

Autism Spectrum Disorder and Behavioral Intervention : An Updated Review

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Autism spectrum disorder (ASD) is a neurodevelopmental disorder marked by impaired social communication and repetitive, restricted behaviors and activities. The prevalence of ASD has been increasing for the past 2 decades, but evidence-based therapeutic approaches are lacking for patients with ASD. To date, there is no cure for the core symptoms of ASD, and the existing treatments focus on improving the patient's function and adaptation by using behavioral intervention methods. Behavioral interventions have been proven to show the greatest effect when applied before the age of 2 years, for at least 40–60 hours per week. Many clinicians and ASD families are unfamiliar with the treatment methods, and consequently, may seek unproven and potentially hazardous methods. The purpose of this article was to present an extensive and updated review on evidence-based ASD behavioral interventions that are commonly used in clinical settings.

KEY WORDS : Autism Spectrum Disorder · Behavioral Intervention · Applied Behavior Analysis · Individualized Treatment.

Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition,¹⁾ autism spectrum disorder (ASD) is defined as a neurodevelopmental disorder marked by persistent deficits in social communication and social interaction across multiple contexts, and restricted, repetitive patterns of behavior, interests, or activities. The severity of ASD is divided into 3 levels according to the degree of social communication impairment, and restricted, repetitive patterns of behavior.

According to a study in 2003, there were approximately 60 out of 10,000 children diagnosed with ASD in the United

States, with an average male-to-female ratio of 4.3 : 1.²⁾ Other epidemiology studies presented controversial results, and have been showing a trend towards an increase in incidence rates. Prevalence estimates range from 0.07% to 1.8%, and continue to rise, but it is still unclear to what extent this is a true increase or a product of expanded diagnostic criteria.³⁾ The trend of increase in prevalence of ASD in Korea is similar to that seen in the U.S. A previous study estimated an ASD prevalence of 2.6% with a male-to-female ratio of 2.5 : 1 in the general population. Despite the increase in prevalence, there remains a high proportion of undiagnosed and untreated children population with autism in Korea ; approximately 2/3 of children with ASD remain undetected and unnoticed.⁴⁾ The main reason is the social stigma associated with autism diagnosis, as many families are unwilling to test their children for autism and be labeled as “genetically inferior.”

Individualized treatment is recommended due to the variety of symptoms and diverse functioning levels of each patient. Currently, there is no medication available to cure the core symptoms of autism. Medications are usually prescribed to treat comorbid conditions such as impulsivity, short attention span, sleep behaviors, anxious mood, agitation, and self-

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injurious behaviors.^{1,3)}

As a primary treatment choice, educational and behavioral interventions play a major role in promoting social, adaptive, and behavioral functions in children with ASD, and address issues including communication, social skills, daily-living skills, play and leisure skills, academic achievement, and maladaptive behaviors.⁵⁾ Although many different techniques are available, only some of these approaches are considered 'evidence-based'. To our knowledge, few Korean guidelines give a comprehensive insight into the evidence-based behavioral treatments. The purpose of this article is to present an updated review on the behavior interventions of ASD, and help develop a more thorough understanding of the non-pharmacological treatments for problem behaviors, and ultimately help clinicians and ASD families to get a better perspective on the selection of appropriate treatments.²⁻⁴⁾

Applied Behavior Analysis

Applied behavior analysis (ABA) is considered the optimal behavioral intervention, well supported by research. ABA is an intervention based on the principles of operant conditioning and is applied in a systematic and measurable manner to increase, reduce, maintain, or generalize target behaviors. ABA reinforces the positive behaviors and discourages maladaptive behaviors. Because each autistic child exhibits different behavior problems, he receives individualized therapies for different target behaviors. Numerous studies during the past 5 decades have shown that ABA successfully yields substantial improvements in patients with ASD in terms of IQ, language, academic performance, and adaptive behavior compared with control ASD groups.⁵⁾ Lovaas⁶⁾ stated that 47% of the studied ASD children who received intensive early ABA had outcomes similar to normally developing peers, and recent studies concluded that ABA is superior to other intervention strategies.⁷⁾

Functional behavior analysis or functional assessment is an empirically based method of gathering information that can be used to maximize the effectiveness of behavioral interventions. It starts with a clear description of the target behavior, identifying the antecedents, consequences, and other environmental factors influencing the behavior; the next step is to hypothesize the motivating function of the behavior, and then collecting observational data to test the hypothesis.⁸⁾

Before a treatment regimen is implemented, the child's developmental and skill levels in communication, play, self-care, and academics are tested.⁹⁾ After a thorough assessment by observing the child's interaction with the environment, ex-

perts design a carefully reviewed regimen. Necessary skills that need to be learned are broken down into smaller components for efficient teaching sessions. Each component of skills is taught in a successive manner. After mastering one skill, the child receives training for more difficult tasks. The final goal of the training is to reach the maximum capacity of the child and independence in daily life.¹⁰⁾ Training sessions are carefully monitored for early detection of inappropriate teaching methods and for assessment of progress.

In order to achieve the stated goals that are set at the beginning of education, ABA based interventions focus on altering the environmental variables through antecedent-behavior-consequence (ABC) contingencies. Antecedent cues behaviors, which is prompted by the behavior therapist or the parent. Consequence is a reinforcer that can increase and sustain the desired behaviors and remove maladaptive ones.

To help children learn through ABC contingencies, it is important to follow certain rules that make behavior interventions effective. Behavior interventions should be applied to children as early as possible and address the main problems of autism in a predictable setting. These personally tailored therapies are more effective in a low teacher-to-student ratio environment, and when the family is involved. Therefore, parents need to undergo extensive training as well.¹⁰⁾ In addition, autistic children should be able to apply the learned lessons to more generalized situations. Otherwise, the child will not be able to utilize the learned skills in an unexpected environment and will exhibit maladaptive and repetitive behaviors again. Learning appropriate behaviors as well as making those behaviors sustainable over time is crucial. Because the learned skills may be lost over time, it is important to assess the child's behavior patterns repeatedly.¹¹⁾

Discrete Trial Training

The success of ABA has led to the emergence of many different forms of training. One of the earliest forms of behavior interventions developed based on ABA is the discrete trial training (DTT), also referred to as early intensive behavioral intervention if delivered before the age of 5 years, and is conducted in classroom-like settings. DTT is now the most widely recognized form of ABA, where the teacher sits down with the child with ASD and follows well-scripted tasks. DTT refers to a technique based on breaking down specific skills into small discrete components, and then teaching them in a graduated fashion, with reinforcement of correct responses and negative feedback to incorrect responses.

DTT has four instructional components: 1) presentation of

a discriminative stimulus, 2) occurrence or approximation of the targeted response, 3) delivery of a reinforcing consequence, and 4) a specified intertribal interval.¹¹⁾ The first part (presentation of a discriminative stimulus) can be divided into two different steps, cue and prompt, and some researchers consider DTT as having five components—cue, prompt, response, consequence, and intertribal interval. Cue is presenting a stimulus and prompt is assisting the child to answer the question correctly. Prompt usually accompanies or immediately follows cue.¹²⁾

DTT is one of the essential training techniques in helping children with ASD with three aspects that may increase learning and motivation. First, each discrete trial only lasts about 2 to 5 minutes for better concentration and more learning opportunities in a given time. Second, teachers work one-on-one with the child, and the child receives tailored learning sessions that can be altered depending on the child's performance. Third, DTT has a definite model, so it clarifies the teaching situation for the child.¹³⁾

There are certain limitations to DTT. First, it is a slow process that takes thousands of trials to master the necessary skills. Second, since it is conducted in a very structured setting with well-written scripts, it is difficult for a child to generalize the learned skills, and he may even become cue- and reward-dependent.¹⁴⁾ Third, it also goes against the basic early childhood teaching principle, wherein children should interact with their peers to develop language and social skills.¹⁵⁾ Fourth, as with non-autistic children, it is not easy to motivate children with ASD to participate in learning behavior for a prolonged period. There arose a need for increasing the responsiveness of these children to tasks,¹⁶⁾ which led the scholars to focus on teaching pivotal responses for improvement in other areas collaterally.¹⁷⁾

Pivotal Response Treatment

To compensate for the limitations of traditional ABA techniques, Koegel et al.¹⁷⁾ developed a more naturalistic approach called the pivotal response treatment (PRT). PRT is based on ABA principles, and differs from traditional methods by being play-based and child-initiated. It targets the “pivotal areas” rather than individual behaviors, including motivation, response to multiple cues, self-management, and initiation of social interactions. Learning within these pivotal areas helps children acquire skills in fields that are not directly covered during teaching sessions in DTT,¹⁸⁾ and PRT is important because it bridges the gap between DTT in a structured setting and incidental learning in a natural setting.¹⁹⁾

Normally developing children are excessively responsive to environmental stimuli requiring curbing of hyperactivity ; however, autistic children are only responsive to certain stimuli. Moreover, children usually learn to behave appropriately in new complex situations through interactions with the natural surroundings ;²⁰⁾ therefore, children with ASD need to explore them in a more proactive manner. This type of a more active form of learning can happen through PRT, and its major goal is to develop motivation. In order to keep the children with ASD motivated to learn, their choice of preferred objects are incorporated into the learning sessions. Although the clinician follows the child's lead, the environment remains structured so that the desired target behaviors are incorporated into the activities, while maintaining the child's attention and decreasing the likelihood that the child will avoid the interactions and engage in disruptive behaviors.²¹⁾

As they become more eager to learn, children with ASD should be able to respond to various stimuli. The interventions that teach these children to respond to multiple cues in the environment have been shown to enhance the attention to social cues and increase learning and generalization.¹⁸⁾

Self-management is another important aspect of PRT. Teaching self-management procedures involve teaching individuals to discriminate between appropriate and inappropriate behaviors, then to actively record the correct responses. This will aid children with ASD to generalize the learned skills across different settings, while the self-initiation skills help them to be more engaged in learning language, social skills, and pragmatics.²²⁾

Training and Education of Autistic and Other Communication Handicapped Children

Along with other ABA-based interventions, the training and education of autistic and other communication handicapped Children (TEACCH) method is commonly used, and has a long history with well-defined features.²³⁾ The framework for TEACCH is structured learning that emphasizes development of vocational, social, and living skills through the use of visual prompts in the environment under the theory that children with ASD are more visually oriented and more deficient in auditory stimulation.²³⁾ The four major areas of focus are physical organization, visual schedules, structured work system, and predictable task organization.²⁴⁾ TEACCH is significant because it was designed to make the children with ASD contribute to the community as a productive individual, whereas many of the previous interventions focused

more on family and social life.¹⁹⁾

There are common characteristics shared between ABA and TEACCH : 1) curriculum content that emphasizes five basic skill domains—ability to selectively attend to stimuli in the environment, imitative ability including both verbal and motor imitation, receptive and expressive language ability, appropriate toy play, and social interaction skills ; 2) highly supportive and structured teaching environment ; 3) predictability and routine ; 4) functional approach to problem behaviors ; 5) transition between preschool to kindergarten/first grade ; and 6) family involvement.²⁵⁾

In the TEACCH program, the skills that are taught in a structured environment can also be taught in a home environment to provide a generalization across the settings.²⁴⁾ Therefore, it is important to share the information regarding the program between therapist and parents.^{22,23)}

In a controlled study, a 4-month TEACCH-based home program along with local day treatment programs showed significantly more improvements in children with ASD compared with a control group with only local day treatment services.²⁶⁾

Developmental Models

While ABA assesses the individual behavior of children to determine which behavior to strengthen or weaken, the teaching goals of developmental models are based on the evaluation of developmental skills. It is based on Piaget's development theory that cognitive development is a combination of biological maturation and adaptation to environment.²⁷⁾

The assessment of the child includes 1) clinical observations of child-caregiver interactions and child-therapist interactions ; 2) review of the child's developmental history ; 3) assessment of current intervention programs and responsiveness of the child to the intervention ; 4) multidisciplinary consultation from specialists ; and 5) biomedical evaluation.²⁸⁾ This comprehensive developmental assessment of a child with ASD leads to individualized therapy that can help in different domains affecting the child's daily functioning, communication, and social skills.

Denver Model

The Denver model is one of the most studied developmental models. It views ASD as a complex disorder, affecting children in virtually all areas of functioning, and especially focuses on affect, arousal, and attention. Interventionists who employ the Denver model focus on areas, which the children

with ASD are lacking but follow the developmental sequence of normally developing children. It is based largely on key deficits in imitation, emotion sharing, theory of mind, and social perception by using play, interpersonal relationships, and activities to foster symbolic thought and teach communication.²⁹⁾ Interventionists create a warm and fostering environment to build a positive relationship between child and adults while encouraging learning.³⁰⁾ Teaching typically occurs in the child's natural habitat with the help of family members during meal time, toilet training, bathing, chores, playtime, and community outings.²⁹⁾

Because the Denver model is one of the most commonly used developmental intervention models, and the importance of early intervention in autism is known, this model has been expanded from school-aged children to infant-toddlers. This is called the Early Start Denver Model (ESDM). The effects of the ESDM have been proved through a randomized controlled trial, where most of the improvements came from receptive and expressive language.³¹⁾

Developmental Individual-Difference Relationship-Based Model

Developmental individual-difference relationship-based model (DIR) is another form of behavior intervention that focuses on the child's developmental assessment. It integrates a relationship-focused intervention with floor time play.³²⁾ The premise of DIR is that an adult can help a child expand his or her circles of communication by meeting the child at his/her developmental level and building on the strengths of the child. The 'D' in the DIR model represents developmental capacities that emerge during the early years including shared attention, engagement, back and forth interactions, creating play ideas, and abstract thinking. The 'I' stands for the individual differences in the sensory and motor processing capabilities, and the 'R' means relationships and environments, through which the child can develop to function fully in emotional, social, and cognitive capacities.³³⁾

One of the major components of the DIR model is the floor time where the child leads the interactions with adults on the floor. The six elements of floor time are self-regulation and shared attention, engagement and relating, two-way intentional communication, purposeful complex problem solving communication, creating and elaborating symbols (ideas), and building bridges between symbols (ideas). During the self-regulation and shared attention stage, the child is led to engage all senses and motor capacities into play for enjoyable interactions. Then, the child is encouraged to feel plea-

surable senses and learn to ‘fall in love’ in the engagement and relating stage. The next stage involves following the child’s lead and challenging him to communicate through exchanges of gestures and emotional signals about his affects. In purposeful complex problem solving communication stage, the adult and child work in a back to back continuous flow communication for 30 minutes before moving onto the next stage of relating to sensations, gesture, and behaviors in a world of ideas, which can be shared in pretend play. In the last stage of building bridges between symbols, the child learns to seek opinion, enjoy debates, and negotiate for things he wants using logical reasons.³³⁾

Preliminary results from an ongoing randomized controlled Canadian trial of 51 preschool age children in either a DIR group or a community treatment group suggested that children in the DIR group had significantly greater gains in social interaction skills compared with those in the community treatment group.³⁴⁾

Relationship-Development Intervention

Relationship-development interaction (RDI) is an intervention that focuses on the activities that facilitate interactive behaviors with the goal of engaging the child in a social relationship where the child can undergo a positive experience and find motivation in learning the social skills to maintain such relationships.³⁵⁾ RDI is based on the perspective that ASD is a deviation from the typical development of social relationships due to the inability of flexible thinking. RDI helps children with ASD to develop dynamic intelligence, or flexible thinking and allow them to cope with changes and new information. The six objectives of RDI are 1) emotional referencing ; 2) social coordination ; 3) declarative language ; 4) flexible thinking ; 5) relational information processing ; 6) foresight and hindsight.

RDI aims to help children with ASD to gradually strengthen the building blocks of social connections. The children start by working in a one-on-one setting with a parent. When the child is ready, they are matched with a peer at a similar developmental level to form a dyad. Additional children are added gradually, as are the number of settings the children practice in order to help them create relationships in different contexts.³⁵⁾

Greenspan demonstrated a positive outcome in a small sample of children with ASD, but RDI efficacy is yet to be evaluated by further studies.³⁶⁾

Skill-Based Developmental Training

There are other forms of interventions for children with ASD that can help them become more interactive and improve the quality of life. The two major forms of interventions that are widely used today are the picture exchange communication system (PECS) and positive behavior support (PBS). The PECS focuses on expressing opinions and asking questions as the name implies, while PBS emphasizes improving the quality of life through a person-centered approach employing different types of techniques.

Picture Exchange Communication System

One of the more specific goal-oriented therapies being used on children with autism concentrates on communication for nonverbal children and this education method is called the PECS. The PECS is based on ABA following the prompt, reinforcement, and error correction sequence. Because children with autism are known to be more receptive to visual stimuli than verbal stimuli,²⁹⁾ the picture system allows them to better connect with their parents.

The PECS consists of six different phases, and two adults are needed for helping in the learning process—mediator and communicative partner. The first phase of the PECS is to teach the child with autism to pick up a picture card and give it to a communicative partner. When the child learns to pick up and spontaneously release a picture card, then the learning can move onto the next phase. Because the PECS is based on ABA, when the child reaches out for a card, the mediator prompts the child to choose one. Then, the child picks up the desired card and receives a reward when he passes the card to the communicative partner. In the second phase of the PECS, the child learns to expand the spontaneity by seeking out the communicative partner who is not in the immediate proximity. During phase III, the child starts discriminating two cards that give different rewards—one with higher satisfaction and the other with no satisfaction. At first, the child will not know why he is receiving such an undesirable reward, but eventually he will learn through error correction process that the two cards are different. After the child learns to differentiate the two cards, he will be taught to make sentences. Earning a desirable object by saying “I want something” is more motivating than commenting ; the child will learn to say what he wants first. He will place “I want” and a picture card on a blank strip, then the communicative partner will give what the child wants. In phase V, the child learns to answer direct

questions—“what do you want?”. As in phase IV, this type of questions can motivate the child and he will learn to answer the question with “I want something.” The last phase of the PECS is to train the child to become responsive and to comment spontaneously. He will also learn to respond to different questions that do not immediately generate rewards.³⁷⁾

There are mixed results regarding the effectiveness of the PECS. According to a randomized controlled trial conducted by Howlin et al.,³⁸⁾ the PECS helps in developing picture communication skills in children with autism, and the positive results disappear once the training has ceased. However, both Howlin et al.³⁸⁾ and Tien³⁹⁾ conclude that the use of the PECS should be considered by practitioners because the method can easily be used in everyday settings without significant changes to the environment, and it can be generalized to different situations.

Positive Behavior Support

PBS is not an individual treatment technique but is a comprehensive intervention that approaches children with ASD based on three different principles—ABA, normalization/inclusion movement, and person-centered values.⁴⁰⁾ PBS aids children with ASD to become more skillful in social interactions and family life. The main purpose of PBS is to bring more autonomy to the daily activities of these children and help them become less dependent on the family members.⁴¹⁾ It minimizes the role of professionals in the management of children with ASD and is mostly implemented by the family members for removing new and recurring behavior problems in these children.⁴²⁾

The active involvement of family members and the goal of developing meaningful lifestyle outcomes led to the establishment of person-centered planning methods in PBS. Person-centered planning is a guide for the individual, family, and team to evaluate the efficacy of the treatment, enhance choice-making opportunities, and respect personal dignity of the individual for whom it is planned.⁴³⁾ Besides, the more humanistic approach of PBS is also unique in preventing negative behaviors rather than showing the consequences of them. Because of this new perspective, the impact of environmental variables (i.e., setting events) and immediate antecedent events became more important and are being studied widely.⁴⁴⁾ Manipulating the antecedent while expecting to change the consequences is another core principle of PBS, which is derived from ABA.

Due to the distinguished features of PBS, this treatment modality is viewed as a multiple theories-based approach

with three major principles. The first embodies the idea that since people in community settings are interdependent, clinically significant changes occur in social systems and not just in individuals. The second principle is that producing a change does not simply derive from teaching specific techniques; rather, a change involves the reallocation of resources such as time, money, and political power. The last principle substantiates the view that an individual’s behavior reflects on the interaction between the individual and the surrounding environment.⁴⁵⁾

Based on these principles, two different techniques of PBS have been developed. The first is the antecedent-based technique that involves building activity patterns, offering choices, and using visual schedules to promote predictability of routines.⁴⁶⁾ The other is the fundamental understanding of the problem behavior by integrating educational strategies and reinforcement-based procedures to improve lifestyle.⁴⁷⁾ These treatment techniques have helped in identifying the cause of behavior problems and in implementing therapies that prevent them. The ultimate goal of PBS is to create effective environments that promote positive behaviors without the interruptions of negative behaviors.

Individualization of ASD Behavioral Interventions

Despite the emergence of various behavioral interventions and increasing number of controlled studies effectively implementing these methods, currently, there is no singular method that ameliorates the core symptoms of ASD and is effective in all children with ASD. The best explanation for this is due to the heterogeneity and developmental nature of ASD that makes it difficult for a single method to be effective in all children with ASD, or to last throughout his or her entire lifetime. Differential response to treatment is common across all of evidence-based approaches, with up to 50% of children showing substantial positive gains, and the other 50% making variable progress, some with extremely limited skill development.⁴⁸⁾

Future research should target methods of individualizing, and instead of using the existing methods as a whole, single components could be delivered in a modular mode, or several methods could be integrated. The efficacy of each intervention should be measured by newly developed tools sensitive to each of the intervention methods, not just using IQ, or pre-existing scales.⁴⁹⁾

Research regarding the pre-treatment characteristics associated with differential response to treatment, including

child and family variables, and how specific behavioral intervention techniques address each of these characteristics is required.⁴⁸⁾ Another method would be to focus on subgroup differences within the ASD treatment outcomes, rather than conducting studies that compare ASD with typically developing individuals. Furthermore, identifying biomarkers sensitive to intervention would reveal whether and which variations in the baseline measures of the brain function predict the responses to treatment and could contribute to individualization of treatment.

Conclusion

ASD is known to incur about three times more medical expenses compared to typically developing children since the children with ASD require support services throughout their lifetime.³⁾ Therefore, it is important to identify evidence-supported treatments to ease the burden on the family and decrease the public health expenditure. Many behavior therapies have been proposed with multiple approaches, but only a few of them have been proven effective in large sample sizes. Although different results have been shown through investigations, there is a growing consensus on the principles for effectiveness. First, early detection and intervention is one of the most important factors in forecasting the prognosis of the disorder and functioning of the child. Children with ASD who had started treatment before 2 years of age showed greater improvement in social adaptation and autonomy compared with an older age group. One possible explanation for better results with early intervention is that children with more attentive parents received earlier diagnosis and treatment that is more intensive. Another pattern exhibited in autism behavior therapies is the absence of sufficient benefits in the long-term. Despite extensive basic research, based on which new behavior intervention methods have been founded, these interventions do not have sufficient evidence for lasting effects. Helping children with ASD to integrate into the society, and function as a productive member is the ultimate goal for everyone involved, and offers an effective way to decrease the public health burden.

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