Review

Psychosocial Treatments for Children with Autism Spectrum Disorder

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Given the situation where various psychosocial treatments for autism spectrum disorder (ASD) are proposed and body of treatment outcome studies for ASD are accumulated, this study purported to review psychosocial treatments for children with ASD that currently receive empirical supports. To address these purposes, the study focused on the three types of psychosocial treatments frequently observed in ASD literature (behavioral interventions, social-communication skills interventions, and parent training interventions), and reviewed research findings pertaining to each of these interventions. Toward the end, clinically useful findings were emphasized, important clinical and research issues were discussed, and directions for future treatment outcome studies were provided.

Key Words: Autism Spectrum Disorder; Psychotherapy; Psychotic Disorders; Children

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INTRODUCTION

Autism spectrum disorder (ASD) is defined by persistent deficits in social reciprocity and communication and highly rigid and repetitive behaviors, interest, or activities that usually emerge early in life, typically before 3 years of age [1]. Lack of social reciprocity is frequently manifested by extreme aloofness, lack of interest in other people, low empathy, and inability to share attention (joint attention) with others. Communication problems are often manifested by odd nonverbal behaviors, odd tone of speech, few or no facial expressions or body gestures, failure to maintain proper eye contact, difficulties understanding speech or using language for conversational purposes, and speech peculiarities (e.g. echolalia, pronominal reversal). Highly rigid and repetitive behaviors, interests, and activities are manifested by perseveration of sameness, strong attachment to particular objects, and fascination by movement. ASD was once considered rare, but it now appears commonly, occurring approximately 1 in 68 children [2]. About one third of children with ASD exhibit delays in cognitive development and daily living skills [2]. Behavioral problems (e.g., temper tantrums, aggression, self-injurious behaviors, anxiety) and medical conditions (e.g., seizure disorder, gastrointestinal disturbance) are reported to be frequently co-occurring [2-4].

Various explanations have been offered for ASD though precise etiology has not been determined [5]. Researchers proposed that family dysfunction, including failed parenting (e.g., perfectionistic, cold, and aloof parenting) and social and environmental stress could contribute to the onset of ASD [6,7]. However, more sophisticated research suggests that such familial-sociocultural characteristics are not limited to children with this disorder [8,9]. Psychological factors such as central perceptual or cognitive disturbance that makes normal interaction and communication impossible have also been proposed. One influential explanation in this area holds that individuals with ASD lack in self-awareness [10,11]. Given that individuals with ASD fail to understand that their existence is distinct from those of others, they avoid first-person pronouns such as *I* and *me* and rather use *he* and *she*. Another influential explanation in this area holds that individuals with ASD fail to develop a theory of mind-an awareness that other people base their behaviors on their own beliefs, intentions, and other mental states, not on information that they have no way of knowing [12]. Studies show that people with ASD do indeed have this kind of

mind-blindness, although they are not the only kinds of individuals with this limitation [13,14]. Biological factors have also been proposed as causes of ASD. Genetic influence has been suggested as inherent in this disorder [15]. Moreover, biological abnormalities including abnormality in cerebellum development [16], increased white matter [17], lower levels of neuropeptide oxytosin [18], structural abnormalities in limbic system, brain stem nuclei, and amygdala [17,19,20], reduced activity in the brain's temporal and frontal lobes when performing language and motor tasks [21], and MMR vaccine (vaccine for measles, mumps, and rubella) [22] have been proposed to play a role in the development of ASD. A recent position regarding etiology of ASD holds that ASD is a complex condition that does not appear to have a single cause [23,24]. Considering research findings accumulated so far, ASD seems to be a product resulting from the interplay between a number of biological contributions and psychosocial influences.

A variety of treatments have been attempted to help children with ASD alleviate their symptoms and adapt better to their environment. Although no treatment has yet been known to totally reverse autistic pattern, behavioral intervention, social-communication skills training, parent training, and community integration have been reported to be particularly helpful. In addition, psychotropic drugs were reported to help sometimes when combined with psychosocial approach [25,26]. Given the situation where a variety of ASD treatments are proposed and attempted and body of outcome studies are accumulated in the literature, it seems important and further needed to shed light on where we are in terms of ASD treatments and where to go from now on. Therefore, this paper sets its goals in reviewing various psychosocial treatments for children with ASD that have been receiving empirical support and providing useful clinical and research tips to people who are working in this field. As mentioned above, biological treatments are being developed and attempted as more and more biological bases underlying ASD are unveiled. Despite the importance of the focus on biological treatments for ASD, this paper will focus only on psychosocial treatments for ASD.

EMPIRICALLY-SUPPORTED PSYCHOSOCIAL TREATMENTS FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

Various psychosocial treatments have been attempted to address ASD symptoms and their resulting functional and psychosocial problems. Some of those are comprehensive, aiming at addressing all areas of need and some of those are focused, having more circumscribed set of goals [27]. Along with this treatment scope dimension, ASD literature implied that ASD intervention strategies can be grouped into other dimensions, such as recipient of the intervention, theoretical principle of the intervention, provider of the intervention, age of target group, setting where intervention is occurring, and outcome areas. In a most recent review on ASD treatment, Smith and Iadarola [28] arranged types of ASD treatments that have research evidence using three the dimensions-scope of treatment (comprehensive, focused, and parent training), recipient of treatment (child, teacher/peers, and parent) and primary theoretical principles (applied behavior analysis, developmental social-pragmatic, and combined of the two). This classification system seems useful and appropriate because it could provide many important clinical tips regarding ASD treatment to professionals and researchers. Given this advantage, the review will utilize some of Smith and Iadarola's classification dimensions in organizing sections and presenting research findings. The review will focus on behavioral interventions, social-communication skills interventions, and parent training interventions, which have actively been applied to children with ASD and has received considerable empirical support.

1. Behavioral interventions for autism spectrum disorder

Since the pioneering work by Lovaas and his colleagues [29], behavioral approaches have consistently been used in treating individuals with ASD. These approaches include teaching appropriate behaviors, including speech, social skills, classroom skills, and self-help skills, while reducing negative, dysfunctional ones. In behavioral therapy, therapists use learning principles such as operant conditioning and modeling. For example, therapists reinforce desired target behaviors, first by shaping them (breaking them down so they can be learned in a step-by-step fashion) and then rewarding each step clearly and consistently. Along with these, functional behavior assessment, differential reinforcement, prompting, task analysis and chaining, stimulus control/environment modification, and extinction can also be used to guide a specific desired behavior. Particularly, differential reinforcement technique has been attempted to replace inappropriate and sometimes potentially dangerous behavior (e.g., self-injurious behavior, aggression) with appropriate or relatively less dangerous behavior. Behavioral therapists also use imitation or modeling principle when treating indi-

viduals with ASD. They demonstrate a desired behavior and guide autistic individuals to imitate it. Imitation or modeling technique is often used to teach people with ASD how to speak. With careful planning and execution, aforementioned behavioral procedures often produce new and more functional behaviors.

Literature has accumulated evidence suggesting the efficacy of behavioral approaches to individuals with ASD. For example, Odom, Collet-Klingenberg, Rogers, and Hatton [30] reviewed the ASD treatment literature and identified 24 focused intervention practices that document empirical evidence. Determination of evidence was made if a focused intervention was effective in addressing specific individualized education planning goals for learners with ASD. Odom et al.'s list includes interventions which pertain to behavioral approaches. The researchers themselves grouped those into two larger descriptors-behavioral intervention strategies (which include prompting, reinforcement, task analysis and chaining, and time delay) and positive behavioral support strategies (which include functional behavior assessment, stimulus control/environmental modification, response interruption/redirection, functional communication training, extinction, and differential reinforcement). Through the review, it was suggested that behavioral intervention strategies are effective in addressing appropriate academic, communication, and playing skills. On the other hand, positive behavioral support strategies were suggested to be effective in addressing interfering behaviors (e.g., tantrums, disruptive behaviors, aggression, self-injury, repetitive behaviors).

Although behavioral interventions for ASD are sometimes delivered in a form of focused intervention, behavioral interventions for ASD are mostly delivered in a form of comprehensive treatment package addressing a broad array of skills and abilities. As described earlier, Odom et al. [27] distinguished this comprehensive treatment model (CTM) from focused intervention practices. Comprehensive interventions entail hundreds of hours of direct intervention with an autistic child (usually more than 1,000 hours) while focused interventions involve fewer than 50 hours of intervention [28]. Examples of CTM include the Lovaas model [31-33], Early Start Denver model (ESDM) [34], Learning Experiences: An Alternative Program for Preschoolers and Parents (LEAP) [35], and Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH) [36].

ASD literature suggests that early intensive behavioral intervention (EIBI), a form of comprehensive behavioral treatment, could be beneficial for young children with ASD. Particularly, an EIBI based on Lovaas and his colleagues' UCLA model could be beneficial for young children with ASD, bringing about long-lasting changes in their intellectual, language, and adaptive functioning [28,37, 38]. The Lovaas' EIBI model is based on applied behavior analysis (ABA) which utilizes learning principles to teach functional behaviors in real-life settings and is highly intensive, with a feature of up to 40 hours per week of one-to-one intervention for 2-3 years [28,39]. Learning readiness, communication, social skills and academic skills are broken down into small steps and taught systematically. Over time, intervention strategies become less structured, supporting children's entry into community settings such as schools. In a pioneering, long-term study done by Lovaas and his colleagues [31,40], 19 autistic children were given intensive behavioral treatments (behavioral treatment group) and 19 autistic children served as a control group. The treatment began when the participants were 3 years old and continued until they were 7. By the age of 7, the behavioral treatment group was doing better in school and scoring higher on intelligence tests than the control group [31]. Moreover, almost half (9 of 19) of the children in the treatment group were fully included into regular education, whereas only one in the control group (2 out of 40) had that outcome [31]. In a subsequent follow-up study by Lovaas and colleagues [40], it was found that the treatment gains continued into these participants' teenage years.

Several studies replicated the Lovaas's intervention model and found similarly positive results. In a randomized controlled trial (RCT) conducted by Smith, Groen and Wynn [41], 28 children with ASD whose mean age was 3 years old received either EIBI or parent training. The EIBI group received interventions for 25 hours per week in the first year which faded over the next 1 and 2 years. The comparison group participated in 10 to 15 hours per week of special education classes and received 5 hours per week of parent training for 3 to 9 months. Although gains were relatively small compared to those of Lovaas' original study, researchers found that autistic children in the EIBI group outperformed autistic children in the comparison group on intellectual, visual-spatial, and academic measures. Similarly, more recent treatment outcome studies targeting children with ASD indicated that the Lovaas model has large effects on IQ, adaptive behavior, or both [42-46]. As Smith and Iadarola [28] pointed out, it is interesting that these effects were all obtained in school settings, rather than in the home where Lovaas recommended intervention to take place. Moreover, Eikeseth et al. [43,44] and Peters-Scheffer et al. [46] demonstrated that

EIBI resulted in treatment gains in autistic children who entered EIBI after age 4 (participants were in age range between 4 and 7). Given the evidence of this kind, Rogers and Vismara [38], in their review of evidence on early intervention programs for autistic children, classified the EIBI based on the Lovaas' model as "well-established" evidence-based treatment (EBT). The status as a well-established EBT was maintained in the most recent EBT review done by Smith and Iadarola [28]. The findings from the two recent reviews seem particularly notable given the facts that these reviews adopted fairly strict method (included outcome studies mostly using random or quasi-experimental designs) and evidence criteria (followed Journal of Clinical Child and Adolescent Psychology's [JCCAP] evidence criteria), and found evidence from different teams of investigators in a wide range of community settings.

Another kind of CTM that has achieved considerable success in treating children with ASD is called Learning Experiences: An Alternative Program for Preschoolers and Parents (LEAP) [35]. The LEAP is a comprehensive ABA intervention program that is to be administered in classrooms. The LEAP integrates children with ASD with typically developing peers in early childhood education settings and uses peers as agents of behavioral interventions. Kohler, Strain, and Goldstein [47] applied this behavioral program to preschoolers with ASD. In this behavioral program, 4 autistic children were integrated with 10 normal children in a classroom. The normal children learn how to use modeling and operant conditioning in order to teach social communication, play, and other skills to the autistic children. The program resulted in significant gains in autistic children's cognitive functioning, social and peer interactions, and play behaviors. Moreover, normal children in the classroom experience no negative effects as a result of serving as intervention agents. More recently, in a RCT of 294 children with ASD in 56 preschool classes over 2 years, Strain and Bovey [48] found that LEAP, as compared to treatment in the usual manner in which the preschool staff were provided with intervention manuals, had moderate positive effects on ASD symptoms and large positive effects on developmental quotient, language, and teacher-rated social skills. However, a subsequent quasi-experimental study using 198 autistic preschoolers found no statistically significant differences between LEAP and Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH) [36], another structured teaching intervention program that includes antecedent-based ABA strategies such as environmental manipulations and visual supports. Given these somewhat con-flicting findings across studies, LEAP was classified as "possibly efficacious" treatment in the Smith and Iadarola's review [28].

As such, previous studies offer evidence for efficacy of both focused behavioral interventions and comprehensive behavioral interventions in addressing autistic children's problems. Particularly, comprehensive behavioral interventions seem to be beneficial for autistic children whether they are administered in a home-based format or a classroom-based format. Despite some variations in results across studies, improvements in IQ and adaptive behaviors appear to be relatively reliably reported. In addition, several studies suggest that higher pre-treatment IQ predict better treatment outcomes, although this prediction may not be perfect [49-51]. Furthermore, ASD literature suggests that the earlier autistic children enter into behavioral interventions, particularly into intensive behavioral interventions, the better the results are [52,53]. That is, behavioral interventions tend to provide more benefits when they are started early in children's lives.

2. Social-communication skills interventions for autism spectrum disorder

The two main theoretical frameworks that are observed in ASD treatment literature are behavioral models which are represented by applied behavioral analysis (ABA) and developmental social-pragmatic (DSP) models which are also referred to as "developmental," "interactive," "transactional," or "interpersonal" models [28]. Behavioral interventions are based on the view that ASD is a learning difficulty and thus needs to be addressed using learning strategies such as operant conditioning. On the other hand, DSP interventions are based on the view that a core feature of ASD is an impaired ability to engage in activities jointly with others, which results in arrays of problems with social communication and interaction [54]. DSP intervention strategies are derived from findings in developmental psychology that stress interactions between child and caregivers. Rooted on these theoretical principles, DSP interventions aim to promote social communication and interaction by being responsive to the child in ways such as imitating or joining into play activities that an autistic child initiates [28, 55].

Given the main theoretical perspectives underlying DSP models, social-communication skill interventions for ASD that are empirically supported are mainly based on DSP models. However, ASD researchers and practitioners have also noted the overlap between DSP and ABA interventions and combined these two to bring about better results in autistic children's social-communica-

tive functions. For instance, Smith [39] points out the overlap between DSP and ABA interventions by emphasizing that DSP and ABA are all purposed to improve child's development and address deficits in social interaction and communication. Similarly, Ingersoll et al. [55] noted the overlap between the two interventions by stating that DSP interventions, like ABA interventions, aim to help autistic children learn new skills. However, the two interventions can be distinguishable in that DSP interventions tend to put highest priority on social communication and interaction while ABA interventions tend to place highest priority on a range of defining and associated features of ASD [28].

Various DSP interventions and blends of DSP and ABA (DSP+ABA) were developed and their efficacies were examined. These studies yield overall positive results. Notably, interventions to address autistic children's social and/or communication deficits take a form of focused treatment, aiming at addressing a circumscribed set of goals such as improving joint attention, playing activities, joint engagement, theory of mind, or communications. Smith and Iadarola [28], in their recent review on EBT for ASD, identified forms of DSP or DSP+ABA blend that meet the criteria for "well-established," "probably-efficacious," and "possibly efficacious" treatment. The review found that a teacher-implemented, focused ABA+DSP intervention fell in the "well-established" category. An individualized ABA intervention for augmentative and alternative communication and an individualized focused ABA+DSP blend intervention fell in the "probably-efficacious" category, and therapist- or teacher-implemented ABA intervention for spoken communication fell in the "possibly efficacious" category. As you can see in the list, evidence-based social-communicative interventions for ASD are generally provided by therapists or teachers. The next section will review parent training interventions which use parents as an intervention mediator. There, certain types of parenting training (e.g., focused DSP parent training) will be discussed as effective interventive approaches to social-communication deficits of autistic children.

Representative types of social-communicative ASD interventions that have received empirical support include therapist- or teacher-implemented focused ABA+DSP approaches and therapist-implemented focused DSP approaches. A focused target that these interventions aim at often includes joint attention (an ability to share interest with others by redirecting others' attention through eye-gazing, pointing, or other verbal or non-verbal indications), play activity, social engagement, theory of mind, or communica-

tion skill. Joint attention tends to be selected as a target because it is an early sign of social-communicative deficits in autism and could aggravate subsequent development of other important social-communicative abilities such as language, play, and imitation. Kasari, Freeman, and Paparella [56] compared the effects of therapist-led ABA+DSP intervention for joint attention and therapist-led ABA+DSP intervention for symbolic play to those without treatment. Results from the initial study and two follow-up evaluations that are made one and five years later each [57,58] revealed that the joint attention and symbolic play groups made larger gains in joint attention initiation, play, and language than no-treatment controls. Goods et al.'s [59] later adaptation of Kasari et al.'s [56] joint attention intervention for delivery by classroom teachers also resulted in significant gains over control group in play diversity and academic engagement.

Reciprocal Imitation Training (RIT) is another type of focused ABA+DSP intervention and integrates incidental teaching and DSP to teach imitation skills to autistic children within naturalistic social-communicative contexts. Ingersoll's recent research on RIT found that children who receive RIT show gains in social communication, including imitation [60] and joint attention and social-emotional functioning [61]. Several other single-subject studies also implied that RIT brings about gains in social-communicative aspects of autistic children [62-64].

As seen in Goods et al.'s findings above, studies on teacher-delivered ABA+DSP interventions specifically targeting autistic children's social-communicative skills yield generally positive outcomes [59,65,66]. Given these positive outcomes, this type of approach was evaluated as "well-established" treatment in the Smith and Iadarola's [28] review. On the other hand, a few researchers paid their attention to identification of treatment mediator and issues on generalization and maintenance of treatment gains. For example, Landa, Holman, O'Neil, and Stuart [67] tested whether interpersonal synchrony (matching the child's behavior and affect) would mediate treatment gains of teacher-delivered social-communicative interventions. Results indicated that a focus on interpersonal synchrony led to increases in socially-engaged imitation, but not in joint attention initiation or play. With regard to generalization and maintenance issues, previous studies suggest that joint attention and joint engagement skills acquired through preschool-based interventions tend to extend to other people including parents [66] and maintain over time [57,65]. However, findings on whether these benefits lead to improvements on more glob-

al outcomes are mixed, with some studies documenting long-term change in language [57] and others documenting no significant gains in language and global ratings of social functioning and communication [65].

Therapist-implemented ABA for augmentative and alternative communication (AAC) is another category of intervention that documents its effects on autistic children's social-communication skills in the literature. Even when being given intensive behavioral treatment, half of the people with ASD remain speechless. As a result, they are often taught other forms of communication, including sign language and simultaneous communication, a method combining sign language and speech. They may also learn to use augmentative communication systems, such as communication boards or computers that use pictures, symbols, or written words to represent objects or needs [68]. Sometimes, they are encouraged to use voice output communication aides, which translate pictorial or textural icons into spoken words [69]. Picture Exchange Communication System (PECS) is also a popular ABA-based approach. The PECS aims to teach children with ASD to select picture symbols and hand them to people in order to make requests or comments. As such, AAC systems such as sign language, gestures, communication aids, and pictures are used to increase communication in minimally verbal autistic children [70]. As documented in multiple systematic reviews, many single-subject studies indicate that PECS can establish communication in minimally verbal children [71,72]. Similarly, a meta-analysis of 24 single-subject studies of 58 individuals with ASD showed that voice output communication aides are consistently related to positive effects on communication [73]. Moreover, positive effects of PECS on communication were reported in random-experimental and quasi-experimental studies using school-aged children [74,75]. However, whether the gains will be generalized to other settings and whether the gains will be maintained over time is not clear.

Some programs use child-initiated interactions to help improve communication skills of autistic children. The children are first encouraged to choose items that they are interested in, and then they learn to initiate questions ("What is that?" "Where is it?" "Whose is it?") in order to obtain the items. This type of treatment is known as the pivotal response therapy (PRT; also referred to as pivotal response treatment or pivotal response training). In such programs, teachers try to identify intrinsic reinforcers rather than trivial ones like food or candy. PRT advocates contend that behavior depends on "pivotal" behavioral skills—motivation and the ability to re-

spond to multiple cues—and that development of these skills will result in collateral behavioral improvements. In several single-subject studies, PRT has been successful in reducing autistic children's social-communicative deficits [76,77]. In a recent review, Sham and Smith [78] located 21 single-subject studies, including 9 on preschoolers, all of which reported substantial improvements in spoken communication or play. Although most evidence comes from single-subject studies, the amount of evidence still suggests that a form of ABA intervention for spoken communication, as represented by PRT, is an effective approach to address autistic children's social-communication deficits.

3. Parent training for autism spectrum disorder

Recent treatment programs for ASD involve parents in a variety of ways. Behavioral programs, for example, often train parents so that they can apply behavioral techniques at home [79]. Such programs typically include instruction manuals for parents and home visits by teachers and other professionals.

ASD literature has demonstrated that focused ABA or DSP parent training interventions are associated with autistic children's improved adaptive and social-communicative and functioning. One popular example is ABA parent training. In ABA parent training, parents were guided to use ABA techniques to help their children learn new skills or reduce challenging behaviors. Several single-subject studies demonstrated benefits of this approach [80]. Subsequent RCTs gave similar results. For example, Strauss et al. [81] used ABA parent training to address autistic children's challenging behaviors and found that joint staff- and parent-delivered early intensive behavioral treatment (EIBT) resulted in positive outcomes in skill acquisition and modification of challenging behavior. Although the results did not inform us of unique contribution of parental involvement to the treatment gains, the results still imply that parent training based on EIBT could help in addressing autistic children's problems. More recently, Tonge and colleagues [82] compared an ABA parent training intervention to educational intervention and treatment as usual. Results found that children whose parents were in the parenting skills intervention group made larger gains in daily living skills, motor skills, and ASD symptom severity than children whose parents were in the other two groups. However, these benefits, for many outcomes, were observed mainly in children with the largest delays at entry into treatment.

As introduced above, another way of involving parents as a treatment mediator is DSP parent training. A representative example

of this kind is Floortime, which encourages parents to engage their children by matching (or imitating) their behaviors. Two recent RCTs showed that the home-based, DSP-focused, parent-mediated Floortime was effective not only in promoting autistic toddlers' and preschoolers' social interaction, communication, symptom severity, and functional-emotional development but also in improving parents' responsiveness to the child [83,84]. These gains in autistic children and their parents were greater than those observed in a routine community-care group. Notably, Casenhiser et al. [83] found that increased parental responsiveness was linked to positive child outcomes. Solomon et al. [85] further added monthly home consultation with parents to the Floortime and examined its efficacy. This program is called as the Play and Language for Autistic Youngsters (PLAY). Children in the PLAY group exhibited significant improvements in ASD classification, social-emotional skills, and quality of parent-child interactions. However, the program did not result in positive gains in ASD symptoms, communication skills, or development level.

Some other RCTs testing the efficacy of DSP parent training interventions have yielded similarly favorable results [52,86-89]. Overall, these studies reported favorable effects of DSP-focused parent training interventions on indices of parent-child relationship, social engagement, and/or communication, although mixing results were reported in more global outcomes such as ASD symptoms, language, or developmental level. Moreover, Kasari et al. [88] demonstrated the benefits of a brief, targeted, parent-mediated intervention that are occurring under naturalistic contexts on child social-communicative outcomes such as joint engagement and qualities of play activities and parent outcomes such as parenting stress associated with child characteristics. Particularly, their findings suggest that treatment gains in children could be maintained over time and be generalized to other settings such as classroom settings (e.g., increased child-initiated joint engagement in classroom).

Then which parent training setting will bring about better results? Roberts et al. [90], in their well-controlled study, compared treatment outcomes of an individualized home-based DSP program to those of a small-group center-based DSP program combined with parent training and support group components and of a waitlist control. Child outcomes were social and communication skill development and parent outcomes were quality of life and stress. Interventions were provided for 12 months. Results showed that children in the center-based program improved the most in social and communication skill development. Furthermore, parents of the children in the center-based program reported the most gains in perception of competence and quality of life. Roberts et al.'s [90] findings suggest that center-based DSP interventions which incorporate parent training and support group components could be a good treatment option for children with ASD, resulting in positive outcomes for both children and parents.

SUMMARY OF IMPORTANT FINDINGS AND FUTURE DIRECTIONS

So far, types of ASD interventions that demonstrate their treatment efficacy were introduced. As you can see in this review, the number of treatment outcome studies for children with ASD has markedly increased since Lovaas's monumental works in 1987 and 1993. Also, the literature witnessed a noticeable progress in research methods and designs for efficacy testing. Reviews on evidence-based treatments for autistic children [e.g., 28,37,38] demonstrate such progress. Through these reviews, we could also see changes in ASD treatments. One generalization that can be made from this review is that no completely effective treatment for ASD exists. Attempts to eliminate ASD symptoms, social-communicative difficulties, and related behavioral and emotional problems have not been successful to date. Rather most efforts have been made on enhancing their communication and daily living skills and on reducing problem behaviors.

The ASD literature demonstrates that ABA and DSP consist of the two main theoretical axles for ASD treatments. Moreover, the literature shows that ABA tends to be a preferred and effective method to address comprehensive goals, conveying various areas of autistic children's needs. However, it should also be noted that ABA has actively been utilized in the field to address specific, focused goals such as social reciprocity and/or communication skills and demonstrated its efficacy. ABA for augmentative and alternative communication (AAC) falls in this category and has documented its effects on communication skills. Sometimes, ABA and DSP tend to be combined to promote efficacy. Reciprocal Imitation Training (RIT) is one of these blended approaches. According to the previous findings, the blended interventions of this kind show their true worth in addressing autistic children's social-communicative areas (e.g., joint engagement in play activities with caregivers and teachers, imitation, joint attention, and social-emotional functioning), regardless of whether it is implemented by a teacher, by a therapist, or by a parent.

In contrast to this versatile utilization of ABA, DSP tends to be predominantly utilized for the purpose of addressing autistic children's deficits in social reciprocity and communication. Various types of DSP interventions are now available, including DSP for joint attention [56], DSP for symbolic play [56], DSP for theory of mind [91], and DSP for communication [70,76]. The literature witnesses that DSP combined with ABA or DSP alone is associated with gains in social-communication areas. The effects of treatment interventions which include DSP components are reported to be spread out in a most recent review by Smith and Iadarola [28], ranging from "well-established" treatment category to "possibly efficacious" treatment category.

Another important treatment approach to children with ASD is parent training. Parent training is not a theoretical principle or orientation. However, it is distinct from other treatment interventions in that it trains parents and uses them as an intervention agent for autistic children. Given this indirect nature, this paper placed separate attention to parent training interventions. Training can be made to guide parents to use ABA techniques to help their autistic children learn new skills or reduce challenging behaviors or guide parents to use DSP techniques to help their autistic children learn how to share attention with others, play with others, engage in social interplay, and communicate with others, or both. The ASD literature demonstrates the efficacy of ABA parent training on the acquisition of adaptive skills and modification of challenging behaviors and the efficacy of DSP parent training and DSP+ ABA parent training on the development of social-communicative skills, particularly skills involving caregivers (e.g., joint engagement with caregivers, communication with caregivers). Both types of parent training were found to bring about positive changes in parents such as increased parental responsiveness to child and increased parental competence. The effects on parent outcomes and some child outcomes involving parents are understandable given the facts that the main purpose of parent training is to make parents their child's therapist and that the therapeutic interventions occur in a parent-child dyad. Therefore, it is natural that parents achieve competency in dealing with their autistic child and improved interactions and communications with their child. These findings imply that parent training will be a good treatment of choice if the therapy is to touch on these areas that involves parents.

This review found that early entry into the treatment could result in better outcomes in autistic children. Of course, findings also showed that entry into the treatment even after age 4 (age range between 4 and 7) resulted in statistically significant treatment gains. However, when considering the facts that ASD is neurologically based, onsets very early in life (mostly onsets between ages of 0 and 3 years old) [1], and persists throughout life, early intervention seems most needed. The review also suggests that early intensive interventions that are targeted at difficult areas of ASD including adaptive skills, social-communicative skills, and challenging behaviors and are provided for several years would lead to better results, bringing long-lasting changes in children's intellectual, social-communicative, and adaptive functioning.

Another important clinical issue that we should consider is about "who will get the most gains in the treatment?" This question pertains to identifying moderators of ASD treatments. The review suggests that autistic children who have relatively intact IQ will get more benefits from the treatment than those who have low IQ [49-51]. Meanwhile, some other studies demonstrated that treatment gains were larger in children with the largest delays at pretreatment [82]. Besides, amount of treatment, family characteristics (these will particularly play a role in parent training interventions), biological variables (e.g., unusual physical features), social interaction style (e.g., passive social interaction style), intervention settings (e.g., home-based, center-based, and school-based), and implementers of intervention (e.g., therapist, teacher, parent, staff, and peer) have been discussed as a variable that could moderate treatment outcomes [39,91]. Future outcome studies need to include sophisticated experimental designs or statistical procedures to address such treatment moderators.

Identification of treatment mediators is another important task for future researchers and clinicians in this field. Researchers such as Landa et al. [67] included a potential treatment mediator in his RCT design and tried to address whether this mediated treatment gains. However, identification of treatment mediators appears particularly difficult in ASD, given the current situation where many of ASD treatment programs include a wide range of therapeutic components in their programs. This is particularly true in comprehensive ASD treatments. Experimental studies that systematically manipulate a potential mediator of interest will help unveil the changing mechanism underlying treatment gains.

Increasing motivations of people who get involved in the treatment process and finding ways to generalize and maintain treatment gains are also things that ASD clinicians and researchers need to work on. Efforts have been made to fulfill these goals. For example, ways to encourage parents who are involved in parent

training interventions have been discussed. Nowadays, individual therapy and support groups are becoming more available to help parents of autistic children better deal with their own emotions and needs [92]. Such attempts seem promising and helpful because parents are often frustrated and depressed by the overwhelming nature of their child's problems. Besides, a number of parent associations and lobbies are available and offer emotional support and practical help to parents with autistic children. This is an area that future research should work on. With regard to maintenance and generalization issues, incorporating as many people in the autistic children's environment as possible (e.g., parent, teacher, and/or peers) to the intervention procedure and training them as intervention agents seem most ideal.

CONCLUSION

This paper reviewed previous findings regarding ASD treatments. From the review, we could better understand the kinds of treatments demonstrating efficacy and their features. Also, we could identify some important clinical and research issues and generated some ideas for better addressing them. The progress that this field has made so far is huge. However, we have a long way to go, in terms of unveiling the mystery of ASD and developing better treatment approaches. The lifetime cost of caring for an individual with ASD is estimated to exceed $2 million [93]. The direct costs and collateral familial and societal costs which are not estimated here but are expected to be tremendous call upon further progress in this field.

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