

We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

185,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com



Early Intensive Behavioural Intervention in Autism Spectrum Disorders

Olive Healy and Sinéad Lydon

Additional information is available at the end of the chapter

<http://dx.doi.org/10.5772/54274>

1. Introduction

Autism spectrum disorder (ASD) is a developmental disorder characterised and diagnosed by behavioural symptoms that mark impairments in social and communication behaviour along with a restricted range of activities and interests. ASD is considered a heterogeneous and complex disorder impacting many areas of development including intellectual, communication, social, emotional, and adaptive (Makrygianni & Reed, 2010). This disorder can present considerable challenges to both the individual and their family across their lifespan.

A myriad of intervention approaches have been highlighted to treat this condition. Some include therapies that have been developed by parents independent of any particular discipline (e.g., Son-Rise Program and Hanen). Others are based on biological approaches (e.g., special and restricted diets, secretin) or alternative medicine (e.g., homeopathy, chelation therapy). Some more prevalent treatment approaches are available and differ in their etiological, methodological and philosophical interpretation of ASD. These include for example, Applied Behaviour Analysis (ABA; sometimes referred to as behaviour therapy), Treatment and Education of Autistic and related Communication Handicapped Children (TEACCH), Picture Exchange Communication System (PECS), sensory integration therapy, occupational therapy, music therapy, auditory integration therapy and speech therapy. Despite the considerable number of various treatment approaches to ASD available to parents and professionals, the majority of empirical support relating to many of these programs remains at the “level of description” (Makrygianni & Reed, 2010; Matson & Smith, 2008), and for many of these proposed interventions there is limited or no evidence provided to demonstrate any effective outcomes with their use (Metz, Mulick, & Butter, 2005; Mulloy et al. 2010; Lang et al. 2012).

Despite the many debates that exist amongst researchers and practitioners with regard to efficacy of intervention approaches, one consensual fact that is recognised across the board is that

early intervention is the best response to the treatment of ASD. Providing treatment of symptoms immediately will result in more favourable treatment outcomes (Dawson, 2008; Howlin, Magiati & Charmin, 2009; Reichow & Wolery, 2009). Many have argued that this early intervention will allow greater opportunities for a young child to move towards a more typical developmental trajectory because of malleability or plasticity of the developing young brain (see for example Dawson 2008). From a learning theory account, teaching new behaviour or replacement behaviour to a very young child presenting with behavioural deficits or excesses, will result in desirable consequences that impacts behavioural repertoires and learning history from the outset. In this way early intervention for the condition may affect the onset of additional secondary problem behaviours which are often not seen at diagnosis. As such these may be minimised or even prevented (Mundy, Sullivan & Mastergeorge, 2009).

While a consensus that early intervention for ASD exists amongst researchers in this field, many argue that the actual approach applied during this critical period may be pivotal in producing the greatest outcomes and ensuring the best chance of attaining a typical developmental trajectory. Over the past four decades, interventions based on the science of ABA have been thoroughly evaluated and shown to produce effective outcomes in targeting many of the challenges presented within this condition. Moreover, behavioural interventions drawn from this science can produce substantial gains in cognitive, adaptive and social behaviours in this population (Dillenberger, 2011). Indeed, this approach is internationally recognised as the most effective basis for treatment for children with ASD (Larsson, 2005).

Improving the core symptoms of ASD is a common goal for parents and professionals. Reports of large improvements in this condition have been documented. For example Smith (1999) provided a summary of published peer-reviewed studies involving seven independent groups of researchers documenting dramatic gains when early intervention was applied. Importantly however, in all studies reviewed, interventions were underpinned by ABA methodology and theory and were intensive involving a range of 15 to 40 hours per week across studies. This approach to autism treatment, known as Early Intensive Behavioural Intervention (EIBI) has generated much discussion and excitement, and continues to gather momentum impressing on policy makers the urgency of effective and substantiated provision for individuals and families affected by the condition.

Studies on EIBI have reported the following gains: (1) average increases of approximately 20 points in IQ (e.g., Harris, Handleman, Gordon, Kristoff, & Fuentes, 1991; Lovaas, 1987; Sheinkopf & Siegal, 1998) (2) increases in standardised test scores (Anderson, Avery, DiPietro, Edwards, & Christian, 1987; Birnbrauer & Leach, 1993; Hoyson, Jamison, & Strain, 1984; McEachin, Smith, & Lovaas, 1993; Strauss et al. 2012), (3) increased gains in adaptive behaviour (Eldevik et al., 2012; Strauss et al., 2012); (4) improved language scores (Eldevik et al., 2012; Strauss et al. 2012); (5) the need for less supports in school (Fenske, Zalenski, Krantz, & McClannahan, 1985; Lovaas, 1987), (6) reduced autism symptomatology (Eikeseth et al., 2012) and (7) decreased challenging behaviour (Fava et al., 2012). Dillenberger (2011) refers to the increasing evidence of clinical, social and financial efficiency of intensive behavioural intervention in autism treatment which has resulted in “legally enshrining” such intervention in North America. For example, the Autism Treatment Acceleration Act (2010) requires

that health insurers cover the diagnosis and treatment of autism spectrum disorders, including access to ABA therapy.

2. What constitutes EIBI?

EIBI is based on the scientifically applied principles of learning and behaviour, and has the discipline of behaviour analysis (Cooper, Heron, & Heward, 2007) at its core. The approach generally targets preschool children and is provided intensively, often in a 1:1 student/teacher ratio, for 20-50 hours per week. Dawson (2008) and Green (1996) summarise many of the common and conspicuous features of successful EIBI programs. These include the following:

1. the EIBI program should be initiated as early as 2 years and before the age of four;
2. intensive delivery of the program involving a minimum of 25 hours per week for at least two years;
3. application of a comprehensive curriculum or various curricula, focusing on imitation, language, toy play, social interaction, motor, and adaptive behaviour targets;
4. the curricula and their implementation should show sensitivity to typical developmental sequences;
5. generalisation strategies should be incorporated to ensure new skills are practiced and demonstrated in novel environments outside those in which they were taught;
6. use of supportive and empirically validated teaching strategies and data-driven decision protocols (notably those of Applied Behaviour Analysis);
7. implementation of behavioural strategies to reduce or eliminate major interfering behaviours that are an impediment to learning new skills and repertoires (noncompliance, inattention, impulsivity, tantrum, aggression and self-injurious behaviours are examples of some of the most critical of these behaviours).
8. a functional analytic approach to treating problem behaviours;
9. continual parental involvement and tailored parent education;
10. progressive and gradual transition to increasingly naturalistic environments;
11. qualified and highly trained staff delivering the program and
12. the provision of supervision by qualified over-viewers resulting in ongoing review and systematic progression of the program.

According to Dawson (2008): *"When these features are present, results are remarkable for up to 50% of children"* (p.790).

It is important to note that EIBI draws from the bedrock of a science- Applied Behaviour Analysis (ABA). This science constitutes over 300 procedures (Greer, 2002; Steege, Mace, Perry, and Longenecker, 2007) each of which have been tested and demonstrated to produce

behaviour change. The careful selection and application of these procedures to treat the behavioural symptoms of autism delivered within the scientific framework of ABA (outlined in Baer, Wolf & Risley, 1968; 1987) is what defines an EIBI approach. It is critical to recognise how ABA and EIBI are interwoven because the science of ABA and the various behaviour change strategies therein, have a very long history of substantiated documentation (see for example Matson, Benavidez, Compton, Paclawskyj, & Baglio, 1996, who reviewed behaviorally based treatments for autism over a 16-year span).

3. History of EIBI

The history of this early intervention approach to autism has been well documented over the last three decades. For example, Matson and Smith (2008) trace the origins of this approach in autism treatment to what they refer to as a “seminal paper” (p.61) published as early as 1973 by Lovaas, Koegel, Simmons, and Long (1973). Matson and Smith argue that this paper demonstrated a visionary conceptual framework for early intervention with ASD.

“The true significance of the study was the authors’ efforts to formulate an overarching treatment of children with autism on a multitude of behaviours including self-stimulation/stereotypies, echolalia, appropriate verbal behaviour, social behaviour, appropriate play, intelligence quotient (IQ), and adaptive behaviour” (Matson & Smith, 2008, pp. 61-62).

Trends in EIBI, to this day, are based on this original template involving the delivery of idiosyncratic treatment packages constituting evidence-based behavioural interventions to target core symptoms as well as expansive groups of behaviours. Numerous studies have been published since this seminal paper in 1973 examining EIBI outcomes in autism. One of the most distinguished and considered published papers which resulted in the acclamation of EIBI involved that of Lovaas (1987). This well-reviewed study which reported an average difference of 31 points on IQ test scores between the ASD treatment group and control group, and classified nine of 19 (47%) participants as having achieved recovery (defined as post-intervention IQ in the normal range). To this current day, the findings of this study have caused much debate among researchers with criticisms focusing on particular methodological limitations (see for example, Gresham and MacMillan 1998; Short & Mesibov, 1989). We will return to this study in a later section.

To date, a substantial number of studies have been conducted and published to demonstrate the effectiveness of EIBI in autism treatment. Moreover, six illustrative review papers and one “mega-analysis” (a combination of all of the data into one single analysis) have been published (see below), each providing somewhat varying angles in exploring the outcomes. Steady growing rates of publications on the findings of EIBI in autism have been evidenced and concise descriptions of methodology have appeared to improve in most recent years, particularly with respect to the inclusion of control-no treatment groups and random assignment of participants across experimental conditions.

The current chapter will provide a synopsis of EIBI studies published between 1987-2012. Systematic searches were conducted using the following databases: Scopus, Psychology & Behavioral Sciences Collection, and PsycINFO

The searches were carried out using the terms “early intensive behavioural intervention AND autism”, and “intensive behavioural intervention AND autism”. The inclusion criteria were largely in line with those of Reichow (2012). Studies were reviewed if they included a treatment group who received EIBI and an alternate-treatment control group who received either no treatment, a different treatment or EIBI provided at different intensity levels. Only studies including children with ASD were reviewed. Each study was required to involve original research that was written in English and published in a peer reviewed journal. In the interest of clarity we grouped published investigations under the following headings: Studies published before 2000 (4 studies), studies published from 2000-2010 (12 studies) and studies published between 2011-2012 (5 studies). We provide a summary of factors associated with each published paper including intake characteristics of participants, outcome measures employed, specific treatment characteristics and group differences following intervention. The following sections provide a synopsis of all studies identified.

4. Studies published before 2000 (4 Studies)

Lovaas (1987) conducted the first evaluation of EIBI for children with Autism. The outcomes of 19 children receiving EIBI, for a minimum of 40 hours per week, were compared to those of two control groups. The first control group, consisting of 19 children, received low intensity (10 hours or less) behavioural intervention and the second control group, consisting of 21 children, received TAU. After two years of treatment, 47% of the EIBI group achieved IQ scores in the normal range and were enabled to integrate fully into mainstream educational settings while only 2% of children in the control group achieved similar outcomes. In this case, almost half of children in the EIBI appeared to recover from their diagnosis of autism.

Birnbaumer and Leach (1992) compared the outcomes of nine children receiving EIBI and five children in a control group (no treatment). Children in the EIBI group received an average of 18.7 hours of EIBI per week delivered by trained volunteers in their homes. Children in the EIBI group achieved significantly higher non-verbal IQ scores and language levels. Four of the nine children in the EIBI group achieved IQ scores within the normal range following treatment.

Smith et al. (1997) compared the outcomes of 11 children receiving EIBI to 10 children who received a low intensity behaviour intervention. Children in the high intensity EIBI group received at least 30 hours of clinician-delivered treatment each week while the low intensity group received 10 hours of clinician-delivered behavioural intervention each week. At follow-up, the children in the EIBI group showed greater increases in IQ and expressive language than children in the control group.

Sheinkopf and Siegel (1998) evaluated the outcomes of 11 children receiving EIBI and 11 children receiving Treatment as Usual (TAU). EIBI was delivered by parents, supervised by clinicians, for 27 hours each week. Children in the control group received 11.1 hours of TAU in a school setting each week. Following treatment, the EIBI group achieved significantly higher IQ scores and significantly lower scores on a measure of symptom severity than the control group.

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment	
Lovaas et al. (1987)	Tx	19	34.6	-	62.7	-	-	-	Intellectual	UCLA	40	24+	47% of the Tx group achieved normal functioning as compared to 2% of the C groups.
	C	19	40.9	-	57.0	-	-	-	Functioning;	UCLA	10	24+	
	C	21	<42	-	60.0	-	-	-	Academic Placement;	TAU	-	24+	
									Diagnostic Recovery				
Birnbaue & Leach (1993)	Tx	9	38.1	5,4	51.3	46.1	-	-	Intellectual	UCLA	18.7	21.6	Functioning; Adaptive Functioning; Language Functioning; Psychopathology
	C	5	33.2	5,0	54.5	51.5	-	-	Functioning;		-	24	
Smith et al. (1997)	Tx	11	36	11,0	28	50.3	-	-	Intellectual	UCLA	30+	35	Mean IQ
	C	10	38	8,10	27	-	-	-	Functioning; Speech; Behaviour Problems	UCLA	10	26	increased by 8 points in the Tx group, but decreased by 3 points in the C group. The Tx group also made significantly more progress with their speech.
Sheinkopf & Siegel (1998)	Tx	11	33.8	-	62.8	-	-	-	Intellectual	UCLA	27.0	15.7	The Tx group presented with significantly higher IQ following treatment. Symptom severity was also significantly lower in the Tx group.
	C	11	35.3	-	61.7	-	-	-	Functioning; DSM Symptomatology	TAU	11.1	18	

Table 1. Summary of EIBI studies Pre-2000, M, F (male, female), VABS (Vineland Adaptive Behaviour Scale), EL (Expressive Language), RL (Receptive Language)

5. Studies published from 2000-2010 (12 Studies)

Ben-Itzhak et al. (2008) compared the outcomes of 44 children with autism receiving 45 hours of EIBI weekly and 37 children with other developmental disabilities receiving TAU. After one year, the children in the EIBI group made significantly greater gains in IQ than the control group. The authors also analysed whether EIBI outcomes were affected by initial cognitive level. Children were categorised as being of normal, borderline, or impaired IQ. They found that baseline cognitive levels did not predict changes in autism symptoms. However, IQ increases due to treatment were correlated with reductions in autism symptoms.

Remington et al. (2007) compared the outcomes of 23 children who received 25.6 hours of EIBI with a control group in which 21 children received an average of 15.3 hours of intervention weekly. After two years of treatment, children in the EIBI group made significantly greater increases in mental age, intellectual functioning, language functioning, adaptive functioning and positive social behaviours.

Reed et al. (2007a) compared the impact of high-intensity and low-intensity home-based EIBI. The high-intensity group was composed of 14 children who each received 30.4 hours of intervention per week. There were 13 children in the low-intensity group who each received an average of 12.6 hours of intervention weekly. The high-intensity group made significantly greater gains on measures of intellectual and educational functioning. However, the children in the low-intensity EIBI group did show significant improvements in educational functioning at follow-up.

Reed et al. (2007b) compared the outcomes of children who had received EIBI, "eclectic" intervention, or portage. The 12 children in the EIBI group received an average of 30.4 hours of home-based intervention each week, the 20 children in the "eclectic" group received a mean of 12.7 hours per week, and the 16 children in portage group received 8.5 hours of weekly intervention. At follow-up, the EIBI group outperformed both groups on measures of educational functioning while both the EIBI group and the "eclectic" group scored significantly higher on measures of intellectual functioning than the portage group.

Given the previous considerations, the current study directly compared the impact of existing ABA, special nursery placements, and portage programs on a variety of aspects of the children's abilities. The latter two were selected because special nursery placement is a commonly occurring program offered to children with ASD, which has received little direct assessment in terms of its effectiveness. Portage was chosen as, again, it is increasingly offered to children with ASD (see Reed et al., 2000; Smith, 2000). The portage intervention also allows comparison of a very intensive intervention (ABA) with a less intensive intervention (portage) in a community-based setting. This comparison formed part of the original clinic-based study conducted by Lovaas (1987), and the current comparison allows assessment of the generalization to a community-based sample. However, the intensity of hours of treatment delivery varied greatly between the three interventions and this can make it difficult to "tease out" whether it was the nature of the intervention or simply the duration of treatment that accounted for the differences in outcomes reported.

Magiati et al. (2007) conducted a prospective comparison of 28 children who received 32.4 hours EIBI each week and 16 children who received 25.6 hours of autism-specific nursery provision each week. The EIBI group received parent-delivered intervention with training and supervision provided by clinicians. At follow-up, both groups achieved similar outcomes although the EIBI group scored significantly higher on the VABS Daily Living Skills subscale.

Eldevik et al. (2006) retrospectively compared the outcomes of 13 children receiving EIBI and 15 children receiving “eclectic” intervention. The EIBI group typically received 12.5 hours of intervention each week. Parent training was also provided to increase maintenance and generalisation of skills. The control group received 12 hours of intervention each week. The EIBI group outperformed the control group on measures of IQ, language functioning, and communication at the follow-up. They also presented with less symptoms of pathology than children in the control group.

Eikeseth et al. (2007) compared the outcomes of 13 children who received 28 hours of EIBI weekly with 12 children who received 29.1 hours of “eclectic” intervention each week. At follow-up, the children who had received EIBI showed significantly greater improvements in IQ, adaptive functioning, and presented with less social and behaviour problems.

Cohen et al. (2006) compared the outcomes of 21 children receiving 35-40 hours of EIBI per week to a control group of 21 children receiving “eclectic” interventions. Parents implementing EIBI received training so that they could use behavioural techniques in the home setting. Following the treatment phase, the EIBI group achieved significantly higher scores on measures of IQ, adaptive functioning, and receptive language. 17 children from the EIBI group transitioned to mainstream education settings as compared to 1 child from the control group.

Sallows and Graupner (2005) compared the effects of clinic-directed EIBI and parent-directed EIBI. This study was the only study we found in our search that directly compared the mode of EIBI delivery. All others either employed an alternate treatment comparison or a control-no treatment comparison. The 13 children in the clinic-directed EIBI group received an average of 37.6 hours of intervention weekly while the 10 children in the parent-directed EIBI group typically received 31.6 hours of intervention. Both groups received a UCLA-based intervention (often referred to “Lovaas therapy” based on the original study in 1987). The groups made similar gains on outcome measures suggesting that the less costly parent-directed intervention was equally effective. It was found that 48% of participants showed rapid learning, achieved normal scores on outcome measures, and, at follow-up, were succeeding in mainstream classrooms. Pre-treatment imitation, language, daily living skills, and socialization were found to be predictive of outcome.

Howard et al. (2005) compared the effects of EIBI, intensive “eclectic” intervention, and low-intensity “eclectic” intervention. The 29 children assigned to the EIBI group received 25-40 hours of EIBI each week and their parents received training so that teaching could extend to the home setting. The 16 children in the intensive “eclectic” intervention group received 25-30 hours of intervention each week, while the 16 children in the low-intensity “eclectic” group received 15 hours of intervention each week. The EIBI group achieved significantly higher scores on measures of intellectual functioning, visual spatial skills, language functioning and adaptive functioning. The outcomes of the two “eclectic” control groups did not differ.

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment Duration	
Smith et al. (2000)	Tx	15	36.1	12, 3	50.5	63.4	41.9	37.3	Intellectual	UCLA	24.5	33.4	The Tx group made significantly greater gains in IQ, visual-spatial skills, and language development. The Tx group tended to make greater academic achievements and to be in less restrictive academic placements.
	C	13	35.8	11, 2	50.7	65.2	45.6	38.3	Functioning; Visual-Spatial Skills; Language Functioning; Adaptive Functioning; Socioemotional Functioning; Academic Achievement; Class Placement; Progress in Treatment; Parent Evaluation	UCLA	15-20	24	
Eikeseth et al. (2002)	Tx	13	66.3	8, 5	61.9	55.8	45.1	49.0	Intellectual	UCLA	28.0	12.2	The Tx group achieved significantly higher scores than the C group on all measures, except the VABS socialization subscale and the daily living subscale. Children in the Tx group had significantly fewer disruptive behaviours than the C group at follow-up.
	C	12	65.0	11, 1	65.2	60.0	51.2	50.4	Functioning; Visual-Spatial Skills; Language Functioning; Adaptive Functioning	Eclectic	29.1	13.6	
Howard et al. (2005)	Tx	29	30.9	25, 4	58.5	70.5	51.9	52.2	Intellectual	EIBI	25-40	14.2	The outcomes of the two eclectic C groups did not differ. The Tx group performed significantly better on all measures, except motor skills than the C groups.
	C	16	37.4	13, 3	53.7	69.8	43.9	45.4	Functioning; Visual-Spatial Skills; Language Functioning; Adaptive Functioning	Eclectic	25-30	13.3	
	C	16	34.6	16, 0	59.9	71.6	48.8	49.0	Functioning; Visual-Spatial Skills; Language Functioning; Adaptive Functioning	Eclectic	15	14.8	

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment	
Sallows & Graupner (2005)	Tx	13	35.0	11, 2	50.9	59.5	47.9	38.9	Intellectual Functioning; Language Functioning; Adaptive Functioning; Social Functioning; Academic Functioning	UCLA	37.6	48	Both Tx groups performed similarly on all outcome measures.
Cohen et al. (2006)	Tx	21	30.2	18, 3	61.6	69.8	52.9	51.7	Intellectual	UCLA	35-40	36	The Tx group made significantly greater gains in IQ, receptive language, and adaptive functioning. 17 children from the Tx group were included in mainstream education settings as compared to 1 child in the C group.
	C	21	33.2	17, 4	59.4	70.6	52.8	52.7	Functioning; Visual-Spatial Skills; Language Functioning; Adaptive Functioning; Academic Placement	Eclectic	-	-	
Eldevik et al. (2006)	Tx	13	53.0	10, 3	41.0	52.5	33.8	37.3	Intellectual	UCLA	12.5	20.3	The Tx group significantly outperformed the C group on intellectual functioning, language functioning, and the communication subscale of the VABS. The Tx group also showed significantly less pathology at the follow-up
	C	15	49.0	14, 1	47.2	52.5	41.6	33.2	Functioning; Language Functioning; Adaptive Functioning; Visual Spatial Skills; Pathology; Degree of Intellectual Disability	Eclectic	12.0	21.4	

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment Duration	
Eikeseth et al. (2007)	Tx	13	66.3	8, 5	61.9	55.8	45.1	49.0	Intellectual	UCLA	28.0	31.4	The Tx group showed significantly greater improvements in IQ, adaptive functioning, social behaviour, and aggressive behaviour.
	C	12	65.0	11, 1	65.2	60.0	51.2	50.4	Functioning; Adaptive Functioning; Socioemotional Functioning	Eclectic	29.1	33.3	
Magiati et al. (2007)	Tx	28	38.0	27, 1	83.0	59.6	2.2 (r)	4.9 (r)	Visual-Spatial Skills;	UCLA	32.4	25.5	Both groups showed comparable improvements. However, the Tx group achieved significantly higher scores on the VABS Daily Living Skills subscales. Large intra-group variation in response to treatment was observed.
	C	16	42.5	12, 4	65.2	55.4	1.7 (r)	2.9 (r)	Intellectual Functioning; Adaptive Functioning; Language Functioning; Play Skills; Autism Symptomatology	Eclectic	25.6	26.0	
Reed et al. (2007a)	Tx	14	42.9	14, 0	60.1	59.3	-	-	Autism	EIBI	30.4	9-10	The Tx group made significantly greater gains on intellectual functioning and educational functioning, although the C group did show significant improvements on educational functioning.
	C	13	40.8	13, 0	56.6	56.5	-	-	Symptomatology; Developmental Functioning; Intellectual Functioning; Adaptive Functioning	EIBI	12.6	9-10	
Reed et al. (2007b)	Tx	12	40	11, 1	56.8	58.2	-	-	Autism	EIBI	30.4	9	Those in the Tx group made significantly
	C	20	43	18, 2	57.8	53.0	-	-	Symptomatology;	Eclectic	12.7	9	
	C	16	38	-	53.4	58.6	-	-	Developmental	Portage	8.5	9	

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment Duration	
									Functioning; Intellectual				greater gains than the portage group on intellectual functioning and made greater gains than both C groups on educational functioning.
Remington et al. (2007)	Tx	23	35.7	-	61.4	114.8 (r)	-	-	Intellectual	EIBI	25.6	24	The Tx group
	C	21	38.4	-	62.3	113.6 (r)	-	-	Functioning; Language	TAU	15.3	24	showed significantly greater increases in mental age, intellectual functioning, language functioning, adaptive functioning, and positive social behaviours.
									Functioning; Adaptive				
									Functioning; Behaviour;				
									Nonverbal Social Communication;				
									Parental Wellbeing				
Ben-Itzhak et al. (2008)	Tx	44	27.3	43, 1	74.8	-	-	-	Intellectual	EIBI	45	12	The Tx group
	C	37	24.2	23, 14	71.0	-	-	-	Functioning; Autism Symptomatology (Tx group only)	TAU	-	12	made significantly greater gains in IQ than the C group.

Table 2. Summary of EIBI studies 2000-2010, M, F (male, female), VABS (Vineland Adaptive Behaviour Scale), EL (Expressive Language), RL (Receptive Language), (r) (raw scores)

Eikeseth et al. (2002) compared the outcomes of EIBI and “eclectic” treatment for children with autism after one year of intervention. The 13 children in the EIBI group received an average of 28 hours of intervention each week in a school setting. Parents were trained for a minimum of four hours each week for three months so that they were able to extend their child’s treatment to the home setting. Children in the “eclectic” group received an average of 29.1 hours of intervention each week. Following treatment, the EIBI group outperformed the control group on measures of intellectual functioning, visual-spatial skills, and language functioning. They also engaged in fewer disruptive behaviours than the “eclectic” group. However, the “eclectic” group showed significantly greater increases in adaptive functioning than the EIBI group.

Smith et al. (2000) evaluated the outcomes of children with autism or pervasive developmental disorder not otherwise specified who were assigned to an EIBI group or parent-delivered behavioural intervention group. The 15 children in the EIBI group received, on average, 24.5 hours of intervention each week delivered by trained student therapists while parents were included in five hours of teaching each week. The 13 children in the parent-delivered behaviour received 15-20 hours of intervention each week. Their parents received bi-weekly training for 3-9 months and a minimum of one hour of supervision each week. At the end of the treatment phase, the EIBI group performed significantly better than the parent-trained group on measures of intellectual functioning, visual-spatial skills, language, and academic functioning. The groups did not differ on measures of adaptive functioning or challenging behaviours. Children with pervasive developmental disorder not otherwise specified tended to respond better to treatment than children with autism.

6. Studies published between 2011-2012 (5 Studies)

Strauss et al. (2012) compared the outcomes of 24 children receiving 35 hours of EIBI each week and 20 children receiving 12 hours of a mixed "eclectic" intervention each week after six months of treatment. EIBI was delivered by staff and by parents, following initial comprehensive parent training. At follow-up, the EIBI group outperformed the control group on IQ measures, early language measures, and also showed greater reductions in autism severity. Both groups made significant gains in adaptive behaviour and receptive language. However, it was found that the "eclectic" intervention led to significant reductions in parental stress while parental stress in the EIBI group did not change over the course of treatment.

Flanagan et al. (2012) conducted a retrospective comparison of the outcomes of 61 children receiving EIBI for over two years and 61 children, matched on chronological age, who were on a treatment waitlist. Children in the EIBI group received, on average, 25.8 hours of treatment each week, typically at community treatment centres, and parent training was available and encouraged. The EIBI group made significantly greater gains in intellectual functioning and adaptive function, and scored lower on a measure of autism symptomatology. Furthermore, younger age at treatment onset, and higher adaptive skills, were found to predict better EIBI treatment outcomes.

Eldevik et al. (2012) analysed the outcomes of 31 children receiving EIBI in a mainstream pre-school and 12 children receiving TAU in the form of an "eclectic" mix of interventions. The EIBI group typically received 13.6 hours of intervention each week and parents were encouraged to use behavioural procedures at home to promote generalisation and maintenance. The TAU group received a minimum of five hours of treatment each week. After two years, the EIBI group achieved significantly greater scores on measures of intellectual and adaptive functioning.

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment Duration	
Fava et al. (2011)	Tx	12	52.0	10,2	62.1	63.3	33.7	48.6	Autism	EIBI	14	6	Tx group showed significant changes in autism severity, intellectual functioning, adaptive behaviour (except for on the VABS socialization subscale), and on ADHD symptomatology. A significant decrease in challenging behaviours was also observed. The C group showed significant changes on all subscales of the VABS. Parents of children in the C group reported significantly less stress.
	C	10	43.7	9,1	69.1	44.3	29.0	84.5	Symptomatology; Intellectual Functioning; Adaptive Functioning; Language Functioning; Challenging Behaviours; Comorbid Psychopathology; Parental Stress	Eclectic	12	6	
Eikeseth et al. 2012	Tx	35	47	29,6	-	67	-	-	Adaptive Functioning;	UCLA	23	12	Tx group scored significantly higher on all VABS subscales. The Tx group showed significant reductions in autism symptomatology
	C	24	53	20,4	-	63.6	-	-	Autism Symptomatology	Eclectic	-	12	
Eldevik et al. (2012)	Tx	31	42.2	25,6	51.7	62.5	-	-	Intellectual Functioning;	EIBI	13.6	25.1	The Tx group made significantly larger gains on intellectual functioning and adaptive behaviour.
	C	12	46.2	8,4	51.6	58.9	-	-	Adaptive Functioning;	TAU	5+	24.6	
Flanagan et al. 2012	Tx	79	42.93	69,10	-	55.38	-	-	Autism Symptomatology; Adaptive	EIBI	25.81	27.84	The Tx group made significantly more gains on all VABS

Study	Intake Characteristics								Outcome Measures	Treatment Characteristics			Group Differences
	Group	n	Age	M, F	IQ	VABS	EL	RL		Model	Hr/wk	Treatment	
	Control	63	42.79	53, 10	-	55.49	-	-	Functioning; Intellectual Functioning	Waitlist Control	-	17.01	subscases. They achieved significantly higher IQ scores and scored significantly lower on a measure of autism symptomatology.
Strauss et al. 2012	Tx	23	55.67	22, 2	58	78.33	32.95	52.60	Autism	EIBI	35	6	Tx group showed
	C	20	41.94	19, 1	66.91	66.92	16.88	47.87	Symptomatology; Intellectual Functioning; Adaptive Functioning; Language Functioning; Challenging Behaviours; Parental Stress	Eclectic	12	6	significantly greater gains in intellectual functioning, expressive language, and social interactions. They showed significantly greater reductions in autism symptomatology and challenging behaviour. Both groups made significant gains in receptive language and adaptive behaviour. Parents in the Tx group were significantly more stressed.

Table 3. Summary of EIBI studies between 2011-2012, M, F (male, female), VABS (Vineland Adaptive Behaviour Scale), EL (Expressive Language), RL (Receptive Language)

Eikeseth et al. (2012) examined the outcomes of 35 children receiving EIBI and 24 children receiving TAU after one year of treatment. Children in the EIBI group received 23 hours of intervention per week, on average, and parent training was provided. Children in the “eclectic” group were attending special education settings where teachers incorporated a variety of interventions. The children in the EIBI group made significantly greater gains in adaptive functioning. They also demonstrated reduced autism symptomatology.

Fava et al. (2011) compared the outcomes of 12 children receiving EIBI and 10 children receiving “eclectic” intervention after six months of treatment. EIBI was delivered by trained therapists, in a clinic-based setting, and by intensively trained and supervised parents, in a home-based setting, with children receiving 14 hours per week on average. Children in the “eclectic” group typically received approximately 12 hours per week. After six months of intervention, the EIBI group showed significantly greater increases in intellectual functioning, and significantly greater decreases in autism symptomatology and challenging behaviour. Both groups, however, showed significant gains in adaptive functioning. Parents in the “eclectic” group showed significant reductions in stress over the course of treatment while no changes in parental stress were observed for the EIBI group.

7. Challenges to EIBI

Ongoing analysis of the outcomes of EIBI in comparison to other treatment programs is clearly continuing to capture the interest of many researchers with five studies alone demonstrating outcomes between 2011 and 2012. Indeed, given the growing international recognition of EIBI as the recommended approach to autism intervention, this ongoing investigation and demonstration of effects is vital. Such demonstrations and continuous rigor in testing this approach with children with autism diagnoses, substantiates the view that intensive early intervention using the scientific precision of behaviour analysis, can be a very powerful intervention (Howlin, 2010; Granpeesheh, Tarbox & Dixon, 2009).

However, despite publication of the numerous studies outlined above, criticism of methodological stringency and dependent variables analysed within and across them, has been documented.

“Remarkably, despite thousands of ABA-EIBI studies on specific core deficits, and related challenging behaviours and skills, and EIBI studies as well, some researchers still question the efficacy of these methods” (Matson, Tureck, Turygin, Beighley & Rieske, 2012, p.1413).

One of the most pronounced criticisms of EIBI research for some time is that large multi-element randomized clinical trials are required to provide a definitive scientific demonstration of its effectiveness in autism treatment (Spreckley & Boyd, 2009). We, and others, (e.g., Keenan & Dillenberger, 2011; Matson et al. 2012) do not support this view and we encourage the reader to examine an excellent rebuttal of the reasons that the gold standard, randomized controlled trial in research evaluation, is in actual fact inappropriate for the design and evaluation of individualised treatment protocols (see Keenan & Dillenberger, 2011 for a thorough analysis).

One criticism presented in relation to the overall interpretation of the studies outlined in this chapter involves the issue that large idiosyncratic differences occur across children diagnosed with autism. Because of the extensive discrepant features and their expression across the condition, Howlin (2010) stresses the need to determine which components of the inter-

vention work best for specific individuals and under what set of circumstances. Smith et al. (2010) also suggest that ongoing research is necessary in identifying key moderating variables in EIBI outcomes. Specifically, they pose the question of what are the most effective components, and the amount of such components, in producing marked changes in core autism symptoms and additional problems. Other researchers have also emphasised this point (Alessandri, Thorp, Mundy, & Tuchman, 2005; Granpeesheh et al. (2009). For some, determining predictor variables such as personal characteristics affecting outcomes has been a focus. For example, Itzhak and Zachor (2009) demonstrated that the presence of an intellectual disability and significantly delayed adaptive skills in young children with autism was a major risk factor and a predictor of weaker outcomes for EIBI. They also showed that children who were 30 months of age or younger responded significantly better to early intervention. A more recent study by Perry et al. (2011) showed that variables including younger age and higher intellectual functioning at onset of intervention were predictors of greater positive effects. Not surprisingly, Perry et al. (2011) also found that duration of intervention was a predictor of positive outcomes for young children undergoing EIBI- the longer the child participated in the intervention, the better the outcome.

While EIBI programs provide strong adherence to the framework and foundational principles of learning within ABA, some investigators have followed a particular "brand name" approach (Healy, Leader & Reed, 2010). There are a number of different ABA approaches that have been outlined in a variety of sources (some examples include: Greer, Keohane & Healy, 2002; Koegel & Koegel, 2006; Lovaas, 1981; Lovaas & Smith, 1989; Sundberg & Michael, 2001). Often this "branding" can lead to obfuscation for the reader in interpreting what "type" of EIBI/ABA program is best. However, these approaches are all built on the same bedrock sharing important common features- intensity in program delivery (up to 40 hours weekly for at least three years), one-to-one teaching where the individual requires such intensive instruction, and discrete-trial reinforcement-based methods (in both massed trial formats and natural environmental teaching opportunities) incorporated within the scientific stringency of a behaviour analytic framework (Matson et al. 2012).

Magiati and Howlin (2001) have argued that many of the EIBI studies employ different measurements across participants and at baseline and follow up thereby compromising interpretation and reliability. For example, Eikeseth et al. (2002) and Howard et al. (2005) did not use the same tests at baseline and at follow up phases. Inconsistencies in participant characteristics across groups (lack of matching: (e.g., Eldevik, Eikeseth, Jahr, & Smith, 2006; Fenske, Zalenski, Krantz, & McClannahan, 1985) have also been critiqued within the studies. In addition, different investigators examined various settings for EIBI- some were clinic-based (Ben-Itzhak et al., 2007; Eldevik et al., 2006) others were community-based (Cohen et al., 2006; Eikeseth et al. 2002; Eikeseth et al., 2007; Eikeseth et al., 2012; Eldevik et al., 2012; Flanagan et al., 2012; Howard et al. 2005; Magiati et al., 2007), while others were home-based (Reed et al., 2007a; Reed et al., 2007b; Remington et al., 2007; Sheinkopf & Siegel, 1998; Smith et al., 2000). This variation in measures/settings across studies may provide challenges in the generalisation of intervention outcomes to different environments (Mudford et al., 2009).

However, we believe that it is critical to be able to assess the effectiveness of EIBI across participants who may reflect different tracts on the spectrum i.e., those with more severe core autism symptoms, presence of challenging behaviours, less linguistically able; impaired IQ; co-morbid or co-occurring problems etc. In this sense it appears important to utilise a wide range of instruments in the assessment procedure, not only to examine autism severity but also measures of intellectual functioning, adaptive behaviour, challenging behaviour, co-morbid psychopathology and educational functioning.

Treatment integrity including initial training of therapists and parents along with continual supervision is often not reported in studies yet many authors have written on the importance of adherence to the scientific rigor of ABA (Symes, Remington, Brown & Hastings, 2006). While many of the studies reviewed referred to training either for therapists or parents, detail on the fidelity of treatment delivery was not measured. Where some have investigated adherence to strict training protocols, highly effective outcomes can be demonstrated using EIBI (see McGarrell, Healy, Leader, O'Connor & Kenny, 2009).

Critiques of the initial results reported by Lovaas (1987) concerning the effectiveness of EIBI were dominant amongst the most vociferous arbiters, especially given that exact replication of such results is not evident to date. Indeed, this is one of the greatest challenges faced by many EIBI researchers. The children undergoing EIBI treatment in the Lovaas study made remarkable gains of up to 30 IQ points and were not noticeably different from neuro typical developing children after 3 years of the intervention. Replications of this original study have certainly attempted to address the methodological criticisms by incorporating more rigorous experimental design including random assignment to groups (Sallows and Graupner 2005; Smith et al. 2000). However, studies to date have yet to achieve the extent of the outcomes reported by Lovaas (1987).

It is clear that over time the methodological criticisms of the earlier studies have been addressed by more recent investigators. Some of the recent published studies have employed larger small sample sizes, comparison groups, random assignment of the children to groups, matched characteristics across groups and standardising measures used for assessment between and within children (e.g., Flanagan et al., 2012)

Certainly, consistency in measures at baseline and follow-up has improved with most of the studies published between 2011-2012 implementing the same measures at entry and output for the majority of variables measured (Eikeseth, et al., 2012, Eldevik, et al, 2012; Fava et al., 2011; Flanagan et al., 2012; Strauss et al., 2012). Furthermore, it is worth noting that most recent studies on EIBI are employing a more extensive battery of measures to assess the effects of EIBI- in addition to IQ and adaptive behaviour which was the focus of earlier research. For example, Fava et al. (2011) and Strauss et al. (2012) measured autism symptomatology, language functioning, challenging behaviour, comorbid psychopathology, and parental stress as outcomes of EIBI. Eikeseth et al. (2012) and Flanagan et al. (2012) also examined autism symptomatology as a dependent variable. This focus on increasing evaluation of treatment outcomes is a welcome development in EIBI research. Examining the impact of EIBI on the core symptoms of autism, challenging behaviours and comorbid psychopathology provides an exciting avenue for future research.

While some authors have provided criticism in response to their interpretation of the EIBI outcome studies summarised within this chapter (e.g., Shea, 2004), others have acknowledged the long-term effects of such an intervention resulting from the best empirically validated interventions (e.g., Granpeesheh, Tarbox & Dixon, 2009).

Prior to 2009 six EIBI descriptive review papers were published each analysing methodologies, variables and outcomes from different perspectives (e.g., Eikeseth 2009; Granpeesheh et al. 2009; Howlin, Magiati & Charman, 2009; Matson and Smith 2008; Reichow & Wolery, 2009; Rogers and Vismara, 2008). As well as these research reviews, Eldevik et al. (2010) gathered individual participant data from 16 group design studies on behavioural intervention for children with autism, resulting in individual participant data for 309 participants in an EIBI group, 39 participants in an alternate treatment comparison group, and 105 in a control group-no treatment group. Their analysis revealed that more children who underwent behavioral intervention achieved significantly greater change in IQ and adaptive behaviour compared with the comparison and control groups (see Eldevik et al. 2010). We encourage the reader to examine these papers in order to discern the conventional acclaim of EIBI as an acknowledged intervention for ASD.

More importantly, since 2009 EIBI research for young children with ASD has been subject to six meta-analytic reviews (Eldevik et al. 2009; Makrygianni and Reed 2010; Reichow and Wolery 2009; Peters-Scheffer, Didden, Korzilius & Sturmey, 2011; Spreckley and Boyd 2009; Virue's-Ortega, 2010). A meta-analysis is a particular type of statistical method for integrating results from many individual studies. This type of statistic can be useful for obtaining an overall estimate of whether or not an intervention is effective and, if so, what the size of the benefits are (i.e., the effect size). The overwhelming findings from five of the six meta-analyses conducted between 2009 to 2012 (Eldevik et al. 2009; Makrygianni and Reed 2010; Peters-Scheffer et al., 2011; Reichow & Wolery 2009; Virue's-Ortega 2010) concluded that EIBI was an effective intervention strategy for many children with ASD, accelerating development, improving IQ and adaptive skills compared to those receiving no intervention or alternate diverse standard care treatments.

Most recently, Reichow (2012) presented an overview of the five meta-analyses on EIBI for young children with ASD. He concluded that the collective and accumulating evidence supporting EIBI from meta-analytic studies cannot be dismissed. Reichow's impressive dissection of the investigations of EIBI to date achieves the following assertion:

"Furthermore, the current evidence on the effectiveness of EIBI meets the threshold and criteria for the highest levels of evidence-based treatments across definitions ... Collectively, EIBI is the comprehensive treatment model for individuals with ASDs with the greatest amount of empirical support and should be given strong consideration when deciding treatment options for young children with ASDs" (Reichow, 2012, p. 518.)

8. Screening for ASD and EIBI provision

It is accepted in the field of autism that there now exists enough evidence to recognise the disorder at a very early age (Feldman et al. 2012; Matson, Boisjoli, Rojahn, & Hess, 2009). While many screening instruments exist for the disorder, the most thoroughly examined of these is the BISCUIT (Matson et al., 2009; Matson, Fodstad, & Mahan, 2009; Matson, Fodstad, Mahan, & Sevin, 2009; Matson, Wilkins, Sevin, et al., 2009; Matson, Wilkins, Sharp, et al., 2009). In addition to providing clinicians with a measure of the very early signs of autism symptomology, the BISCUIT also provides a measure of emotional/behavioural disorders and comorbid psychopathology. We believe that providing EIBI to young infants showing early signs of autism, before the condition is fully manifest, will target core skills by accelerating developmental sequences, halting deteriorating behavioural repertoires, and preventing additional secondary problems. Provision of EIBI at the time when symptoms are initially detected, may in tandem, alter the course of early behavioural and brain development increasing the likelihood that children attain a rate of typical development (Dawson, 2008).

We advocate for the need to screen children for this disorder during routine health and developmental checks. Screening in Ireland is currently haphazard and often depends on a parent showing concern for some area of their child's development. In particular, prevention entails detecting infants at risk before the full diagnostic criteria are present and it has been recognised that early signs may emerge as soon as 9 months in infants with siblings who have ASD (Ozonoff et al. 2010; Zwaigenbaum et al. 2005). Screening these biologically "at risk" children in early infancy should allow greater access to the effective methods demonstrated by EIBI. We strongly believe that the availability of both standardised screening techniques and EIBI provision to such children will impact on a more promising prognosis in the long-term.

9. The benefits of EIBI

There is no doubt that the cost of an intensive and accomplished EIBI program is expensive. For example, cost analysis studies revealed that the average annual cost of an EIBI program in North America to be \$33,000 per year with the average duration being three years (Jacobson, Mulick & Green, 1998). However, further analysis of this cost-effectiveness and saving over time has also been provided. For instance, the Autism Society of America reported in 2008 that the cost of lifelong care could be reduced by up to as much as two thirds with early diagnosis and EIBI.

Dillenberger (2011) provides a synopsis of recent cost-benefit analyses showing the savings that can be achieved by implementation of EIBI in autism treatment. She puts forward the following:

1. in Ontario, Canada, an estimated annual CA\$ 45 million can be saved if EIBI is made available to all children diagnosed with ASD (see Motiwala et al., 2006);

2. in Texas, USA, a total of US\$ 208,500 per child is saved by the education system through the use of EIBI (see Chasson, Harris & Neely (2007);
3. and in Pennsylvania, USA, average savings per child are estimated even higher to range from US\$ 274,700 to US\$ 282,690 (see also Chasson, Harris & Neely (2007).

Based on these cost-saving analyses increasing change has been shown in policy regarding the role of EIBI in early intervention. For example, the state of Ontario in Canada, has legislated to make EIBI services available for all children diagnosed with ASD (Perry & Condillac, 2003). In the USA, 32 States have passed legislation to ensure that ABA-based interventions are either state-funded or provided through medical insurance companies (Dillenberger, 2011; Market Watch, 2012). It remains to be seen whether government policy in the United Kingdom or Ireland will catch up with that of Canada and the USA and provide government funded EIBI once children are deemed at risk for or indeed presenting with this condition. Interestingly, the use of trained volunteers to deliver EIBI has been shown to produce effective outcomes (Birnbauer & Leach, 1993) and may be an option for some parents/services to consider when cost is an issue. Many university students who train on third level post-graduate programmes in Applied Behaviour Analysis could make strong contributions in a voluntary capacity, to EIBI in autism treatment, as part of their ongoing accreditation process as Board Certified Behaviour Analysts with the international certification body (Behaviour Analyst Certification Board®). Alternatively providing parents of children with autism with training in behavioural interventions (demonstrated by Sallows and Graupner, 2005) can result in cost-saving and important positive outcomes for children with autism.

10. Controversies related to EIBI efficacy

The published studies outlined in this chapter highlight the possible positive outcomes for young children diagnosed with autism. EIBI continues to be investigated internationally as a treatment intervention for this condition and as a result of these investigations attracts many critics and controversies. In the past, some authors have criticised a behavioural approach to autism intervention with regard to “robotic” teaching and behaviour patterns that lack generalisation to naturalistic settings (Jordan, Jones & Murray, 1998; Shea, 2004) along with the use of negative consequences in acquisition teaching and behaviour reduction (Carr, Robinson & Palumbo, 1990). Others have highlighted the concerns with regard to claims of “recovery” or a “cure” for autism (Offit, 2008). However, the improvements shown over the last decade in EIBI refinement and provision, particularly with regard to training and regulatory protocols with its delivery (Behavior Analyst Certification Board®, 2012) has addressed many of these issues. Indeed, professional training in behaviour analysis and behavioural intervention has never been as well regulated as it is today.

No doubt there are still many issues that continue to require analysis in the EIBI and autism field of research. We would like to draw the reader’s attention to a recent publication by Matson and Smith (2008) providing an analysis of the current status of intensive behavioural

intervention for young children with autism. We believe that this paper provides an excellent summary of the criticisms provided on EIBI and we will highlight these here. Firstly, many of the studies providing analysis of EIBI outcomes fail to report the severity of ASD across participants and groups. This makes it difficult to decipher which children will show greatest susceptibility to the intervention. Those with greater severity of symptoms may show slower progress or less gains. It has been reported that a milder degree of autism is related to better prognosis (e.g., Bartak & Rutter, 1976) and therefore it is essential that variables at intervention onset include such a measure. Secondly, Matson and Smith (2008) highlight the fact that researchers often do not take into account the additional, co-morbid, problems that present with autism (e.g., ADHD symptoms or anxiety disorders). Psychopathological problems can co-occur with the condition and may exacerbate the challenges and deficits for many children. The impact this can have on treatment susceptibility is underreported and often not addressed in treatment research. For example, only two studies in our review provided outcome measures of co-morbid psychopathology (Birnbrauer & Leach, 1993; Fava, 2011). Matson and Smith (2008) provide a strong argument for the assessment of psychopathology before, during, and after EIBI, to determine ongoing changes in child profiles or to address any required adjustments to the delivery of EIBI (e.g., increasing or decreasing the duration of intervention, removing skills acquisition teaching from artificial environments, less emphasis on massed trial instruction etc.). Perhaps not enough attention has been given to these issues in EIBI research. The young age of onset of EIBI and the intensity of the intervention may have undesired side effects such as anxiety, stress, “burn out” or indeed refusal to participate. Other controversial issues involving EIBI include parent and sibling involvement which can often induce stress and family strain when highly intensive intervention is provided within the family home. The negative side effects of this kind of intensive intervention certainly warrant separate analysis.

Unfortunately, like any professional practice or therapeutic intervention, there will be those who claim to provide EIBI without adhering to the scientific demonstrations of what is, and is not, effective within an intervention protocol. We have heard of anecdotal accounts of the applications of behavioural interventions in autism treatment that are outdated and often lack individualisation. Treatment fidelity is often a major problem in the field and often authors fail to demonstrate or report adherence to effective and current practice in many of the published studies on EIBI. Such problems can lend support to a negative view of the use of EIBI with young children with autism diagnoses.

An analysis of changes in adaptive functioning of young children has become an added focus of EIBI studies in more recent years. Traditionally, studies tended to focus on changes in intellectual and social functioning and language and communication abilities. Some authors have criticised EIBI for overly focusing on cognitive skills with 1:1 teacher/student ratios and a focus on desk-top instruction and intensive “drills” (e.g., Shea, 2004). Increasingly, EIBI curricula and instructional protocols have grown to ensure inclusion of adaptive skills teaching and acquisition of novel skills in natural environments. Studies evaluating outcomes of EIBI have also focused more on adaptive functioning changes as a result of the intervention. In 2002, Eikseth et al. reported greater increases in adaptive functioning in a

group of young children who received “eclectic” intervention than those receiving EIBI. Furthermore, Fava et al. (2011) and Strauss et al. (2012) showed that both groups receiving EIBI and “eclectic” intervention showed significant gains in adaptive functioning. Two more recent studies by Eldevik et al. (2012) and Eikseth et al., (2012) reported the opposite findings to Eikseth et al. (2002) in relation to adaptive functioning when comparing both interventions.

Another variable that has been increasingly analysed in early intervention autism research includes parental stress. Interestingly, two comparison studies (Fava et al., 2011; Strauss et al., 2012) showed significant reductions in parental stress for those parents whose children were receiving “eclectic” intervention. The same effect was not shown for parents of children receiving EIBI. This is another important area of analysis particularly in light of the demands that EIBI places on parents and family.

11. Conclusion

EIBI as an approach to autism treatment is one of the most intensively analysed interventions in paediatric clinical psychology (Matson & Smith, 2008).

Substantial objective evidence for EIBI has been demonstrated at an experimental, descriptive and meta-analytic level of analysis (Reichow, 2012). We support the contention of many authors in the field of autism treatment, that EIBI prevails by adhering to a principle of evidence-based practice, incorporating standardised objective measurement of outcomes along with implementation of robust experimental design. This robust demonstration of effectiveness is driving policy change on the international stage and some authors (e.g., Dawson, 2008) suggest that one of the most important goals of investigations in the domains of autism and behaviour analysis research, is to become more effective communicators of scientific findings to the general public/government bodies/advocacy groups/related professionals, not only to harvest their support, but to ensure the dissemination of accurate and effective intervention to so many who require it.

Author details

Olive Healy and Sinéad Lydon

National University of Ireland, Galway

References

- [1] Alessandri, M., Thorp, D., Mundy, P., & Tuchman, R. F. (2005). Can we cure autism? From outcome to intervention. *Revista de Neurologia*, 40, S131–S136.

- [2] Anderson, S. R., Avery, D. L., DiPietro, E. K., Edwards, G. L., & Christian, W. P. (1987). Intensive home-based early intervention with autistic children. *Education and Treatment of Children*, 10, 353–366.
- [3] Autism Treatment Acceleration Act (ATAA). (2010). Summary of the Autism Treatment Acceleration Act of 2009 (ATAA) (S. 819 and H.R. 2413) Retrieved from <http://autismtreatmentaccelerationact.org/4.html>.
- [4] Behavior Analyst Certification Board® (2012). <http://www.bacb.com>.
- [5] Baer, D. M., Wolf, M. M. & Risley, T. R. (1968). Some current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 1, 91-97.
- [6] Baer, D. M., Wolf, M. M. & Risley, T. R. (1987). Some still-current dimensions of applied behavior analysis. *Journal of Applied Behavior Analysis*, 20, 313-317.
- [7] Ben-Itzhak, E., Lahat, E., Burgin, R., & Zachor, A. D. (2008). Cognitive, behavior and intervention outcome in young children with autism. *Research in Developmental Disabilities*, 29, 447-458.
- [8] Birnbrauer, J. S., & Leach, D. J. (1993). The Murdoch early intervention program after 2 years. *Behaviour Change*, 10, 63-74.
- [9] Carr, E.G., Robinson, S., & Palumbo, L.W. (1990). The wrong issue: Aversive versus nonaversive treatment. The right issue: Functional versus non-functional treatment. In A. Repp & N. Singh (Eds.), *Perspectives on the use of nonaversive and aversive interventions for persons with developmental disabilities* (pp. 361-379). Sycamore, IL: Sycamore Publishing Co.
- [10] Chasson, G. S., Harris, G. E., & Neely, W. J. (2007). Cost comparison of early intensive behavioural intervention and special education for children with autism. *Journal of Child and Family Studies*, 16, 401–413.
- [11] Cohen, H., Amerine-Dickens, M., & Smith, T. (2006). Early intensive behavioral treatment: Replication of the UCLA model in a community setting. *Developmental and Behavioral Pediatrics*, 27, S145-S155.
- [12] Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.
- [13] Dawson, G. (2008). Early behavioral intervention, brain plasticity, and the prevention of autism spectrum disorder. *Development and Psychopathology* 20, 775–803.
- [14] Dillenberger, K. (2011). The Emperor's new clothes: Eclecticism in autism treatment. *Research in Autism Spectrum Disorders*, 5, 1119–1128.
- [15] Eikeseth, S. (2009). Outcome of comprehensive psycho-educational interventions for young children with autism. *Research in Developmental Disabilities*, 30, 158–178.
- [16] Eikeseth, S., Hayward, D., Gale, C., Gitlesen, J. P., & Eldevik, S. (2009). Intensity of supervision and outcome for preschool aged children receiving early and intensive

behavioral interventions: A preliminary study. *Research in Autism Spectrum Disorders*, 3, 67-73. doi: 10.1016/j.rasd.2008.04.003

- [17] Eikeseth, S., Klintwall, L., Jahr, E., & Karlsson, P. (2012). Outcome for children with autism receiving early and intensive behavioral intervention in mainstream pre-school and kindergarten settings. *Research in Autism Spectrum Disorders*, 6, 829-835.
- [18] Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2002). Intensive behavioral treatment at school for 4- to 7- year old children with autism: A 1-year comparison controlled study. *Behavior Modification*, 26, 49-68.
- [19] Eikeseth, S., Smith, T., Jahr, E., & Eldevik, S. (2007). Outcome for children with autism who began intensive behavioral treatment between ages 4 and 7: A comparison controlled study. *Behavior Modification*, 31, 264-278.
- [20] Eldevik, S., Hastings, R. P., Hughes, C., Jahr, E., Eikeseth, S., & Cross, S. (2009). Meta-analysis of early intensive behavioral intervention for children with autism. *Journal of Clinical Child and Adolescent Psychology*, 38, 439-450.
- [21] Eldevik, S., Eikeseth, S., Jahr, E., & Smith, T. (2006). Effects of low-intensity behavioral treatment for children with autism and mental retardation. *Journal of Autism and Developmental Disorders*, 36, 211-224.
- [22] Eldevik, S., Hastings, R. P., Jahr, E., & Hughes, J. C. (2012). Outcomes of behavioral interventions for children with autism in mainstream pre-school settings. *Journal of Autism and Developmental Disorders*, 42, 210-220.
- [23] Eldevik, S., Hastings, R. P., Hughes, J. C., Jahr, E., Eikeseth, S., & Cross, S. (2010) Using participant data to extend the evidence base for intensive behavioral intervention for children with autism. *American Journal on Intellectual and Developmental Disabilities*, 115, 381-405.
- [24] Fava, L., & Strauss, K. (2011). Cross-setting complementary staff and parent-mediated Early Intensive Behavioral Intervention for young children with autism: Aresearch-based comprehensive approach. *Research in Autism Spectrum Disorders*, 5, 512-522.
- [25] Fava, L., Strauss, K., Valeri, G., D'Elia, L., Arima, S., & Vicari, S. (2011). The effectiveness of a cross-setting complementary staff- and parent-mediated early intensive behavioral intervention for young children with ASD. *Research in Autism Spectrum Disorders*, 5, 1479-1492.
- [26] Feldman M.A., Ward R.A., Savona D., Regehr, K., Parker, K., Hudson, M., Penning, H. & Holden, J.J.A. (2012). Development and initial validation of a parent report measure of the behavioral development of infants at risk for autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 42, 13-22.
- [27] Fenske, E. C., Zalenski, S., Krantz, P. J., & McClannahan, L. E. (1985). Age at intervention and treatment outcome for autistic children in a comprehensive intervention program. *Analysis and Intervention in Developmental Disabilities*, 5, 49-58.

- [28] Flanagan, H. E., Perry, A., & Freeman, N. L. (2012). Effectiveness of large-scale community-based intensive behavioral intervention: A waitlist comparison study exploring outcomes and predictors. *Research in Autism Spectrum Disorders*, 6, 673-682.
- [29] Granpeesheh, D., Tarbox, J., & Dixon, D. R. (2009). Applied behavior analytic interventions for children with autism: A description and review of treatment research. *Annals of Clinical Psychiatry: Official Journal of the American Academy of Clinical Psychiatrist*, 21, 162-173.
- [30] Green, G. (1996). Early behavioral intervention for autism: What does research tell us? In C. Maurice, G. Green, & S. Luce (Eds.). *Behavioral intervention for young children with autism: A manual for parents and professionals* (pp. 29- 44). Austin, TX: PRO-ED.
- [31] Greer, R.D. (2002). *Designing teaching strategies: an applied behavior analysis systems approach*. Academic Press: Dan Diego, CA.
- [32] Greer, R. D., Keohane, D. D. & Healy, O. (2002). Quality and applied behavior analysis. *The Behavior Analyst Today*, 3 (2), 120-132. www.behavior-analyst-today.org.
- [33] Gresham, F.M. & MacMillan, D.L. (1998). Early intervention project: Can its claims be substantiated and its effects replicated? *Journal of Autism and Developmental Disorders*, 28, 5-13.
- [34] Harris, S. L., Handleman, J. S., Gordon, R., Kristoff, B., & Fuentes, F. (1991). Changes in cognitive and language functioning of preschool children with autism. *Journal of Autism and Developmental Disorders*, 21, 281-290.
- [35] Healy, O., Leader, G., & Reed, P. (2009). Applied Behavior Analysis and the Treatment of Autism Spectrum Disorders in the Republic of Ireland. In Leon V. Berhardt (Ed.) *Advances in Medicine and Biology*, Volume 8. Nova Science Publishers.
- [36] Howlin, P. (2010). Evaluating psychological treatments for children with autism-spectrum disorders. *Advances in Psychiatric Treatment*, 16, 133-140.
- [37] Hoyson, M., Jamieson, B., & Strain, P. S. (1984). Individualized group instruction of normally developing and autistic-like children: The LEAP Curriculum Model. *Journal of the Division for Early Childhood*, 8, 157-172.
- [38] Howard, J. S, Sparkman, C. R., Cohen, H. G., Green, G., & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatment for young children with autism. *Research in Developmental Disabilities*, 26, 359-383.
- [39] Howlin, P., Magiati, I., & Charman, T. (2009). A systematic review of early intensive behavioural interventions (EIBI) for children with autism. *American Journal on Intellectual and Developmental Disabilities*, 114, 23-41.
- [40] Jacobson, J. W., Mulick, J. A., & Green, G. (1998). Cost-benefit estimates for early intensive behavioral intervention for young children with autism: General model and single state case. *Behavioral Interventions*, 13, 201-226.

- [41] Jordan R, Jones G, Murray D. (1998). Educational Interventions for Children with Autism: A literature review of recent and current research. School of Education, University of Birmingham, UK.
- [42] Keenan, M. & Dillenberger, K. (2011). When all you have is a hammer ... : RCTs and hegemony in science. *Research on Autism Spectrum Disorders*, 1-13.
- [43] Kelley, E., Naigles, L., & Fein, D. (2010). An in-depth examination of optimal outcome children with a history of autism spectrum disorders. *Research in Autism Spectrum Disorders*, 4, 526-538.
- [44] Klintwall, L., & Eikeseth, S. (2012). Number and controllability of reinforcers as predictors of individual outcome for children with autism receiving early and intensive behavioral intervention: A preliminary study. *Research in Autism Spectrum Disorders*, 6, 493-499.
- [45] Koegel, Robert L. and Lynn Kern Koegel (2006). *Pivotal Response Treatments for Autism: Communication, Social, and Academic Development*. Baltimore, Md.: Paul H. Brookes.
- [46] Kovshoff, H., Hastings, R. P., & Remington, B. (2011). Two-year outcomes for children with autism after the cessation of early intensive behavioral intervention. *Behavior Modification*, 35, 427-450.
- [47] Lang, R., O'Reilly, M., Healy, O., Rispoli, M., Lydon, H., Streusand, W., Davis, T., Kang, S., Sigafoos, J., Lancioni, G., Didden, R., & Giesbers, S. (2012). Sensory integration therapy for autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders*, 6, 1004-1018
- [48] Larsson, E. (2005). Resources for parents. In M. Keenan, M. Henderson, K.P. Kerr, & K. Dillenburger. *Applied behaviour analysis and autism. Building a future together* (pp. 255-287). London: Jessica Kingsley Publishers.
- [49] Lovaas, O. I. (1981). *Teaching developmentally disabled children: The me book*. Baltimore: University Park.
- [50] Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3-9.
- [51] Lovaas, O. I., Koegel, R., Simmons, J. Q., & Long, J. S. (1973). Some generalization and follow-up measures on autistic children in behavior therapy. *Journal of Applied Behavior Analysis*, 6, 131-166.
- [52] Lovaas, O. I., & Smith, T. (1989). A comprehensive behavioraltheory of autistic children: Paradigm for research and treatment. *Journal of Behavior Therapy and Experimental Psychiatry*, 20, 17-29.

- [53] Love, J. R., Carr, J. E., Almason, S. M., & Petursdottir, A. I. (2009). Early and intensive behavioral intervention for autism: A survey of clinical practices. *Research in Autism Spectrum Disorders*, 3, 421-428.
- [54] Magiati, I., Charman, T., & Howlin, P. (2007). A two-year prospective follow-up study of community-based early intensive behavioural intervention and specialist nursery provision for children with autism spectrum disorders. *Journal of Child Psychology and Psychiatry*, 48, 803-812.
- [55] Magiati, I., & Howlin, P. (2001). Monitoring the progress of preschool children with autism enrolled in early intervention programmes. *Autism*, 5, 399-406.
- [56] Market Watch (2012). <http://www.marketwatch.com/story/departments-of-defense-and-tricare-ordered-to-provide-applied-behavioral-therapy-to-autistic-children-of-military-dependents-2012-07-26>.
- [57] Makrygianni, M. K., & Reed, P. (2010). A meta-analytic review of the effectiveness of behavioural early intervention programs for children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 4, 577-593.
- [58] Matson, J. L., Benavidez, D. A., Compton, L. S., Paclawskyj, T. R., & Baglio, C. S. (1996). Behavioral treatment for autistic persons: A review of research from 1980 to the present. *Research in Developmental Disabilities*, 17, 433-466.
- [59] Matson, J. L., Boisjoli, J., Rojahn, J., & Hess, J. (2009). A factor analysis of challenging behaviors assessed with the Baby and Infant Screen for Children with aUtism Traits (BISCUIT-Part 3). *Research in Autism Spectrum Disorders*, 3, 714-722.
- [60] Matson, J. L., Fodstad, J. C., & Mahan, S. (2009). Cutoffs, norms, and patterns of comorbid difficulties in children with developmental disabilities on the Baby Infant Screen for Children with aUtism Traits (BISCUIT-Part 2). *Research in Developmental Disabilities*, 30, 1221-1228.
- [61] Matson, J. L., Fodstad, J. C., Mahan, S., & Sevin, J. A. (2009). Cutoffs, norms, and patterns of comorbid difficulties in children with ASD on the Baby Infant Screen for Children with aUtism Traits (BISCUIT-Part 2). *Research in Autism Spectrum Disorders*, 3, 977-988.
- [62] Matson, J. L., Wilkins, J., Sevin, J. A., Knight, C., Boisjoli, J. A., & Sharp, B. (2009). Reliability and item content of the Baby and Infant Screen for Children with aUtism Traits (BISCUIT): Part 1-3. *Research in Autism Spectrum Disorders*, 3, 336-344.
- [63] Matson, J. L., & Smith, K. R. M. (2008). Current status of intensive behavioral interventions for young children with autism and PDD-NOS. *Research in Autism Spectrum Disorders*, 2, 60-74.
- [64] Matson, J.L., Tureck, K., Turygin, N., Beighley, J., Rieske, R. (2012). Trends and topics in Early Intensive Behavioral Interventions for toddlers with autism. *Research in Autism Spectrum Disorders*, 6, 1412-1417.

- [65] McEachin, J. J., Smith, T., & Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation*, 97, 359–391.
- [66] McGarrell, M., Healy, O., Leader, G., O'Connor, J., & Kenny, N. (2009). Six reports of children with autism spectrum disorder following intensive behavioural interventions using the Preschool Inventory of Repertoires for Kindergarten (PIRRK®). *Research in Autism Spectrum Disorders*, 3, 767–782.
- [67] Metz, Mulick, J., and Butter, E. (2005). Autism: A late-20th-century fad magnet. In J. W. Jacobson, R. M. Foxx, and J. A. Mulick (Eds.), *Controversial therapies for developmental disabilities: Fad, fashion, and science in professional practice*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- [68] Motiwala, S. S., Gupta, S., Lilly, M. B., Ungar, W. J., & Coyte, P. C. (2006). The cost-effectiveness of expanding intensive behavioural intervention to all autistic children in Ontario. *Health Policy*, 1, 135–151.
- [69] Mudford, O., et al., (2009). Technical review of published research on applied behaviour analysis interventions for people with autism spectrum disorders: Auckland Uniservices Ltd. Wellington, New Zealand: Ministry of Education.
- [70] Mulloy, A., Lang, R., O'Reilly, M., Sigafoos, J., Lancioni, G., & Rispoli, M. (2010). Gluten-free and casein-free diets in the treatment of autism spectrum disorders: A systematic review. *Research in Autism Spectrum Disorders*, 4, 328–339.
- [71] Mundy, P., Sullivan, L., & Mastergeorge, A. (2009). A parallel and distributed-processing model of joint attention, social cognition and autism. *Autism research*, 2, 2–21.
- [72] Offit, Paul (2008). *Autism's False Prophets: Bad Science, Risky Medicine, and the Search for a Cure*. Columbia University Press: New York.
- [73] Ozonoff, S., Iosif, A.-M., Baguio, F., Cook, I. C., Hill, M. M., Hutman, T., et al. (2010). A prospective study of the emergence of early behavioral signs of autism. *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(3), 258–268.
- [74] Perry, A., & Condillac, R. (2003). *Evidence-based practices for children and adolescents with autism spectrum disorders: Review of the literature and practice guide*. Ontario, Canada: Children's Mental Health Ontario.
- [75] Perry, A., Cummings, A., Geier, J. D., Freeman, N. L., Hughes, S., Managhan, T., et al. (2011). Predictors of outcome for children receiving intensive behavioral intervention in a large community-based program. *Research in Autism Spectrum Disorders*, 5, 592–603.
- [76] Peters-Scheffer, N., Didden, R., Korzilius, H., & Matson, J. (2012). Cost comparison of early intensive behavioral intervention and treatment as usual for children with autism spectrum disorder in the Netherlands. *Research in Developmental Disabilities*, 33, 1763–1772.

- [77] Reed, P., Osborne, L. A., & Corness, M. (2007a). Brief report: Relative effectiveness of different home-based behavioral approaches to early teach intervention. *Journal of Autism and Developmental Disorders*, 37, 1815-1821.
- [78] Reed, P., Osborne, L. A., & Corness, M. (2007b). The real-world effectiveness of early teaching interventions for children with autism spectrum disorder. *Exceptional Children*, 73, 417-433.
- [79] Reichow, B. (2012). Overview of Meta-Analyses on Early Intensive Behavioral Intervention for Young Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders*, 42, 512-520.
- [80] Reichow, B., & Wolery, M. (2009). Comprehensive synthesis of early intensive behavioral interventions for young children with autism based on the UCLA Young Autism Project model. *Journal of Autism and Developmental Disorders*, 39, 23-41.
- [81] Remington, B., Hastings, R. P., Kovshoff, H., degli Espinosa, F., Jahr, E., Brown, T. & Ward, N. (2007). Early intensive behavioral intervention: Outcomes for children with autism and their parents after two years. *American Journal on Mental Retardation*, 112, 418-438.
- [82] Rogers, S. J., & Vismara, L. A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child and Adolescent Psychology*, 37, 8-38.
- [83] Sallows, G. O., & Graupner, T. D. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal on Mental Retardation*, 110, 417-438.
- [84] Schopler, E., Short, A., & Mesibov, G. (1989). Relation of behavioral treatment to normal functioning: Comment on Lovaas. *Journal of Consulting and Clinical Psychology*, 57, 162-164.
- [85] Sheinkopf, S. J., & Siegel, B. (1998). Home-based behavioral treatment of young children with autism. *Journal of Autism and Developmental Disorders*, 28, 15-23.
- [86] Schreibman, L. (2000). Intensive behavioral/psychoeducational treatments for autism: Research needs and future directions. *Journal of Autism and Developmental Disorders*, 30, 373-378.
- [87] Shea, V. (2004). A perspective on the research literature related to early intensive behavioral intervention (Lovaas) for young children with autism. *Autism*, 8, 349-367.
- [88] Smith, T. (1999). Outcome of early intervention for children with autism. *Clinical Psychology: Science and Practice*, 6, 33-49.
- [89] Smith, T., Eikeseth, S., Klevstrand, M., & Lovaas, O. I. (1997). Intensive behavioral treatment for preschoolers with severe mental retardation and pervasive developmental disorder. *American Journal on Mental Retardation*, 102, 238-249.
- [90] Smith, T., Eikeseth, S., Sallows, G. O., & Graupner, T. D. (2010). Efficacy of applied behavior analysis in autism. *The Journal of Pediatrics*, 155, 151-152.

- [91] *Smith, T., Groen, A. D., & Wynn, J. W. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation*, 105, 269-285.
- [92] Spreckley, M., & Boyd, R. (2009). Efficacy of applied behavioral intervention in pre-school children with autism for improving cognitive, language, and adaptive behavior: A systematic review and meta-analysis. *The Journal of Pediatrics*, 154, 338-344.
- [93] Steege, M. W., Mace, C., Perry, L., & Longenecker, H. (2007). Applied behavior analysis: Beyond discrete trial teaching. *Psychology in the Schools*, 44, 91-99.
- [94] Strauss, K., Vicari, S., Valeri, G., D'Elia, L., Arima, S., & Fava, L. (2012). Parent inclusion in early intensive behavioral intervention: The influence of parental stress, parent treatment fidelity and parent-mediated generalization of behavior targets on child outcomes. *Research in Developmental Disabilities*, 33, 688-703.
- [95] Sundberg, M. L., & Michael, J. (2001). The value of Skinner's analysis of verbal behavior for teaching children with autism. *Behavior Modification*, 25, 698-724.
- [96] Symes, M. D., Remington, B., & Brown, T. (2006). Early intensive intervention for children with autism: Therapists' perspective on achieving procedural fidelity. *Research in Developmental Disabilities*, 27, 30-42.
- [97] Virue's-Ortega, J. (2010). Applied behavior analytic intervention for autism in early childhood: Meta-analysis, meta-regression and dose-response meta-analysis of multiple outcomes. *Clinical Psychology Review*, 30, 387-399.
- [98] Zwaigenbaum, L., Bryson, S., Rogers, T., Roberts, W., Brian, J., & Szatmari, P. (2005). Behavioral manifestations of autism in the first year of life. *International Journal of Developmental Neuroscience*, 23, 143-152.

