



The Challenges Associated with *Changing Practice*: Barriers to Implementing Naturalistic Developmental Behavioral Interventions in ABA Settings

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Abstract

Naturalistic developmental behavioral intervention (NDBI) supports early social communication skills in young autistic children. Given their emphasis on child-led learning opportunities, NDBI is thought to be a socially valid approach to autism early intervention. Applied behavior analysis (ABA) practices could be an ideal setting to increase access to NDBIs for young autistic children; however, current ABA services continue to rely primarily on structured and adult-led approaches to teaching, including discrete trial training (DTT), which have been criticized for their intensity, limitations in skill generalization, and possible harms. Thus, while there is growing interest in translating NDBI into ABA settings, delivering NDBI in these settings may require de-implementing or transitioning away from using DTT approaches with young autistic children. The current study sought to understand the perspectives of ABA providers on the use of NDBI strategies within ABA clinical settings and the factors impacting the transition away from DTT approaches to effectively integrate NDBI. Semi-structured interviews were conducted with 18 ABA frontline and supervising clinicians across several ABA organizations. Rapid qualitative methods grounded in standard content analysis were used to analyze qualitative data. Results indicated that ABA clinicians generally viewed NDBI positively. However, several themes emerged related to the relative ease of using NDBI and DTT; the relative effectiveness of NDBI and DTT; client, caregiver, and staff perceptions of NDBI; and clinical decision-making around who might benefit from NDBI. Barriers to implementing NDBI included the need to unlearn existing DTT strategies, limited training and self-efficacy delivering NDBI, mixed attitudes toward NDBI, and broader systemic issues in the delivery of ABA services. Findings underscore the importance of understanding ABA frontline clinicians' perspectives regarding the implementation of NDBI and suggest the need for more targeted strategies to integrate NDBI strategies in ABA clinical settings.

Keywords Autism · Applied behavior analysis (ABA) · Early intervention · De-implementation · Naturalistic developmental behavioral intervention (NDBI)

Introduction

Naturalistic developmental behavioral interventions (NDBIs) include a class of intervention approaches that support early social communication skills in autistic children by using developmental and naturalistic behavioral teaching strategies (Bruinsma et al., 2020; Frost et al., 2020; Schreibman et al., 2015). NDBIs are distinct from more common natural environment training (NET) approaches that are often used as an

“add-on” strategy following more structured teaching to help facilitate generalization (Halle, 1982). Although NDBI also includes naturalistic teaching strategies, NDBI approaches are more strongly rooted in developmental principles that emphasize child-led learning, developmentally appropriate goals, and naturalistic forms of teaching and reinforcement that build on a child's current interests and abilities to support social communication and emotion regulation skills. Two recent meta-analyses found small to medium effects for NDBI on social engagement, communication, and cognition in young autistic children (Sandbank et al., 2020; Song et al., 2024; Tiede & Walton, 2019). Further, given their emphasis on child-led learning opportunities, NDBI approaches are thought to have moderate social validity and to be aligned with neurodiversity affirming care when rated by autistic adults (Schuck et al., 2024).

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In light of these findings, there has been growing interest in translating NDBI into community settings serving young autistic children and their families (e.g., Boyd et al. 2022; D’Agostino et al., 2023). This includes research that including work that has proposed the value of implementing NDBI within community-based applied behavior analysis (ABA) practices (Dueñas et al., 2023) and that has evaluated the current use of NDBI within these settings (Hampton & Sandbank, 2022). This work has argued that ABA practices could be an ideal setting to increase access to NDBIs for young autistic children given that about half of children are now receiving autism diagnoses and qualifying for ABA prior to age three years (Maenner et al., 2023; Monz et al., 2019). Additionally, there has been significant expansion of ABA insurance coverage over the past decade (McBain et al., 2021) that has driven the proliferation of ABA practices across the United States (Trump & Ayres, 2020). It is estimated that there are more than 68,000 supervising Board-Certified Behavior Analysts (BCBAs) and 168,000 frontline behavior technicians delivering services within ABA practices within the United States (Behavior Analyst Certification Board, 2024).

Although community ABA practices may indeed be a ripe setting in which to deliver NDBI to autistic children, there are likely multifaceted implementation challenges that would impede the delivery of NDBI. For instance, research has demonstrated that many practicing BCBAs are unfamiliar with NDBI models and have not received explicit training in principles of child development or parent coaching—foundational elements of NDBI (e.g., Hampton & Sandbank, 2022). Perhaps an even larger challenge than the lack of NDBI knowledge is that some BCBAs believe that NDBI practices are ineffective and/or inappropriate for autistic children (Hampton & Sandbank, 2022). Even when BCBAs have a foundation in child development and are brought into NDBI, they will likely face practical barriers to implementation in their clinical setting. Although these implementation barriers have not yet been formally evaluated, they have been hypothesized to include the complexity of NDBI, increased pre-service and in-service training needs to support knowledge gaps, negative attitudes and organizational culture toward the delivery of NDBI, challenges billing for the use of NDBI, and the need for adequate data collection systems to monitor client progress in response to NDBI (Dueñas et al., 2023).

While outlining potential implementation barriers is important, it is also the case that implementing NDBI for autistic toddlers and preschoolers may inevitably require reducing the use of some standard practices used within many ABA settings for autistic toddlers—including the sole reliance on discrete trial training (DTT)—a more traditional treatment approach with a long history of use within ABA therapy (Lovaas, 1987). DTT emphasizes frequent,

adult-directed teaching trials of specific elements of communication, cognition, and adaptive skills in structured environments (e.g., at a table) and often with unrelated reinforcers (i.e., receiving a chip for labeling a picture) rather than natural reinforcers (e.g., having a snack opened after communicating “open”). Although it has some empirical support, DTT has been criticized for its impractical intensity and its limitations related to the generalization of skills from clinic settings into meaningful home and community-based settings (e.g., Koegel et al., 1998; Schreibman et al., 2015; Wilkenfeld & McCarthy, 2020). Further, a growing body of researchers and autistic advocates have argued support that relying solely on Lovaas-style DTT when intervening with young autistic children may limit treatment gains, and at worst be harmful and traumatic to some autistic individuals (Anderson, 2023; Wilkenfeld & McCarthy, 2020). Given the demonstrated problems relying solely on a DTT-based intervention approach and the solid evidence to show NDBI approaches are equally effective in autistic young children (Kasari et al., 2023; Rogers et al., 2021), it is important to understand how best to implement NDBI and, importantly, the extent to which reducing, or de-implementing, certain aspects of traditional ABA approaches is needed.

De-implementation is defined as reducing, replacing, removing, or restricting practices that are ineffective, have mixed evidence of effectiveness, are contradicted, or are untested (Norton et al., 2018). The extent to which de-implementation is warranted and the speed by which it should occur is influenced by the extent to which the practice is harmful, whether the practice is in widespread use, the extent to which de-implementation will benefit patient populations equitably, and the cost of de-implementation efforts (Norton et al., 2018). Using a de-implementation lens may provide important insight into the unique challenges of implementing NDBI approaches in a manner that will require the reduction of DTT (sometimes referenced as substitution; Helfrich et al., 2019). This lens takes into consideration the reality of the current ABA landscape and is critical because de-implementing DTT may facilitate the implementation of NDBI (e.g., Farquharson et al., 2023) by speeding up or increasing the effectiveness of NDBI implementation efforts. However, the factors that impact the de-implementation of DTT for autistic toddlers are likely overlapping yet distinct from those that support the implementation of NDBI within ABA practices (Helfrich et al., 2019; Ingvarsson et al., 2022; Patey et al., 2018).

Factors that are delineated in de-implementation frameworks and that may be relevant to ABA service settings include clinicians’ perception of the relative effectiveness of DTT and NDBI for autistic toddlers, as well as the relative complexity of delivering these intervention approaches (e.g., Norton et al., 2018). Substituting an existing intervention with a new evidence-based intervention may be particularly

challenging if the latter requires additional time and the acquisition of new skills. Research has shown that NDBI is sometimes implemented with lower fidelity than traditional DTT approaches in ABA settings (Pellecchia et al., 2015), a finding that may reflect the relative ease of using DTT approaches and/or the infrastructure that is already in place to support DTT use. Indeed, the training models that are already in place for DTT via pre-service onboarding may impact how ingrained DTT is within organizations and thus the amount of support that may be needed to unlearn practices (Helfrich et al., 2019; Norton & Chambers, 2020). Further, although some organizations may welcome the opportunity to de-implement DTT to the extent that it affords them an opportunity to improve efficiency, optimize use of limited resources, and reduce burden, other organizations may be less open and/or ready for these changes.

The de-implementation of DTT to increase the delivery of NDBI is further complicated by the fact that community ABA services are delivered by teams of Registered Behavior Technicians (RBTs) who are frontline clinicians that are supervised by BCBAs. Several research studies advocating for the integration of NDBI into ABA practices have focused on the delivery of NDBI by BCBAs (e.g., D'Agostino et al., 2023) rather than RBTs. The requirements for RBT certification and entry into the autism intervention work force are minimal, and turnover rates are quite high for RBTs in most ABA organizations (Novack & Dixon, 2019; BHCOE, 2023). Thus, embedding NDBI into RBT onboarding and utilizing an intervention that matches the typical RBT skill-set and level of experience is critical. To implement NDBI to fidelity in ABA clinic settings, RBTs may require a higher degree of initial training, coaching, and feedback provision than with traditional DTT approaches.

Although a number of research studies have discussed the alignment and possible challenges implementing NDBI within ABA practices (e.g., Dueñas et al., 2023), research has yet to directly examine barriers to the delivery of NDBI by both BCBAs and frontline RBTs. Using a de-implementation lens to address this gap is critical given that gradually transitioning away from DTT may be necessary to implement NDBI (Farquharson et al., 2023), and the factors driving the de-implementation of DTT may be distinct from those that support the implementation of NDBI within ABA practices (Ingvarsson et al., 2022; Patey et al., 2018). To address these gaps, the current study sought to better understand the perspectives of BCBA practitioners and RBT direct care staff about integrating NDBI approaches within their clinical practice. The current study was grounded in de-implementation frameworks (e.g., Norton & Chambers, 2020) to examine the following: (1) BCBA and RBT perceptions of reducing the use of traditional ABA approaches in order to integrate the use of NDBI; and (2) factors that impact the de-implementation of DTT approaches.

Method

Design

This study was grounded in a post-positivist qualitative paradigm, in which the approach to designing interview questions, sampling participants, conducting analysis, and presenting findings are focused on a deductive and relatively structured categorization of data based on existing conceptual frameworks (Berkovich, 2018; Sobh & Perry, 2006). We intentionally selected a post-positivist approach given that the primary goal of this study was to evaluate the relevance of de-implementation frameworks (i.e., an existing conceptual model) to understand whether the factors considered in the model might be relevant when considering how to more effectively implement NDBI within an ABA context. Further, in contrast to a more traditional positivist approach, a post-positivist approach would not prevent new explanations or themes from emerging from this study in the event that they departed from the conceptual framework (Berkovich, 2018).

Procedures

Participants in this study were 18 Board Certified Behavior Analysts (BCBAs) and Registered Behavior Technicians (RBTs) working within university-affiliated and community-based clinics. All participants completed a de-identified survey of their sociodemographic background followed by a semi-structured interview lasting approximately thirty minutes. Interviews were conducted using Zoom or Webex and audio recorded. Interviewers included three post-baccalaureate students and one senior author, three of which have experience in both DTT and NDBI in clinical and/or academic settings, and all with experience in NDBI. All research procedures were approved by the Children's Healthcare of Atlanta Institutional Review Board (IRB).

Participants

Participants were nine Board Certified Behavior Analysts (50%) and nine Registered Behavior Technicians (50%). One of the BCBAs who participated also served in an administrative role. The majority of participants worked within a large, university-affiliated ABA clinic (77.8%) with a smaller percentage working within community ABA clinics (22.2%). BCBAs and RBTs demographic information can be found in Table 1.

Setting

This study occurred within a university-affiliated ABA clinic, as well as three ABA clinics not affiliated with

Table 1 Participant demographic information

	Percent or mean (SD)
Gender	
Female	77.8%
Age in years	31.23 (8.52)
Race	
White/Caucasian	66.7%
Black/African American	16.7%
Asian/Pacific Islander	11.1%
Multiracial	5.6%
Ethnicity	
Hispanic/Latinx	5.6%
Education	
Bachelor's	33.3%
Master's	50.0%
Doctorate	16.7%
Years of NDBI experience (SD)	0.93 (.79)
Received formal training in NDBI	83.3%
Participant role	
Registered Behavior Technician (RBT)	44.4%
Board Certified Behavior Analyst (BCBA)	50.0%
Administrative role	5.6%
Place of work	
University-affiliated clinic	77.8%
Community clinic	22.2%

a university setting. RBT and BCBA participants who worked in the university-affiliated ABA clinic-maintained caseloads of 6 to 10 autistic clients ages 2 to 12 years who receive intervention between 15 and 30 h per week. DTT approaches had historically been heavily relied on for teaching early social communication skills. Since 2020, NDBI approaches had gradually been introduced and utilized in the clinic, and most BCBA providers had received some formal training in NDBI (i.e., Project IMPACT).

Measures

Demographic Information Participants provided basic demographic information, including their age, gender identity, race, ethnicity, educational attainment, years of experience working with autistic children, years in their current position, previous training in NDBI approaches, and number of autistic children on their caseload. Participating BCBAs were also asked to report on the number of RBTs that they oversee within their clinical practice.

Interviews All interviews were conducted via Zoom and were led by trained research staff who had experience using both DTT and NDBI either via formal training and/or by having previously served as an RBT, BCBA, or both.

Interviews were led by individuals who did not know the interviewee. It is important to acknowledge that all research staff held favorable views toward integrating more NDBI into ABA practice for autistic toddlers and young children. However, as described below and depicted in the appendix, all interview questions were designed to be agnostic with the goal to have participants reflect on their general experiences delivering both DTT and NDBI to encourage a comparative lens that is central to de-implementation frameworks.

Consistent with the post-positivist qualitative approach (i.e., Berkovich, 2018), interview questions for the current study were based on a thorough review of literature and frameworks specific to de-implementation. This review was used to select and refine interview questions (see appendix). Interviews for all participants were semi-structured with questions intentionally grounded in de-implementation frameworks that asked participants to reflect on the relative ease and effectiveness of NDBI and DTT, as well as the client-, provider-, organization-, and system-level factors impacting the transition from DTT to NDBI (Norton et al., 2018). All participants were asked to describe their current clinical practice prior to being asked about: (1) their general impressions of delivering NDBI and DTT; (2) their training background in DTT and NDBI; (3) the relative ease of reducing the use of DTT to deliver NDBI within ABA settings; (4) the amount of support needed to learn and use

NDBI given prior training in DTT; (5) the perceived effectiveness of NDBI and DTT; (6) autistic clients' and their caregivers' experience of NDBI and DTT; and (7) the barriers and facilitators to implementing NDBI with an emphasis on onboarding and billing procedures; administrative support, provider attitudes, staff turnover, and the general ABA service system landscape. See appendix for interview guide.

Throughout the interview process, the research team met weekly to debrief interviews, to reflect on high-level themes emerging from interviews, and to discuss how our interpretation of interviews could be shaped by beliefs that NDBI represents a developmentally appropriate approach to intervention that should be used more within ABA contexts. A focal point of these discussions was on NDBI descriptions of NDBI made by participants that the interview team perceived as seeming inaccurate. In several meetings, we discussed the importance of allowing space for these statements and responding to these statements neutrally. We also used these discussions to delineate a true misunderstanding of core NDBI strategies from more general statements on the value of NDBIs for autistic children. In keeping with our post-positivist paradigm, in addition to reflecting on our biases and understanding of NDBI, these conversations resulted in adding a misunderstanding theme to our coding even though it was not a component of our existing de-implementation framework.

Data Analysis

All interviews were recorded and de-identified in the transcription process. Transcription was conducted by an external transcription agency. The qualitative coding process and framework was developed by two senior authors with a background in qualitative analysis and supported by three post-baccalaureate students with experience delivering DTT and NDBI. Rapid qualitative analysis was used as the overarching process for qualitative analysis with coding grounded in standard content analysis. Rapid qualitative methods are a positivist and deductive approach to qualitative analysis intended to expedite the analytic process, particularly within implementation contexts in which more rapid turnaround may be needed to quickly address the implementation challenges and needs of community partners (Hamilton, 2013; Hamilton & Finley, 2019; Nevedal et al., 2021). This approach was selected given: (1) our deductive approach to analysis that was grounded in a de-implementation lens; (2) that many of the team members were also in ABA clinical roles with limited time to dedicate toward intensive and inductive approaches to qualitative analysis; (3) the goal to use preliminary qualitative data to rapidly evaluate the relevance of a de-implementation lens in order to set the stage and provide guidance for more intensive forms of

mixed-methods data collection. As part of rapid qualitative analysis, the coding team met weekly to debrief interviews that had occurred, including to reflect on high-level themes from the interviews and to determine when thematic saturation, or when no new high-level themes, had occurred.

Following this process, the core domains of the interview protocol were used as the organizing framework for developing an initial codebook (e.g., Hamilton, 2013; Taylor et al., 2018). As part of the rapid analytic approach, the codebook included an initial set of codes that were deductive and directly mapped onto the following core interview domains: previous experiences and training in DTT and NDBI; the relative complexity of NDBI and DTT; clinician decision making around when and how NDBI and DTT are delivered; and the barriers and facilitators to using NDBI and DTT. The entire research team was involved in developing this initial codebook, which was developed in close review of two initial transcripts. The codes were then applied by one senior author and three students to two additional interview transcripts: one transcript from a BCBA and the other from an RBT. This first round of coding focused on refining the initial codebook definitions and inductively adding any codes or sub-codes that were not present based on the initial review. This process to refine the codebook occurred one more time with two additional transcripts. Once refined, the codebook was applied to all subsequent interviews, with two individuals coding all transcripts and consensus coding used to resolve discrepancies. Although saturation was reached early in the coding process, all transcripts were coded with the intention of fully representing all participants.

All coding occurred within MAXQDA software. Member checking occurred in which the research team presented a summary of results and then subsequently the drafted manuscript to participants. Feedback was encouraged through a series of discussion questions, PowerPoint presentations, and questions that invited participants to reflect on the framing and coding of qualitative data. Participants reported satisfaction and no new themes emerged. In addition to formal member checking, the initial results of this study were presented back to a neurodiversity taskforce consisting of caregivers of autistic children, autistic researchers and staff, BCBAs, and other non-autistic students and clinicians working within a large autism center. This presentation was used to obtain input on the overall goals of the study and framing of the project regarding de-implementation. The taskforce felt as though the project was relevant in the neuro-affirming space with rich discussion centering on their perceptions of ABA within the community and the need for more developmental and naturalistic approaches to therapy while acknowledging the complexity of delivering NDBI in a system where DTT is the prevailing treatment approach and the polarization of the field around distinct approaches to ABA. They also reported the need for more research evaluating the benefits

and harms of particular DTT and NDBI strategies to inform future implementation and de-implementation efforts.

Results

Qualitative results are summarized by overarching category with specific themes grouped under their relevant category. The main qualitative categories include provider perceptions of NDBI and DTT; caregiver perceptions of NDBI; child perceptions of NDBI; relative effectiveness of DTT and NDBI therapeutic approaches; relative ease of therapeutic approaches; clinical decision making regarding the delivery of DTT or NDBI; and implementation barriers. The results section presents the most prominent qualitative themes within each category with more specific information regarding all themes shown in Table 2.

Staff Perceptions of NDBI and DTT

Participants' perception of NDBI was largely positive, with many RBTs and BCBAs reporting that they *enjoy delivering NDBI*. Participants shared that they felt that NDBI helped them to build stronger relationships with their clients and gave them more autonomy in how they delivered services.

On the other hand, when asked to describe their use of NDBI, several participants described NDBI strategies inaccurately and in a manner that suggested *misconceptions about NDBI delivery*. The three most common misconceptions included viewing NDBI as exclusively following a child's lead, as not providing structure within NDBI, and as not being sensitive to a child's communication and preferences. Although misunderstandings were reported by both BCBAs and RBTs, they were more prevalent among RBT participants. For example, one RBT noted about NDBI:

For me, it's not very functional for them [autistic child] to play for three hours with an adult following them around and narrating constantly and looking in their eyes constantly and thinking that's somehow going to help them.

Caregiver Perceptions of NDBI

Participants who were BCBAs were best able to describe caregivers' perceptions of NDBI given their more active role in the delivery of caregiver coaching and support. BCBAs indicated that caregivers had provided almost universal positive feedback regarding their child's receipt of NDBI and particularly related to the autonomy it provided to their child and the generalization of communication into their home setting. One BCBA shared:

Because ABA has kind of a bad reputation right now, most of my parents are pretty excited to hear that we're really thinking of their child and they're enjoying that level and [that we're] not creating over compliant robots.

Child Perceptions of NDBI

When asked about how participants felt that their clients responded to NDBI in comparison to the use of DTT approaches, many participants shared that autistic children demonstrated more frequent positive affect during NDBI and seemed to enjoy having an adult follow their lead. They also indicated perceiving that children had more agency within NDBI that could foster their positive sense of self. One RBT noted:

In a clinic, it's going to be hard to get rid of that [DTT], but I'm hoping it's more fun for the kids to get to respond with their own creativity there, to be themselves. I'm hoping that's helping foster their own personalities emerging using NDBI and seeing how their interests help them shape their own communication.

Relative Effectiveness

Participants were asked to describe the relative impact of NDBI and DTT on autistic children's growth and development. Across all participant groups, there was strong consensus that while DTT might result in faster discrete skill gain, the use of NDBI appeared to allow for the development of more *spontaneous* skills. Once BCBA described this differentiation as:

In DTT, with such a structure, you see progression faster, but generalization was always a hit or miss. But with NDBI, we've seen a little bit more spontaneous communication happening, we've seen more dots connect, especially when you're engaging with them in their preferred environment, and you're using those items to teach them skills, and it makes more sense.

Both BCBAs and RBTs referenced that autistic children also seem to *generalize* what they learn more easily when they receive NDBI. One RBT indicated that "you're helping them make those connections more naturally ... rather than me asking for an arbitrary thing that they might not encounter in a normal day."

Clinical Decision Making

When asked to describe the effectiveness of NDBI and DTT, participants described a few characteristics that might lead

Table 2 Primary themes, definitions, and example quotes

Construct	Theme	Definition	Exemplar quote
Staff perceptions	Enjoyment	How staff view NDBI vs DTT The extent to which staff enjoy each therapeutic approach	“... once they get it, then the session is so fun. And then they're enjoying the fact that their kid wants to spend time with them, and they have that good relationship that goes both ways. And then they see that and that's really, really helpful and does seem to be really highly enjoyable for both parties...”
	Misconception	Clinicians who reported an incorrect understanding of NDBI principles	“It can be physically exhausting when the client is four years old and hyperactive and you're trying to maintain eye contact for three hours.”
Caregiver perceptions		Staff's interpretation of caregivers' experience with NDBI and DTT	“I've had really great caregiver buy in. Mom's like, 'yes, please.' I have a lot of caregivers that are like, 'I don't want my kids to become very robotic.' And so, showing them, hey, we're going to follow her lead, and now we're working on more of that toleration of, hey, it's going to be my choice right now and not your choice but still following her lead with a lot of it.”
Child perception		Staff's interpretation of an autistic child's experience with NDBI and DTT	“I think overall they're feeling more in control. I would say anecdotally, and I hope that they're happier. I hope that we're selecting therapies for them that are less traumatizing and more inclusive. It's hard to measure happiness.”
Relative effectiveness		Staff's perceptions of the effectiveness of NDBI and DTT approaches	“My favorite outcome that I see often and that I think has really been winning over a lot of the staff is the spontaneity piece of it. The spontaneity is just coming naturally, as one expects with an approach like this. And we're really seeing the kids start to request more spontaneously or [identify] things in their environment.”
	More spontaneous skills	Staff's reflection on the spontaneity of children's learning and development	“NDBI has been fantastic because she's been able to generalize what she's learned into the whole environment ... since it's child led, she has to point to whatever things she wants in the environment, and that was how we started off her NDBI protocol. And she's been able to generalize that not perfectly but nearly perfectly to everything.”
Relative ease	More generalizable skills	Staff's observation that autistic children seem to generalize what they learn better when they receive NDBI	“I think the job is tiring. You're on your feet. Yeah, especially with a child that has a lot of energy or ... kids who seem to be running around more. Or more so jumping from one activity to another, which was developmentally appropriate for younger. But I think yeah, I do think it's a barrier for other people.”
	Physically demanding	Staff's perceptions of the ease of NDBI and DTT approaches Participants reported the physical challenges delivering NDBI	“There's more of a creative aspect to NDBI, where DTT is very clear cut: These are the steps, this is what you follow. You could think of one as a science and the other as an art.”
	Need for creativity and flexibility	Participants citing need for creativity and flexibility within NDBI approaches	

Table 2 (continued)

Construct	Theme	Definition	Exemplar quote
Clinical decision making	Ability to generalize treatment approaches across children	Participants described NDBI as more difficult to learn and generalize across autistic children	“So, I looked at the protocol; it was very detailed. But again, how you implement it looks different for each kid. It’s still individualized. So, it took me some time, being exposed to more kids and getting opportunities to practice that way helped me integrate myself into that.”
		The factors driving clinicians’ decisions to deliver certain therapeutic approaches	
	Child age	Staff citing a child’s age as a factor of when deciding approaches	“It [NDBI] is easiest probably with some of my younger kiddos. As we always say, those are probably the easiest ones to start with.”
	Disruptive behaviors	Staff citing a child’s behavior as a factor of when deciding approaches	“There are cases that that level of focus and rigidity is important like when you’re talking about unsafe behaviors. You have to take all that noise out.”
Implementation barriers		The perceived barriers to implementing NDBI strategies in clinic	
	The need for unlearning	Previous training in DTT makes it more difficult to learn NDBI	“I think in terms of a training perspective, making that shift for therapists who are more seasoned, who have been here for a longer period of time, for some has been more of a challenge. And that’s just because, again, you’re used to doing what you’re doing, what you were trained in, what you’re comfortable with.”
Training		Current training infrastructure does not support NDBI learning	“For our clinic, adding that NDBI training is in the books and will happen eventually and will be I’m sure super helpful. Not that physical product has been a big barrier for me in that beginning stage for the RBTs for doing assessment purposes, for parents, showing them what was happening.”
Self-efficacy		RBTs reporting lower self-efficacy delivering NDBI in comparison to DTT	“I don’t think I was prepared. I had to slowly take baby steps in trying to learn and figure out what’s going on and figure out why, figure out the why. In school we talked about NDBI and Project ImPACT but never got to implement it, so it’s very different whenever you have to implement it. So, I honestly don’t feel very prepared. I had to take my time to learn the ropes and see what actually happens.”
Attitudes		More negative attitudes surrounding NDBI reduce the motivation to change practice	“Even though this kid, we do it this one way ... we might be doing NDBI completely differently with this other kid because that’s where they are developmentally. So it can look so different. And just being comfortable embracing those differences, that’s really been a culture shift that we’re working

Table 2 (continued)

Construct	Theme	Definition	Exemplar quote
Implementation strategies	Culture	Negative culture surrounding NDBI reduces use	“I don’t think you can get big on a sustainable track unless that’s a part of your culture. It has to be a part of your culture that if the person who’s taking care of the kid paid well, cared about, and trained, then the natural environment, DDT, pairing, it don’t matter what it is, you can’t do it
	For profit industry	The for-profit ABA industry limits investment and support for training and high-quality care more generally	“I also think that the growth of it has been so interesting to see a private ABA company. The growth, there’s so many other things that go into that. Take away from focus unfortunately. When you’re trying to grow your company, you can’t always be focused on the RBTs and developing the programming that is arguably the most important part.”
	Better and earlier training	Strategies that were suggested to help ABA clinicians use less DTT and greater NDBI	
		Staff cited need for better NDBI training early on in onboarding to increase self-efficacy and reduce need for unlearning	“I think it would be really nice for every new hire at least or anybody who’s maybe still learning about NDBI or still uncomfortable with the protocols, I think it would be nice to have some kind of lecture style or brief training to working with clients on what NDBI even is ... the framework and everything. Though that came several months after I was hired. So, I think something like that would be really nice for every new hire who’s starting out.”
Attitudes		Staff cited need for more focused efforts to increase buy-in for NDBI over DTT	“For me personally I’d like to really up the academic exposure to NDBI versus just watching the particular clients And they do a really good job. They have a whole checklist, a skill list, for the RBTs, and they go through, you’re doing this, you’re doing this, you’re working on this, working on that. And that’s fine. That hits all the markers. But for me personally, it would have been more beneficial to understand the whys behind all those markers.”

them to use one therapeutic approach over another with children. It is important to note that within this domain especially, the relative use of NDBI and DTT often reflected the gradual addition of structure to teach young children new skills—again highlighting some misconception that the use of NDBI lacks structure. The presence of *disruptive behaviors*, such as physical aggression and self-injury, were described as leading clinicians to deliver DTT over NDBI. As one clinician noted:

If we're working on more behavior management and if they're a part of specific protocols through NDBI, then there might be a decision, okay, we're just going to stick to their DTT until we get some sort of instructional control and behaviors down.

Participants also shared that a child's age was another contributing factor in their decision to deliver NDBI or DTT, with both BCBAs and RBTs reporting that they would be more likely to deliver DTT strategies to older children.

I have another kid who's older and for him, he inherently needed a little bit more structure and it was more age appropriate to have the structure and have a little bit more of a routine and have demands placed versus always following his lead.

Relative Ease

Participants were asked to describe the relative ease of using DTT and NDBI. As was the case in other categories, there was strong consensus in the primary themes for both university-affiliated and community-based BCBAs and RBTs. Given their role in providing direct services, RBTs especially shared that NDBI is more *physically demanding* than DTT. One RBT stated, "I think NDBI can be very tiring because we have six-hour long sessions with the client. Following a child lead for even half of that can be really exhausting."

Participants, especially RBTs, also shared that NDBI required a level of *flexibility and creativity* in its application in comparison to the much more protocolized and standardized delivery of structured DTT. As one RBT shared:

The transition initially was tough because DTT doesn't give you much chance to be creative. So, I had to start dusting off some cobwebs about being creative with the kids because the targets are a little bit more ambiguous because it's based on their favorite toys, their environment that they prefer. So, it was a learning curve, but it took some time. I had to let go of some of that rigidity myself.

BCBAs especially noted that this level of flexibility could be quite difficult to teach RBTs, and that even once taught,

it was not easy for RBT staff to *generalize the use of NDBI* across clients with distinct support needs and interests. One BCBA shared:

Something that I found interesting is that [training] doesn't generalize very easily. They can learn it and start to do it really, really well with one kid. But then I'll put them on a different kid, and it just falls completely apart. So, it's creating that foundation from scratch has been quite difficult, I will say.

Implementation Barrers

Participating RBTs and BCBAs shared a number of barriers to implementing NDBI within ABA clinical settings. Most prominent and consistent of these barriers was *the need for unlearning*. Participants emphasized that most pre-service training, including the onboarding modules completed by RBTs, continue to emphasize more structured and adult-led treatment approaches, including DTT. Both RBTs and BCBAs indicated that the foundational training in DTT and its prevalence across other community ABA clinics made the task of learning NDBI quite challenging given the need to unlearn and alter previous training. One BCBA and administrator reported:

But I think that's where I lose a lot of the RBTs, is really they talk about that 40-hour training that they did, and it's focused heavily on DTT or even their training when they start here focuses on DTT. So, they think very differently. They're like so that's different.

Participants shared that the *amount of training* provided to support NDBI implementation is often quite limited or informal or is being delivered by individuals who themselves were not formally trained in NDBI approaches. The limited availability of strong NDBI training was described as lowering both RBT's and BCBA's *self-efficacy delivering NDBI*, especially in comparison to the ease of delivering more structured and protocolized approaches. Participating RBTs especially reported feeling as though they do not have the skills to effectively implement NDBI, even when the desire to learn these approaches is present. As one RBT noted:

It gets overwhelming and is a learning curve with everything new that's presented. Ooh, I have to learn this new thing, which is not bad. But it's just so confusing sometimes where I don't believe I'm delivering the best therapy session to a child if I'm confused.

In addition to barriers related to unlearning, NDBI training, and self-efficacy, nearly all participants indicated that RBT and BCBA *attitudes toward NDBI* could be quite variable. For example, some participants reported that they themselves or other individuals they worked with viewed

NDBI as ineffective, had misconceptions about what it was, or viewed the approach as generally being a fad that would eventually fade away. One BCBA described this as:

It [NDBI] has been described in the classroom as this fad and I don't know why we're doing this because it's just a fad in ABA. So, I think the biggest struggle has been showing them that it's really not that and not as different as you think.

Participants indicated that more pervasive negative attitudes toward NDBI could fuel a *negative culture* around the use of NDBI, particularly within ABA clinical settings that employ a large number of RBTs. One RBT reported:

When everyone's, "I don't feel like I know what I'm doing, I don't feel I know what's going on, there's all these big changes, I don't know this protocol, I don't know what I'm doing," that can create a lot of anxiety. And then when you're in a clinic like ours when everyone's so close together all the time, that can impact morale.

Finally, several participants highlighted how the *for-profit ABA industry* could be a significant and overarching barrier to the delivery of NDBI and high-quality care more generally. Participants described the for-profit nature of the ABA industry as driving a culture focused on maximizing profit that comes at the expense of prioritizing training in NDBI and quality control regarding community services.

If it's all about paying the RBT less and investing less, you can make more money, then that's a problem. I know this interview is supposed to be about naturalistic care and high-quality care, but when those things aren't in place, you can't improve care.

Discussion

Although a growing number of research studies have discussed the alignment and possible challenges implementing NDBI within ABA practice settings (e.g., Dueñas et al., 2023; Hampton & Sandbank, 2022), research had not yet directly examined barriers to the delivery of NDBI from the perspectives of both BCBAs and frontline RBTs. The current study sought to address this gap by understanding difficulties inherent in the transition from traditional ABA approaches to those that integrate NDBI. A second goal was to understand factors that may impact the de-implementation of adult-led DTT approaches. Qualitative findings highlighted that many RBTs and BCBAs felt quite positively about incorporating NDBI into their ABA practice and perceived the strategies to be more effective in helping autistic children learn and generalize skills in a manner that provides them with more

agency and autonomy. At the same time, participants shared many barriers to efficiently and effectively integrating NDBI into community settings, including the challenges associated with needing to unlearn DTT approaches, the higher skill-level needed to deliver NDBI, misconceptions about what it means to deliver NDBI, negative attitudes toward NDBI in the ABA community at large, and the role of the for-profit ABA industry in driving low-value care.

Implications

Findings from the current study have several implications. First, the emphasis on needing to unlearn traditional ABA approaches underscores the relevance of using de-implementation frameworks to clarify what it might take to more effectively implement NDBI within a context in which DTT is in widespread use. As many participants noted, the need to unlearn DTT and adult-led approaches is driven by the current pre-service training landscape for RBTs and BCBAs, which predominantly focuses on teaching the use of adult-led strategies in highly structured settings. The transition from relying on traditional ABA approaches to implementing practices that are grounded in developmental science was reportedly a difficult one, particularly in the absence of formal training and ongoing supervision. Thus, implementing NDBI more efficiently and effectively may require explicit training in child development and NDBI during pre-service and onboarding rather than after individuals have already been trained in DTT. Others have recently called for BCBA training alignment with NDBI (Dueñas et al., 2023), and we also posit that the BACB should align RBT training, including the required 40-h training, with these approaches as well. In the absence of formal changes to pre-service training, implementation efforts centered on NDBI must consider the strategies necessary to train a workforce that may have more varied clinical backgrounds and experiences and that has already been formally trained in DTT.

The current study also highlights how frontline clinicians may have reduced self-efficacy, more varied attitudes, and limited peer support to deliver NDBI in comparison to more structured, adult-led therapeutic approaches. Negative attitudes and self-efficacy delivering NDBI appeared to be driven by perceptions that NDBI requires a higher level of physical activity and clinical skill and perceptions that NDBI may be a temporary fad within the ABA field. Participants shared that these perceptions and attitudes could easily fuel a negative culture surrounding the use of NDBI within large clinical settings or even ABA chains that employ many RBTs and BCBAs. These findings are important, as they directly relate to well-established theories of behavior change (i.e., Theory of Planned Behavior, which state that an individuals' attitudes, norms, and self-efficacy are highly predictive of their intentions to use a clinical practice and their actual

use of the practice within a variety of settings (Ajzen, 1991). Thus, it will be important for future research to incorporate theories of behavior change and attempt to systematically change clinicians' attitudes, norms, and self-efficacy regarding the use of DTT in order to increase the use of NDBI.

Findings from the current study also have implications for how NDBI is being communicated within ABA settings. Many RBTs described perceiving that NDBI provided little to no structure to autistic children and that more traditional ABA approaches were often necessary to provide an appropriate level of routine and predictability. These comments likely highlight misperceptions of NDBI among frontline staff and may reflect a broader misunderstanding of the fundamental philosophies and strategies that are similar and that differentiate the two approaches. For example, certain aspects of NDBI and DTT overlap, such as the use of environmental arrangement and reinforcement to support autistic children in learning new skills. However, the way that teaching occurs within NDBI and DTT is quite different; with NDBI, teaching is child-led and embedded in the context of the child's natural activities and interests, whereas with DTT, teaching is adult-led and not contextually relevant to the child. Given the nuanced differences between the approaches, it is somewhat unsurprising that the ways in which they are being differentiated by community ABA providers reflects inaccurate generalizations that mask the specific components of the treatments themselves. However, this misunderstanding likely contributes to the polarization of treatment approaches (e.g., one approach utilizes structure and the other does not) and prevents us from using a more nuanced approach to understand which specific therapeutic strategies are socially valid and beneficial, and which may be harmful, inappropriate, or ineffective.

Participants often described the characteristics of autistic children that made them feel as though NDBI or DTT might be a more beneficial intervention approach. This clinical decision making surrounding who might benefit from which approach highlighted factors such as an autistic child's age, level of support need, and self-injury or other challenging behaviors as driving decisions around therapeutic approach. These factors, including a child's age and support needs, are similar to factors that have been evaluated as treatment moderators within head-to-head trials of NDBI and DTT. Although these trials have shown equivalent outcomes and have not yet demonstrated that a child's age or behavior moderate treatment response (Kasari et al., 2023; Rogers et al., 2021), these studies may not be structured in a way that would differentiate treatment approaches in outcomes that clinicians in the current study described (e.g., child and caregiver enjoyment; skill generalization). Head-to-head comparisons of distinct intervention approaches may not

be the most helpful mechanism to best determine how child characteristics should drive how clinicians decide to blend certain therapeutic strategies for autistic children. Given that providers in our study commonly discussed how they utilize both NDBI and DTT, future research is needed to provide further guidance on if, when, and how clinicians can best integrate DTT in their overall intervention planning that is grounded in NDBI.

Although this study did not ask autistic adults, caregivers of autistic children, or autistic children themselves their perception of various early intervention approaches, BCBAAs and RBTs shared that children and caregivers appeared to have more positive experiences with NDBI. For autistic children, clinicians attributed this enjoyment to the intentional focus on connecting with children to understand their experiences and to teach them in more relevant and individually meaningful ways. Caregivers were perceived to view NDBI more positively given its emphasis on teaching within naturalistic routines and in a manner that promotes more generalization into home and community routines. These preliminary findings highlight the need for much deeper partnerships with caregivers, autistic adults, and autistic children to understand their own perspectives regarding a variety of therapeutic strategies and approaches, and ultimately raise questions of who should get to decide the therapeutic modality used within ABA settings given the preferences that have already been voiced by various stakeholder groups (Schuck et al., 2024).

This study highlighted some traditional barriers to the use of NDBI within ABA settings, including clinician attitudes and self-efficacy; additionally, many community-based participants discussed the role of the ABA industry in fueling the continued use of lesser-quality care. Although it will be important to systematically develop and test strategies that facilitate the uptake and use of NDBI, it will be critical to consider strategies that may better incentivize the use of high-quality care within an industry that may be primarily driven by profit. Recently, organizations such as the Behavioral Health Center of Excellence (BHCOE) and Autism Commission on Quality (ACQ) have set standards for quality service provision in the ABA sector that many large organizations have voluntarily begun to participate in (BHCOE Accreditation, 2023). However, quality standards within the ABA industry are relatively new. As evidence for the increased effectiveness and social validity for NDBI accumulates, it will be important that quality standards be aligned with this evidence to hold individual providers and ABA organizations accountable for delivering developmental practices that may be better suited to help autistic children achieve meaningful outcomes across a range of home and community settings.

Limitations

An obvious limitation of this work is its reliance on participant interviews with no direct observation of clinical practice. Although, it is not possible to know the extent to which participants were using NDBI within ABA settings, future research could examine the association between reported NDBI practice and actual practice, especially regarding specific therapeutic techniques and strategies practiced by providers of ABA intervention. Additionally, the focus of this study was on implementation barriers and thus necessarily heavily involved partnering with service providers. However, this emphasis neglected the experience of autistic adults and caregivers of autistic children in the context of NDBI implementation. Future work in this area should include the perceptions, perspectives, and opinions of caregivers of children receiving ABA as well as those of autistic adults. This study was also conducted in settings where NDBI implementation was already occurring and within organizations whose leaders had backgrounds in child development and held strong positive opinions of NDBI. Future research should investigate how these implementation barriers might vary across ABA settings with varying degrees of NDBI training, exposure, and buy-in. Finally, this study intentionally used a deductive and rapid approach to qualitative analysis to provide a preliminary picture of how de-implementation may be relevant to the integration of NDBI within a context predominantly using other teaching approaches. However, this study was small and intended to foster more robust data collection related to the specific DTT strategies that may need to be reduced to increase the uptake of NDBI.

Findings from the current study underscore the importance of understanding ABA clinicians' perspectives regarding the delivery of NDBI. Previous research has predominantly focused on BCBA knowledge and perspectives of NDBI and has, thus, overlooked the barriers experienced by the majority of the ABA workforce. Qualitative results from both frontline clinicians and supervising BCBAs underscore that scaling up NDBI for young autistic children within ABA settings may inevitably require, among other things, reducing the widespread use of DTT for young autistic children. To effectively develop strategies that help ABA clinicians reduce the use of DTT, it will be critical to partner with ABA clinicians, autistic adults, and caregivers of autistic children to gain a much deeper understanding of the acceptability, appropriateness, and harms of specific elements of DTT and NDBI. These partnerships can then be leveraged to develop and test strategies that alter ABA clinician's attitudes, norms, and self-efficacy around practices and, thus, increase the effective scale-up of NDBI for young autistic children being served in ABA settings.

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Data Availability The de-identified, transcribed data from this project can be obtained by contacting the corresponding author, Katherine Pickard, at katherine.e.pickard@emory.edu.

Declarations

Competing Interests The authors do not have competing interests to declare.

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