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Progress in Moving Toward a More Progressive Approach to Applied Behavior Analysis

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Abstract

Leaf and colleagues (2016) provided a definition and description of progressive applied behavior analysis (ABA) in the context of autism treatment in which a behavior analyst takes a structured, yet flexible, approach to treatment that is responsive to the learner and includes on-going, in-the-moment analysis of teaching. Since Leaf and colleagues' publication, there have been many research and dissemination advancements across the domains outlined in the original paper. This includes advancements in the types of progressive procedures implemented, instructional arrangements, progressive reinforcement strategies, preventive functional analysis, progressive discrete trial teaching, data collection, progressive curriculum development, and staff training. The purpose of this paper is to highlight these advances citing peer-reviewed research where possible. Although many advancements have occurred, there is still a great need in the field of ABA for more clinicians and researchers to evaluate and implement procedures associated with the progressive approach to ABA. The paper will conclude with a call to action for behavior analysts to move away from rigid, protocolized, and conventional ABA practices and move towards implementing progressive ABA.

Keywords:

Progressive Applied Behavior Analysis, ABA, Autism Spectrum Disorder, ASD

Introduction

A progressive approach to applied behavior analysis (ABA) is a philosophical approach in which behavior analysts employ a structured, yet flexible, approach to behavior change. This approach is used most often in the context of behavioral intervention for autistic children/children diagnosed with autism spectrum disorder (ASD) in which changes in the behavior of the interventionist are contingent upon and responsive to the learner and based on the interventionist's clinical judgement, analysis, and in-the-moment assessment of relevant contextual variables. Progressive ABA was first discussed in an article by Leaf and colleagues (2016) entitled "Applied Behavior Analysis is a Science and, Therefore, Progressive", but the authors discuss that the roots of progressive ABA began early in the field of ABA with the clinical and experimental work of individuals

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such as Montrose Wolf (e.g., Wolf et al., 1963), Teodoro Ayllon and Nathan Azrin (e.g., Ayllon & Azrin, 1965), Sandra Harris (e.g., Harris, 1975), Ivar Lovaas (e.g., Lovaas, et al., 1973; Lovaas 1987), Donald Baer (e.g., Baer et al., 1967), and Barbara Etzel (e.g., Etzel & Gewirtz, 1967)[1]. The early work of these pioneers in the field of ABA used the science of behavior analysis to change socially important behaviors using a structured yet flexible approach, altering their interventions frequently based on in-the-moment analysis and clinical judgement (Leaf, Leaf, McEachin, 2018; Leaf, Leaf, McEachin, & Cihon, 2018). One study in which this approach is exemplified is Wolf and colleagues (1963) in which they described the application of operant behavior procedures while working with a 3-year-old autistic child, Dicky. Wolf and colleagues used the principles of behavior to decrease temper tantrums, decrease challenging behavior around bedtime, teach Dicky to wear his glasses, teach Dicky communication and verbal behavior, and increase eating appropriately during mealtimes. Wolf and colleagues implemented procedures such as differential reinforcement, time-out, extinction, discrimination training, and shaping while they worked with Dicky to increase appropriate behaviors and decrease challenging and harmful behaviors. The paper is written as a case-study that describes the problem-solving process the researchers went through, which exemplifies a structured, yet flexible, approach. For example, as Wolf and colleagues described the process of teaching Dicky to wear his glasses, the authors discuss the original plan to reinforce glasses wearing with Dicky's full prescription glasses. However, because past attempts to wear those glasses had been associated with physically being forced to wear them, the authors adjusted their plan and instead began to shape glasses wearing with glasses that had empty frames before reintroducing the prescription glasses. Throughout the paper, Wolf and colleagues discuss the "original plan" (p. 309) but then review the variables that led them to deviate from the plan based on their analysis and clinical judgement.

Implementation of a progressive approach to ABA relies heavily upon well-trained and clinically skilled interventionists and supervisors that can use clinical judgement to be responsive to the learner and other relevant contextual variables to make in-the-moment decisions based on their analysis (Leaf et al., 2016). Clinical judgement allows the interventionist to make decisions in-the-moment based on environmental factors (e.g., distractions in the room) and client variables (e.g., attending; Leaf, Leaf, & McEachin, 2018). Decisions based on clinical judgement are influenced by a knowledge of scientific principles, long and short-term goals of the learner, current environmental conditions, personal experiences and other relevant factors (Redelmeier et al., 2001). By possessing a breadth of knowledge of the basic principles of ABA, interventionists are likely to have a better understanding of how to predict patterns of behavior and manipulate the environment to increase the likelihood of the desired behavioral goal (Leaf et al., 2016).

Within a progressive approach to ABA, interventionists must also be familiar with, and able to implement, a variety of procedures such as discrete trial teaching (DTT; Smith, 2001), the teaching interaction procedure (e.g., Leaf et al., 2009), and incidental teaching (e.g., McGee et al., 1999), as well as understand the advantages and disadvantages of each procedure to determine the most appropriate procedure to use at any given time. For example, an interventionist implementing the Cool versus Not Cool™ procedure (CNC; Leaf et al., 2012) to teach interactive play skills may determine that the learner does not have some general knowledge skills that are necessary to engage in the more complex skill being taught through the CNC. Therefore, the interventionist may first implement DTT to develop a general knowledge repertoire. Once this is learned, the interventionist may shift back to the CNC while embedding the skills learned through DTT. In this example, the interventionist determined which skills need to be targeted, the most effective and efficient way to teach the skills, and shifted between procedures as needed for progress.

Shifting between procedures is only beneficial if the interventionist has thorough knowledge of the short- and long-term goals of the learner. The long-term goals are the skills that are determined to be developed for the client to have maximized independence, happiness, and quality of life. These skills are broken down into smaller parts that are developed with the short-term goals of the learner. If the learner is doing well with the current short-term goal, for example taking turns in conversation, the next goal, perhaps initiating a conversation, would be the next step needed to reach the long-term goal of engaging in meaningful conversation to develop meaningful relationships with others. If the interventionist encounters difficulty with a short-term goal, the interventionist must be able to accurately identify the skill deficit interfering with learning the skill, develop that skill, then embed the skill within the overarching goals that are targeted through programming. For example, if a learner seems to have a deficit identifying common objects, the interventionist must identify if the deficit is due to difficulty with recall, lack of attending to the items (e.g., not looking at the correct object), interfering behaviors (e.g., grabbing materials during instruction), lack of problem-solving (e.g., not choosing the unknown item in a group of known items), prompt dependency, or another issue. Many of these deficits might shift the focus of the curriculum to developing learning-how-to-learn skills, rather than simply adding programming to increase receptive language (or listener behavior).

A progressive approach to ABA stands in contrast to a conventional approach to ABA in which the interventionist's behavior is responsive to a pre-determined protocol rather than the learner's behavior in-the-moment (Leaf, Leaf, McEachin, & Cihon, 2018). These protocols are typically developed after a formal functional assessment and used in an effort to increase or decrease a target behavior. Supervisors will then provide initial and ongoing training to ensure that the interventionists continue to implement the protocol with fidelity. Other formal procedures, such as the type of preference assessments and prompting systems, are selected by the supervisor and the interventionists are expected to conduct specific procedures within a learner's session. While the procedures are typically individualized to the client, the procedures used with each client are likely to remain consistent until a predetermined measure of mastery has been met, or no progress is reported after a period of time. When considering if intervention is effective, there is no determined time period where a reevaluation or change must be made but waiting for a clear trend in the data could mean days or weeks of ineffective intervention until modifications are made to a behavior plan. These practices are commonly regarded as standard within the field of ABA and autism treatment. It is a way to protect the consumer to ensure only evidence-based procedures are being implemented, and that they are being implemented correctly. However, with the advancement of research for effective procedures and a sudden need to quickly provide services for the high demand in autism treatment, some procedures may be put into place that may or may not have been detrimental to the science and the outcome of treatment overall. With an over emphasis on procedural replicability, there may be some nuanced skills and methods that may have been lost over time. These restrictions may include: (a) implementing only one procedure for a target behavior, (b) overreliance on possible reinforcers only identified through formal preference assessments, (c) use of only continuous data collection procedures, (d) using only one prompting system, and (e) only following one curriculum book/program. This approach may lose the clinical and applied significance of ABA within autism treatment (Leaf et al., 2016).

Although Leaf and colleagues' (2016) discussion of a progressive approach to ABA was only published seven years ago, much has changed in the field of ABA and autism treatment. For example, at the time Leaf et al. (2016) was published the authors cited that there were "over 17,000 certified behavior analysts and between 3000 to 5000 registered behavioral technicians" (p. 721). Current data now shows that there are over 65,000 Board Certified Behavior Analysts and Board Certified Assistant Behavior Analysts and over 130,000 Registered Behavior Technicians (Behavior Analyst Certification Board, n. d.). That is tremendous growth in just seven years and this growth has advantages and disadvantages. With more certified individuals and direct line technicians, more individuals diagnosed with ASD can access services. But along with this growth has come an increase in criticism and concern when it comes to ABA based interventions and autism treatment. These concerns and criticisms include the use of physical punishment used during autism treatment at the UCLA Young Autism Project in the 1970s, shock to treat harmful behaviors, intervention intensity (i.e., 40 hours a week), rigid interventions, extinction-based procedures, targeting self-stimulatory and stereotypic behavior, selection of inappropriate goals, lack of social validity, inherently changing an individual's personality, ABA is abusive, and ABA produces long-term negative outcomes (Leaf et al., 2022). Many of these concerns and criticisms are likely to be mitigated by the implementation of a progressive approach to ABA that is focused on family and learner involvement, assessment of social validity and applied significance, well-trained staff, and the implementation of flexible, responsive procedures and programming. What follows is an update on the advances in research and dissemination of a progressive approach to ABA across the domains Leaf and colleagues (2016) originally outlined and a call to action for more clinicians and researchers to evaluate and implement procedures associated with the progressive approach to ABA.

Advances in Progressive ABA

Not Just One Procedure

Leaf and colleagues (2016) outlined how progressive, quality, early intensive behavioral intervention (EIBI) does not involve the implementation of just one set of procedures. Instead, a variety of evidence-based procedures should be employed to teach learners diagnosed with ASD (e.g., DTT, shaping, role-play, video modeling, prompting, chaining). Well-trained, quality interventionists implementing a wide variety of behavior analytic procedures to address respondent and operant behavior allow learners to make progress quickly. A research study that highlights this component of the progressive approach to ABA was conducted by Leaf, Leaf, and colleagues (2017).

Leaf, Leaf, and colleagues (2017) evaluated a behaviorally based social skills group for 15 children diagnosed with ASD using a progressive approach to ABA. The behaviorally based social skills group was conducted by two lead teachers and two support teachers. The lead teachers had at least five years of experience implementing progressive ABA interventions with children diagnosed with ASD and the support teachers had at least two years of experience. The 15 participants were randomly divided into group A (8 participants) or group B

(7 participants) with the participants in group A receiving treatment in the behaviorally based social skills group first and group B receiving treatment 16 weeks later. The teachers implemented a variety of behavior analytic procedures throughout the social skills groups. These procedures included group DTT, the CNC procedure, the teaching interaction procedure, shaping, modeling, incidental teaching, flexible prompt fading, embedded instruction, and a variety of reinforcement systems such as a level system and individualized token systems for learners in the group who needed more support. These procedures were often used in combination to target various skills. For example, to teach making on topic statements the teachers used group DTT, modeling, and the teaching interaction procedure across multiple sessions to increase the participants' use of on-topic statements during conversation. The results demonstrated that all participants made statistically significant improvements in their social behavior following their participation in the social skills group and the improvements maintained up to 32 weeks after the social skills group had concluded. This study highlights the meaningful gains children diagnosed with ASD can make when a variety of behavior analytic procedures are used to teach valuable skills. Additionally, this study highlights the role of clinical judgement when implementing a progressive approach to ABA. The teachers employed a structured, yet flexible, approach each session and would add or change the procedures used to target the social skills depending on how the participants in the group responded. Strict protocols were not written or followed throughout the study, and instead the teachers assessed in-the-moment what changes needed to be made for the participants in the group to be successful which often involved the combination of behavior analytic procedures.

Instructional Arrangements

Leaf and colleagues (2016) discussed that within a progressive approach to ABA intervention should occur within a variety of instructional arrangements. Initial intervention may typically start in one-to-one instruction, but as learning-how-to-learn skills are acquired, a progressive approach to intervention should move toward a more dynamic environment. Leaf and colleagues (2016) highlighted group instruction as a critical component to quality progressive behavioral intervention. Since Leaf et al. (2016), several studies on progressive ABA have been conducted evaluating skill development across instructional arrangements. These instructional arrangements include learning in a dyad (e.g., Cihon, Ferguson, Leaf et al., 2019; Ferguson, Majeski et al., 2020), small group (e.g., Cheung et al., 2022; Leaf, Cihon et al., 2017), large group (e.g., Leaf, Leaf et al., 2017; Milne et al., 2017), one-to-one (e.g., Cihon et al., 2020; Ferguson, Leaf, et al., 2020), and via telehealth (e.g., Cihon et al., 2021; Ferguson, Majeski et al., 2020). Multiple procedures were evaluated in dyad and group formats including instructive feedback (e.g., Ferguson, Majeski et al., 2020; Leaf, Cihon et al., 2017), the CNC procedure (e.g., Milne et al., 2017), group DTT (e.g., Leaf, Cihon et al., 2017), embedded instruction (e.g., Cheung et al., 2022), and the use of a level system (e.g., Cihon, Ferguson, Leaf et al., 2019).

Leaf, Cihon et al. (2017), conducted in a small group arrangement, highlighted the observational learning that can occur when instruction is conducted in a group. Specifically, Leaf, Cihon, and colleagues evaluated the use of instructive feedback during group DTT with nine children diagnosed with ASD. Instructive feedback is the practice of consistently presenting non-target information during the antecedent or consequent portion of a discrete trial (Werts et al., 1995). For example, an interventionist would present a picture of a kiwi, provide an instruction (e.g., "What is it?"), the learner would respond (e.g., "kiwi"), and then the interventionist would provide praise and instructive feedback (e.g., "Yes! You're right and a kiwi is a fruit"). In this example, the primary target is the label "kiwi" and the secondary target presented via instructive feedback is that a kiwi is a fruit. When implementing instructive feedback, the learner is not required to respond to or echo the instructive feedback and reinforcement is not provided contingent upon responses to the instructive feedback. Therefore, if a learner acquires the secondary target it is considered to be "free" learning because the response was not directly taught or reinforced.

Leaf, Cihon, and colleagues (2017) divided the nine participants into three groups of three in which group DTT with instructive feedback was used to directly teach the names of two superheroes to each participant in the group. The instructive feedback provided throughout group DTT was the superhero's superpower (e.g., super strength). The purpose of the study was to assess if the participants learned the primary targets (i.e., superhero's names) taught through group DTT, the secondary targets (e.g., superpowers) targeted through instructive feedback, and the primary and secondary targets of their peers through observational learning. Leaf, Cihon, and colleagues found that all nine participants learned their primary targets, the secondary targets provided via instructive feedback, and learned the primary and secondary targets of their peers in the group. Therefore, in this study, the participants were directly taught only two targets but learned an additional eight targets for "free" through instructive feedback and observational learning. This study highlights how learning can be maximized in a group setting, which is a core component of progressive ABA, as compared to a one-to-one setting.

Reinforcement

Reinforcement is a core component of not just progressive ABA, but any ABA-based intervention or procedure. Key differences in reinforcement in a progressive approach to ABA compared to a conventional approach include how interventionists identify reinforcers, the types of reinforcers used, the variety of reinforcers used, and the types of reinforcement systems implemented. For example, within a progressive approach to ABA interventionists rarely (if ever) use formal preference assessments (e.g., paired stimulus preference assessment, multiple stimulus without replacement) to identify items that might function as reinforcers. Instead, interventionists are trained in how to assess if an item may serve as a reinforcer in-the-moment (i.e., in-the-moment reinforcer analysis; IMRA). Interventionists are trained to assess and analyze if an item would be likely to function as a reinforcer by assessing a variety of variables including: (a) the learner's affect with the item, (b) the learner's previous history with the item, (c) the learner's verbal and non-verbal behavior, (d) current motivating operations, and (e) the learner's previous responding (see Table 1 for skills to develop for IMRA). Another difference between progressive and conventional ABA approaches are the types of reinforcement systems used. Within a progressive approach, reinforcement systems are often implemented in a flexible manner in which the amount, type, or schedule of reinforcement provided is not predetermined. Instead, the interventionist has the flexibility to assess and determine the magnitude of reinforcement provided, what type of reinforcer will be used, and the schedule of reinforcement based on the learner's responding and treatment goals. Finally, a distinct feature within a progressive approach includes the frequent incorporation of conditioning procedures to expand the number of stimuli that function as reinforcers, as well as transitioning toward the use of naturally occurring consequences to reinforce behaviors (Leaf, Milne, et al., 2020).

Since the publication of Leaf et al. (2016) there have been several research and dissemination advancements in a progressive approach to reinforcement. This includes continued research on IMRA (Alcalay et al., 2019; Leaf, Leaf, Leaf, et al., 2018), research on changing preferences through observation (i.e., Cihon, Weiss, et al., 2021; Leaf, Oppenheim-Leaf, et al. 2016), and research on flexible reinforcement systems such as a levels system (i.e., Cihon, Ferguson, Leaf, et al., 2019) and a token economy with a flexible exchange rate (i.e., Cihon, Ferguson, Milne, et al., 2019). An additional dissemination advancement has been the addition of IMRA in the chapter on positive reinforcement within the predominant behavior analytic textbook (i.e., Applied Behavior Analysis; Cooper et al., 2020). Described next are two studies that highlight some of the advancements that have occurred in the research evaluating a progressive approach to reinforcement.

Alcalay and colleagues (2019) further advanced the research on IMRA by comparing IMRA to multiple stimulus preference assessment without replacement (MSWO) on the rate of responding of four children diagnosed with ASD. Additionally, Alcalay and colleagues evaluated the use of IMRA and MSWO preference assessment procedures with interventionists who were not previously familiar with the reinforcer identification procedures. Finally, Alcalay and colleagues extended the literature on IMRA by requiring the interventionists to select rationales for the variables they were analyzing to determine which item to use to function as a reinforcer in the IMRA condition. These rationales included: (a) child affect, facial expression, and body language; (b) how the child interacted with the item; (c) frequency with

Table 1.

Description of skills developed during staff training for IMRA

Step	Skill
1	Allows learner to sample potentially reinforcing items/activities free from demands and instructions
2	Provides the learner with choices and honors their choice
3	Follows the learner's lead
4	Analyzes and adjusts based on the learner's affect
5	Analyzes and adjusts based on the learner's non-verbal behavior (e.g., approach to item/activity, reaching for item)
6	Assesses if item/activity is functioning as reinforcer by observing if desired behavior is increasing or decreasing when reinforcer is held contingent
7	Continuously assesses learner's motivation for item/activity and observes for signs of deprivation and satiation

which the item had been used during previous sessions or trials; (d) child's skill improvement; (e) item had a similar quality to other previously identified reinforcers; (f) the interventionist attempting to condition a new item to function as a reinforcer; (g) novelty of the item; and (h) child request for an item. The results demonstrated that the items selected to function as reinforcers through IMRA and MSWO preference assessments were equally effective at increasing the rate of responding for the participants, but the IMRA condition was more efficient when it came to the total time it took to determine items to serve as reinforcers. Additionally, Alcalay and colleagues found that the interventionists were responding to at least two variables most often when selecting the rationale(s) for why an item was selected as a reinforcer in the IMRA condition. This information is beneficial when it comes to training staff to implement IMRA as it is likely that interventionists will need to respond to more than one variable (e.g., learner affect and current motivating operations) when selecting an item to function as a reinforcer rather than just one factor in isolation (e.g., child request).

Cihon, Ferguson, Leaf, and colleagues (2019) evaluated the use of a level system implemented with flexible shaping to increase synchronous engagement with two dyads of children diagnosed with ASD. The level system consisted of three tiers. The top tier was titled "Superfriend" and if the child ended the session on that tier it resulted in 2 min of access to a treasure chest and being able to pick one item to keep. The middle tier was titled "Friend" and if the child ended the session on that tier it resulted in 2 min of access to a treasure chest, but the child could only play with the items in the treasure chest and could not keep an item. The bottom tier was titled "Miss out on a fun activity" and if the child ended the session on that tier it resulted in not earning access to the treasure chest. This study employed a flexible shaping approach while using the level system in which the interventionist used clinical judgement to determine if and how much each child moved up or down on the level chart at each check in. Variables the interventionist analyzed included the frequency and duration of synchronous engagement with their peer in the dyad compared to previous check-ins or sessions, responding to peer comments, responding to peer requests, following or checking-in with their peer, ignoring their peer, playing together, playing independently, and any aberrant behavior. The results of the study demonstrated that the use of a level system with flexible shaping was successful in increasing the percentage of intervals of synchronous engagement between the peers in the two dyads. This study also demonstrates how flexible, progressive interventions can increase socially important behaviors using an interventionist's analysis and clinical judgement in-the-moment, rather than relying on a predetermined protocol of when and how to reinforce desired behavior.

Functional Analysis and Aberrant Behavior

Leaf and colleagues (2016) discuss that a hallmark of quality, progressive ABA is the evaluation of the function of behavior within natural environments and only using analogue experimental functional analyses (e.g., Iwata et al., 1994) when necessary. Additionally, a progressive approach to functional analysis includes interventionists using their knowledge of the function of behavior to be preventative with their teaching by beginning to teach appropriate behaviors that result in access to important reinforcers (e.g., access to tangibles, escape, access to attention) at the onset of intervention (Leaf et al., 2016). Finally, Leaf and colleagues outline how well-trained interventionists often may be able to identify the function of behavior in-the-moment based on their analysis of the context and other relevant variables rather than relying on analogue functional analyses or standard functional assessments.

The biggest advancement since the publication of Leaf et al. (2016) with respect to a progressive approach to functional analysis was Ala'i-Rosales and colleagues' (2019) article entitled "The Big Four: Functional Assessment Research Informs Preventative Behavior Analysis" which provided guidelines for preventative and proactive intervention to teach a skill set that would prevent the occurrence of challenging behavior as opposed to conducting a functional analysis and teaching a functional alternative response following the onset of challenging behavior. Ala'i-Rosales et al. proposed the proactive development of four repertoires: (a) teaching learners to communicate their wants, needs, and likes/dislikes in a safe, effective, and respectful manner that are understood by others; (b) teaching learners to gain the attention and affection of others in a safe, effective, and pleasant manner that is understood by others; (c) teaching learners to joyfully and safely engage in a variety of activities alone and with others; and (d) teaching learners to cope and tolerate adversity in a safe and effective way. Since the publication of this paper, it has been cited 31 times (identified via Google Scholar) demonstrating its impact on the field of ABA in only a short amount of time. More research on a progressive approach to functional analysis is needed including research on in-the-moment assessment of function and research evaluating teaching the preventative skill set outlined by Ala'i-Rosales and colleagues.

Discrete Trial Teaching

The greatest advancements in the research on a progressive approach to ABA has been within

the research and publications on progressive DTT. Leaf and colleagues (2016) described a flexible approach to the implementation of DTT in which the interventionist makes in-the-moment assessments based on the learner's behavior to alter and change their implementation of DTT. These changes could include altering a prompt, changing the target, changing the instruction, manipulating the field size, moving the stimuli in the array, providing corrective feedback, increasing or decreasing the schedule of reinforcement, or interspersing known tasks.

The first advancement that occurred after Leaf and colleagues' (2016) publication was a paper providing guidelines on the implementation of progressive DTT (i.e., Leaf, Cihon et al., 2016). Leaf, Cihon, and colleagues (2016) provided eight guidelines for interventionists implementing progressive DTT: (a) select trial targets and placement of stimuli based on the learner, (b) use natural language when possible, (c) vary instructions as soon as possible, (d) use flexible prompt fading, (e) use instructive feedback to teach additional skills, (f) do not avoid error correction, (g) take data on a sliding scale, and (h) teach toward a busy environment. After these guidelines were published, the research on progressive DTT evaluating these guidelines increased. In the past seven years since the publication on progressive ABA and progressive DTT, over 15 publications evaluating components of progressive DTT have been published. Research has been conducted on the in-the-moment assessment of trial targets and placement of stimuli (e.g., Leaf, Cihon, Ferguson et al., 2018; Wong et al., 2020), the use of flexible prompt fading (e.g., Cihon et al., 2020; Leaf, Cihon et al., 2019), the effects of instructive feedback (e.g., Ferguson, Majeski et al., 2020; Leaf, Cihon et al., 2017), the effects of error correction (e.g., Aljohani et al., 2022; Isenhower et al., 2018; Leaf, Townley-Cochran et al., 2019; Leaf, Cihon et al., 2020; Townley-Cochran et al., 2017), and estimation data collection (e.g., Ferguson, Milne et al., 2020). These studies evaluating the individual guidelines of progressive DTT culminated in a study comparing a progressive approach to DTT to a conventional approach to DTT (Milne et al., 2022).

Milne and colleagues (2022) sought to compare progressive DTT to conventional DTT using a group design with 12 children diagnosed with ASD. The participants were randomly assigned to the conventional DTT group or the progressive DTT group and received 20 teaching sessions using the assigned methodology. The interventionist's goal was to teach as many tact relations as possible (up to 100 available unknown tact relations) using the conventional or progressive approach to DTT. The conventional DTT condition consisted of identifying reinforcers through a formal preference assessment, providing reinforcement on a fixed rate, using a static-simple instruction for every trial (i.e., "Who is it?"), counterbalancing the trial order of targets, implementing progressive prompt delay to teach targets, using error correction for incorrect responses, interspersing maintenance trials for mastered targets, and collecting data trial-by-trial. The progressive DTT condition consisted of identifying reinforcers through IMRA, providing reinforcement on a variable schedule based on the interventionist's clinical judgment, using varied instructions, basing trial order on the interventionist's assessment, implementing flexible prompt fading to teach targets, using a variety of feedback procedures (e.g., instructive, error correction, no feedback), conducting maintenance based on the interventionist's clinical judgment, and using estimation data collection procedures. Milne and colleagues found that both methodologies were effective at teaching tact relations but found statistically significant differences between how many tacts were learned by the participants in the progressive DTT group. On average, the participants assigned to the progressive DTT group responded at 90.4% accuracy on the post-assessment that tested their knowledge of the 100 tact relations, while the participants assigned to the conventional DTT group responded at 35.7% accuracy on the post-assessment. Therefore, this study demonstrated the significant benefits of implementing progressive DTT compared to conventional DTT for children with ASD.

Data Collection

A hallmark of ABA is the reliance on objective measurement and data collection procedures of observable and measurable events (Baer et al., 1968). Throughout ABA-based intervention and EIBI the data that are collected should be useful to the interventionists and supervisors and data should not be prioritized over teaching and reinforcer delivery (Leaf et al., 2016). A progressive approach to data collection is one that collects data on a sliding scale ranging from continuous data collection procedures to discontinuous, estimation data collection procedures (e.g., Ferguson, Milne et al., 2020; Taubman et al., 2013). The data collection procedures selected should be based on considerations such as what is needed for the child to make the most progress, what system will be most efficient for the interventionist, and what type of system will provide an accurate enough representation of the child's behavior for the interventionist and supervisor to make decisions. Within clinical practice of progressive ABA, interventionists commonly collect estimation data on programs with periodic continuous data collection samples. Since Leaf et al. (2016), an additional estimation data collection study has been published.

Ferguson, Milne, and colleagues (2020) sought to extend the previous literature on estimation data collection (i.e., Taubman et al., 2013) by comparing

estimation data collection procedures to trial-by-trial data collection procedures during DTT with three children with ASD. The data collection procedures were examined by measuring accuracy, rate of child acquisition of the DTT targets, and the number of teaching trials delivered per session. In the estimation data collection condition, the interventionist had 3 min to conduct DTT with flexible prompt fading. Specifically in the estimation data collection condition, the interventionist did not collect any data on child responding until after the 3 min had expired. Then, the interventionist used a rating scale to estimate the child's responding on the teaching targets. The rating scale was from 0 to 4 with the "0" representing 0-20 % independent correct responding on trials, "1" representing 21-40% independent correct responding, "2" representing 41-60% independent correct responding, "3" representing 61-80% independent correct responding, and "4" representing 81-100% independent correct responding. In the trial-by-trial data collection condition, the interventionist also had 3 min to conduct DTT with flexible prompt fading, but data were collected after each trial. Ferguson, Milne, and colleagues found that estimation data collection was accurate at determining mastery when compared to the test for mastery probe conducted after the interventionist estimated that the child had mastered the targets in the set. Additionally, when the estimation data ratings were compared to continuous data after the study had concluded it was found that the interventionist was accurate in their ratings except for one session in which they underestimated the learner's independent correct responding. Overall, this study demonstrated that estimation data can be an accurate form of data collection and may be beneficial within clinical practice when used in conjunction with other data collection procedures (Ferguson, Milne et al., 2020).

Curriculum

Within a progressive approach to ABA, curriculum books and programs are used as guidelines rather than a cookbook in which all steps and recipes need to be followed to the letter (Leaf et al., 2016). Those developing curriculum for a client from a progressive approach should first and foremost be knowledgeable on how to determine meaningful goals (discussed later). Once these are agreed upon and established with the client, those supervising the intervention (e.g., case supervisor) must be fluent with behavior analytic principles and various procedures that will effectively and efficiently progress the learner toward those goals. Additionally, the supervisor and interventionist modify procedures immediately if progress is not being made. This could include, but is not limited to, an adjustment to the prompting strategy, instructional procedures, rate of reinforcement, and materials used. Further, on-going and consistent supervision must occur to maintain the clinical skills of those directly implementing procedures ensure that the decisions made, especially surrounding modifications, are in line with the client's goals. The rate of supervision may vary based on the skills of the direct line interventionist. Additionally, progressive curriculum should focus on all areas of need for each child diagnosed with ASD which likely includes programs to reduce challenging behavior, teach social skills, teach learning-how-to learn behaviors, teach communication and language, teach play skills, teach self-help and adaptive behaviors, teach safety skills, and teach academic skills. Often a child's programmatic needs cannot be found in just one curriculum, which is why in a progressive approach to ABA multiple sources are used to create an individualized curriculum and programs are developed and created to meet the individualized needs to each child.

One advancement that has occurred in the domain of progressive curriculum is the publication of a new curriculum book for social skills groups entitled "The Autism Partnership Method: Social Skills Groups" (Leaf, Milne et al., 2020). Although the curriculum book is focused on curriculum that can be implemented in a group setting, many of the programs could also be implemented in a one-to-one instructional format. The curriculum found in the book is divided into five domains: (a) social interaction skills, (b) social communication skills, (c) social awareness skills, (d) social relatedness skills, and (e) social learning skills. A total of 92 skills and games are provided within the curriculum and are further divided into basic, intermediate, and advanced social behaviors. Leaf, Milne, and colleagues (2020) highlight that the programs found within the curriculum should be taken as guidelines, not rules to be followed, and should be modified for each child. As is standard within a progressive approach to ABA, curriculum will need to be modified based on the individual strengths and weaknesses of each learner as well as what social skills goals may be relevant and socially valid for each learner.

Applied Significance

Within a progressive approach to ABA, a clinician continuously assesses the applied significance and social validity (Wolf et al., 1978) of the goals, procedures, and effects of their program for each individual learner (Leaf et al., 2016). The assessment of social validity occurs so that our practices are humane, culturally responsive, collaborative, and compassionate for our consumers and relevant stakeholders. This is also an important component of many other standard ABA programs, but the assessment of social validity is something that has been lacking within applied behavior analytic research.

Kennedy (1992) found that less than 20% of articles published in the Journal of Applied Behavior Analysis (1968-1990) and Behavior Modification (1977-1990) included measures of social validity. Carr and colleagues (1999) found similar rates of the reporting of social validity with approximately 25% of articles reporting on social validity. Finally, Ferguson and colleagues (2019) found that only an average of 12% of articles published in the Journal of Applied Behavior Analysis between the years of 1999 to 2016 reported measures of social validity. The lack of assessment of social validity is not only a problem in behavior analytic research, but social invalidity is currently a large issue in the field of ABA, specifically as it relates to behavioral intervention for individuals diagnosed ASD. Increasing numbers of autistic individuals are expressing their disapproval of ABA services on social media and other platforms (Leaf et al., 2022), articles are being published claiming ABA based interventions are abusive (e.g., Sandoval-Norton & Shkedy, 2019) and cause post-traumatic stress disorder (e.g., Kupferstein, 2018), and ABA as a whole is being called unethical (Wilkenfeld & McCarthy, 2020). The assessment of social validity and the applied significance of ABA programs is needed now more than ever in the field of ABA. Fortunately, a recent review of the assessment of social validity in the journals of The Analysis of Verbal Behavior, The Behavior Analyst/Perspectives on Behavior Science, Behavior Analysis in Practice, The Behavior Analyst Today/Behavior Analysis: Research and Practice, Behavioral Interventions, Behavior Modification, Journal of Applied Behavior Analysis, and The Psychological Record found that the assessment of social validity occurred in 47% of the intervention studies reviewed (Huntington et al., 2022) demonstrating an increase in the percentage of social validity in journals other than the Journal of Applied Behavior Analysis. Huntington and colleagues (2022) also noted that there was a significant rise in the assessment of social validity between the years of 2019 and 2020. This is a positive trend in ABA research and hopefully this trend continues into clinical practice.

Within the recent research on progressive interventions, the results of the assessment of social validity have been positive. For example, Leaf, Leaf and colleagues (2017) assessed the social validity of a 16-week long behaviorally based social skills group. Social validity was assessed via an anonymous survey that asked 13 questions to the parents of the children that participated in the behaviorally based social skills group. Questions on the social validity survey asked parents to rate their satisfaction with the social skills group in general, satisfaction with the social and play skills their child learned in the group, satisfaction with the teachers that conducted the group, satisfaction with the procedures used to teach skills in the group, and more. Parents answered the questions using a 7-point Likert scale with a 7 representing "very satisfied" and a 1 representing "very dissatisfied". Results of the assessment of social validity indicated that the parents were satisfied with the behaviorally based social skills group outcomes, the procedures used, the skills taught within the group, and the teachers who conducted the group.

Staff Training

Well trained and highly skilled interventionists are critical when it comes to implementing a progressive approach to ABA. Interventionists implementing progressive ABA need to have a strong foundational knowledge of behavior analytic principles, critical thinking skills, be skilled in analysis and in-the-moment assessment, and engage in dynamic, fun, and compassionate programming (Leaf et al., 2016). Other indicators of a quality interventionist include being fun, innovative, objective, social, systematic, professional, and collaborative (Leaf, Milne et al., 2020). Additionally, staff need to know how to implement a wide variety of behavior analytic procedures (e.g., DTT, teaching interaction procedure, incidental teaching, chaining, shaping).

Within a progressive approach to staff training multiple modalities are used to train interventionists. This includes didactic training, role-play, modeling, feedback in-the-moment, and packaged procedures such as the teaching interaction procedure or behavioral skills training (Leaf, Milne, et al., 2020). Advances in progressive staff training research have emerged in the past seven years including research on using the teaching interaction procedure to teach interventionists to implement social skills interventions (i.e., Ferguson et al., 2021; Green et al., 2020) and the evaluation of a comprehensive staff training package used to teach a variety of behavior analytic procedures to newly hired interventionists (i.e., Cheung et al., 2020).

Cheung and colleagues (2020) evaluated the effects of a training package to teach four new interventionists 38 skills a direct line interventionist would need to engage in to work effectively with children diagnosed with ASD. The 38 skills included six targeting engagement strategies, six measuring the use of reinforcement, six related to the implementation of DTT, three related to prompting and prompt fading, six related to the implementation of mand training, two related to maximizing the child's progress in session, and nine related to behavior management techniques. These skills were assessed during 30 min probe sessions with a child diagnosed with ASD in which no training, feedback, or prompting was provided to the interventionists. During the probe, the researcher scored the interventionists' behaviors on a Likert scale from 0 (i.e., participant rarely/never displayed the skill) to 2 (i.e., the participant frequently/often/always displayed the skill). A unique feature of this training

study was the inclusion of a dual mastery criterion in which the participants first had to score 80% or above on two consecutive probes scored by the researcher, and then the clinic supervisor observed a 30 min probe to determine if the interventionist's performance was passable. The training methods used to teach the 38 skills occurred through didactic modules and hands-on training. Didactic training included behavior analytic readings and video presentations. Hands-on training included modeling from the trainer, discussion between the trainer and interventionist, and the interventionist working directly with a child while receiving prompts, praise, and feedback on their implementation of the targeted behavior analytic skills. The comprehensive training package was successful in teaching the interventionists the 38 targeted skills and the researchers found that it took an average of 429 hr to train the interventionists to mastery. This study demonstrates that the initial training of quality interventionists requires much more time than just 40 hr. Additionally, it should be noted that this study did not focus on teaching more advanced skills such as clinical judgement and analysis. The training of quality interventionists does not end after initial training and ongoing supervision and training is needed to continue to develop and refine a progressive teaching repertoire.

Conclusion and Future Directions

Although advances have been made when it comes to a progressive approach to ABA in autism treatment, there is still ample room for more research and clinical advancements. Quality, progressive ABA does occur in clinical practice, but unfortunately this is often the outlier and not the norm within the field of ABA. Research has shown that behavior analysts lack compassionate care and collaboration skills (e.g., Taylor et al., 2019), and the field has been criticized as engaging in ableism, abusive, and unethical practices (e.g., Wilkenfeld & McCarthy, 2020). As the popularity of ABA rises, so will the scrutiny of its practices. Some of the criticisms of abuse, ableism, and unethical practices may be a product of the short cuts in training made to meet the rapidly growing need for services. Without thorough training and support, professionals in the field may have strayed too far from its core values which have resulted in socially invalid goals, procedures, and effects of ABA-based treatment. Despite this seeming downfall, there are future directions that will ideally realign us to our roots and materialize the potential of ABA when executed as intended.

Regarding a progressive approach, more research is needed in the areas of staff training, functional analysis, and applied significance. Perhaps the biggest area of need within the staff training research is how to train staff to be skilled in analysis and clinical judgement. Research should specifically focus on what variables interventionists are responding to when making in-the-moment assessments and the procedures used when training others to respond to those variables in ways that lead to maximizing child progress.

Within the domain of progressive approaches to functional analysis, research is needed on the preventative, progressive approach of teaching the "big four" behavioral repertoires outlined by Ala'i-Rosales and colleagues (2019). Further research should aim to determine if these skills prevent challenging behavior, and if there will be a continued need for formalized experimental functional analysis if these skills are taught early within EIBI. Additionally, within this domain, research is needed on the accuracy and utility of in-the-moment assessment of function. Anecdotally, highly skilled clinicians often report that they can assess function of behavior in-the-moment, but research is needed on if this is true and if their assessment is accurate. Even further, if the corresponding intervention select based on the assessment of function results in socially significant changes.

More long-term research is needed on the progressive approach which analyzes the applied significance and social validity of the program's goals, procedures, and short and long-term effects. Questions remain as to if long-term outcomes are better when implementing a progressive approach to ABA when compared to standard or conventional approaches. Research is needed to evaluate outcomes in terms of IQ, language development, educational placement and other typically measured outcomes, but long-term outcome measures are also needed on aspects such as quality of life, meaningful relationships, employment, and independence.

Finally, more research groups and labs need to conduct, replicate, and extend previous research on a progressive approach to ABA. The current body of research is primarily derived from one research lab. This is not sufficient evidence in the field of ABA for procedures and practices to be considered evidence based. Research conducted on the progressive approach conducted outside of just one lab also allows for research lines to extend and more knowledge to be gained on the conditions under which a progressive approach is effective in autism treatment.

Within clinical practice, more behavior analysts need to implement progressive ABA procedures and devote resources to training interventionists in critical thinking skills, clinical judgement, and in-the-moment assessment. Currently, too much valuable instructional time is likely wasted on conducting procedures such as formal preference assessments when there is research available supporting how clinicians can identify reinforcers in-the-moment saving critical teaching

time. Although training in the progressive approach may be time-consuming (e.g., Cheung et al., 2020), the likely benefits may outweigh the initial costs of training. Staff that feel supported and highly skilled in their job are more likely to continue to work in their job role, therefore decreasing staff turnover (Modway, 1984). Additionally, and more importantly, well-trained staff that are skilled in implementing intervention can teach skills quickly which leads to faster client progress and ultimately better outcomes for the children with whom they work.

Recognizing and adopting the clinical skills initially practiced by the early founders and pioneers in the field can lead to life changing effects for individuals diagnosed with ASD. We contend that progressive, quality interventions that are rooted in the science of ABA, individualized and responsive to the learner, socially valid, and compassionate are the pathway forward in the field of ABA. We can continue to progress our field with the heart that it was intended, and the continued precision gifted by our science, but there is still much more work left to do in research and in practice.

Footnotes

[1]It should be stated that this list of individuals is not exhaustive of all the early pioneers employing a progressive and responsive approach to ABA. Please see Leaf, Leaf, and McEachin (2018) and O'Donohue and colleagues (2001) for more history and information on early founders of the field.

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