Vol. 3 No. 4 (2025)
ISSN 3007-3170(O)
ISSN :3007-3162(P)
Social Sciences & Humanity Research Review

Applied Behavioral Analysis Intervention for a 7-Year-Old Child with Mild Intellectual Disability and Pachygyria: A Case Study

Aftab Khan Khattak[1], Saher Fazal[2], Zohra Altaf[3]

[1]MS Scholar, Foundation University, Islamabad,
Email: aftabkhattak12363@gmail.com
[2]PhD Scholar, Fatima Jinnah Women University, Rawalpindi,
Email: saherfazal1@gmail.com
[3]MS Scholar, Foundation University, Islamabad, Email: zohraaltaf21@gmail.com

ARTICLE INFO

Keywords:
Applied Behavior Analysis, Intellectual Disability, Pachygyria, Adaptive Functioning, Child Development, Behavioral Intervention.

Corresponding Author:
Aftab Khan Khattak,
MS Scholar, Foundation University, Islamabad,
Email: aftabkhattak12363@gmail.com

ABSTRACT

Intellectual disability (ID) is characterized by limitations in intellectual functioning and adaptive behavior that originate during the developmental period. Among the neurodevelopmental conditions associated with ID, pachygyria an abnormal neuronal migration disorder represents a rare yet complex clinical presentation. This case study explores the assessment and behavioral intervention of a 7-year-old female, pseudonymously referred to as *Anaya Ali*, diagnosed with mild intellectual disability and pachygyria. Anaya exhibited delayed milestones, limited expressive speech, and mild cognitive impairment. The therapeutic approach was based on Applied Behavior Analysis (ABA) integrated with behavioral intervention and family counseling. Over multiple therapy sessions, structured activities such as deep breathing, matching objects, sensory play, art therapy, and puzzles were implemented. Notable improvements were observed in adaptive functioning, attention span, social responsiveness, and cognitive focus. The case highlights the significance of early behavioral intervention and parental involvement in enhancing developmental outcomes for children with mild intellectual disability and neurodevelopmental anomalies like pachygyria. Implications for practice and future research in behavioral rehabilitation are discussed.

Introduction

Intellectual disability (ID) is a neurodevelopmental disorder characterized by significant limitations in intellectual functioning—such as reasoning, learning, and problem-solving—and adaptive behavior, which encompasses social and practical skills (American Psychiatric Association [APA], 2022). Globally, ID affects

approximately 1–3% of the population, with variations in etiology, severity, and co-occurring conditions (Maulik et al., 2021). Early developmental delays, particularly in language and motor skills, are hallmark features, and interventions often require multidisciplinary collaboration to enhance functioning (Schalock et al., 2021).

One rare yet clinically significant neurological condition associated with ID is pachygyria, which refers to a malformation of cortical development involving abnormal neuronal migration. This condition leads to the formation of abnormally broad and few gyri in the cerebral cortex, resulting in varying degrees of cognitive and motor impairments (Barkovich et al., 2019). Children with pachygyria may present with delayed milestones, seizures, hypotonia, and difficulties in communication or adaptive skills (de Wit et al., 2020). The severity and extent of developmental challenges depend on the degree and location of cortical malformation.

Behavioral therapy has been widely recognized as an effective approach for improving the functional and adaptive skills of children with developmental disabilities (Matson et al., 2020). Applied Behavior Analysis (ABA), in particular, utilizes learning theory principles—such as reinforcement, prompting, shaping, and task analysis—to improve socially significant behaviors (Baer et al., 1968; Leaf et al., 2022). ABA has demonstrated significant efficacy in improving communication, cognitive flexibility, and adaptive behaviors among children with developmental disorders (Eldevik et al., 2021). Its structured, measurable, and individualized format allows for progressive development even in children with neurological impairments.

The integration of Behavioral Intervention (BI) and Family-Based Intervention (FBI) further supports holistic improvement, as parents play a pivotal role in maintaining consistency, reinforcement, and generalization of learned behaviors (Estes et al., 2021). Through structured activities and active parental involvement, the child's engagement, motivation, and adaptive independence can be enhanced.

The present case study explores the application of ABA techniques in improving cognitive and adaptive functioning in a 7-year-old child with mild intellectual disability and pachygyria. The intervention aimed to promote self-help skills, communication, and executive functioning while addressing behavioral regulation and attention. The case underscores how structured behavioral methods and supportive family engagement can foster developmental progress despite neurological limitations.

Method

Case History

Identifying Information:

Anaya Ali (pseudonym) is a 7-year-old female, firstborn among four siblings. She lives in a nuclear family system with both parents and three younger siblings. Her father, aged 38, holds an MBA and works as a university auditor. Her mother, aged 34, is a homemaker. The family environment is stable and supportive, though a cousin (paternal uncle's son) with disability contributes to mild emotional stress within the extended family.

Medical and Developmental History:

Prenatal history was normal, with regular medical supervision. Postnatal complications included difficulty in breathing and asthma, which resolved with treatment. However, neuroimaging revealed **pachygyria**, a cortical developmental anomaly involving abnormal neuronal migration. The child's vaccination schedule was complete. She was hospitalized once due to pneumonia. Developmental milestones were delayed: neck holding, sitting, crawling, and walking all occurred later than average. Speech development was particularly affected—her first word ("Ama") emerged late, and she did not progress to phrases or full sentences.

Behavioral and Cognitive Profile:

Anaya exhibits limited expressive language but understands simple commands and responds to names and familiar objects. She follows instructions and displays recognition memory. There are no signs of repetitive, stereotyped, or self-injurious behaviors. Socially, she smiles, responds to greetings, and plays with siblings. Her adaptive skills are functional—she can feed herself and participate in household routines. Intellectual functioning corresponds to mild intellectual disability.

Family and Social Context:

The child spends most of her time with her mother and grandmother, both primary caregivers. The family demonstrates warmth and consistency. Educationally, she attends a local school but struggles with academic demands due to her limited speech and cognitive functioning.

Assessment

Techniques Used:

- **Clinical Observation: T**o evaluate attention, alertness, and eye contact.
- **Functional Behavioral Assessment (ABC Model): T**o analyze antecedents, behaviors, and consequences.
- **Adaptive Behavior Checklist:** To assess daily living and self-help skills.
- **Parent Interviews:** To understand developmental history and current functioning.

Findings:

- **Cognitive:** Moderate developmental delay with good visual memory.
- **Language:** Limited expressive vocabulary; understands verbal cues.
- **Social:** Appropriate emotional response to caregivers; enjoys cooperative play.
- **Adaptive:** Can feed herself and perform simple self-care tasks.
- **Motor:** Coordination within limits; slight fine motor delay.

- **Emotional/Behavioral:** No aggression or self-harm; calm and cooperative disposition.

Tentative Diagnosis:

Mild Intellectual Disability secondary to pachygyria.

Recommendations:

Initiation of **Applied Behavior Analysis (ABA)**, **Behavioral Intervention (BI)**, and **Family-Based Intervention (FBI)** focusing on cognitive and adaptive enhancement.

Intervention

The therapeutic protocol for *Anaya Ali*, a seven-year-old girl diagnosed with **mild intellectual disability (ID)** and **pachygyria**, was carefully structured to target her *adaptive functioning, executive skills, and behavioral regulation*. Considering her developmental delays and cognitive limitations, the intervention was individualized using the principles of **Applied Behavior Analysis (ABA)**, supplemented by **behavior modification**, **sensory integration**, and **art-based activities** to promote engagement and emotional regulation.

Therapy sessions were held **twice weekly** over several weeks, each lasting approximately **45–50 minutes**. The child's progress was monitored through direct behavioral observation, parent reports, and therapist session notes. The overall therapeutic aim was to improve *attention, compliance, and independent functioning* while enhancing *communication, social interaction, and cognitive processing*.

Therapeutic Framework

The intervention plan integrated several complementary evidence-based techniques:

Applied Behavior Analysis (ABA):

Core strategies of **positive reinforcement**, **prompting**, and **shaping** were employed

to encourage desired behaviors such as following commands, initiating communication, and completing tasks independently (Cooper et al., 2020).

Behavior Modification Techniques:

Undesired behaviors (e.g., inattentiveness, restlessness) were managed through *planned ignoring, differential reinforcement of alternative behaviors (DRA)*, and consistent application of token reinforcement. Behavioral expectations were clearly modeled and positively reinforced.

Sensory and Art-Based Activities:

Given the child's limited verbal communication and mild sensory sensitivity, **multisensory stimulation** was incorporated using rhythmic musical exercises, deep breathing, tactile play (e.g., clay, fidget toys), and visual art tasks to improve attention, arousal regulation, and fine motor coordination (Case-Smith et al., 2015).

Parental Involvement:

Family counseling sessions were conducted to train parents in **home-based reinforcement** and **structured routines**. Parents were encouraged to practice daily living tasks at home (e.g., dressing, sorting, coloring) using praise and small tangible rewards.

Session Summaries

Session 1-2: Orientation and Initial Engagement

Activities included **deep breathing** and **musical exercises** aimed at enhancing attention span, motor control, and emotional self-regulation. The child demonstrated positive engagement, maintained appropriate **eye contact**, and followed **simple commands** after modeling. Reinforcement was provided through verbal praise ("Good job!") and clapping to strengthen task persistence.

Home Plan: Parents were instructed to encourage *independent dressing* and *buttoning shirts* to enhance fine motor skills and self-care ability.

Session 3-4: Object-Matching and Behavioral Regulation

The second session introduced **object-matching tasks** (color and size differentiation) alongside **behavior modification strategies** to reduce impulsivity. The therapist applied **token reinforcement** (stars and stickers) for task completion and appropriate social responses. The child showed an increased ability to discriminate between objects and demonstrated reduced distractibility.

Home Plan: The family was advised to help the child *arrange household items by size and color*, encouraging sorting, categorization, and cognitive organization.

Session 5-6: Animal Recognition and Attention Training

Activities focused on **animal identification**, **fidgeting exercises**, and **guided deep breathing** to enhance attention and working memory. The child responded accurately to visual prompts and verbal cues, showing improved participation. Reinforcement was immediate and consistent, strengthening task completion behavior.

Home Plan: Parents were guided to introduce **coloring familiar animals and shapes** to promote creativity, concentration, and fine motor control at home.

Session 7-8: Sensory Integration and Cognitive Engagement

This session incorporated **matching boards**, **piano-based sensory activities**, and **pattern puzzles** to improve visual scanning, coordination, and problem-solving. Observable outcomes included *increased attention*, *decreased restlessness*, and *enhanced command-following*. The therapist used **progressive prompting** and fading techniques to promote independence and reduce reliance on external cues.

Outcome: Noticeable improvement in *cognitive engagement* and sustained focus during tasks.

Sessions 9-12: Advanced Cognitive and Social Development

Subsequent sessions integrated **art therapy**, **ABC board activities**, **receptive identification of letters**, **dot matching**, **color and shape recognition**, and **family counseling**. The focus was on expanding the child's **language comprehension**, **symbolic reasoning**, and **task sequencing**. Parents were actively involved in sessions to learn **reinforcement schedules**, **positive behavior supports**, and **structured play strategies** for use at home.

Assistive devices such as **learning pads**, **puzzles**, and **interactive boards** were introduced to improve **visuospatial processing** and **cognitive generalization**. Each task was designed to reinforce both **academic readiness skills** (letters, colors, sequencing) and **adaptive behavior** (turn-taking, waiting, requesting help appropriately).

Short-Term Goals

- **Enhance Adaptive Functioning:**
  Improve daily living skills such as dressing, eating independently, and following simple routines through structured task analysis and reinforcement.
- **Develop Executive Functioning:**
  Strengthen working memory, attention control, and cognitive flexibility using sequential matching, patterning, and categorization exercises.
- **Encourage Behavioral Compliance:**
  Increase task persistence and cooperation through consistent reinforcement, clear commands, and predictable session routines.
- **Increase Parental Involvement:**
  Train parents in applying reinforcement strategies at home to ensure consistency across settings.

Long-Term Goals

- **Enhance Cognitive and Visuospatial Abilities:**
  Promote logical reasoning, object recognition, and visuospatial coordination through the use of **puzzles, matrix activities, and interactive learning tools**.
- **Develop Communication and Problem-Solving Skills:**
  Strengthen receptive and expressive communication through **ABA-based prompting hierarchies** and **visual aids**.
- **Promote Generalization of Learned Behaviors:**
  Facilitate the transfer of learned adaptive and cognitive skills from the therapy setting to home and school environments via **family coaching** and **reinforcement continuity**.
- **Foster Self-Regulation and Independence:**
  Encourage the child to initiate and complete tasks independently, use coping mechanisms such as deep breathing during frustration, and build emotional resilience.

Summary of Intervention Outcomes

Over the course of the sessions, *Anaya* demonstrated **significant improvements** in her ability to attend to tasks, follow instructions, and engage in reciprocal interactions. Her **eye contact**, **response to verbal cues**, and **fine motor coordination** notably improved. The combined use of **ABA techniques**, **sensory integration**, and **parental reinforcement** contributed to steady gains in adaptive and cognitive domains. The **prognosis** remains *favorable* with continued therapy and home-based reinforcement.

Supporting Literature

Research consistently supports the effectiveness of **ABA** in enhancing adaptive and cognitive functioning in children with intellectual and developmental disabilities (Eldevik et al., 2021; Smith et al., 2022). Additionally, **multisensory and art-based interventions** have shown to increase engagement, fine motor control, and emotional regulation in children with neurodevelopmental challenges (Case-Smith et al., 2015;

Schlaug et al., 2020). Parental involvement further strengthens outcomes by ensuring behavioral consistency and generalization (Bearss et al., 2015).

Results

Following eight structured therapy sessions, *Anaya* demonstrated noticeable progress across several developmental domains. Progress was evaluated qualitatively through therapist observation, parent feedback, and behavioral checklists. Although formal psychometric reassessment was not conducted due to time limitations, behavioral indicators and functional milestones revealed consistent improvement.

Behavioral and Adaptive Progress

By the end of the intervention cycle, *Anaya* displayed significant gains in **adaptive functioning** and **task compliance**. She successfully performed simple self-care routines such as dressing, buttoning shirts, and organizing her school bag with minimal assistance. Her ability to **follow two-step commands** improved markedly, and she exhibited **spontaneous engagement** during structured activities.

Her **attention span** extended from approximately **2–3 minutes to 7–8 minutes per task**, and she was able to remain seated and focused during activities such as puzzles and matching boards. The **frequency of restlessness and distractibility decreased**, while **command-following behavior increased** as reported by both the therapist and her parents.

Cognitive and Communication Improvement

Cognitive stimulation through ABA and visuospatial tasks led to improved recognition of **colors, shapes, and objects**, and partial letter recognition on the ABC board. The child began initiating simple verbal responses, expanding her vocabulary to include basic words like "ball," "cat," "red," and "done." Although sentence formation remained underdeveloped, her **receptive language** improved significantly, as she consistently understood and acted upon verbal prompts.

Social and Emotional Development

Anaya's **eye contact, social smiles, and reciprocal interactions** became more consistent. She displayed positive emotional expressions during musical and art activities, and engaged cooperatively with the therapist and peers. Parents reported increased **social engagement at home**, particularly with siblings, indicating improved emotional responsiveness and comfort in social settings.

Parental and Home-Based Reinforcement Outcomes

Through **family counseling sessions**, parents demonstrated improved understanding of structured reinforcement and applied behavioral techniques at home. The home plans provided after each session were implemented regularly, and parents reported greater ease in managing the child's routines. This collaborative effort contributed substantially to *Anaya's* developmental gains and behavioral stability.

Discussion

The current case study demonstrates that a **multi-modal intervention integrating Applied Behavior Analysis (ABA), sensory-based activities, and family training** can produce meaningful behavioral and cognitive improvements in a child with mild intellectual disability and pachygyria. The observed outcomes are consistent with previous evidence suggesting that early behavioral interventions are effective in enhancing developmental trajectories in children with neurodevelopmental conditions (Eldevik et al., 2021; Lovaas, 1987).

Interpretation of Findings

Anaya's improvement in attention span, adaptive functioning, and command following can be attributed to **structured reinforcement schedules**, **consistent prompting**, and **task sequencing**. The child's enhanced responsiveness and reduced

restlessness align with the principles of ABA, where positive reinforcement strengthens desired behaviors (Cooper et al., 2020). Moreover, the gradual inclusion of **sensory and art-based tasks** likely supported *sensory modulation* and *emotional regulation*, which are frequently impaired in children with developmental delays (Case-Smith et al., 2015; Schaaf et al., 2018).

The development of receptive language skills—though limited in expressive expansion—suggests that **repetitive auditory exposure** combined with **visual cues** facilitated comprehension. This aligns with research indicating that pairing verbal input with sensory experiences can promote language acquisition in children with neurocognitive disorders (Rogers & Dawson, 2010; Smith et al., 2022).

Role of Family Involvement

Parental participation proved essential in maintaining behavioral consistency and ensuring the generalization of learned skills across settings. Consistent with prior studies, home-based reinforcement and structured play substantially enhance intervention outcomes (Bearss et al., 2015; Matson & Goldin, 2014). *Anaya's* parents' active engagement likely contributed to her progress in independence and self-care behaviors. This finding underscores the value of **parental coaching** in behavior analytic and developmental interventions.

Therapeutic Implications

The results highlight several important clinical implications:

- **Early Intervention and Neuroplasticity:**
  Children with neurological abnormalities like pachygyria can still demonstrate measurable progress when provided with consistent, individualized interventions that target cognitive, sensory, and behavioral domains.
- **Integration of ABA and Sensory Techniques:**
  Combining ABA with sensory and art-based activities addresses both **behavioral deficits** and **sensory processing issues**, fostering holistic development.
- **Parental Empowerment:**
  Training parents as co-therapists extends the therapeutic environment beyond clinical sessions and ensures the **maintenance and generalization** of learned behaviors.
- **Structured Reinforcement Schedules:**
  Systematic reinforcement through **token economies** and **visual feedback** is effective in enhancing motivation and task persistence in children with ID.

Challenges and Limitations

Despite notable progress, some challenges were observed. *Anaya's* **verbal expression remained limited**, and her **abstract reasoning** showed minimal advancement. The **short duration** of the intervention and **lack of formal post-assessment tools** also restrict the ability to quantify improvement statistically. Future interventions should extend over several months with standardized cognitive and adaptive behavior scales (e.g., Vineland Adaptive Behavior Scales, Stanford–Binet Intelligence Scales) for more precise evaluation.

Conclusion

This case study underscores the importance of **individualized, evidence-based interventions** for children with mild intellectual disability and structural brain abnormalities such as pachygyria. The combination of **ABA, behavior modification, sensory integration, and family involvement** led to significant gains in adaptive behavior, attention, and cognitive engagement in *Anaya*.

Her progress demonstrates the potential for positive developmental change even in the presence of neurobiological constraints, provided that interventions are **consistent, structured, and family-centered**. The findings advocate for a **multidisciplinary**

approach integrating behavioral, educational, and family-based strategies to promote long-term functional independence and quality of life in children with intellectual disabilities.

References

Bearss, K., Johnson, C., Smith, T., Lecavalier, L., Swiezy, N., Aman, M., & Scahill, L. (2015). Effect of parent training on behavioral problems in children with autism spectrum disorder: A randomized clinical trial. *JAMA, 313*(15), 1524–1533. https://doi.org/10.1001/jama.2015.3150

Case-Smith, J., Weaver, L. L., & Fristad, M. A. (2015). A systematic review of sensory processing interventions for children with autism spectrum disorders. *Autism, 19*(2), 133–148. https://doi.org/10.1177/1362361313517762

Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied behavior analysis* (3rd ed.). Pearson Education.

Eldevik, S., Hastings, R. P., Hughes, J. C., Jahr, E., Eikeseth, S., & Cross, S. (2021). Meta-analysis of early intensive behavioral intervention for children with autism. *Journal of Clinical Child & Adolescent Psychology, 50*(3), 383–396. https://doi.org/10.1080/15374416.2019.1702382

Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*(1), 3–9. https://doi.org/10.1037/0022-006X.55.1.3

Matson, J. L., & Goldin, R. L. (2014). Comorbidity and autism: Trends, topics, and future directions. *Research in Autism Spectrum Disorders, 8*(9), 1223–1233. https://doi.org/10.1016/j.rasd.2014.06.004

Rogers, S. J., & Dawson, G. (2010). *Early start Denver model for young children with autism: Promoting language, learning, and engagement*. Guilford Press.

Schaaf, R. C., Dumont, R. L., Arbesman, M., & May-Benson, T. A. (2018). Efficacy of occupational therapy using Ayres Sensory Integration®: A systematic review. *American Journal of Occupational Therapy, 72*(1), 7201190010p1–7201190010p10. https://doi.org/10.5014/ajot.2018.028431

Schlaug, G., Marchina, S., & Norton, A. (2020). From singing to speaking: Why singing may lead to recovery of expressive language function in patients with Broca's aphasia. *Music Perception, 27*(4), 315–323. https://doi.org/10.1525/mp.2010.27.4.315

Smith, T., Iadarola, S., Mandell, D., & Kasari, C. (2022). Advancing behavioral interventions for neurodevelopmental disorders. *Annual Review of Clinical Psychology, 18*, 503–530. https://doi.org/10.1146/annurev-clinpsy-072720-014546