Article 1

Autism and Education in Mainstream School Settings

Article 2

Behavioral Intervention for Children with Autism in Mainstream School Setting.

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Abstract

Traditionally most children with autism have attended special schools. In many countries this changed in the 1990s. Many children with autism where instead enrolled in their local mainstream school, with varying degree of help. Depending on the number of children attending a specific school, their education is often organized in smaller groups in separate classroom, either part of the day or the whole day. There is however, very little research based knowledge on how to organize and provide education for children with autism in the mainstream educational setting. There seems to be an argument that it needs to be highly individualized, but how exactly should the day be organized? How much one-to-one teaching should be provided? How much should be done in smaller groups and should the group consist of other children with autism or special needs or more typical children? In addition there is much debate over which teaching method to use. There are many research studies that have shown the effect of early intensive behavioral interventions for children with autism, but can a similar model be implemented in a mainstream school setting.

Autism

It is now 70 years since Leo Kanner published his research on autism in 1943, in which he introduced the term *early infantile autism,* identifying a unique group of children; "These characteristics from a unique "syndrome", not heretofore reported, which seems to be rare enough, yet is probably more frequent than is indicated by the paucity of observed cases" (p. 242). Kanner (1943) noted that many of the children had been diagnosed with schizophrenia at one point. He differentiated the two disorders by stating that a person with schizophrenia steps outside his or her world and departs from already existing relationships, whereas the children he described had never established such relationships, experiencing an extreme aloneness from very early on (Kanner, 1943; Blacher & Christensen, 2011).

Just one year later Hans Asperger published an account of four children with typical intellectual functioning and speech, but with significant impairment in social interactions and restricted stereotyped patterns of interests and behaviors (Asperger, 1944, 1991). Published during the war years and in German, Asperger´s observations went largely unnoticed and were not translated into English until 1991 by Frith. Asperger´s writings were quite similar to Kanner´s. He coined the term *autism* or *autistic psychopathy* to describe the children he observed and similarly indicated that the syndrome he described was distinct from childhood schizophrenia. Unlike Kanner, however, he believed that the syndrome he described was rarely, if ever, recognized in infancy (Blacher & Christensen, 2011; Frith, 1991: Wing, 1981).

The idea that autism may have spectrum qualities was introduced by Wing (1981, 1997) who argued that disruption in reciprocal social interaction was the key component in a spectrum of disorders and could be accompanied by a variety of other impairments. Although Kanner (1943) suggested that autism was highly stigmatizing, his labeling of the disorder was

the beginning of autism awareness. Kanner and Asperger´s work is as important today as the first step in proper diagnosis and treatment.

Today we often use the term autism spectrum disorders (ASD), and it is suggested to include childhood autism, atypical autism, Asperger syndrome, pervasive developmental disorders not otherwise specified (PDD-NOS), and autism is not a single condition it is a spectrum disorder that results in individuals presenting with a wide range of abilities and disabilities (Heflin & Simpson, 1998a; Iovannone, Dunlap, Huber & Kincaid, 2003). ASD refers to a continuum of disorders that ranges from severe to mild (Blacher & Christensen, 2011; Neisworth & Wolfe, 2005 Stahmer, Collings & Palinkas, 2005), and are a group of complex developmental disorders which are heterogeneous both in etiology, clinical phenotype, outcomes and concurrent comorbidities. Common characteristics are reduced interest in socializing and/or reduced ability in communication and to interact verbally, couples with limited range of interests and/or stereotypic behavior patterns (Blacher & Christensen, 2011; Isaksen et al., 2012; Zablotsky, Boswell & Smith, 2012).

ASD has increased markedly over the past few decades (Fombonne, 2003; Newschaffer & Curran, 2003). The reason for this increase are a matter of debate; some argue that this group of disorders is becoming more common (Blaxill, 2004), while others attribute the increase to broadening of diagnostic criteria, greater awareness among parents and professionals, and improved case-finding methods (Fombonne, 2003; Charman, 2002; Wing & Potter, 2002; Coo et al., 2008). Autism spectrum disorder is a lifelong disorder, usually diagnosed before four years of age and persisting through adulthood, with no identified etiology or cure.

In a Norwegian study by Sponheim and Skjeldal (1998) the prevalence rate was estimated to 5.3 pr 10.000, while a recently conducted Norwegian prevalence study by

Isaksen, Diseth, Schjølberg and Skjeldal (2012) including 31.015 children (age 6 – 12) showed a prevalence rate of 51 per 10.000 for ASD. Several studies outside Norway have demonstrated the same trend. A British cohort study has reported the highest prevalence of ASD in Europe so far with 116 per 10.000, whereas a newly published South-Korean prevalence report estimates 264 per 10.000 (in Isaksen et al., 2012). Fombonne (2003) estimated that in the United States between 55,602 and 121,324 adolescents between the age of 15 and 19 have an ASD.

The increase in the number of students with ASD along with the explosion in the quantity of ineffective interventions converge to create a critical need to examine the nature, type, and frequency of educational services provided to students with ASD enrolled in public schools. Related to the increase in the number of students with ASD in the school system, there has been a significant increase in the number of contested Individualized Education Programs (IEP) (Heflin & Simpson, 1998b, Hurth, Shaw, Izeman, Whaley & Rogers, 1999; Iovannone et al., 2003). With appropriate training and education individuals with ASD can integrate meaningfully into the community (Schall, Cortijo-Doval, Targett & Wehman, 2006) and work competitively (Gerhardt & Holmes, 2005; Hurlbutt & Chalmers, 2004).

Education for children with autism

There is no longer a question of whether the local educational system will encounter children with ASD, but when and how. In 2005 Simpson and colleagues (2005) evaluated the scientific evidence for 37 interventions and treatments for children with ASD in preschool and school. As a matter of organization, interventions were divided into five broad categories based upon the main feature of the treatment; (a) Interpersonal Relationships, (b) Skill-based, (c) Cognitive, (d) Physiological, Biological, Neurological, and (e) Other. The interventions included in the evaluation reflect a variety of treatments that families frequently choose.

Simpson and his colleagues also conducted reviews of literature for each of the individual treatments and then rated them using the following criteria: (a) Scientifically-based, those with evidence of benefit following substantial, scrupulous research, (b) Promising practice, those witch have been used for time with no or limited adverse results and/or have research suggestive of beneficial outcome, but warrant further investigation, (c) Limited support, treatments which have limited research and have been widely used or those with a range of reported results, and (d) Recommended, interventions of treatment that have been proven ineffective or have unfavorable effect on some. Of the 37 treatments evaluated 11 % (n=4) were considered scientifically-based, 35 % (n=13) were considered a promising practice, 49 % (n=18) had limited support of their use, and 5 % (n=2) were not recommended for practice with children with ASD. This lead to the question of how these objective classifications of interventions compare to treatments children are actually receiving in public schools (Simpson et al., 2005).

Although, one specific treatment has not emerged as the established standard for all children with autism, research reviews have described several methods that have been demonstrated to be efficacious with some children with autism in research settings. The well-researched programs are treatments based on the principles of applied behavior analysis (Dunlap, 1999; Heflin & Simpson, 1998a, 1998b; National Research Council, 2001; Odom, Brown, Frey, Karasu, Smith-Canter & Strain, 2003; Rogers, 1998), which represents a wide range of early intervention strategies for children with autism.

What is applied behavior analysis?

The term behavior analysis was coined by B. F. Skinner, and many consider him to be the father of behavior analysis. Skinner contribution to psychology is (among many other) that he considered thinking and feelings as covert forms of behavior.

Thoughts and feelings do not explain behavior; they are more behavior to be explained (Skinner, 1953, 1974). Skinner thought that the concept of the mind belonged to the philosophers, and that science should focus on behavior. He labelled the opposing view *methodological behaviorism* and his own view *radical behaviorism*. Methodological behaviorism was based on realism and they distinguished between the objective world and the subjective world (Baum, 2005). Radical behaviorism is based on pragmatism. They reject the dualism of inner and outer world as and instead propose a science based on behavior in one world. The methodological behaviorist tries to describe behavioral events in terms as mechanical as possible, as close to physiology as possible. "*The mind – body problem has never been and never will be solved, because it is a pseudo-question, a question that itself makes no* sense" (Baum, 2005 s. 43). A radical behaviorist consider private events, if they need to be spoken of at all, as natural and shearing all the properties of public behavior. Even if they are to be spoken of, their origins lie in the environment, just like other behavior. Behavior never originates in private events (Baum, 2005). Skinner proposed to exclude terms like, mind, intelligence, reason and belief from behavior analysis. Ryle thought that the term might be useful if we could avoid using them illogically (Baum, 2005; Holth, 2001; Ryle, 1949). Behaviorism is a set of ideas about the science called behavior analysis, and not the science itself, but the philosophy of science (Baum, 2005).

The field of Behavior Analysis grew out of the scientific study of principles of learning and behavior. It has two main branches: experimental and applied behavior analysis. The Experimental Analysis of Behavior (EAB) is the basic science of this field and has over many decades accumulated a substantial and well-respected body of research literature. In a series of studies using mouse models of some mental retardation syndromes and neurological disorders, they have demonstrated that behavior analytic discrimination training reversed abnormalities in brain structures and neurotransmitter levels as well as learning and behavior.

Training was most effective when it began early in development (Loupe, Schroeder & Tessel, 1995; Stodgell, Schroeder & Tessel, 1996; Tessel, Schroeder, Loupe & Stodgell, 1995; VanKeuren, Stodgell, Schroeder & Tessel, 1998). This literature provides the scientific foundation for applied behavior analysis, which is both an applied science that develops methods for changing behavior and a profession that provides services to meet diverse behavioral needs

In Applied Behavior Analysis (ABA) individual analysis of a child´s functioning are undertaken to identify and task analyze skills needed for improved performance and functioning. Subsequent to such identification, systematic teaching and intervention methods are used to train the child to independently perform desired responses. A salient element of ABA is precise and ongoing performance evaluation. ABA is a highly utilitarian and efficacious method based on analysis and manipulation of antecedent conditions, consequences and other documented instructional methods, such as shaping and fading. The field of ABA has always rested on the fundamental principle that the empirical demonstration of measurable changes in behavior must be related to systematic and controlled manipulations in the environment. That is, the observed changes in the dependent variable (behavior) must be attributed to changes in the independent variable (some events). Without this empirical demonstration, a true science of human behavior is an impossibility (Skinner, 1953). Without objective and documented specification of an independent variable as well accurate independent variable application, definitive conclusion regarding the relation between an independent variable and a dependent variable are compromised (McIntyre, Gresham, DiGennaro & Reed, 2007). Based on the above it should be clear that contrary to common misconception; ABA is not a procedure specific to students with autism. Rather it is a general strategy that has wide applicability to various groups and settings.

Early intensive behavioral intervention (EIBI)

Outcome studies have shown early and intensive behavioral intervention (ABA) may improve intellectual, language and adaptive functioning in children with autism (Cohen, Amerine-Dickens & Smith, 2006; Eikeseth, Smith, Jahr & Eldevik, 2002, 2007; Hayward, Eikeseth, Gale & Morgan, 2009; Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Lovaas, 1987; Lovaas & Smith, 1989; Remington et al., 2007; Sallows & Graupner, 2005). The likelihood that effective early intervention can produce lasting neurobiological as well as behavioral changes has been suggested by research showing that early experiences play a critical role in shaping architecture as well as brain function (Dawson & Fischer, 1994; Shore, 1997).

Lovaas (1987) reported an average difference of 31 points on IQ tests between the treatment and control group, and nine of 19 (47 %)children in that study who received early intensive behavior analytic treatment for at least 2 years had cognitive and language test score in the normal range by the age of 6 – 7 years and completed first grade without special instruction. In contrast few gains were made by children with autism in two control groups who received either 10 h behavior analytic treatment per week or typically available community services over the same time period. A follow-up study found that the "best outcome" children from the Lovaas study continued to function normally into adolescence. The study by Lovaas (1987) was singular for documenting substantially improved functioning in a sizeable proportion of children who received comprehensive, intensive, long-duration behavior analytic intervention starting before they reached four years of age (McEachin, Smith & Lovaas, 1993). In a systematic review of interventions for young children with autism Rogers and Vismara (2008) found that EIBI, or what they call the "Lovaas treatment approach", should be considered "well established" and that no other intervention presently qualified for this status.

EIBI programs, including the Lovaas treatment approach, have been described by Green, Brennan and Fein (2002) as having the following common elements; [1] intervention is individualized and comprehensive, addressing all skill domains, [2] many behavior analytic procedures are used to build new repertoires and reduce interfering behavior (e.g. differential reinforcement, prompting, discrete-trial instruction, incidental teaching, activity-embedded trials, task analysis and other), [3] one or more individuals with advanced training in applied behavior analysis and experience with young children with autism to direct the intervention, [4] normal developmental sequences guides the selection of intervention goals and short-term objectives, [5] parents serve as active co-therapists for their children, [6] intervention is delivered in one-to-one fashion initially with gradual transition to small-group and large-group formats when warranted, [7] intervention typically begins in the home with gradual systematic transition to kindergarten, preschool and elementary school, when children develop the skills required to learn in those settings, [8] programming is intensive, includes 20 – 30 h of structured session per week and are practiced throughout the year and for most of the child´s waking hours, [9] in most cases the duration of intervention is two, or more years, and [10] most children start intervention when they are 3 to 4 years of age.

Mainstream educational settings and autism

Many outcome studies, reviews and meta-analysis have reported the results of early intensive behavioral interventions for young children with autism, but what happens with these children when they begin school. A study by Harris and Hendleman (2000) evaluated educational placement for children who had participated in an intensive applied behavior analysis center-based treatment program for children with autism. The participants were 27 children who had entered the Douglas Developmental Disabilities Center at Rutgers University. All children were diagnosed with autism spectrum disorders from an outside source. The children were tested with standardized IQ test and with the CARS at admission

and at discharge. The children's mean age at time of admission was 49 months, range 31 – 65 months, and their mean IQ was 59, range 35 – 109. At the time of follow-up the mean age was 142 months, range 122 – 170. The children's IQ´s had increased considerably at the time of discharge, and higher intake IQ was associated with better prognosis. Among children with a discharge IQ of 80 or more, 11 were included in regular classes and 3 were in special education classes and by contrast for the 13 children with IQ´s of 76 or less, all went to special education classes.

Eikeseth and colleagues (2002) published an evaluation of ABA-based comprehensive educational intervention for children with autism in preschool and elementary school setting. Progress of 13 children who received 28 hours per week of behavioral intervention was compared with the progress of 12 children who received 29 hours per week of eclectic special education intervention. Both interventions took place in public mainstream preschools and elementary schools. After 1 year standard scores for children in the behavioral intervention group increased by an average of 17 points in IQ and 11 points in adaptive behavior. These gains were significantly larger than the changes in the eclectic group where there was an average of 4 points in IQ and no change in adaptive behavior. All children in the behavioral intervention group continued with the intervention for another one to two years, when they were tested again and all children in the eclectic group remained in special education programs that combined a variety of approaches. The follow-up showed that the differences between the groups were maintained (Eikeseth et al., 2007).

The mainstream school setting provides a fertile ground for delivering effective social skills programming, but it also presents formidable obstacles. The school day is filled with abundant opportunities to interact with peers in a natural social environment. Schools are often relied upon to shoulder the responsibility of delivering social skills programming to children with social skills deficits, because the presence of these deficits significantly

interferes with social relationships and has a deleterious impact on academic performance (Welsh, Parke, Widaman & O´Neil, 2001). However, implementing social skills programming in schools can be challenging for school personnel, who often are presented with limited time, resources, and training (Bellini, Peters, Benner &Hopf, 2007).

Bellini and colleagues (2007) provided a meta-analysis of school-based social skills interventions. The purpose of the study was to provide a quantitative synthesis of existing single-subject research on school-based social skills interventions for children with ASD. The results of this meta-analysis suggest that school-based social skills interventions are minimally effective for children with ASD. Specifically, social skills intervention produced low treatment effects and low generalization effects across participants, settings, and play stimuli. Moderate maintenance effects were observed, suggesting that gains made via social skills interventions are maintained after the intervention is withdrawn. Furthermore, similar intervention, maintenance, and generalization effects were observed between interventions targeting collateral skills (e.g. play skills, joint attention, and language skills) and interventions targeting specific social behaviors (e.g. social initiation, social responses, and duration of interaction). The low treatment effects observed in the present study are consistent with the results of previous social skills intervention meta-analysis (Mathur, Kavale, Quinn, Forness & Rutherford, 1998; Scruggs & Mastropieri, 1994).

Although social skills deficits are a central feature of ASD, few children receive adequate social skills programing (Hume, Bellini & Pratt, 2005; Bellini et al., 2007). This is a troubling reality, especially considering that the presence of social impairments may portend the development of more detrimental outcomes, such as poor academic achievement, social failure and peer rejection, anxiety, depression, substance abuse and other forms of psychopathology (Bellini, 2006; La Greca & Lopez, 1998; Tantam, 2000; Welsh et al., 2001; Bellini et al., 2007). Research has demonstrated that social and academic competences are

related (Wentzel, 1993; Parker & Asher, 1987; Bursuck & Asher, 1986). However, the nature of this relation needs to be better understood.

Very little research has been conducted to evaluate the effects of mainstream school-based behavioral intervention for children whit ASD. A school-based intervention is likely to be a less intensive model because intervention is delivered during school hours, typically not during vacation periods, and haves less parent involvement. I have found very few evaluation studies of comprehensive behavioral interventions in mainstream and special school settings for children with autism using standardized test outcomes (Grindle et al., 2012; McGarrell, Healy, Leader, O´Connor &Kenny, 2009: Waddington & Reed, 2009).

However, to more fully influence autism practice, behavioral intervention models need to be evaluated in mainstream contexts.

References

Asperger, H. (1944). Die “autistischen psychopathen” im kindersalter. *Archives fur Psychiatrie und Nervenkrankheiten,* 117, 76 – 136.

Asperger, H. (1991/1944). “Autistic psychopathology” in childhood. In U. Frith (Ed.), *Autism and Asperger syndrome* (pp. 37 – 92). New York; Cambridge University Press.

Baum, W.M. (2005). *Understanding Behaviorism.* Malden. MA: Blackwell Publishing

Bellini, S. (2006). The development of social anxiety in high functioning adolescents with autism spectrum disorders. *Focus on Autism and Other Developmental Disorders*. 21, 138 – 145. doi: 10.1177/10883576060210030201

Bellini, S., Peters, J.K., Benner, L. &Hopf, A. (2007). A Meta-Analysis of School-Based Social Skills Interventions for Children with Autism Spectrum Disorders. *Remedial and Special Education*, 28,(3), 153 – 162. doi: 10.1177/07419325070280030401

Blacher, J. & Christensen, L. (2011). Sowing the seeds of the autism field: Leo Kanner (1943). *Intellectual and Developmental Disabilities,* 49(3), 172 – 191. doi:10.1352/1934-9556-49.3.172

Blaxill, M.F. (2004) .What´s going on? The question of time trends in autism. *Public Health Reports*, 119(6), 536 – 551. doi:10.1016/j.phr.2004.09.003

Charman, T. (2002) The prevalence of autism spectrum disorders: Recent evidence and future challenges. *European Child and Adolescent Psychiatry*, 11(6), 249 – 256. doi:10.1007/s00787-002-0297-8

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(2), 145 – 155. doi:10.1097/00004703-200604002-00013

Coo, H., Ouellette-Kuntz, H., Lloyd, J., Kasmara, L., Holden, J.J. & Lewis, M. (2008) Trends in autism prevalence: Diagnostic substitutions revisited. *Journal of Autism and Developmental Disorders*, 38, 1036 – 1046. doi:10.1007/s10803-007-0478-x

Dawson, G. & Fischer, K.W. (Eds.) (1994). *Human behavior and the developing brain.* New York: Guilford.

Dunlap, G. (1999). Consensus engagement and family involvement for young children with autism. *The Journal of the Association for Persons with Severe Handicaps*, 24(3), 222 – 226. doi:10.2511/rpsd.24.3.222

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. doi:1177/0145445502026001004

Eikeseth, S., Smith, T., Jahr, E. &Eldevik, S. (2007). Outcomes for children with autism who began behavioral treatment between ages 4 and 7: A comparison controlled study. *Behavior Modification*, 31, 264 – 278. doi:10.1177/0145445506291396

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 for Intellectual and Developmental Disabilities*, 115, 381 – 405. doi:10.1352/1944-7558-115.5.381

Fombonne, E. (2003) The prevalence of autism. *The Journal of the American Medical Association*, 289, 87 – 89. doi:10.1001/jama.289.1.87

Frith, U. (1991). *Autism and Asperger syndrome* (pp. 37 – 92). New York; Cambridge University Press.

Gerhardt, P.F. & Holmes, D.L. (2005). Employment: Options and issues for adolescents and adults with autism spectrum disorders. In F.R.Volkmar, R. Paul, A. Klin, & D. Cohen, (Eds.). *Handbook of autism and pervasive developmental disorders, Vol 2: Assessment, interventions and policy* (3rd ed., pp. 1087 – 1101). New York: John Wiley.

Harris, S.L. & Handleman, J.S., (2000) Age and IQ at Intake as Predictors of Placement for Young Children with Autism: A Four – to Six-Year Follow-up. *Journal of Autism and Developmental Disabilities*, 30,(2), 137 – 142. doi: 0162-3257/00/0400-0137$18.00/0

Hayward, D.W., Eikeseth, S., Gale, C.M. & Morgan, S. (2009). Assessing progress during Treatment for young children with autism receiving intensive behavioral interventions. *Autism,* 13(6), 613 – 133. doi: 10.1177/1362361309340029

Hayward, D.W., Gale, C.M. & Eikeseth, S. (2009). Intensive behavioral intervention for young children with autism: A research-based service model. *Research in Autism Spectrum Disorders,* 3, 571 – 580. doi:10.1016/j.rasd.2008.12.002

Heflin, L.J. & Simpson, R.L. (1998a). Interventions for children and youth with autism: Prudent choice in a world of exaggerated claims and empty promises. Part 1: Intervention and treatment option review. *Focus on Autism and Other Developmental Disabilities*, 13(4), 194 – 211. doi: 10.1177/108835769801300401

Heflin, I.J. & Simpson, R.I. (1998b). Intervention for children and youth with autism: Prudent choices in a world of exaggerated claims and empty promises: Part II: Legal/policy analysis and recommendations for selecting interventions and treatments. *Focus on Autism and Other Developmental Disabilities,* 13(4), 212 – 220. doi: 10.1177/108835769801300402

Holth, P. (2001). On the persistence of category mistakes in psychology. *Behavior and Philosophy,* 29, 203 – 219. URL: http//www.jstor.org/stable/27759428

Howard, J.S., Sparkman, C.R., Cohen, H.G., Green, G. & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities,* 26, 359 – 383.doi:10.1016/j.ridd.2004.09.005

Hume, K., Bellini, S. & Pratt, C. (2005). The usage and perceived outcomes of early intervention and early childhood programs for young children with autism spectrum disorder. *Topics in Early Childhood Special Education*, 25, 195 – 207. doi: 10.1177/02711214050250040101

Hurlbutt, K. & Chalmers, L. (2004). Employments and adults with Asperger syndrome. *Focus on Autism and Other Developmental Disabilities,* 19(4), 215 – 222. doi: 10.1177/10883576040190040301

Hurth, J., Shaw, E., Izeman, S.G., Whaley, K. & Rogers, S.J. (1999). Areas of agreement about effective practices among program serving young children with autism spectrum disorders. *Infants and Young Children,* 12(2), 17 – 26.

Iovannone, R., Dunlap, G., Huber, H. & Kinkaid, D. (2003). Effective educational practice for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 18(3), 150 – 165. doi:10.1177/10883576030180030301

Isaksen, J., Bryn, V., Diseth, T.H., Heiberg, A., Schjølberg, S. & Skjeldal, O.H. (2012). Children with autism spectrum disorders – The importance of medical investigations. *European Journal of Paediatric Neurology*, (in-press) http://dx.doi.org/10.1016/j.ejpn.2012.08.004

Isaksen, J., Diseth, T., Schjølberg, S. & Skjeldal, O.H. (2012). Observed prevalence of autism spectrum disorders in two Norwegian countries.

European Journal of Pediatric Neurology, 16(6), 592 – 598. doi:10.1016/j.ejpn.2012.01.014

Kanner, L. (1943). Autistic disturbances of affective contact.

Nervous Child, 2, 217 – 250.

Kanner, L. (1949). Problems of nosology and psychodynamics in early childhood autism.

American Journal of Orthopsychiatry, 19(3), 416 – 426. doi:10.1111/j.1939-0025.1949.tb05441.x

La Greca, A.M. & Lopez, N. (1998). Social anxiety among adolescents: Linkages with peer relations and friendship. *Journal of Clinical Child Psychology*, 26, 83 – 94 .

doi: 10.1023/A:1022684520514

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

doi: 10.1037/0022-006X.55.1.3

Lovaas, O.I. & Smith, T. (1989). A comprehensive behavioral theory of autistic children: Paradigm for research and treatment.

Journal of Behavior Therapy and Experimental Psychiatry, 20(1), 17 – 29. doi:10.1016/0005-7916(89)90004-9

Lupe, P.S., Schroeder, S.R. & Tessel, R. (1995). FR discrimination training effects in SHR and microencephalic rats.

Pharmacology, Biochemistry and Behavior, 51(4), 869 – 876.

doi:10.1016/0091-3057(95)00061-Z

Mathur, S.R., Kavale, K.A., Quinn, M.M., Forness, S.R. & Rutherford, R.B. (1998).

Social skills intervention with students with emotional and behavioral problems: A quantitative synthesis of single subject research.

Behavioral Disorders, 23(3), 193 – 201.

McEachin, J.J., Smith, T. & Lovaas, O.I. (1993). Long-term outcome for children with autism who received early intensive behavior treatment.

American Journal on Mental Retardation, 97, 359 – 372.

McIntyre, L.L., Gresham, F.M., DiGennaro, F.D. & Reed, D.D. (2007) Treatment integrity of school-based interventions with children in the journal of applied behavior analysis 1991 – 2005. *Journal of Applied Behavior Analysis,* 40, 659 – 67.

doi: 10.1901/jaba.2007.659-672

National Research Council. (2001). *Educating children with autism.*

Washington, DC: National Academy Press.

Neisworth, J.T. & Wolfe, P.S. (2005). *The autism encyclopedia.*

Baltimore: Brookes.

Newschaffer, C.J. & Curran, L.K. (2003). Autism: an emerging public health problem. *Public Health Reports*, 118(5), 393 – 399.

Odom, S.I., Brown, W.H., Frey, T., Karasu, N., Smith-Canter, I.L. & Strain, P.S. (2003). Evidence-based practice for young children with autism: Contributions of single subject design research. *Focus on Autism and Other Developmental Disabilities*, 18, 166 - 175. doi: 10.1177/10883576030180030401

Parker, J.G. & Asher, S.R. (1987). Peer relations and later personal adjustment: Are low-accepted children at risk? *Psychological Bulletin*, 102, 357 – 389. doi: 10.1037/0033-2909.102.3.357

Remington, B., Hastings, R.P., Kovshoff, H..Espinosa, F., Jahr, E., Brown, T., Alsford, P., Lemaic, M. & 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. doi: 10.1352/0895-8017(2007)112[418:EIBIOF]2.0.CO;2

Rogers, S.J. (1998). Empirically supported comprehensive treatments for young children with autism. *Journal of Clinical Child Psychology*, 27, 268 – 179. doi:10.1207/s15374424jccp2702_4

Rogers, S.J. & Vismara, L.A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child & Adolescent Psychology*, 37, 8 – 38. doi:10.1080/15374410701817808

Ryle, G. (1949). Descartes´ myth. I G. Ryles. *The concept of mind* (pp. 13 – 25). New York: Barnes & Noble. Inc.

Sallows, G.O. & Graupner, T.D. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal of Mental Retardation*, 110, 417 – 438.

Schall, C., Cortijo-Doval, E., Targett, P.S. & Wehman, P. (2006). Applications for youth with autism spectrum disorders. In P. Wehman (Ed.). *Life beyond the classroom: Transition strategies for young people with disabilities* (4th ed., pp. 535 – 575). Baltimore, Maryland: Brookes Publishing Co.

Scruggs, E.T. & Mastropieri, M.A. (1994). The effectiveness of generalization training: A quantitative synthesis of single subject research. In T.E. Scruggs & M.A. Mastropieri (Eds.) *Advances in learning and behavioral disabilities*. Greenwich. Ct: JAI Press. (Vol. 8. p. 259 – 280).

Shore, R. (1997). *Rethinking the brain: New insights into early development.* New York: Families and Work Institute.

Simpson, R.L., de Boer-Ott, S.R., Griswold, D.E., Myles, B.S., Byrd, S.E., Ganz, JJ.B., Cook, K.T., Otten, K.L., Arich, J.B., Kline, S.A. & Adams, L.G. (2005). *Autism spectrum disorders: Interventions and treatments for children and youth.* Thousand Oaks, CA: Corwin Press.

Skinner, B.F. (1953). *Science and Human Behavior.* New York NY: the Free Press

Skinner, B.F. (1974). *About Behaviorism.* New York: Alfred A. Knopf, Inc.

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(4), 269 – 285.* doi: 10.1352/0895-8017(2000)105<0269:RTOIEI>2.0.CO;2

Sponheim, E. & Skjeldal, O. (1998). Autism and related disorders: Epidemiological findings in a Norwegian study using ICD-10 diagnostic criteria. *Journal of Autism and Developmental Disorders,* 28(3), 217 – 227. doi:10.1023/A:1026017405150

Stahmer, A., Collings, N.M. & Palinkas, L.A. (2005). Early intervention practices for children with autism: Descriptions from community providers. *Focus on Autism and Other Developmental Disabilities*, 20(2), 66 – 79. doi:10.1177/10883576050200020301

Stodgell, C.J., Schroeder, S.R. & Tessel, R.E. (1996). FR discrimination training reverses 6-hydroxydopamine-induced striatal dopamine depletion in a rat model of Lesch-Nyhan syndrome.

Brain Research, 713(1), 246 – 252. doi:10.1016/0006-8993(96)80777-3

Tantam, D. (2000). Psychological disorder in adolescents and adults with Asperser syndrome.

Autism, 4, 47 – 62. doi: 10.1177/1362361300004001004

Tessel, R.E., Schroeder, S.R., Loupe, P.S. & Stodgell, C.J. (1995). Reversal of 6HD-induced neonatal brain catecholamine depletion after operant training.

Pharmacology, Biochemistry and Behavior, 51(4), 861 – 867.

doi:10.1016/0091-3057(95)00062-2

Topor, D.R., Keane, S.P., Shelton, T.L. & Calkins, S.D. (2010). Parent involvement and student academic performance: A multiple meditational analysis.

Journal of Prevention and Intervention in the Community, 38(3), 183 – 197. doi:10.1080/10852352.2010.486297.

VanKeuren, K.R., Stodgell, C.J., Schroeder, S.R. & Tessel, R.E. (1998). Fixed-ratio discrimination training as replacement therapy in Parkinson´s disease: Studies in a 6-hydroxydopamine-treated rat model.

Brain Research, 780(1), 56 – 66.

doi:10.1016/S0006-8993(97)01184-0

Welsh, M., Parke, R.D., Widaman, K. & O´Neil, R. (2001). Linkages between children´s social and academic competence: A longitudinal analysis. *Journal of School Psychology,* 39(6), 463 – 481. doi:10.1016/S0022-4405(1)00084-X

Wentzel, K. (1993). Does being good make the grade? Social and academic competence in middle school. *Journal of Educational Psychology,* 85(2), 357 – 364. doi: 10-1037/0022-0663.85.2.357

Wing, L. (1981). Asperger´s syndrome: A clinical account. *Psychological Medicine,* 11(1), 115 – 129. doi:10.1017/S003329170053332

Wing, L. (1997). The history of ideas on autism: Legends, myths and reality. *Autism,* 1(1), 13 – 23. doi:10.1177/1362361397011004

Wing, L. & Potter, D. (2002). The epidemiology of autism spectrum disorders: Is the prevalence rising? *Mental Retardation and Developmental Disabilities Research Reviews,* 8(3), 151 – 161. doi:10.1002/mrdd.10029

Zablotsky, B., Boswell, K. & Smith, C. (2012). An evaluation of school involvement and satisfaction of parents of children with autism spectrum disorders. *American Journal on Intellectual and Developmental Disabilities*, 117(4), 316 – 330. doi:10.1352/1944-7558-117.4.316

Running head: BEHAVIORAL INTERVENTION IN SCHOOLS

Behavioral Intervention for Children with Autism in Mainstream School Setting.

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Abstract

Ten children with autism were part of a project in Oslo where they were offered behavioral intervention in a mainstream school setting. All children had previously received intensive behavioral interventions in preschool for two to four years. Due to unplanned circumstances intervention was either reintroduced after two and three years in school (n=2), or was simply continued without interruption into a mainstream educational school setting (n=8). Outcome was measured after three to five years in mainstream school using standardized assessments of intelligence, adaptive behavior and autistic symptomatology. Most children improved their scores on measures of intelligence and adaptive behavior and autistic behavior was reduced. The results while promising needs to be looked at with caution as very few children were enrolled in the study and the experimental design was not very strong.

As the prevalence of autism spectrum disorders increases, more and more children with ASD present for services in public school classrooms (Yeargin-Allsopp et al., 2003). There are debates over which intervention that hold the most promise for persons with autism. Some of the intervention programs appear to have little sound theoretical or empirical foundation (Biklen, 1993), some have been shown to lack efficacy (Koegel & Koegel, 1995; Simpson & Myles, 1995), some have not been thoroughly evaluated (Freeman, 1993), and even methods based on empirically sound foundations are involved in controversies related to outcome claims and exclusive extensive use (Gresham & MacMillan, 1997).

There exists a myriad of interventions for autism, which range from dietary manipulation to intensive psychodynamic therapy. There are only a few that have empirically demonstrated efficacy. Among those with empirical support, a particular class of treatments for autism incorporates principles of Applied Behavior Analysis (ABA), which emphasizes environmental associations and contingences. While ABA treatments vary in intensity and structure, they all share similar principles. In addition, when discussed within the context of treating young children, these techniques are also referred to as Early Intensive Behavioral Interventions (EIBI).

Applied behavior analysis grew out of earlier work on behavior modification. Individual analysis of a child's functioning are undertaken to identify and task analyze skills needed for improved performance and functioning. Subsequent to such identification, systematic teaching methods are used to teach a wide variety of skills. A salient element of ABA is precise and ongoing performance evaluation. ABA is not a procedure specific to students with autism. Rather it is a general strategy that has wide applicability to various groups and settings. Within these various formats specific instructional procedures (e.g. prompt delivery, shaping, fading) are provided at a level and intensity that fits the context and

the unique characteristics of the student (Harrower & Dunlap, 2001). Strategies based on ABA principles include intense structured approaches (e.g. discrete trial teaching), naturalistic approaches (e.g. incidental teaching, pivotal response training), and self-management procedures. Strategies based on ABA principles are also used to improve the acquisition of novel skills and to maintain and generalize learned skills (Iovannone, Dunlap & Kinkaid, 2003). The field of applied behavior analysis has always rested on the fundamental principle that the empirical demonstration of measurable changes in behavior must be related to systematic and controlled manipulations in the environment. Without this empirical demonstration, a true science of human behavior is an impossibility (Skinner, 1953). Without objective and documented specification of an independent variable as well accurate independent variable application, definitive conclusion regarding the relation between an independent variable and a dependent variable are compromised.

Powers (1992) provided one of the first sets of core components of effective instructional practice for students with autism. These identified components included structured treatment using principles of applied behavior analysis; [a)] parent involvement in the school, community, and home, [b)] early intervention, [c)] intensive treatment; programming for generalization, [d)] specified curricula emphasizing social and communication skills, and [e)] integration with typical peers when possible.

Outcome studies have shown early and intensive behavioral intervention may improve intellectual, language and adaptive functioning in children with autism (Cohen, Amerine-Dickens & Smith, 2006; Eikeseth, Smith, Jahr & Eldevik, 2002, 2007; Hayward, Eikeseth, Gale & Morgan, 2009; Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Lovaas, 1987; Lovaas & Smith, 1989; Remington et al., 2007; Sallowe & Gaupner, 2005; Smith, Groen & Wynn, 2000). Several authors have reported that roughly half of the children who receive

early intensive behavioral intervention make major developmental gains, the gains for the other half are more modest (Anderson, Campbell & Cannon, 1994; Cohen et al., 2006; Eikeseth et al., 2007; Eldevik et al., 2010; Hayward, Gale & Eikeseth, 2009; Howard et al., 2005; Lovaas, 1987; McClannahan & Krantz, 1994; Remington et al., 2007; Sallows & Graupner, 2005; Smith et al., 2000). Recent systematic reviews and meta-analysis suggest that standardized test outcomes for cognitive functioning in particular equates to large size effects when compared with control data and active comparison interventions (Eikeseth, 2009; Eldevik et al. 2009; Reichow & Wolery, 2009; Rogers & Vismara, 2008; Virués_Ortega, 2010).

Iovannone and associates (2003) identified six common elements of effective programs: [a)] individualized support and services for student and families, [b)] systematic instruction, [c)] understandable and structured environment, [d)] specialized curriculum content focusing on symptoms of autism, [e)] a functional approach to problem behaviors, and [f)] family involvement. These critical elements may be more important to child outcome than the use of individual techniques. Setting should include ongoing interactions with typically developing peers.

Eikeseth and colleagues (2002) published an evaluation of ABA-based comprehensive educational intervention for children with autism in preschool and elementary school setting. Progress of 13 children who received 28 hr per week of behavioral intervention was compared with the progress of 12 children who received 29 hr per week of eclectic special education intervention. Both interventions took place in public mainstream kindergarten and elementary schools. After 1 year standard scores for children in the behavioral intervention group increased by an average of 17 points in IQ and 11 points in adaptive behavior. These gains were significantly larger than the changes in the eclectic group where there was an average of

4 points in IQ and no change in adaptive behavior. All children in the behavioral intervention group continued with the intervention up to the time of the follow-up and all children in the eclectic group remained in special education programs that combined a variety of approaches. The follow-up showed again gains that were significantly larger for the behavioral intervention group than the eclectic special education group (Eikeseth et al., 2007). While there has been much discussion of early intervention, is there evidence that intervention delivered after the pre-school years can be effective?? There is some evidence that children who begin intensive ABA treatment later (after 4 years of age) or continue with treatment after their pre-school years make substantial gains across all skill areas measured over the same group who received intensive "eclectic" treatment (Eikeseth et al., 2007). There have been studies that have looked at ABA in comparison to other treatments (intensive ABA, intensive "eclectic" interventions and non-intensive intervention (Howard et al., 2005). Again the results of this study showed that children with intensive ABA treatment performed better on post-treatment testing than either of the other two groups.

Increasingly, educators are placing children with disabilities in regular classrooms, intending to enhance social as well as academic development. However, little is known about how children with disabilities, and with high functioning autism in particular, form peer relationship and friendships in these environments. Some evidence suggests that in certain situations, inclusive placements may lead to increased rejection of children with disabilities (MacMillan, Gresham & Forness, 1996; Ochs, Kremer-Sadlik, Solomon & Sirota, 2001; Sale & Carey, 1995). Other researchers stress the benefits to children both with and without disabilities (Gallagher et al. 2000; Villa & Thousand, 1995).

Bellini, Peters, Benner & Hopf, (2007) provided a meta-analysis of school-based social skills interventions. The purpose of the study was to provide a quantitative synthesis of

existing single-subject research on school-based social skills interventions for children with ASD. The results of this meta-analysis suggest that school-based social skills interventions are minimally effective for children with ASD. Specifically, social skills intervention produced low treatment effects and low generalization effects across participants, settings, and play stimuli. Moderate maintenance effects were observed, suggesting that gains made via social skills interventions are maintained after the intervention is withdrawn. Furthermore, similar intervention, maintenance, and generalization effects were observed between interventions targeting collateral skills (e.g. play skills, joint attention, and language skills) and interventions targeting specific social behaviors (e.g. social initiation, social responses, and duration of interaction). The low treatment effects observed in the present study are consistent with the results of previous social skills intervention meta-analysis (Mathur, Kavale, Quinn, Forness & Rutherford, 1998; Scruggs & Mastropieri, 1994). Studies implemented in the child´s classroom setting produced significantly higher intervention, maintenance, and generalization effects than interventions that involved removing the child from the classroom. Finally, only one study systematically matched the type of intervention strategy with the type of skill deficits exhibited by participants (Bellini et al., 2007).

Harris and Hendleman (2000) evaluated educational placement for children who had participated in an intensive applied behavior analysis center-based treatment program for children with autism. The participants were 27 children who had entered the Douglas Developmental Disabilities Center in Rutgers University. All children were diagnosed with autism spectrum disorders from an outside source. The children's data were taken at administration and discharge, pre- and post- IQ data and CARS scores at admission. The children's mean age at time of admission was 49 months, range 31 – 65 months, and their mean IQ was 59, range 35 – 109. At the time of follow-up the mean age was 142 months,

range 122 – 170. Although the children's IQ´s increased considerably at the time of discharge, the predicative pattern of IQ at intake pattern held true. Among children with a discharge IQ of 80 or more, 11 were included in regular classes and 3 were in special education classes and by contrast for the 13 children with IQ´s of 76 or less, all went to special education classes.

Lovaas (1987) reported an average difference of 31 points on IQ tests between the treatment and control group, and classified 9 of 19 (47%) participants as having achieved recovery, defined as post-intervention IQ in the normal range and successful completion of first grade in a regular education setting. There was also promising, although limited evidence that these outcomes may maintain over the long term into adolescence following the cessation of intervention (Eldevik et al., 2010; McEachin, Smith & Lovaas, 1993).

Very little research has been conducted to evaluate the effects of school-based behavioral intervention for children whit ASD. A school-based intervention is likely to be a less intensive model because intervention is delivered during school hours, typically not during vacation periods, and have less parent involvement (Grindle et al. 2012). There have been a small number of evaluation studies of comprehensive ABA-based interventions in special school settings for children with autism using standardized test outcomes (McGarrell, Healy, Leader, O´Connor &Kenny, 2009: Waddington & Reed, 2009). Standardized instruments like IQ tests and adaptive behavior scales are widely used in autism research, and scores on such tests have been shown to correlate reasonably well with overall adjustment for individuals with autism (Klin, Carter & Sparrow, 1997). Individuals with ASD have demonstrated significant progress in attainment or competencies instructional approaches that are both comprehensive and systematic (Hefline & Alberto, 2001; Simpson, 2001). Although less information is available regarding the application of these practices with school-age children, there is no reason to believe that these core components of intervention would not

apply as well to an older child. However, to more fully influence autism practice, ABA-based intervention models need to be evaluated in mainstream contexts (Grindle et al. 2012).

In Norway schools do not offer specialized ABA or other behavioral services that some parents have come to see as standard treatment or intervention methods for their children in preschool. Some children with ASD will be offered intensive behavioral intervention services in their local mainstream preschool. The aim of this study was first to test a model where ABA could continue from preschool mainstream school settings in Oslo, and second to evaluate the effect of such an intervention model.

Methods

Participants

The participants in this study were recruited from the center for early intervention (STI) in Oslo. All children that had received intervention through STI in preschool were a part of this project, and was followed in to mainstream school were the intervention was continued. All children had received a clinical diagnosis within the autism specter from a multidisciplinary team before they started the intervention through STI. They were free of any chronic or serious medical condition that might interfere with their education, and all lived in their family home. A total of then children was included in this study, eight boys and two girls. Age at intake was between 29 and 69 months (M = 47.8 months of age). All children attended their local preschool with supervision and training from STI. The children had between two and four years of intervention before transferring to their local mainstream school at the age of six. See table 1 for more details on the children's characteristics at intake and when they started school.

--- Insert Table 1 about here ---

Outcome measures

Standardized tests of intelligence and adaptive functioning were administered at intake, and then once a year. *The Bayley Scales of Infant Development – II and III Edition* (BSID-II; BSID-III)(Bayley, 1993; 2006) is a measure of mental development for children up to 42 months. It will yield a mental developmental index, which is considered broadly equivalent to an IQ score. Bayley were used for the youngest children or the children that scored below the basal on intelligence tests standardized for their chronological age. For the older and higher functioning children the most frequently used measure of intelligence were the *Stanford-Binet Intelligence Scale, Fourth and Fifth Edition* (SB:FE; SBV) (Thorndike, Hagen & Sattler, 1986; Roid, 2003).

The Vineland Adaptive Behavior Scale - II (VABS-II)(Sparrow, Cicchetti & Bella, 2005, 2008) is the most widely used assessment of adaptive skills and is viewed as a valid measure of overall adjustment in children with autism spectrum disorders (Klin et al., 1997). The VABS yields standard score on four domains; communication, daily living skills, socialization and for children younger than seven years motor skills. Based on these scores it will yield a standardized ABC score.

The Childhood Autism Rating Scale, second edition (CARS2) (Schopler, Bourgondier, Wellman & Love, 2010; Schopler, Reichler & Renner, 1988) was used to measure autism severity. As recommended in the manual, the standard version (CARS2-ST) was used with children younger than six years of age and those with an IQ score below 80. The version for high functioning and older children (CARS2-HF) was used with children that were older than six years of age and had an IQ score above 80. The CARS2 expresses autism severity on a scale from 15 to 60, with cutoff points for mild/moderate autism and severe autism.

Settings

Organization of the preschool intervention.

Children attended their local preschool. STI gave supervision and training to the existing staff between two to three hours weekly. Two to four members of the staff build a team round the child, and were responsible for the day-to-day implementation of the ABA program. One of the team members are given responsibility to; [a)] scheduling and monitoring intervention hours, [b)] preparing the weekly team meeting, [c)] updating the program records and, [d)] finding the instructional materials needed for the various programs. All children received an individualized education program (IEP), which was developed by using a curriculum-based assessment, and received services based on applied behavior analysis (ABA). This ensured the individual and comprehensive nature of each child's intervention services. All children in the study were provided with at least 20 h per week in preschool.

Transition from preschool into local mainstream school setting.

In Norway almost all children attend their local mainstream school, but there are no ABA services in school settings. The department of education (UDE) in Oslo started a project with STI in 2007 on how to implement ABA methods in school settings. All children in this study were a part of this project. The project started the school-year 2007 – 2008 with three children (Group 1). In 2008 – 2009 the project continued with four new children (Group 2), and in 2009 – 2010 three new children (Group 3) continued into the mainstream educational setting. All children received an IEP, and a team was built around each child after the organizational model in preschool. STI provided the school with training of the existing staff and supervision on a weekly basis.

Procedures

In preschool

The selection of intervention goals, in the IEP, was done in the same way as in preschool. Thus it was guided by consideration of a typical developmental trajectory and programs were developmentally progressive with certain skills usually being taught before others skills. These target skills were selected from the research literature and published curriculum guides for children with autism. Behavior analytic procedures were used to teach children new skills and reduce problematic behaviors (e.g., shaping, chaining, prompting, fading, modeling, discrimination learning, task analysis, functional analysis, and differential reinforcement). Discrete trial training (DTT) is a specific, systematic method by which ABA is implemented with students who have autism. Typically based on one-to-one (1:1) methodology, DTT follows a basic pattern where an instructor gives a cue for a student to perform, provides reinforcement for the desired behavior, and continues ongoing evaluations of student performance. Responses acquired in a 1:1 discrete trial format were then trained so that the child was able to generalize them into natural environments. As each child's skills developed, the focus shifted gradually to help children generalize skills learned in 1:1 setting into small group activities (with other typical developing peers) and then into natural environments (e.g. mainstream preschool, family home, community settings). A final objective was for children to learn new skills in the mainstream setting. The curriculum was driven by each child´s strength and needs as delineated in the child's IEP, which was developed with the use of curriculum-based assessment (ABLLS, VB-MAPP, social skills m.m.) This ensures the individual and comprehensive nature of each child's intervention services.

A weekly two hour team meeting is conducted during which all team members, including parents, participate. During these meetings all team members work with the child on the current programs. This enables the team and the consultant to provide feedback on teaching procedures and progress (hands-one). It also enables them to review the curriculum and revise them for the following week. Notes are typed during the team meeting, based on the conclusions of all advice that was given and the discussion that have been held. The team then follows this advice throughout the next week of teaching.

In the mainstream educational classroom.

All the children followed the educational curriculum in the classroom. The IEP were driven by each child's strength and needs mainly in the area of social skills. Specialized curriculum would include systematic instruction in social engagement skills, including initiating and responding to social bids, appropriate recreational or leisure skills and language comprehension and communication. The supervisor from STI also observed the child in the classroom during education and break time with their peers.

The educational classroom often used two different approaches; [1]One teach, one assist: In this model one teacher provides the instruction for all students and the other teacher provides assistance to the students who need additional support. This model is beneficial for all students because it not only allows for students with ASD to access the general curriculum, but it also provides instructional support for all the students in the classroom, who require additional support. [2]Station teaching: This model requires for students to be broken into separate small groups. Two groups work with a teacher, or one teacher and one assistant, while the other groups works independently over a block period. Once that period is over the students rotate to another station. This model is beneficial because it allows for all students to work within small groups and receive small group instruction.

In the special education group.

Each child had their own room within the special education class, where they have their one-to-one (1:1) teaching sessions. Daily timetables and other arrangements also approximated the mainstream school as closely as possible. For example, break times occurred at the same time across the school, and children from the special group shared the playground facilities with their typically developing peers. All children received an IEP, which was developed by using a curriculum-based assessment, and received services based on applied behavior analysis (ABA). Focus was on those skills that; [a] are most likely to be useful in the students life to control his or her environment, [b] will increase the students independence and quality of life, and [c] will increase the students competent performance.

Weekly two hour team meetings were conducted, in the education classes and the special classes. The team was teachers, assistant, parents, supervisor from STI and sometimes someone from the schools administration. The meetings followed the same routines as in preschool. Staff in the program were trained and supervised closely. However, we did not have systematic measures of procedural fidelity and consistency through the study.

Design

Two children were reintroduced to behavioral intervention after two and three years of eclectic special education in school. These circumstances created a reversal design (ABA) where the A phase constitute behavioral intervention and B the eclectic special education.

The remaining children all continued their behavioral intervention program from preschool into the school setting without any interruption, and thus were not exposed to a control condition.

Results

On average the children gained 15 IQ points when they were in preschool. During three to five years in mainstream school they gained 10.8 IQ points. The average gain in ABC points from the preschool program was 10.6 points and after three to five years in school the average gain in ABC was a further 2.6 points. The mean score for intellectual (IQ) and adaptive functioning (ABC) at intake, at start of school and then after three to five years in school are shown in table 2. This table also shows the gains in IQ and ABC separately for the children in special education groups, children in normal educational groups and the whole group.

--- Insert Table 2 about here ---

On average the children reduced their CARS scores with 12 points. Seven of the children received an improved classification. Individual CARS data at intake and after three to five years in school are shown in table 3.

--- Insert Table 3 about here ---

Individual outcome data in IQ and ABC for group 1 (started intervention in school 2007) is shown in figure 1. Two children that received behavioral intervention for three years in preschool where reintroduced to behavioral intervention after several years of eclectic special education. Child 1 after three years and child 2 after two years. Child 3 went directly from preschool into the mainstream educational classroom and continued his behavioral intervention program without interruption.

--- Insert Figure 1 about here ---

Individual outcome data for group 2 (started intervention in school in 2008) is shown in figure 2. Four children transits into mainstream school setting, two of these (child 5 and 6) attend mainstream educational classroom fulltime, and two of these (child 4 and 7) attended a special education group.

--- Insert Figure 2 about here ---

Individual outcome for group 3 (started intervention in school 2009) is shown in figure 3. These three children transits into a mainstream school setting, two of them (child 8 and 9) in fulltime educational classroom and one (child 10) attended a special education group.

--- Insert Figure 3 about here ---

Discussion

The individual outcome data in intellectual (IQ) and adaptive functioning (ABC) show that nine out of ten children enrolled in this study continued to make gains when their intervention continues in school. The outcome data for group 1 showed that both the children that went into eclectic school (the B phase – control condition) lost IQ points during these years. Child 1 lost 13 IQ points over a period of three years and child 2 lost 11 IQ points over two years. Child 3 whose behavioral intervention was not interrupted continued to make gain when he transited into school setting. Adaptive behavior was stable for all children. Outcome data from group 2 and 3 show stable gains in IQ and adaptive behavior, except for child 10 who’s IQ score decreased.

It should be noted that those children who went into special education settings showed considerable gains in IQ from intake in preschool to testing after three to five years in school, except from one child who lost 24 IQ points. The rest of the group (special education classroom) had a mean IQ of 53. 3 at intake and after three to five years a mean of 81.6. This 28.3 point increase should be considered clinically meaningful (Eldevik et al., 2010). Their progress was not however sufficient to allow them to function effectively in a regular education class. By contrast, the group of children who went to regular classes (mainstream classroom group) had a mean IQ of 72 at intake in preschool and 104.8 after three to five years in school, showing a 32.8 point gain, again a clinically meaningful gain. All children in these group maintained and continued to gain skills. A general difference between these groups appear to be that the children in regular classroom settings learned new academic and social skills in the natural environment. The children in special groups learned new skills mostly in a 1:1 setting and maintained them in the natural environment.

The outcome from the adaptive behavior composite was not as strong. The mean gain for the group as a whole was 13.2 points in ABC from intake in preschool following three to five years in school. But the gains in school were only about 2 points on average. It has been reported earlier that it is hard to achieve gains in ABC scores following early intervention, but there is a present no good explanation for this.

CARS outcome for the children is also promising. Most children lost points on this measure. Just three children stayed in the same classification group. Five children went from the severe group into the minimal severity group. Child 4 went from sever to a moderate and child 6 went from moderate to minimal. No child received a more severe classification.

These outcome data all look promising. However this study had very few participants and also lacks a proper scientific design. Although some control was inadvertently achieved through a reversal condition for two of the children enrolled, the current design has some very severe short comings. Most notable is the lack of a comparison group, but I was not able to locate children that had received behavioral intervention in preschool and were tested on standard tests for IQ and adaptive functioning after attending mainstream eclectic school for three to five years. Further research is needed with more subjects and stronger design before any conclusion can be drawn.

I have only one study that reported outcome on standardized test following early intensive behavioral interventions into a school setting. Harris and Hendleman (2000) reported that about 40 % of the children attended regular education after behavioral intervention in preschool. They also noted that higher IQ predicated such a placement. In the present study about 60% attended regular classes following intervention in preschool, and I also found that that higher IQ was associated with this placement.

All children in this study went to different schools in Oslo and the overall quality of the education was different from school to school. In the regular education settings the children participate fully in the general education curriculum and receive special education services as needed in the classroom. The team around each child, the supervisor from STI and the parents developed the child's IEP. For some of the schools this was a new situation, the teachers was used to do this them. An IEP is a legal document outlining measurable goals that may include educational and functional targets (i.e., social skills, academic skills, self-help skills etc. Opplæringsloven, 1998). For the teacher in the special groups this was a challenge. They typically had an "eclectic" approach to special education and had long term IEP curriculum goals (e.g. colures – blue, red, yellow and green, was thought the child over the

next year). The goals of education for individuals with ASD are the same as the goals for any other student, to provide opportunities to acquire skills that increase personal independence and social responsibility (Kavale, Forness & Siperstein, 1999). For these teachers it was challenging to learn how to make the curriculum and how to teach the child using ABA. In eclectic programs the particular composition of treatments is to be adjusted to the individual child´s needs and may vary a great deal across children and across time.

In some of the schools with special education groups there were different and sometimes increasing restrictive self-contained groups where students remain in and receive services in a special education classroom for the majority of their school day. For some of the children with ASD in special groups, the environment in which to achieve the skills was under continuing debate, and sometimes negatively affected the likelihood of achievement. The supervisors sometimes experienced educational professionals downplayed the child's capabilities and willingness to live a "normal" life, and also argued that excluding them in educational processes was justified, proper and right.

The increase in the number of students with ASD along with the explosion in the quantity of ineffective interventions converge to create a critical need to examine the nature, type, and frequency of educational services provided to students with ASD enrolled in public schools

Although the limitations of the present study, I think we were able to demonstrate that behavioral interventions for children with autism could be provided in a public mainstream educational setting. As Grindle and colleagues (2012) say "these findings have important ramification for public policy, because delivering ABA-based education in a mainstream school setting may be a cost-effective way of providing services to young children with autism" (pp 19). Behavior interventions, especially those implemented in applied settings as

schools, may be at high risk for treatment inaccuracies due to the setting, treatment agent, complexity of the protocol and demands placed on teacher´s time and resources (McIntyre, Gresham, DiGennario & Reed, 2007).

The present study, like much research, raises more questions than it answers. We do not know for sure to what extent applied behavior analytic teaching methods were crucial to the outcome as other kinds of treatment. Further research is important if we are to provide the most effective learning experience for children with autism and have optimal use of the educational resource.

References

Anderson, S.R., Campbell, S. & Cannon, B.O. (1994). The may center for early childhood education. In S.L. Harris & J.S. Handleman (Eds.). *Preschool education programs for children with autism* (pp.15 – 36). Austin, TX: Pro-ed.

Bayley, N. (1993). *Bayley scales of infant development.* (2nd ed.) San Antonio, TX: The Psychological Corporation.

Bayley, N. (2006). *Bayley scales of infant and toddler development.* (3rd ed.) San Antonio, TX: Pearson Education, Inc.

Bellini, S., Peters, J.K., Benner, L. & Hopf, A. (2007). A Meta-Analysis of School-Based Social Skills Interventions for Children with Autism Spectrum Disorders. *Remedial and Special Education*, 28,(3), 153 – 162. doi:10.1177/07419325070280030401

Biklen, D. (1993). *Communication unbound: How facilitated communication is challenging traditional views of autism and ability/disability.* New York: Teachers College Press.

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(2), 145 – 155. doi:10.1097/00004703-200604002-00013

Eikeseth, S. (2009). Outcome of comprehensive psycho-educational interventions for young children with autism. *Research in Developmental Disabilities*, 30, 158 – 178. doi:10.1016/j.ridd.2008.02.003

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. doi:1177/0145445502026001004

Eikeseth, S., Smith, T., Jahr, E. & Eldevik, S. (2007). Outcomes for children with autism who began behavioral treatment between ages 4 and 7: A comparison controlled study. *Behavior Modification*, 31, 264 – 278. doi:10.1177/0145445506291396

Eldevik, S., Hastings, R.P., Hughes, J.C., Jahr, E. Eikeseth, S. & Cross, S. (2009). Meta-analysis of early intensive behavioral intervention for children with autism. *Journal of Clinical Child & Adolescent Psychology*, 38, 439 – 450. doi:1080/15374410902851739

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 for Intellectual and Developmental Disabilities*, 115, 381 – 405. doi:10.1352/1944-7558-115.5.381

Freeman, B.J. (1993). Questions to ask regarding specific treatment. *The Advocate*, 25(2), 19.

Gallagher, P.A., Floyd, J.H., Stafford, A.M., Taber, T.A., Brozovic, S.A. & Alberto, P.A. (2000). Inclusion of students with moderate or severe disabilities in educational and community settings. Perspectives from parents and siblings. *Education and Training in Mental Retardation and Developmental Disabilities,* 35(2), 135 – 147

Gresham, F.M. & MacMillan, D.L. (1997). Autistic recovery? An analysis and critique of the empirical evidence on the Early Intervention Project. *Behavioral Disorders,* 22, 185 – 201.

Grindle, G.F., Hastings, R.P., Saville, M., Hughes, C., Huxley, K., Kovshoff, H., Griffith, G.M., Walker-Jones, E., Devonshire, K. & Remington, B. (2012) Outcomes of a Behavioral Education Model for Children with Autism in a Mainstream School Setting. *Behavior Modification,* 36(3), 298 – 319. doi:10.1177/0145445512441199

Harris, S.L. & Handleman, J.S., (2000) Age and IQ at Intake as Predictors of Placement for Young Children with Autism: A Four – to Six-Year Follow-up. *Journal of Autism and Developmental Disabilities,* 30,(2), 137 – 142. doi:0162-3257/00/0400-0137$18.00/0

Harrower, J.K. & Dunlap, G. (2001). Including children with autism in general education classrooms: A review of effective strategies. *Behavior Modification,* 25, 762 – 784. doi:10.1177/0145445501255006

Hayward, D.W., Gale, C.M. & Eikeseth, S. (2009). Intensive behavioral intervention for young children with autism: A research-based service model. *Research in Autism Spectrum Disorders,* 3, 571 – 580. doi:10.1016/j.rasd.2008.12.002

Hayward, D.W., Eikeseth, S., Gale, C. & Morgan, S. (2009). Assessing progress during treatment for young children with autism receiving intensive behavioral interventions. *Autism*, 13, 613 – 633.

Heflin, I.J. & Alberto, P.A. (2001). Establishing a behavioral context for learning for students with autism. *Focus on Autism and Other Developmental Disabilities,* 16, 93 – 101. doi:10.1177/108835760101600205

Howard, J.S., Sparkman, C.R., Cohen, H.G., Green, G. & Stanislaw, H. (2005). A comparison of intensive behavior analytic and eclectic treatments for young children with autism. *Research in Developmental Disabilities,* 26, 359 – 383. doi:10.1016/j.ridd.2004.09.005

Iovannone, R., Dunlap, G., Huber, H. & Kinkaid, D. (2003). Effective educational practice for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 18(3), 150 – 165. doi:10.1177/10883576030180030301

Kavale, K.A., Forness, S.R. & Siperstein, G.N. (Eds.) (1999). *Efficacy of special education and related services.*

Washington, DC: American Association on Mental Retardation.

Klin, A., Carter, A. & Sparrow, S.S. (1997). Psychological assessment. In D.J. Cohen & F.R. Volkmar (Eds.), *Handbook of autism and pervasive developmental disorders* (2^{nd} ed. pp. 418 – 427). New York: Wiley.

Koegel, R.L. & Koegel, L.K. (Eds.). (1995). *Teaching children with autism.* Baltimore: Brookes.

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 doi:10.1037/0022-006X.55.1.3

Lovaas, O.I. & Smith, T. (1989). A comprehensive behavioral theory of autistic children: Paradigm for research and treatment. *Journal of Behavior Therapy and Experimental Psychiatry*, 20(1), 17 – 29. doi:10.1016/0005-7916(89)90004-9

MacMillan, D.L., Gresham, F.M. & Forness, S.R. (1996). Full inclusion: An empirical perspective. *Behavioral Disorders*, 21(2), 145 – 159.

Mathur, S.R., Kavale, K.A., Quinn, M.M., Forness, S.R. & Rutherford, R.B. (1998). Social skills intervention with students with emotional and behavioral problems: A quantitative synthesis of single subject research. *Behavioral Disorders*, 23(3), 193 – 201.

McClannahan, L.E. & Krantz, P.J. (1994). The Princeton child development institute. In S.L. Harris & J.S. Handleman (Eds.). *Preschool educational programs for children with autism* (pp. 107 – 126). Austin, TX: Pro-ed.

McEachin, J.J., Smith, T. & Lovaas, O.I. (1993). Long-term outcome for children with autism who received early intensive behavior treatment. *American Journal on Mental Retardation*, 97, 359 – 372.

McGarrell, M., Healy, O., Leader, G., O´Connor, J. & Kenney, N. (2009). Six reports of children with autism spectrum disorders following intensive behavioral intervention using the Preschool Inventory of Repertoires for Kindergarten (PIRK). *Research in Autism Spectrum Disorders*, 3, 767 – 782. doi:10.1016/j.rasd.2009.02.006

McIntyre, L.L., Gresham, F.M., DiGennaro, F.D. & Reed, D.D. (2007) Treatment integrity of school-based interventions with children in the journal of applied behavior analysis 1991 – 2005. *Journal of Applied Behavior Analysis,* 40, 659 – 67. doi: 10.1901/jaba.2007.659-672

Obiakor, F.E, Harris, M., Mutua, K., Rotatori, A. &Algozzine, B. (2012). Making inclusion work in general education classrooms. *Education and Treatment of Children*, 35(3), 477 – 490. doi: 10.1353/etc.2012.0020

Ochs, E., Kremer-Sadlik, T., Solomon, O. & Sirota, K.G. (2001). Inclusion as a social practice: Views of children with autism. *Social Development*, 10(3), 399 – 419. doi: 10.1111/1467-9507.00172

Opplæringsloven, (1998). Lov om grunnskolen og den videregående opplæringa. http://www.lovdata.no/all/nl-19980717-061.html

Powers, M.D. (1992). Early intervention for children with autism. In D.F. Berkell (Eds.). *Autism: Identification, education and treatment (225 – 252).* Hillsdale, NJ: Erlbaum

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. doi:10.1007/s10803-008-0596-0

Remington, B., Hastings, R.P., Kovshoff, H..Espinosa, F., Jahr, E., Brown, T., Alsford, P., Lemaic, M. & 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. doi: 10.1352/0895-8017(2007)112[418:EIBIOF]2.0.CO;2

Roid, G.H. (2003). *The Stanford-Binet Intelligence Scale: Fifth Edition.* Itasca, IL: Riverside Publishing

Rogers, S.J. & Vismara, L.A. (2008). Evidence-based comprehensive treatments for early autism. *Journal of Clinical Child & Adolescent Psychology*, 37, 8 – 38. doi:10.1080/15374410701817808

Sale, P. & Carey, D.M. (1995). The sociometric status of students with disabilities in a full-inclusion school. *Exceptional Children*, 62(1), 6 – 19.

Sallows, G.O. & Graupner, T.D. (2005). Intensive behavioral treatment for children with autism: Four-year outcome and predictors. *American Journal of Mental Retardation*, 110, 417 – 438.

Schopler, E., Bourgondien, M., Wellman, G., & Love, S. (2010). *The Childhood Autism Rating Scale – Second Edition.* Los Angeles, CA: Western Psychological Services.

Schopler, E., Reichler, R. J., & Renner, B. R. (1988).*The Childhood Autism Rating Scale.* Los Angeles: Western Psychological Services.

Scruggs, E.T. & Mastropieri, M.A. (1994). The effectiveness of generalization training: A quantitative synthesis of single subject research. In T.E. Scruggs & M.A. Mastropieri (Eds.) *Advances in learning and behavioral disabilities*. (Vol. 8. p. 259 – 280). Greenwich. Ct: JAI Press.

Simpson, R.I. (2001). ABA and students with autism spectrum disorders: Issues and considerations for effective practice.

Focus on Autism and Other Developmental Disabilities, 16, 68 – 71.

doi: 10.1177/108835760101600202

Simpson, R.L., de Boer-Ott, S.R., Griswold, D.E., Myles, B.S., Byrd, S.E., Ganz, JJ.B., Cook, K.T., Otten, K.L., Arich, J.B., Kline, S.A. & Adams, L.G. (2005). *Autism spectrum disorders: Interventions and treatments for children and youth.*

Thousand Oaks, CA: Corwin Press.

Simpson, R.L. & Myles, B.S. (1995). Effectiveness of facilitated communication with children and youth with autism. *The Journal of Special Education, 28, 424 – 439.*

doi: 10.1177/002246699502800403

Skinner, B.F. (1953). *Science and Human Behavior.* New York NY: the Free Press

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(4), 269 – 285.*

doi: 10.1352/0895-8017(2000)105<0269:RTOIEI>2.0.CO;2

Sparrow, S.S., Cicchetti, D.V., & Bella, D.A, (2005). *Vineland Adaptive Behavior Scales: Second Edition (Vineland II), Survey interview form/caregiver rating form.*

Livonia, MN: Pearson Assessments.

Sparrow, S.S, Cicchetti, D.V., & Bella, D.A. (2008). *Vineland Adaptive Behavior Scales: The expanded interview form.* (2nd ed) Livonia, MN: Pearson Assessments.

Thorndike, R.L., Hagen, E.P. & Sattler, J.M. (1986). *The Stanford-Binet intelligence scale, Guide for administrating and scoring.* (4th ed.) Chicago, IL: Riverside Pub. Co.

Villa, R.A. & Thousand, J.S. (Eds.) (1995). *Creating an inclusive school.* Alexandria VA: Association for Supervision and Curriculum Development (ASCD).

Virués-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. doi:10.1016/j.cpr.2010.01.008

Waddington, E.M. & Reed, P. (2009).The impact of using the "Preschool Inventory of Repertoires for Kindergarten" (PIRK) on school outcomes of children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, 3, 807 – 827. doi:10.1016/j.rasd.2009.03.002

World Health Organization, (2010) International statistical classification of diseases an related health problems 10th revision. URL: www.who.int/whosis/icd10/

Yeargin-Allsopp, M., Rice, c., Karapurkar, T., Doernberg, N., Boyle, C. & Murphy, C. (2003). Prevalence of autism in a US metropolitan area. *Journal of the American Medical Association*, 289, 49 – 55. doi:10.1001/jama.289.1.49.

Table 1

Child Characteristics;

Child Characteristics at Intake					Child Characteristics at school start	
Child	Gender Male – M Female - F	Age	Diagnosis	Level of MR (Mental Retardation)	Years in STI preschool	School placement Normal class – N Special class - S
Child 1	M	42	Autism	Mild	3	N/S
Child 2	M	62	Autism	Mild	3	N
Child 3	M	43	Autism	Moderate	4	N
Child 4	F	47	Atypical	Moderate	3 ½	S
Child 5	F	50	Atypical	Mild	2 ½	N
Child 6	M	47	Atypical	Mild	2 ½	S
Child 7	M	52	Autism	Borderline	2	N
Child 8	M	69	Asperger	Borderline	2	N
Child 9	M	37	Asperger	NO	3	N
Child 10	M	29	Autism	Moderate	4	S

Table 2

Mean score;

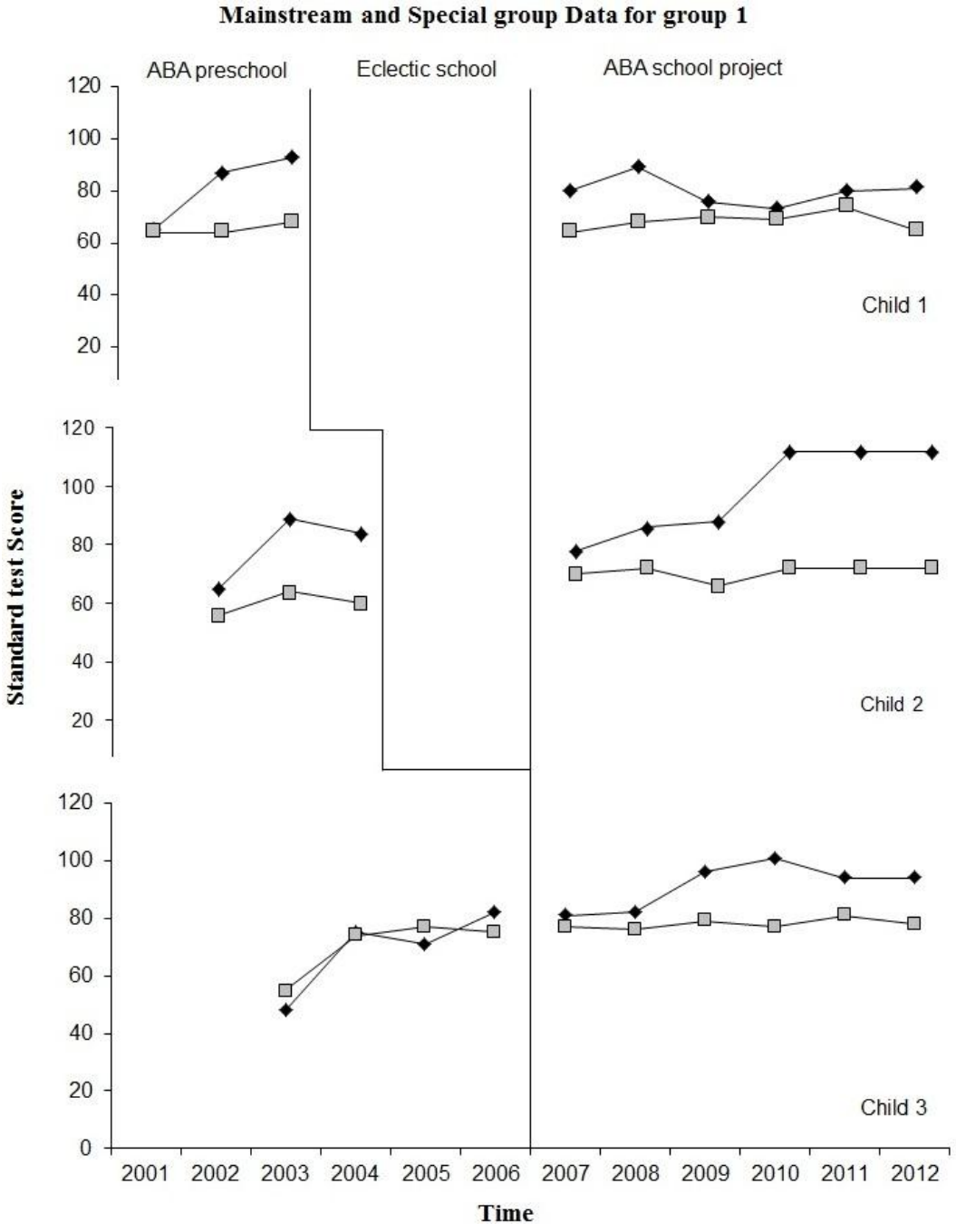
Placement	Score	Intake	School start	School 3 – 5 years	Gain
Special group	IQ	58	64.2	68.7	10.7
	ABC	59.2	67.2	68	8.8
Normal group	IQ	68	88.8	103.8	35.8
	ABC	64.1	76.5	80.3	16.3
All children	IQ	64	79	89.8	25.8
	ABC	62,2	72,8	75,4	13,2

Table 3

	Intake		School after 3 – 5 years	
	CARS raw score	Severity Group	CARS raw score	Severity Group
Child 1	40,5	Severe	28	Minimal
Child 2	39,5	Severe	38,5[HF]	Severe
Child 3	44,5	Severe	26[HF]	Minimal
Child 4	41,5	Severe	31,5	Mild/Moderate
Child 5	39,5	Severe	17[HF]	Minimal
Child 6	26,5	Moderat	26,5[HF]	Minimal
Child 7	36,5	Moderat	36,5	Mild/Moderate
Child 8	47,5[HF]	Severe	26[HF]	Minimal
Child 9	55	Severe	19,5[HF]	Minimal
Child 10	52,5	Severe	53,5	Severe

[HF] were taken with the high functioning version of CARS, the rest was taken with the standard version.

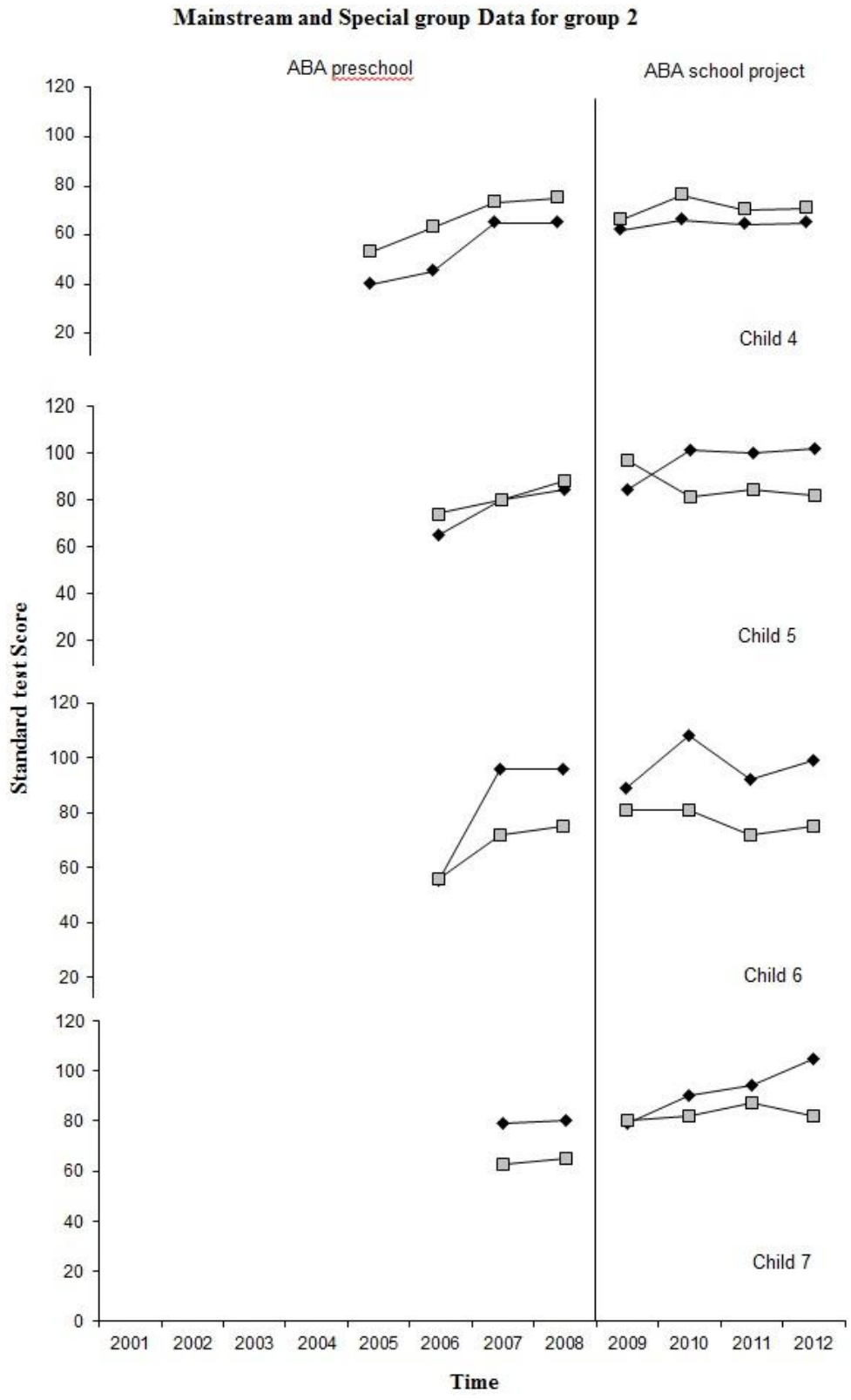
Figure 1



The black square is standardized IQ score

The gray square is standardized ABC score

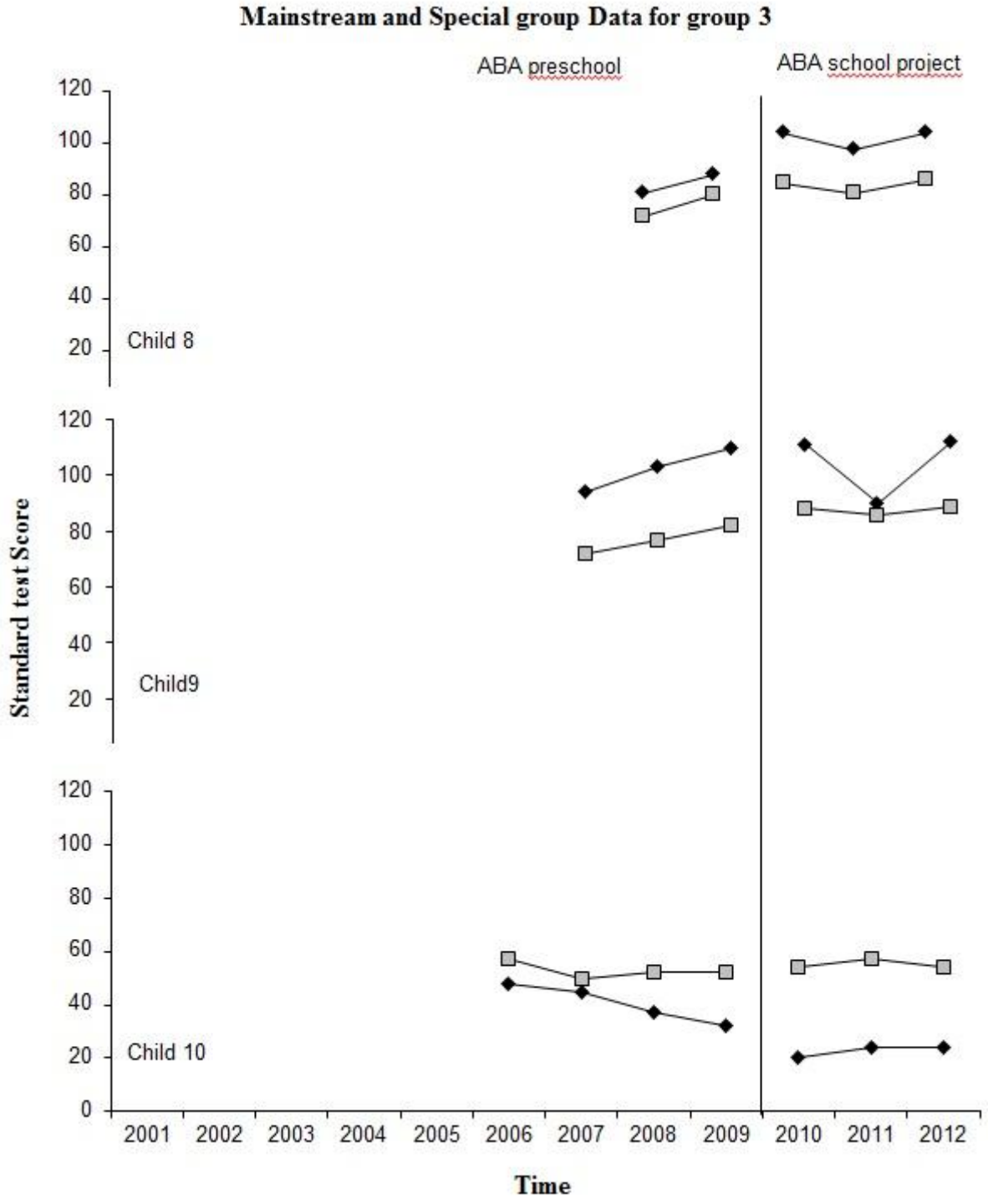
Figure 2



The black square is standardized IQ score

The gray square is standardized ABC score

Figure 3



The black square is standardized IQ score

The gray square is standardized ABC score