



Cross-setting complementary staff- and parent-mediated Early Intensive Behavioral Intervention for young children with autism: A research-based comprehensive approach

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ABSTRACT

Although, recent reviews and outcome research support empirical evidence for Early Intensive Behavior Intervention in University and community settings, research has also indicated that not all intensive behavioral service provisions are equally effective. Therefore, it was necessary to comprehend key variables that are common to empirically validated programs. This paper provides a research-based comprehensive EIBI model which has been recently implemented in Italy. Important components include post-diagnostic provision, complementary treatment in clinical setting by professionals and parent-mediated in the child's natural environment, treatment based on applied behavior analysis–verbal behavior, staff and parent training, as well as evaluation of progress.

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1. Introduction

Researchers conducting treatment validation and outcome studies have agreed that evidence for the effectiveness of Early Intensive Behavior Intervention (EIBI) is substantial in producing improvements in cognitive, communication, social, and adaptive skills (Cohen, Amerine-Dickens, & Smith, 2006; Eikeseth, Smith, Jahr, & Eldevik, 2002; Eikeseth, Smith, Jahr, & Eldevik, 2007; Eldevik, Eikeseth, Jahr, & Smith, 2006; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Reed, Osborne, & Corness, 2007; Remington et al., 2007; Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000; Zachor, Ben-Izchak, Rabinovich & Lahat, 2007). Outcomes obtained from these studies are promising, but since the original Lovaas study (1987) methodological weaknesses have provoked a debate concerning the effectiveness of EIBI's. Matson and Smith (2008) enumerated methodological flaws that recent research fails to address adequately, such as sample size, use of matched control groups, multiple baseline and assignment strategies. Meta-analyses to summarize, integrate and interpret studies with sufficient methodologies are rare in the autism research field (Eldevik et al., 2009; Makrygianni & Reed, 2010; Peters-Scheffer et al., in press; Reichow & Wolery, 2009; Spreckley & Boyd, 2009). However, those published meta-analyses and meta-analytic reviews support the efficiency of applied behavior analysis (ABA) programs over standard care from not adequate (Spreckley & Boyd, 2009) to sufficiently provided (Reichow & Wolery, 2009).

Much remains to be done, nonetheless via identifying the most critical elements of treatment effectiveness. In order to provide a comprehensive EIBI program for young children with Autism Spectrum Disorder (ASD), we draw key variables from meta-analysis and systematic reviews on key treatment variables.

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Makrygianni and Reed (2010) provided a meta-analysis that addresses constraints of previous ones. Supporting the effectiveness of ABA approaches based on developmental gains, the authors detected factors that impact the developmental trajectory of children. Along with Makrygianni and Reed (2010) the basic key variables to account for change and to consider in our proposed comprehensive EIBI program are: intensity and duration of the program, parent training, as well as child's age and adaptive behavior functions at intake. Nevertheless, a number of questions went unaddressed in the literature and received little attention in implementation from clinical toward natural environment settings. In sum, inquiries into the relationship between intensity of treatment and the child's age, into the relationship of clinical setting and home-based approach, as well as into the advantages and difficulties of parental involvement (Matson & Smith, 2008).

The purpose of the following paper is to provide a research-based comprehensive EIBI model which has been recently implemented in Rome (Italy). Important components include post-diagnostic provision, complementary treatment in clinical setting by professionals and parents in the child's natural environment, treatment based on applied behavior analysis—verbal behavior, staff and parent training, and continuous evaluation of progress.

1.1. Post-diagnostic and intensive provision of treatment

We stress the need to provide a post-diagnosis program to pre-scholar young children with ASD and their families. A widespread consideration of early childhood intervention is, regardless of age at entry, that the more intensive the treatment is (in treatment hours and duration of therapy), the greater will be the gains for the child and the family. However, this tactic assumption needs to be differentiated for several points. It was shown that high-intensity treatments produce significantly greater developmental gains (Reed et al., 2007) and this pattern was outlined by recent meta-analyses of EIBI research (Makrygianni & Reed, 2010; Reichow & Wolery, 2009). Though, it was specified that effective EIBI programs are implemented for approximately 25 h per week, while raising the intensity above 25 h did not produce significant increases in outcome (Makrygianni & Reed, 2010). Further, it could not be demonstrated that exceeding an intervention over years increases the maintenance of developmental gains, which queries the general advice of a several years' clinical training. Indeed, Reed et al. (2007) could demonstrate marking a child's progress in an overall duration of 9–10 months of treatment. Moreover, it has been demonstrated that child's age at entry impact the treatment outcome (Harris & Handleman, 2000; Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Makrygianni & Reed, 2010). Particularly, starting an ABA program before the 35th month of age was found to be associated with progress in language and in intellectual disabilities (Makrygianni & Reed, 2010). Granpeesheh et al. (2009) differentiate this interaction in demonstrating that an increase in treatment hours and decrease in child age predict mastery of tasks and positive treatment outcome. Older age (remarkable in over 7 years old) was related to points of diminishing-returns from increased treatment hours where children began to burn out.

Based on these research findings, we provide a post-diagnosis program for 18 months to 7 years aged toddlers and young children with ASD in order to prevent that children fall consecutive behind, when remained untreated. This post-diagnostic EIBI program embeds an appropriate treatment intensity of maximum 29 h a week and duration of 12 months without engaging in unnecessarily intensive training with exhaustion of children, parents and staff as well as financial expenses.

1.2. Complementary staff- and parent-mediated treatment

Thus, EIBI programs in clinical settings have been shown to be effective, parental factors influence the effectiveness of EIBI, and child outcomes. One variable, besides parent's mental well-being, social economic status and parental education that affect a child's performance on EIBI is the level of parenting stress. Osborne, McHugh, Sounders, and Reed (2008) found that clinical EIBI programs, especially those with higher time-input, are less effective when parenting stress levels are high. Hastings and Johnson (2001) found no association between severity of ASD and increased risk for parental stress. Contrary, negative beliefs about the efficacy of the intervention were strongly predictive for increased parental stress. Moreover, teaching parents to provide the intervention leads to reduced feelings of depression, stress and increase feelings of empowerment (Brookman-Frazer, 2004). A variety of parent education programs in home-based settings address those considerations and are shown to be effective in EIBI programs (Makrygianni & Reed, 2010; Matson & Smith, 2008; Smith et al., 2000). However, limitations exist with these strategies. Several of the validated programs require extensive amount of time, possess limited access to validated intervention and are often not covered by insurances. Consequently, enrolled parents may face taking substantial time off work, long waiting lists and high expenses. Recent programs design short interventions implemented by a professional team. Communication and adaptive behavior improvements have been shown after 12-week parent-directed programs in single case home-based and large-scale investigations of community-based settings (Baker-Ericzèn, Stahmer, & Burns, 2007; Stahmer & Gist, 2001). However, those studies lack assessment of parent's mastery of the implemented techniques, thus whether the parents applied the procedures correctly is unknown. Vismara, Colombi, and Rogers (2009) transferred a brief parent training in a clinical setting and controlled the parent's acquisition of teaching procedures. All parents showed mastery of the Pivotal Response Techniques after 5–6 weeks out of a 12 weeks training (1 h a week). Once acquired, mastery skills were maintained for the 3 months following the end of the training, leading to lasting child's behavior change. These are promising results but lack facilitation of generalization and maintenance. Research suggests that EIBI need to be delivered in many of the child's daily environments to provide differential learning opportunities and encourage learning amongst normal family and peers activities. Therefore, one of the most critical elements of excluding natural environment is the generalization of skills across settings (Matson & Smith, 2008). Durability of intervention is related to both, maintenance of target behavior change across

time and its generalization across setting and persons. Variations of generalization prompts at the end of treatment are included in programs (Matson, Sevin, Box, Francis, & Sevin, 1993; Pierce & Schreibman, 1995) but miss out the opportunity of continuous facilitation of generalization across persons and of transition from clinical- to home-based settings. To accomplish advantages and encompass deficits of both settings, we propose an integrative approach of centre- and home-based treatment. Typically, programs advocate a period of individualized instructions prior to place in inclusive settings such as small groups in order to work on prerequisite behavioral skills (Anderson & Romanczyk, 1999; Harris & Handleman, 1994). Strain, McGee, and Kohler (2001) emphasize the fact that although the commonly held assumption of behavioral readiness greatly influences EIBI programming, there are no data to support this claim. Consequently, we do not fall in favor for any hierarchical application of one of the settings. The proposed model encompasses a initial 3-week clinical setting followed by alternating 3 weeks home-based training done by parents and 1-week follow-up of clinical setting done by professionals involving the parents for the duration of 1 year. Total treatment hours in a clinical setting are 29 per week.

Lastly, in our program we stressed the need to work both in structured environment (one-to-one room) and quasi-naturalistic environment which reproduces a typical school class (play group rooms) and to alternate with treatment made in a naturalistic environment such as at school and at home. All of that due to the focus of generalize and maintain the skills acquired at the clinical setting in a natural and everyday life environment of the children.

1.3. Centre-based program

The centre-based program provides two curriculums for each child: one-to-one training and an inclusive group program. Fundamental difference between group program and one-to-one training was the involvement of structured and quasi-naturalistic settings. In the structured setting of the one-to-one training the child and the operator are seated at a table for the target teaching trails, the child had limited choice of items and materials while consecutive trails of the target skill were processed. During the quasi-naturalistic setting in the group room the child was allowed to move to the floor, had unlimited choice in activities and greater wait times for spontaneous productions of target behavior were provided. This procedure was employed to raise opportunities for generalization of the skills target at the table in other more naturalistic settings. Moreover, spontaneous approaching of the child was supported by teaching functional use of toys in order to facilitate play routines and imitation of the child itself as well as in activities with peers.

The inclusive group program encompasses several learning opportunities in a free play and guided play setting. Each play room serves five children at once with a high operator-child ratio of 1–2. All groups of five children attend structured play sessions for 45 min three times a day and free play programs for 30 min three times a day. The total amount of structured and free play was 18 h a week. During free play sessions operators use prompts to encourage participation in peer games and to facilitate appropriate play routines and use of toys instead of wandering or other challenging behavior such as tantrum or stereotypes. During guided play sessions operators include children in process-based sensory and interaction play. The rooms are arranged like typical toddler classrooms, with toys appropriate for different levels of child functioning and different play routines to be acquired.

One-to-one training takes part in separated rooms with reinforcers under control of the operator. Each child attends the one-to-one training for 45 min three times a day with a total amount of 11 h a week. In the one-to-one training sessions the operator targets the individual skills and problem behaviors comprised in the child's curriculum.

Thus, each child follows a daily rotation of all three learning environments in the sequential order of free play, guided play group session, followed by the intensive one-to-one training for three times a day. This sequence was chosen in order to let the child going through more spontaneous environment such as a free play room to structured environment as present in the one-to-one rooms and viceversa.

1.4. Home-based program

During the alternating 3-week home-based phase, treatment is basically done by the trained parent. Home-based treatment follows an individual treatment plan of each child and has to be conducted for at least 2 h each day or respectively 14 h a week. Parents are provided with the given guidelines to accomplish teaching techniques, the individual treatment plan of their child including pre-defined material, setting and procedure to be used and reminders in form of video-recorded sessions out of the centre. During the period of 3 weeks home-based treatment, parents receive 2 h of weekly supervision either by phone or personal meetings and the possibility of joining a parent support group of additional 2 h a week.

2. Training

2.1. Staff training

Each operator needs to provide an academic degree, which is equivalent to a master degree in psychology or special education and experiences with children with ASD. New operators are provided with a comprehensive information package including: applied behavior analysis-verbal behavior (ABA-VB) theory, guidelines for teaching procedures and a manual for ABA-VB techniques. Further, following training is done: 15 working days of full time training in ABA-VB theory and practice where the content of the information package is reviewed and trained in live sessions with children with ASD. These 15

working days comprise seminars of 1 week on basic theoretical principles of ABA–VB, 1 week on advanced theoretical principles covering topics such as Natural Environment Teaching (NET), Discrete Trial Teaching (DTT), and 1 week of practical training providing 20 h of guidance in the applied setting.

While working with children, the operators get supervised by 2 experienced tutors with a minimum of 5 years experience with at least 20 children and the program director which is a certified clinical psychologist, CBT psychotherapist and holds a PhD in behavioral treatments.

2.2. Parent training

Parent training is conducted in a wide variety from group to individual training, home- and centre-based training using a multitude of tools such as manuals, curriculums, video training, live instructions, etc. In accordance to [Matson, Mahan, and LoVullo \(2009\)](#) regards toward parent training for children with ID parent training is conducted in a combination of intensive theoretical and practical teaching in centre-based setting. The basic concept of a parent training protocol lend support by [Ingersoll and Dvortcsak \(2006\)](#) who facilitated the generalization and maintenance of parent's teaching skills and child's progress by a 9 weeks combination of group and individual parent training.

An intensive parent training protocol was integrated and implemented in our EIBI program embedding two phases. The first phase took place during the initial phase of three consecutive centre-based weeks. Matching with the staff training, all parents undergo a theoretical training of basic ABA–VB principles and specialized teaching techniques in a total amount of 20 h a week. Practical training was initialized by 10 h of live streamed one-to-one training session with either one of the supervisors or the program director. Successive practical training merges from 10 h of shadowing in group play setting to 10 h of direct one-to-one training. At the end of the initial phase, the parents are staffed with a manual of procedures and teaching guidelines, an individual treatment plan of their child and video reminders from centre-based sessions. During the alternating weekly follow-ups in the centre, parents are shadowing in the conducted one-to-one sessions at least twice a day.

2.3. Treatment fidelity

Sessions done by the operators are randomly video-recorded once a day for each child in the one-to-one training and once a week in the group setting. During the home-based treatment, all parents are asked to record each home-based session by pre-defined skill acquisition sheets and video-tape at least 2 sessions a week. Videos are checked for treatment fidelity using a checklist that has been adopted from [Hayward, Gale, and Eikeseth \(2009\)](#) and which specifies treatment skills and applications. For both, operators and parent, the supervisors and the program director verify mastery of skills on ongoing clinical practice and supervise the treatment progress. Additionally, operators' development of professional skills, such as working with parents and assessing child's behavior was verified ([Symes, Remington, Brown, & Hastings, 2005](#)).

2.4. Treatment procedures

The treatment is based on the applied behavior analysis–verbal behavior (ABA–VB) approach. Principles of the ABA–VB are used to decrease behavioral excesses and developmental deficits circumscribed by the ASD core symptoms and to enhance a child's developmental progress in language and social skills.

2.5. ABA–VB teaching techniques

The treatment follows essential assumptions, principles and teaching techniques based on ABA–VB theory. Our basic approach to start teaching is the identification of the child's abilities and deficits that mark educational goals, target behaviors to be taught and enhance the child's motivation to learn.

Stimulus Preference Assessment is fundamental to individualize the potential reinforcement and materials to be used during each teaching process in order to move from sensory, edible and tangible reinforcers to social reinforcers such as praise and social attention.

Stimulus control and motivational operations represent antecedent variables, including the effects of stimulus conditions and changes which occur prior to behavior. Stimulus control is defined as a stimulus when preceding a response acquires an evocative effect on the relevant behavior. Essentially, the stimulus control is a stimulus which gives a signal that reinforcement is available given a certain response and mainly is acquired through discrimination training. Motivational operations are defined as establishing operation (EO) that alter the effectiveness either of some stimulus, objects or activity as reinforce and the current frequency of all behavior that has been reinforced by that stimulus, objects or activity.

In particular, the treatment focuses on the verbal behavior who is basically characterized by a set of *verbal operants* such as *Mand, Tact, Echoic and Intraverbal*. We teach the functional communication between the child and the environment taking into consideration the motivational operation in order to use the establish motivation effect at specific moment to obtain a certain reinforce for teaching the Mands. Thus, at the first we teach Mands and Echoics in a natural or quasi natural environment in order to let the child start to communicate in more adaptive and functional way, passing through teaching the Tact we arrive to teach the Intraverbal in a time when the child has acquired the previous verbal operants.

During *Discrete Trial Teaching* instructions and materials are presented to the child, that is physically or verbal prompted when needed to ensure task completion and receives appropriate reinforcement for target response.

Natural Environment Teaching aims to teach and modify behaviors during their natural occurrence and daily routines (home-based and clinical group-room setting). However, several target behaviors (such as toileting) may incorporate complex and parallel operations that need to be broken down in its single sequences (as it is done in DTT) to be taught efficiently.

Task analyses and chaining are used to decompose complex behaviors into its single sequences, which are equally applicable in teaching language. Language training starts on the basic level of the child language ability. In non-verbal children training starts at the most basic behavioral component of language, namely vocal imitation of sounds (echoic skill). All individual behavior sequences (in the case of language behavior components) would then be singularly taught and systematically chained together to build up the complexity of the full behavioral goal, using both, backward or forward chaining techniques.

In accordance with [Sundberg and Partington \(1999\)](#) we apply a combination of Discrete Trial Teaching (DTT) and Natural Environment Teaching (NET). This commitment to a combination of both teaching strategies is derived by the consideration that both approaches teach receptive and expressive language but focus on different verbal operants. Namely, DTT bases on Tact training and non-specific reinforcement of verbal and non-verbal stimuli, while NET contrasts in use of Mands training respective the child's current establishing operation (EO) and delivering specific reinforcement.

In each teaching unit prompts, prompt fading and shaping techniques are central. Whenever possible the last necessary prompt is used and each approximation of the target behavior is reinforced until mastery is achieved. Generally, the goal is to provide the consequence that naturally follows the target behavior.

Incidental Teaching facilitates spontaneous initiations of interaction of the child. Preferred stimuli are presented but remain basically unreachable, that stimulates the child to interact with the adult at the basis of its communication skills (each request such as indication until verbal communication). Successively, the child is prompted to request in a more appropriate way and receive the desired object as reinforce.

In accordance with [Cooper, Heron, and Heward \(2007\)](#) to reduce inappropriate and problem behavior we used various Reinforcement Techniques which includes Differential Reinforcement of Other Behavior (DRO), Differential Reinforcement of Incompatible Behavior (DRI), Differential Reinforcement of Alternative Behavior (DRA), and extinction. In *DRO* is applied if the child does not respond in an inappropriate manner within a pre-defined time span. *DRI* is applied when it is more efficient to reinforce a response that is forced by tasks that are incompatible with the inappropriate behavior. *DRA* reinforce instead a response that is a functional alternative to the inappropriate behavior. Each reinforcement method is combined with extinction procedures of inappropriate behavior through withholding a maintaining factor for a previously reinforced response.

When appropriate skills and behaviors are learned and maintained, generalization is the successive goal. *Generalization* is defined as a skill which has been learned in a structured environment and is being generalized in novel situations, with novel persons and in various settings different from that one where has been firstly acquired. Generalization is achieved mainly using various stimuli and presenters, thinning reinforcement schedules and utilizing natural reinforces which occurs spontaneously in the everyday life such as activity and social reinforces. This last point is essential due to the importance of defining an acquired skill, each skill is firstly often acquired in a structured environment, however that skill for being totally defined as acquired it should be reproduced in a generalized way with different persons, in different environment, and at different times.

2.6. Augmentative communication systems

Augmentative communication systems are introduced to teach functional communication through the *Picture Exchange Communication System* (PECS; [Frost & Bondy, 1994](#)) or *sign language* in children that do not have the basic verbal repertoire necessary to acquire new behaviors in the present learning environment. In addition, research has indicated that the use of augmentative communication systems does not interfere with verbal language acquisition when paired with spoken words ([Charlop-Cristy, Carpenter, Ie, LeBlanc, & Kellet, 2002](#)). Selection between augmentative communication systems includes the decision between selection-based (PECS) and topography-based forms of verbal behavior (sign language) that is often done based on program's philosophy or in preference due to teachers' training, but not necessarily due to more effective performance of the child ([Sundberg & Sundberg, 1990](#); [Sundberg, 1993](#)). Nevertheless, it has been demonstrated that individual children often indicate a preference for one introduced communication system over the other by using one system more readily ([Anderson, 2002](#)). Based on this consideration, both sign language and PECS are introduced to children who are entering the program without consistent vocalizations. As children exhibit a preference for one system over the other, the use of that system is intensified and the other is abandoned. Although communication systems may be more systematically trained during one-to-one training, they are applied naturalistically throughout the group-room and home-based setting while combined with the same instructional techniques such as verbal language. Both augmentative systems are paired with verbal language, and as the child develops spoken words, verbal language is targeted.

2.7. Case management/program planning

To each child a supervisor was assigned as responsible for the program planning and providing 1 h a day of supervision. Prior to development of individual programs and treatment, each child's skill strength and deficits are evaluated on the base of its

Table 1
Program domains and program examples.

Domain		Sample of program examples
Non-verbal imitation	Base intermediate advanced	Single movements, oral motor movements, actions with objects rebuilds constructions, continues sequences and patterns, imitates in mirror continues sequences and patterns using multiple objects, imitates to peer, delayed imitation
Verbal imitation	Base intermediate advanced	Sounds and vocals on request words, animal sounds word combinations, varying speed, varying inflection
Attention	Base intermediate advanced	Eye contact in response to name and objects sits in chair independently, eye contact in response to instructions, responds to instructions
Visuo-spatial ability	Base intermediate advanced	Matches identical categories 2D and 3D with and without discriminator objects to pictures, pictures to objects, matches by association, puzzles, sort by feature, class and function, seriating by size, quantity and sequence, mazes
Expressive language	Base intermediate advanced	Request by indicating, labels common objects, persons labels and request without item present, responding yes/no, takes choice, request attention, labels class and function labels emotions, actions, social behavior, responds to social questions, recalling events, request information using "wh.." questions
Receptive language	Base intermediate advanced	Identifies desired objects, persons, body parts, follows simple instructions identifies verb instructions, verbs in pictures, pictures in book, objects in environment, follows symbols identifies functions, possessions, environmental sounds, emotions, social interactions
Gross and fine motor skills	Base intermediate advanced	Walk forward with appropriate gait, roll sideway, hopping, place objects, single puzzles, transfer objects between hands throw balls, gallop, balance color with boundaries, remove lids, snips with scissor kick and bounce balls, jumping jacks replace lids, cuts out shapes, paste shapes and patters
Social interaction	Base intermediate advanced	Puzzle, sorting, toy play, play imitation, looks at others thematic play, pretend play, turn taking, mand from peer, sharing with others initiates to peer, enters play situations, social game play, observational learning, obtains and maintains attention
Pre-scholastic abilities	Base intermediate advanced	Makes marks on paper, colors between lines, differentiates quantities copy lines, curves, figures, add items to make specific quantity print lines, curves, figures, labels quantities,
Autonomy	Base intermediate advanced	Drinks by itself, removes clothes dressing, self-feeding, toilet training, sleep training, hand washing uses napkins, tooth brushing, tie shoes

performance in the Assessment of Basic Language and Learning Skills (ABLLS; Partington & Sundberg, 1998) done by the assigned supervisor. The ABLLS was used both to identify learning goals and to control either progress or regression during the treatment on the following domains: Cooperation and reinforcer, visual performance, receptive language, imitation, vocal imitation, requests, labeling, intraverbals, and spontaneous vocalizations. Interfering problem behaviors and effective reinforcers for acquisition of target skills were examined applying Functional Behavior and Stimulus Preference Assessments.

Individual programs were derived by nine domains to work on, chosen for their importance in early learning and divided into basic, intermediate and advanced skill levels (Table 1).

2.8. Transition planning

Research suggests that successful transitions for children with autism need intense parent–professional relationships and support for the future staff in program planning and monitoring in order to ensure that treatment gains are not lost (Forest, Horner, Lewis-Palmer, & Todd, 2004; Fox, Dunlap, & Cushing, 2002). Collaboration between centre staff, parents and school/nursery staff is achieved by transition planning, that begin as soon as placement is anticipated. Transition planning includes a comprehensive survey of current skills and difficulties of the child as a base to identify needs and to develop an ongoing treatment plan. The integration of future staff accounts for a successful transition of the child from the centre to a new placement in kindergarten or schools. Teachers receive preparation from the centre supervisor and program director that comprehend training in the individual educational goals, the treatment procedures and teaching strategies applied with the child. Follow-up is done every 6 months by an identified centre supervisor, both in the new placement and in the home to ensure the appropriateness of the change and ongoing child progress.

2.9. Assessment

Researchers suggest that the content of any EIBI program should comprehend all areas of deficits to be an effective intervention (Matson & Nebel-Schwalm, 2007; Matson, 2007). Child's and parent's comprehensive assessment toward strength and deficits are presented in Table 2 while the assessment protocol applied by external and objective psychiatric staff as well as in the centre are displaced in Table 3.

2.10. Child outcome

At intake of each child, a Stimulus Preference and Functional Behavior Assessment is conducted to investigate functional relationships between challenging behavior and specific environmental events and its linkage to positive, negative and

Table 2
Child's and parent's domains of strength and deficits assessed.

Diagnosis	ADI-R Language and communications, Reciprocal social interactions, Restrictive, repetitive, stereotyped behaviors and interest, Social communication	ADOS- G Reciprocal social interactions, Play Stereotyped behavior and restricted interests
ASD core symptoms	SCQ Cut-off	M-CHAT Cut-off
Adaptive skills	VABS-II Communication, Daily living skills, Socialization Motor skills, Maladaptive behavior	
Cognitive skills	Leiter-R Full scale IQ, ADHS screener	
Developmental stage	GMDS-ER 2-8 Locomotors, Personal-social, Language, Eye and Hand Coordination, Performance, Practical Reasoning	
Language skills	CDI Words and sentences, Words and gestures	
Comorbid psycho-pathologies	CBCL 1.5-5 Emotionally reactive, Anxious/depressed Somatic complaints, Withdrawn Sleep problems, Attention problems, Aggressive behavior	CBCL 6-18 Affective problems, Anxiety problems, Somatic problems, Conduct problems Attention deficit/hyperactivity Oppositional defiant problems
Child skill strength and deficit	ABLLS – R Cooperation & R+ effectiveness, Visual performance, Receptive language Imitation, Vocal imitation, Requests Labeling, Intra-verbal, Spontaneous vocalizations	
Challenging behavior/behavior function	QABF Attention, Escape, Non-social, Physical, Tangible	ASD-BPC Internalizing, Externalizing
Parental stress	PSI Child domain, Parent domain, Situational domain	
Parent needs assessment	Parent treatment priorities Perception of child's performance in skill area, Importance of treatment provision for skill area, Satisfaction with treatment provision for skill area	
Parent evaluation of treatment	Parent satisfaction survey Belief in EIBI efficiency, EIBI knowledge, Structure and organization, Building rapport	

automatic reinforcers in order to enhance reinforcement programs during sessions (Hanley, Iwata & McCord, 2003). Stimulus Preference Assessment comprises parent interview and observational trails with and without stimuli replacement. Functional Behavior Assessment involves a structured interview as well as parental report (QABF, Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2000). Resulting hypotheses of the behavioral function and its reinforcement are tested in observational trails specifying incidences of the aberrant behavior and its antecedent and consequent events (Hanley, Iwata & McCord, 2003). Observations embed four conditions – social positive reinforcement (attention), automatic positive reinforcement, social negative reinforcement (escape), tangible reinforcement – and a free play control condition.

Children's developmental state such as in language, cognitive function and ASD core symptoms were assessed at entry and in duration of the treatment. This procedure provides evidence about the child's developmental progress, enables adequate adaption of individual treatment plans and prevents conduction of ineffective treatment strategies. At termination of the treatment a comprehensive assessment as at entry is done with each child to determine the efficiency of the treatment and to base the transition to community setting such as kindergarten or school.

Prior to intake, the diagnosis of ASD was confirmed by the Autism Diagnostic Interview-Revised (ADI-R, Lord, Rutter, & LeCouteur, 1994) and the Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter, DiLavore, & Risi, 1999). As measures of ASD core symptom severity the Social Communication Questionnaire (SCQ, Rutter et al., 2003) and the Modified Checklist for Autism in Toddlers (M-CHAT, Robins, Fein, Barton, & Green, 2001) were applied. Adaptive behavioral functioning was

Table 3

Child's and parent's assessment prior, during and at termination of 1 year treatment.

External evaluation of child by external pediatrician and child psychiatrist	
Diagnosis	ADI-R + ADOS – G
ASD core symptoms	SCQ + M – CHAT
Adaptive skills	VABS – II
Cognitive skills	Leiter – R
Developmental stage	GMDS – ER 2 – 8
Language skills	CDI
Comorbid psychopathologies	CBCL 1.5-5/6-18
Parental stress	PSI
Prior to treatment centre-based evaluation of child by supervisor and centre director	
Child skill strength & deficit	ABLLS – R
Challenging behavior & behavior functions	ASD – BPC + QABF
Parent needs assessment	Parent treatment priorities - importance
6 month follow-ups	
Evaluation by external pediatrician and child psychiatrist	
Adaptive skills	VABS – II
Cognitive skills	Leiter – R
Developmental stage	GMDS – ER 2 – 8
Language skills	CDI
Parental stress	PSI
Evaluation by supervisor and centre director	
Child skills strength & deficits	ABLLS – R
Challenging behavior & functions	ASD – BPC + QABF
Termination of treatment	
Evaluation by external pediatrician and child psychiatrist	
ASD core symptoms	SCQ + M – CHAT
Adaptive skills	VABS – II
Cognitive skills	Leiter – R
Language skills	CDI
Comorbid psychopathologies	CBCL 1.5-5/6-18
Developmental stage	GMDS – ER 2 – 8
Parental stress	PSI
Evaluation by supervisor and centre director	
Child skills strength & deficits	ABLLS – R
Challenging behavior & functions	ASD – BPC + QABF
Parent needs assessment	Parent treatment priorities - satisfaction
Parent evaluation of treatment	Parent satisfaction survey

examined using the Vineland Adaptive Behavior Scales (VABS-II, Sparrow, Cicchetti, & Balla, 2005), while challenging behaviors were assessed with the Autism Spectrum Disorder-Behavior Problems for Children (ASD-BPC, Matson, Gonzalez, & Rivet, 2008). A measure of the child's cognitive, developmental and communicative stage is provided by the Leiter International Performance Scale (Leiter-R; Roid & Miller, 1997), the Griffiths Mental Development Scales (GMDS-ER 2–8; Luiz et al., 2006) respective the brief MacArthur Communication Inventories (CDI; Fenson, Pethick, Renda, & Cox, 2000). Early comorbid psychopathologies are identified with the Child Behavior Checklist (CBCL; Achenbach, 1991). Assessment is conducted at intake, at 6-month follow-up during treatment, at termination of treatment and 6-month follow-up after treatment.

2.11. Record of treatment

Continuous record of treatment was done on a trail by trail basis within each session based on the target behavior to learn. Data include motivational operation program applied, instructions, materials, prompts, and reinforcers used, response obtained and criteria of mastery.

Prompts were used in a more-to-least hierarchy that began more generally using verbal instructions to using specific prompts such as hand-over-hand physical guidance, and included fading procedures. Discrimination has been used between partial or total verbal and physical prompts.

Two measures of skill acquisition were used for each educational program trained: number of days to mastery single programs and number of days to mastery of complex domains (Weiss, 1999). Mastery of skills was determined by the supervisors on instance of 80% performance in at least 3 consecutive sessions. New programs were introduced after mastery in expanded trails (e.g. mastery in discrimination with previously mastered items). Full mastery of complex curricular domains was evaluated on the same instance (80%/3 sessions) but had to be generalized with a different operator.

2.12. Parent outcome

Parents are provided with the Parent Stress Index (PSI, Abidin, 1995) to gather the level of parental stress that is attributed to characteristics of the child, to functioning in the parental role and to situations in the parent life.

In order to meet parent needs and to gain an insight in parent's perception of the child's progress a needs assessment is done, that has been adapted from assessment of parent's treatment priorities (Pituch et al., in press). It has been decided to exclude questions of domestic living skills and job skills due to child's maximum age of 7 years. Thus, prior to treatment parents were asked to rate their perception of their child's disability in 37 adaptive skills as well as 10 problem behaviors. In addition parents are asked to rate the importance to receive a training that facilitate change for that ability respective behavior. At end of treatment parents are provided with the same schedule asking how far the perceived needs were met and the achieved child's progress is satisfactory.

Parent's satisfaction with the received care is assessed at end of treatment using the parent satisfaction survey adopted from Ingersoll and Dvortcsak (2006). The original parent satisfactions survey has been extended in regard to the comprehensive parent treatment priorities survey applied (Pituch et al., in press). Questions about belief that child's skill improvements relate to the received treatment have been supplemented for self-care skills, community living skills, recreational skills, motor skills, academic skills and problem behaviors.

2.13. Research

Applied behavior analysis–verbal behavior for children with ASD is a scientific treatment which enhance through treatment evaluation and methodology research. Claiming for a scientific treatment, we undergo research into outcome and treatment methodology (Schreibman, 2000). The spectrum of outcome research focuses (1) on inter-group differences examining factors that influence mastery of skills, generalization and maintenance of treatment progress in children with and without ID and pre-treatment verbal skills, and (2) on pre–post treatment outcome after 1 year using a matched control group design. The spectrum of research in treatment methodology focuses: (1) on providing evidence for continuous parent training/involvement, (2) treatment fidelity checks, and (3) Functional Behavior Assessment as core of achieving efficiency of treatment.

3. Conclusion

Children with autism have greatly benefited from EIBI programs and techniques. It is suggested in this article that it is possible to make further gains by comprehending several key elements of effective ABA programs and by including elements of verbal behavior analysis as a basis for assessment and intervention program. Key elements shared by effective ABA programs include: post-diagnostic early provision of treatment, combination of discrete trail and natural environment teaching, complementary treatment in clinical setting by professionals including the parent, parent-mediated treatment in the child's natural environment, extensive staff and parent training, control of treatment fidelity as well as sound and continuous evaluation of child's progress, and early transition planning. The purpose of the present paper is to provide an approach to integrate those key variables into an EIBI program.

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