

Review

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Review

The Impact of Applied Behavior Analysis on Autism in Diverse Cultural Contexts: A Non-Western Perspective

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Abstract: Applied behavior analysis (ABA) interventions first introduced by Lovas in the 1960s have been proven historically effective in reducing challenging behaviors such as self-harm and aggressive behaviors and improving communicative language skills in children with autism. While the interventions have evolved, focusing on restricting punishments and enforcing more reinforcements to teach skills, some concerns are yet to be evaluated. With the boom of ABA in Non-Western settings this review focuses on understanding the techniques used and the progression of ABA by reviewing the existing literature. It aims to critically analyze the ABA strategies used to target challenging behaviors and teach new skills to gauge their long-term impact on children undergoing these interventions.

Keywords: ABA; autism; Asia; children; behavioural intervention

1. Introduction

Autism Spectrum disorder is a neurodevelopmental condition that primarily affects social communication and is often characterized by repeated behaviors and restricted interests. Intervention approaches for individuals with autism encompass a wide variety of educational and behavioral modification strategies. Applied behavior analysis (ABA) has been one of the most extensively recognized and utilized approaches. The roots of ABA can be traced back to the 1960s when O. Ivar Lovaas pioneered the application of ABA interventions to decrease severely challenging behaviors and establish communicative language. Through the principle of social secondary reinforcers, Lovaas built techniques to teach children to imitate and reduce life-threatening self-injury and aggressive behaviors. He showed improved outcomes by highlighting early intervention for preschoolers with autism, provided in family homes, which was pivotal evidence against the confinement of children with autism. His work indicated that many children who received early intensive ABA made substantial leaps in their development [1].

ABA primarily comprises strategies that aim to solve problems of social importance while implementing the fundamental concepts of behavioral learning rooted in classical conditioning and classical conditioning [2,3]. Baer and colleagues (1968) laid out the groundwork for ABA and contextualized its fundamental concepts in the form of seven primary dimensions - i) applied to focus on tasks that are important to society, for example, to teach a child with autism who does not speak to request preferred items, ii) behavior based on direct observation, objective measurement, prediction, and control, iii) analyze to use an objective intervention that permits believable demonstration, iv) technological to accurately and elaborately explain the processes conducted in clinical practice, v) conceptually systematic to implement behavior principles in true form backed by empirical research, vi) effective in evaluating data to gauge the behavior change, and vii) generalizable to show its applicability across different settings, populations, and behaviors. These foundational characteristics focused on how behaviors that are targeted for change have real-life

applications for the person that is worked with and are real, observable behaviors rather than an abstract formulation of a diagnosis [4].

The practice of applied behavior analysis in the field of autism showed first in the study titled “Application of operant conditioning procedures to the behavior problems of an autistic child” by Wolf, Risley and Mees (1964) that was published in the first applied behavior journal, Behavior Research and therapy [5]. This paper showed the efficacy of implementing operant methods with children, later popularizing Discrete Trial Training as an intervention [6]. Behaviorally-based interventions then developed a wide scope and are being used as a treatment for autism spectrum disorder (ASD) along with psychopathological conditions [7,8]. ABA-based interventions for autism are multi-component with several evidence-based practices such as Discrete Trial Training [9], Incidental Teaching [10], Picture Exchange Communication [11], Pivotal Response Training (Koegal and Kern, 2006), Verbal Behavior [12] and Early Intensive Behavior Intervention [9] (see Table 1).

Within the Asian context, ABA as a new science remains unregulated, and the number of properly skilled professionals remains low [13,14]. It remains imperative to have a comprehensive understanding of the intervention and its long-term effects. Thus, the current article brings forth evidence of the effectiveness of the interventions by critically reviewing them in the non-Western context and assessing the gaps in current practice.

Table 1. The advantages and identified issues of the various techniques used in ABA.

Techniques	Definition	Evidence
Discrete Trial Training	This is a method for individualizing and simplifying instruction to enhance children’s learning. Discrete trials are implemented in an instructional program focusing on a specific teaching objective such as identifying body parts or tying shoes.	Merits: Studies have reported significant improvements in target behaviors, non-verbal communication skills and even teaching language. A repeated measures analysis tracker changes in target behaviors employed DTT, NET and mass trials over seven time points within a three month period corroborate the findings [15]. Another format of DTT called embedded DTT which embeds in a more naturalistic environment of teaching was found more preferred and created a positive affect [16,17]. Embedded DTT has also been suggested as a preferred mode of intervention when dealing with self-injurious escape behaviour [18]. Gaps: A lack of strong evidence that proved its sustenance. Moreover, inablement of generalizability of the skills in different time-zones, people, and environments after ending the training hadn’t been able to prove in determining the effectiveness of the program. The variables of self-injury, correct responding and mood may affect the instructional format to be chosen.
Pivotal Response Training	Works to increase	Merits: Various studies showed how specific PRT principles such as reinforcing child’s attempts and following their lead

	<p>motivation while teaching essential skills, typically language acquisition. Important aspects of training include turn-taking, reinforcing attempts at appropriate responding, frequent task variation, allowing the child's choice of activities, interspersing maintenance tasks, and using natural consequences.</p>	<p>could produce positive outcomes. In addition to positive child affect, parent-child bonding and interactions, it can mirror natural real-life reinforcement contingencies [19,20].</p> <p>Gaps: It has been identified that emphasis is on the social validity when implementing PRT. A qualitative study identified three subthemes: overemphasis on spoken language, individualization of intervention, and interpretation of child behavior. There is often infidelity while practicing PRT, for instance adults often did not follow the child's lead, reinforcements were often skipped when attempts were made during acquisition tasks and there were interruptions during activities to prompt children to speak. The varying competence levels in clinicians and caregivers may explain difference in response to interventions [20,21].</p> <p>These practices can be harmful to achieve intervention goals.</p>
<p>AAC</p> <p>Picture Exchange Communication System (PECS)</p>	<p>Aims to teach spontaneous social-communication skills using symbols or pictures, and teaching relies on behavioral principles, particularly reinforcement techniques. Behavioral strategies are employed to teach the child to use functional communicative behaviors to request desired objects.</p> <p>The requesting behavior is reinforced by the receipt of the desired item. Physical prompts are used to teach the child to pick up and exchange a symbol/ picture for the desired object is then faded using 'backward-chaining' techniques.</p>	<p>Merits: Improvements have been found using PECS in a variety of areas. Improving spontaneous communication, expressive language, targetted and adaptive behaviors [22–24]. However, a parallel finding from a meta-analysis reported no statistical difference in expressive language and adaptive behavior outcomes [25].</p> <p>Gaps: There are logistical concerns when using pictures as they can get lost easily. Electronic system may be an effective way to address this problem. It remains imperative to monitor that while making these shifts, no current skill loses and the social approach is intact [26].</p>
<p>NET</p>	<p>Application of ABA techniques such as DTT, AAC in natural settings such school, playground, home environment etc.</p>	<p>Merits: Combining NET with DTT and mass trials in a repeated measure study revealed significant change in targetted behaviors in children as well as adults ([15])</p> <p>Gaps: However, Dawson-Squibb (2019) highlighted how evidence for NET included small samples that were not representative, thus, a conclusive take is yet</p>

		to be undertaken on the effectiveness of NET for autism [27].
Functional communication training (FCT)	Within FCT, a functional behavior assessment (FBA) is conducted to determine the variable(s) maintaining challenging behavior. Next, the individual is taught an appropriate communicative response that produces the same reinforcer(s) as the challenging behavior.	<p>Merits: The technique have been found effective in reducing problem behaviors while also addressing other functions [28,29].</p> <p>Additionally when multiple schedules were put in across settings, there were sharp reductions in problem behaviors [30]. FCT when implemented with follow up sessions that maintain fidelity with paraeducators have been found to be effective and feasible to persist with the maintenance stage [31].</p> <p>Gaps: FCT has shown little evidence to sustain these new learned behaviors as the focus is meager on maintenance and generalization [32–34].</p>
Shaping	Based on the principles of operant conditioning, where successive approximations of a desired behavior are reinforced. Shaping aims to help individuals with autism develop new skills or modify existing behaviors by reinforcing small, incremental steps that gradually lead to the target behavior.	<p>Merits: Hume (2021) indicated shaping as a technique that gradually modifies behavior is an effective intervention for autism. Gajić (2021), used shaping to increase compliance with haircutting, Turner (2020) used shaping to increase food acceptance and Kahveci (2019), applied shaping to reduce vocal stereotypy[35–38].</p> <p>Gaps: The situation and context of the behavior may vary, causing the effectiveness of shaping to vary as well as indicated by Sandbank [39].</p>
Chaining	Chaining involves breaking down a complex behavior or task into smaller, more manageable steps, and teaching each step sequentially. This method is particularly effective for teaching multi-step tasks or behaviors that are difficult for individuals with autism to learn holistically.	<p>Merits: Muldoon (2021) indicated that chaining used within speech-language pathology may be an effective strategy for managing feeding difficulties in children with autism [40].</p> <p>Gaps: Lack of conclusive evidence</p>
Scripting	This approach involves teaching individuals to use pre-written or pre-rehearsed verbal or behavioral scripts to navigate social situations. These scripts provide a structured framework that helps individuals initiate, maintain, and conclude interactions more effectively.	<p>Merits: Scheibel (2021) found that teaching social scripts is effective to improve social communication in children with autism. Canestaro (2021) and Sparaprani (2020) indicated that using text-in-speech modality and reading intervention improved conversation ability in children with autism [41–43].</p> <p>Gaps: There is strong evidence backing this strategy, however, the use of language and instruction is vital in effectiveness of scripting [44].</p>

Stimulus transfer	This technique involves transferring control of a behavior from one stimulus to another. The goal is to help individuals with autism respond appropriately to natural cues in their environment rather than relying on artificial prompts or cues provided during learning.	Merits: Stimulus transfer procedures, such as stimulus control transfer and transfer trials, can be effective in promoting communication and language skills in children with autism [45,46]. Gaps: Shkedy (2021) pointed out the long term effects of techniques such as stimulus transfer can be abusive and rather ineffective for children who are non-verbal and autistic [47].
Token Economy	Involves the systematic reinforcement of desired behaviors using tokens, which can later be exchanged for preferred items or activities. This approach is rooted in the principles of operant conditioning and is designed to increase desirable behaviors and decrease undesirable behaviors.	Merits: Whitney (2019) showed that token economy combined with a motivator reduced inappropriate behaviours in a child with autism [48] Gaps: Token economy requires individualized assessment as the reinforcing value of tokens varied amongst children with autism [49].
Contingency contract	This technique involves a written agreement between the individual and another person (such as a therapist, teacher, or parent) that specifies the expectations for behavior and the corresponding rewards or consequences.	Merits: The use of prompts and reinforcements in contingency contracts led to higher engagement in social interactions [50]. Gaps: access to fun activities should not be contingent upon completing a task, appropriate balance of adult-created learning opportunities and free play in interventions used

2. The Delivery of ABA-Based Interventions

The prevalence of autism spectrum disorder (ASD) in South Asia is around 1 in 93 children [51] with intellectual disabilities in India being reported at 1% [52]. Some commonly used practices to treat developmental disabilities include pharmacological and non-pharmacological interventions, such as ayurveda, homeopathy, and pranic healing; sensory integration and speech-language pathology [53–55]. There is a paucity of literature present on the effectiveness of function-based behavior interventions in treating children with developmental disabilities outside of the United States, particularly in India [56]. The critiques of ABA in the Western context where it is studied the most are beyond the scope of this paper.

Across Asia, the primary mode of ABA intervention is through one-to-one sessions. A countable few schools implement ABA in classroom instructions, but these classrooms are limited to urban cities. In a review detailing the limitations of ABA in India, it was seen that there is a lack of adequate facilities, trained educators, and inadequate policies to support the wide use of ABA across classrooms making it nearly impossible to impact the larger Indian school system [57]. ABA therapy has been adapted to cultural factors, and the best practices continue to have Western influence. Studies conducted in Asia report that there is a similar rate of success as that of Western countries [58]. These results may not replicate with larger sample sizes and across every culture.

Owing to the socioeconomic context of Asia, the popularity of one-to-one sessions is unaffordable for the average Japanese household as ABA and related therapies are not covered by Japanese insurance agencies. There is no proper infrastructure, policies, and trained staff that accommodate the needs of children with ASD in regular school systems. Furthermore, visiting therapists is expensive, leading to an increased involvement of parents stepping in as co-therapists

for their children. While parents are highly invested in the process of learning and applying ABA therapy, they frequently report irritability caused by the added burden it lays on the parents' schedules and the loneliness they experience due to inadequate support within social networks and the government systems [59]. In Cambodia, children within the ASD spectrum experience isolation and discrimination within their communities. Asian countries greatly value social skills such as communication- which incites societal stigma and fear among families of the diagnosed to seek assistance, let alone urge changes in the social sphere to include policies, training, and education [60].

The Program for the Education and Enrichment of Relational Skills (PEERS) has been widely applied in Hong Kong, China, and South Korea to address cultural differences; as parents typically do not teach social coaching or mannerisms. These programs seem to have brief positive outcomes in improving social and interpersonal skills and in relieving depressive symptoms [58]. With an increase in the grades, students tend to fall back on ABA therapy, specifically the PEERS program in South Korea as students are expected to engage in multiple activities. An RCT conducted in Korea substantiates that PEERS enables children provided that they have average IQ and possess verbal skills [61]. Stakeholders take precedence within the Asian contexts and their feedback encourages adopting ABA to benefit the cultural context. Various countries acknowledge the positive impact of ABA although a lack of other alternatives, limited research, and knowledge about the efficacy of ABA and/or other forms of therapy for persons with ASD may be factors influencing parents' response.

3. Effectiveness of ABA

3.1. Relevance to Cultural Needs

Training individuals to implement evidence-based treatments may not show productive outcomes if they do not cater to the prevailing cultural atmosphere and preferences of a population or ethnic group [62]. ABA as a behavioral intervention is still in its infancy, lacking in terms of being culturally relevant. Concerning the intensity and mode of the intervention conducted, it becomes imperative that the professionals seek more inclusivity. In a study conducted by Tiura et al. (2017), it was seen that participants who had English as a primary language responded faster as opposed to participants who spoke another language at home [63]. In another study, it was seen that mothers believed that a child's behavior must be person sensitive whereas the child's conduct and food are central concerns of the family [64]. These findings indicate a crucial need to equip culturally fair ABA training modules.

3.2. Lack of ABA-Skilled Professionals

There is a significant gap between the number of children receiving the diagnosis of ASD and the number of professionals who practice behavior-analytic intervention in India. According to the BACB registry, there are only 13 individuals residing in India, representing only 0.2% of the BCBAs worldwide [13]. The infrastructural deformities, along with the lack of administrative support, create a rather hostile environment for individuals to seek behavior-based intervention.

4. Availability of Resources to Access ABA

There is a gross lag in publicly funded policies that individuals can avail access to the benefits of ABA providers [65]. The significant gap in educational opportunities and appropriate exposure to the available options for an individual diagnosed with ASD draws attention to the low rates of turnout for such functional-behavior interventions. The Westernized concepts and lack of cost-effective resources drive an additional force against the effectiveness of ABA in the country [66].

Parent Training as an Effective Tool for Intervention

Although ABA-based interventions run against various logistical and socio-cultural challenges in the Indian cultural context, it has been proved to be efficacious in terms of certain culturally relevant techniques. In a study conducted by Sambandam and colleagues (2014), ABA intervention

was administered to 15 children with autism to show significant improvements in receptive and expressive language [67]. Importantly, the current literature points towards adoptive parent training programs showing effective improvements [65]. In another study conducted by Awasthi et al. (2021), it was seen that parent training is an effective tool for behavior analysts to improve effectiveness [66].

5. Appraising ABA Interventions and Therapeutic Practices

Through its therapeutic practice, ABA has been successful in providing the required treatment, rehabilitation and care to the autistic population. The global foothold of ABA approach has represented vast rates of efficacy. However, like all therapies that emerge from the behavioral school of thought, ABA has its pitfalls that require addressing. The ABA approach omits how the biological and etiological factors of Autism alter the structure of the brain [68]. This implies that there is an excessive stimulation of the brain areas. Additionally, ABA is applicable only among individuals with verbal abilities. This implies that a general approach to treatment expects that the individual has a set of abilities that are essential for the treatment to display effectiveness. This would require easily accessible support to the child at most times; which is generally unavailable in the Asian context [69]

ABA heavily relies on external reinforcement, which can lead to a sense of over-dependence on external stimuli and reinforcement to generate responses. While children continue to access ABA therapy, they develop a dependence on the external cues (verbal, visual and other environmental cues) that would enable them to respond to the social situation. This would imply that should the environment be strange or unique to the autistic individual, they would develop a difficulty in leveraging their therapy practices in real life scenarios [47]

The ABA therapy is identified to have a reduced cultural humility. Cultural humility is the ability to acknowledge the diversity among the population that seeks and accesses therapy. This would pertain to respecting the diversity of the autistic population and ensuring that people are able to access therapy in equity [70]. Research has suggested that ABA's approach lacks cultural humility, that is often observed with stereotyping and negating access to therapy. This has been identified as a serious flaw with the ABA approach. To connect this with the Indian context, one can identify the ABA therapeutic approach is often inaccessible to individuals coming from low-income communities and isn't entirely applicable in the local linguistic context [14,71,72]

The effectiveness of delivery of ABA based techniques is dependent on culture and policy environment. The comparative study conducted by Liao and colleagues 2018 stressed on how Chinese mothers involved greatly in the treatment sessions attending them with their children while UK parents completed their parental responsibility by connecting with the therapists after sessions and taking feedback and progress notes. This could also be a keypoint to identify that with each culture comes different ways, and in a country such as India, the methods used can be diverse considering the nature of culture variability in different geographical locations within the country [14].

Researchers have suggested a dearth in licensed ABA therapists and most on-field practitioners are either self-trained through online courses or through trainees on the verge of receiving their licenses. Given the wide gap that exists between the service and demand, an additional factor that comes in is the culture familiarity of the therapist with the native language, norms, values to effectively work towards the treatment plan [73]. Another observational study by Choi revealed how there is limited concordance between a patient centered (outcomes that are important for caregivers and parents) and a healthcare or clinician defined outcomes. However, ABA aims to support healthcare-defined outcomes as the evidence places it to decrease or even alleviate social, intellectual, and verbal impairments. It also remains important to place patient centered outcomes on an equal pedestal for gains to be experienced by what is considered important for families and caregivers [74]. It thereby needs a very person centered formularised treatment plan to have a balanced bar.

6. Conclusion

While ABA has its limitations, we must not omit the significance of an effective ABA intervention that has improved the chances of integration into mainstream society among the autistic

population. Such effective therapeutic approaches can never be discarded for its flaws, rather a flexibility to acknowledge errors and adopt changes must be encouraged by its practitioners. Most literature that is cited identifies that ABA fails when the practitioners and the stakeholders in the process are either uninformed or lack adequate skills to conduct the interventions and therapy. Mounting to this is the lack of cultural humility that has been identified in the ABA approach.

To curb this issue, Wright (2019) suggests a two-tiered reflective approach – self-reflection and institutional reflection. Through the process of self-reflection, the practitioner must be able to identify the errors and flaws in the practice by taking a step further to identify if their practice is culturally sensitive to the catered population and promoting the habit of updating themselves in the area of research. Through institutional reflection, one can identify the relevance of the ABA approach and encourage ample flexibility to accommodate required changes in the model [75].

As the treatment derives its approaches from the West, ABA needs to be tailored to the Indian population to bring effective and desired changes. To adopt ABA therapy and improve engagement to bring about positive outcomes, the incorporation of music and language therapy, and sensory integration has been identified by various studies. Including various other forms of therapy to sustain ABA within non-European contexts is not amply backed with empirical evidence. The use of integrative technology would further narrow the application of ABA to persons who have higher IQ and affordability of access [25,76].

One of the recent models introduced and is well-known for its effectiveness is the ASD nest model. The goal is to help persons with ASD adjust comfortably in mainstream settings by inculcating certain techniques that have been proven to help. Some of these are reducing class size, classes taught with two teachers at a time, a multidisciplinary team consisting of speech/ language therapist, occupational therapists, school administrator and social worker.

Despite the cultural considerations adopted into ABA therapy, the vast majority of Asian countries face limitations with common denominators such as lack of relatability, inadequate information, lack of well-trained practitioners, and incompatibility with the educational systems. Given the dynamic state and nature of each individual with autism, it remains imperative for the therapist to create a personalized treatment plan. Another narrative is also given by caregivers who would want to target certain behaviors on priority before addressing other issues. Machine learning in the Indian context has proven to bring 80-85% accuracy in the treatment outcomes.

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