49.3	
On-target comment frequency (comments per minute)		0.149
Education	16.7	
Experience	11.0	
Mini-AAI	29.5	
Vignettes	42.7	

Note. Education ranged from 0 to 3 (0 = lower than B.A.; 1 = B.A.; 2 = M.A.; 3 = Ph.D.). Experience was measured by reported years of experience in the field. *N* for these analyses is reduced to 34 due to missing data

We believe the mini-AAI predicted fidelity because it measured a stable aspect of internal experience that is important to the ABC intervention in a *specific* way. That is, the mini-AAI was designed to measure providers' valuing of attachment experiences, which may be critical for implementing an attachment-based parenting intervention. Additionally, unlike many attribute measures used in prior work, the original AAI is a coder-rated measure and is rated based on discourse analysis rather than response valence, making it difficult for respondents to fake an autonomous responding style (Hesse 2008); we sought to capture these aspects of the interview in our adaptation.

The vignettes were designed to assess providers' ability to understand and recognize ABC-targeted behaviors and to use in the moment comments to address these behaviors, a critical aspect of ABC implementation. The vignettes thus measured providers' ability to quickly learn a novel process, which predicted their implementation of a very similar process in the more complex setting of home-based intervention sessions. For research teams interested in designing screening vignettes for other evidence-based interventions, we recommend developing initial vignettes that model an intervention strategy (e.g., identifying, then challenging, a maladaptive cognition in cognitive-behavioral therapy) as well as novel vignettes that assess understanding of, and initial ability to apply, this strategy. The modeling aspect of the vignettes in the current study departs from those in the motivational interviewing domain (e.g., Baer et al. 2012; Miller et al. 1991; Rosengren et al. 2005) but may better assess teachable components of fidelity. Written, audio, or video format may be used, with written formats minimizing demands on executive functioning, and audio/video formats increasing both realism and demandingness.

When the mini-AAI and vignette assessments were included together in RWAs, both contributed to all three outcomes, but the relative importance of each differed by outcome. Vignette scores appeared relatively more important for the two outcomes associated with commenting frequency. This suggests that providers' ability to quickly learn the skill of in the moment commenting in the vignettes may be particularly important in predicting future ease of commenting. The mini-AAI was a relatively stronger predictor of percentage of on-target comments, a measure of comment quality. This suggests that providers' valuing of attachment may predict their ability to *accurately* describe ABC's target behaviors, consistent with prior work linking state of mind to the ability to respond sensitively to infants' needs (Main and Goldwyn 1998). Taken together, comment frequency is more associated with the theoretically teachable aspect of the screening interview (i.e., the vignettes) than comment quality.

Given that fidelity was examined across only the first five ABC sessions, questions of malleability of providers' skill cannot be answered satisfactorily by the current study. The current findings could be interpreted as suggesting that comment frequency is more teachable than comment quality, that is, it may be easier to teach a provider to make many comments than to make high quality comments. Alternatively, this finding may reflect the typical developmental process in ABC training and consultation: first, making comments, and later, refining comments; specifically, until coaches are commenting relatively frequently, they can receive only limited feedback on improving the quality of their comments. Additionally, during ABC consultation, coaches improve both comment frequency and quality (Caron 2017). Thus, we do not consider these results to suggest that coaches cannot learn to improve their comment quality, but rather that the mini-AAI predicts coaches' comment quality at a specific point in time: after training but early in the consultation process. Consistent with general consensus in the field (e.g., Edmunds et al. 2013), we believe that training is insufficient, and consultation is necessary, to change clinicians' implementation. Over the course of ABC consultation, both low- and high-scoring interviewees may reach comparable levels of fidelity, making it critical to replicate the current study over a longer period of time. Future research should also explore whether the screening measures predict the rate of change in fidelity over time and the amount of training needed to attain ABC certification. Finally, the results of the RWA should be interpreted with caution, as they showed that both screening measures predicted a proportion of each outcome.

Both screening measures appear useful in predicting parent coaches' future implementation of ABC. This information could be used in several ways. First, the screening measures could be used to identify providers who are likely to need more training and consultation to reach proficiency, as well as providers who may require less support. Predicting providers' training/consultation needs could allow consultation to be offered in doses adjusted to those needs. Additionally, by identifying providers who are likely to excel in the intervention for selection as site supervisors and trainers, the screening measure could also promote sustainability. Alternatively, the screening measure could inform selection of providers for ABC training. Implementation in the prevention science field has historically taken the approach of training broadly, but provider selection may provide one way to improve implementation outcomes. In all cases, the screening interview could inform agencies' and trainers' decision-making about allocation of financial and human resources. Using this type of screening measure may be burdensome, requiring extra time in the adoption phase of implementation and potentially complicating hiring or selection decisions. However, the long-term impact on families due to increased treatment fidelity may be worth the added time and effort, and increased sustainability of implementation could save organizational time and resources in the long run.

A few limitations must be discussed. First, the screening interview and fidelity measure were scored by individuals in clinical roles. The screening interview was rated by workshop trainers, one of whom also provided clinical consultation to much of the sample. Knowledge of trainees' screening performance could have led the trainers/consultants to train or supervise differently. The fidelity measure was scored by consultants for use in individual consultation sessions; prior work has shown that consultants' ratings may be biased (e.g., Martino et al. 2009). In the current study, concerns about bias due to the clinical roles of raters are tempered by strong reliability for both the screening interview and fidelity measure.

Our sample was further limited by a restricted range in screening scores, partly because early support for the screening interview's predictive utility (Meade et al. 2013) led to its utilization in helping agencies make selection decisions. Further selection bias was introduced because all screened providers were interested in learning ABC and were put forth as possible trainees by their agencies. However, the problem of restricted range would likely only reduce our ability to find associations between variables, making it notable that the interview predicted fidelity in spite of the range. A further limitation is that provider-level data were nested in multiple ways, including within fidelity-focused consultant, within clinical consultant, within agency, and within training cohort, and analyses did not account for nesting.

In summary, we found that two screening measures, a brief assessment of valuing of attachment/openness and vignettes assessing initial aptitude for a key intervention component, predicted providers' initial fidelity to ABC. Identifying providers who will implement an intervention with fidelity could promote efficient use of training resources and could improve the quality of intervention provided to families. Others may also find it useful to screen trainees, and this paper provides an example and theoretical basis for the design of screening procedures.

Acknowledgments We would like to thank the parent coaches and ABC fidelity consultants who participated in this study. We would also like to thank Amanda Costello and Fabianne Blake for their coding of screening interviews and Chase Stovall-McClough and Lori Potter for their ABC consultation with the parent coaches in this sample.

Funding This research was supported by the National Institutes of Health Grants R01 MH052135, R01 MH074374, and R01 MH084135 to the fourth author.

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 and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent For this type of study, formal consent is not required.

References

Aarons, G. A., Hurlburt, M., & Horwitz, S. M. (2011). Advancing a conceptual model of evidence-based practice implementation in public service sectors. *Administration and Policy in Mental Health and Mental Health Services Research, 38*, 4–23. https://doi.org/10.1007/s10488-010-0327-7.

Baer, J. S., Rosengren, D. B., Dunn, C. W., Wells, E. A., Ogle, R. L., & Hartzler, B. (2004). An evaluation of workshop training in motivational interviewing for addiction and mental health clinicians. *Drug and Alcohol Dependence, 73*, 99–106.

Baer, J. S., Carpenter, K. M., Beadnell, B., Stoner, S. A., Ingalsbe, M. H., Hartzler, B., ... & Drager, Z. (2012). Computer assessment of simulated patient interviews (CASPI): Psychometric properties of a web-based system for the assessment of motivational interviewing skills. *Journal of Studies on Alcohol and Drugs*, 73, 154.

Barth, R. P., Landsverk, J., Chamberlain, P., Reid, J. B., Rolls, J. A., Hurlburt, M. S., et al. (2005). Parent-training programs in child welfare services: Planning for a more evidence-based approach to serving biological parents. *Research on Social Work Practice, 15*, 353–371. https://doi.org/10.1177/1049731505276321.

Beidas, R. S., & Kendall, P. C. (2010). Training therapists in evidence-based practice: A critical review of studies from a systems-contextual perspective. *Clinical Psychology: Science and Practice, 17*, 1–30. https://doi.org/10.1111/j.1468-2850.2009.01187.x.

Bernard, K., Butzin-Dozier, Z., Rittenhouse, J., & Dozier, M. (2010). Cortisol production patterns in young children living with birth parents vs children placed in foster care following involvement of Child Protective Services. *Archives of Pediatrics & Adolescent Medicine, 164*, 438–443. https://doi.org/10.1001/archpediatrics.2010.54.

Bernard, K., Dozier, M., Bick, J., Lewis-Morrarty, E., Lindhiem, O., & Carlson, E. (2012). Enhancing attachment organization among maltreated children: Results of a randomized clinical trial. *Child Development, 83*, 623–636. https://doi.org/10.1111/j.1467-8624.2011.01712.x.

Bernard, K., Hostinar, C. E., & Dozier, M. (2015). Intervention effects on diurnal cortisol rhythms of child protective services-referred infants in early childhood: Preschool follow-up results of a randomized clinical trial. *JAMA Pediatrics, 169*, 112–119. https://doi.org/10.1001/jamapediatrics.2014.2369.

Bowlby, J. (1988). *A secure base: Parent-child attachment and healthy human development*. New York: Basic Books.

Campbell, B. K., Buti, A., Fussell, H. E., Srikanth, P., McCarty, D., & Guydish, J. R. (2013). Therapist predictors of treatment delivery fidelity in a community-based trial of 12-step facilitation. *The American Journal of Drug and Alcohol Abuse, 39*, 304–311. https://doi.org/10.3109/00952990.2013.799175.

Caron, E. (2017). *Effects and processes of fidelity-focused consultation* (dissertation). University of Delaware, Newark.

Caron, E., Bernard, K., & Dozier, M. (2016). *In vivo feedback predicts parent behavior change in the Attachment and Biobehavioral Catch-up intervention*. *Journal of Clinical Child & Adolescent Psychology*. Advance online publication. doi:https://doi.org/10.1080/15374416.2016.1141359.

Carpenter, K. M., Cheng, W. Y., Smith, J. L., Brooks, A. C., Amrhein, P. C., Wain, R. M., & Nunes, E. V. (2012). "Old dogs" and new skills: How clinician characteristics relate to motivational interviewing skills before, during, and after training. *Journal of Consulting and Clinical Psychology, 80*, 560–573. https://doi.org/10.1037/a0028362.

Crowell, J. A., & Feldman, S. S. (1991). Mothers' working models of attachment relationships and mother and child behavior during separation and reunion. *Developmental Psychology, 27*, 597–605. https://doi.org/10.1037/0012-1649.27.4.597.

Damschroder, L. J., & Hagedorn, H. J. (2011). A guiding framework and approach for implementation research in substance use disorders treatment. *Psychology of Addictive Behaviors, 25*, 194. https://doi.org/10.1037/a0022284.

Durlak, J. A., & Dupre, E. P. (2008). Implementation matters: A review of research on the influence of implementation on program outcomes and the factors affecting implementation. *American Journal of Community Psychology, 41*, 327–350.

Edmunds, J. M., Beidas, R. S., & Kendall, P. C. (2013). Dissemination and implementation of evidence-based practices: Training and consultation as implementation strategies. *Clinical Psychology: Science and Practice, 20*, 152–165. https://doi.org/10.1111/cpsp.12031.

Fixsen, D. L., Naoom, S. F., Blase, K. A., Friedman, R. M. & Wallace, F. (2005). *Implementation research: A synthesis of the literature*. Tampa: University of South Florida, Louis de la Parte Florida Mental Health Institute, The National Implementation Research Network (FMHI Publication #231).

Frost, A., Jelinek, C., Bernard, K., Lind, T., & Dozier, M. (2017). Longitudinal associations between low morning cortisol in infancy and anger dysregulation in early childhood in a CPS-referred sample. *Developmental Science*. https://doi.org/10.1111/desc.12573.

George, C., Kaplan, N., & Main, M. (1985). Adult attachment interview.

Hesse, E. (2008). The adult attachment interview: Protocol, method of analysis, and empirical studies. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of attachment: Theory, research, and clinical applications* (2nd ed., pp. 552–598). New York: Guilford Press.

Hulleman, C. S., & Cordray, D. S. (2009). Moving from the lab to the field: The role of fidelity and achieved relative intervention strength. *Journal of Research on Educational Effectiveness, 2*, 88–110. https://doi.org/10.1080/19345740802539325.

van Ijzendoorn, M. (1995). Adult attachment representations, parental responsiveness, and infant attachment: A meta-analysis on the predictive validity of the adult attachment interview. *Psychological Bulletin, 117*, 387–403. https://doi.org/10.1037/0033-2909.117.3.387.

van Ijzendoorn, M. H., Schuengel, C., & Bakermans-Kranenburg, M. J. (1999). Disorganized attachment in early childhood: Meta-analysis of precursors, concomitants, and sequelae. *Development and Psychopathology, 11*, 225–249. https://doi.org/10.1017/S0954579499002035.

Johnson, J. (2000). A heuristic method for estimating the relative weight of predictor variables in multiple regression. *Multivariate Behavioral Research, 35*, 1–19. https://doi.org/10.1207/S15327906MBR3501_1.

Kallestad, J. H., & Olweus, D. (2003). Predicting teachers' and schools' implementation of the Olweus bullying prevention program: A multilevel study. *Prevention & Treatment*, 6. doi:https://doi.org/10.1037/1522-3736.6.1.621a.

Klimes-Dougan, B., August, G. J., Lee, C. Y. S., Realmuto, G. M., Bloomquist, M. L., Horowitz, J. L., & Eisenberg, T. L. (2009). Practitioner and site characteristics that relate to fidelity of implementation: The early risers prevention program in a going-to-scale intervention trial. *Professional Psychology: Research and Practice, 40*, 467–475. https://doi.org/10.1037/a0014623.

Letendre, M. L., & Reed, M. B. (2017). The effect of adverse childhood experience on clinical diagnosis of a substance use disorder: Results of a nationally representative study. *Substance Use & Misuse, 52*, 689–697. https://doi.org/10.1080/10826084.2016.1253746.

Lewis-Morrarty, E., Dozier, M., Bernard, K., Terracciano, S. M., & Moore, S. V. (2012). Cognitive flexibility and theory of mind outcomes among foster children: Preschool follow-up results of a randomized clinical trial. *Journal of Adolescent Health, 51*, S17–S22. https://doi.org/10.1016/j.jadohealth.2012.05.005.

Lievens, F., & Sackett, P. R. (2006). Video-based versus written situational judgment tests: A comparison in terms of predictive validity. *Journal of Applied Psychology, 91*, 1181–1188. https://doi.org/10.1037/0021-9010.91.5.1181.

Lundby, K. M., & Johnson, J. W. (2006). Relative weights of predictors: What is important when many forces are operating. In A. I. Kraut (Ed.), *Getting action from organizational surveys: New concepts, technologies, and applications*. San Francisco: Jossey-Bass.

Main, M., & Goldwyn, A. (1998) *Adult attachment interview scoring and classification manual.* Unpublished manual. Berkley: University of California, Department of Psychology.

Martino, S., Ball, S., Nich, C., Frankforter, T. L., & Carroll, K. M. (2009). Correspondence of motivational enhancement treatment integrity ratings among therapists, supervisors, and observers. *Psychotherapy Research, 19*, 181–193. https://doi.org/10.1080/10503300802688460.

Meade, E., Blackwell, M., Roben, C.K.P., & Dozier, M. (2013). Using screening interviews to predict therapist performance in the Attachment and Biobehavioral Catch-up intervention. Poster presented at the biennial meeting of the Society for Research on Child Development (SRCD), Seattle, WA.

Miller, W. R., Hedrick, K. E., & Orlofsky, D. R. (1991). The helpful responses questionnaire: A procedure for measuring therapeutic empathy. *Journal of Clinical Psychology, 47*, 444–448.

Miller, G. E., Chen, E., & Parker, K. J. (2011). Psychological stress in childhood and susceptibility to the chronic diseases of aging: Moving toward a model of behavioral and biological mechanisms. *Psychological Bulletin, 137*, 959–997. https://doi.org/10.1037/a0024768.

Project MATCH Research Group. (1998). Therapist effects in three treatments for alcohol problems. *Psychotherapy Research, 8*, 455–474. https://doi.org/10.1093/ptr/8.4.455.

Riem, M. M. E., Bakermans-Kranenburg, M., van Ijzendoorn, M. H., Out, D., & Rombouts, S. A. R. B. (2012). Attachment in the brain: Adult attachment representations predict amygdala and behavioral responses to infant crying. *Attachment & Human Development, 14*, 533–551. https://doi.org/10.1080/14616734.2012.727252.

Roben, C. K., Dozier, M., Caron, E., & Bernard, K. (2017). Moving an evidence-based parenting program into the community. *Child Development, 88*, 1447–1452. https://doi.org/10.1111/cdev.12898.

Rosengren, D. B., Baer, J. S., Hartzler, B., Dunn, C. W., & Wells, E. A. (2005). The video assessment of simulated encounters (VASE): Development and validation of a group-administered method for evaluating clinician skills in motivational interviewing. *Drug and Alcohol Dependence, 79*, 321–330. https://doi.org/10.1016/j.drugalcdep.2005.02.004.

Stein, L. A. R., Clair, M., Soenksen-Bassett, S., Martin, R. A., & Clarke, J. G. (2015). Studying process and proximal outcomes of supervision for motivational interviewing. *Training and Education in Professional Psychology, 9*, 175–182. https://doi.org/10.1037/tep0000073.

Tabak, R. G., Khoong, E. C., Chambers, D. A., & Brownson, R. C. (2012). Bridging research and practice: Models for dissemination and implementation research. *American Journal of Preventive Medicine, 43*, 337–350. https://doi.org/10.1016/j.amepre.2012.05.024.

Taylor, W. D., Asgary-Eden, V., Lee, C. M., & Laroche, K. J. (2015). Service providers' adherence to an evidence-based parenting program: What are they missing and why? *Journal of Child and Family Studies, 24*, 50–56. https://doi.org/10.1007/s10826-013-9812-4.

Tyrrell, C., Dozier, M., Teague, G. B., & Fallot, R. D. (1999). Effective treatment relationships for persons with serious psychiatric disorders: The importance of attachment states of mind. *Journal of Consulting and Clinical Psychology, 67*, 725–733.

U.S. Department of Health & Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2018). Child maltreatment 2016. Available from https://www.acf.hhs.gov/sites/default/files/cb/cm2016.pdf.

Wittenborn, A. K. (2012). Exploring the influence of the attachment organizations of novice therapists on their delivery of emotionally focused therapy for couples. *Journal of Marital and Family Therapy, 38*, 50–62. https://doi.org/10.1111/j.1752-0606.2012.00290.x.