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Who benefits from early intervention in autism spectrum disorders?

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ABSTRACT

Research in autism spectrum disorders (ASD) described individual differences in response to intervention. This study explored child and parental characteristics at baseline that predict outcomes in adaptive skills and acquisition of cognitive gains. Seventy-eight children aged 15–35 months diagnosed with ASD by standardized diagnostic tools were included. Evaluations of verbal and non-verbal abilities, adaptive skills and autism severity were obtained at pre-intervention (T1) and after one year of intervention (T2). At T2, children improved significantly in their verbal ability and the severity of autism symptoms was reduced. Outcome in adaptive skills was best predicted by baseline verbal ability and maternal age. Better verbal ability especially in those with severe autism symptoms, and older maternal age predicted better adaptive skills outcome. T1 autism severity, child's age and maternal age and educational attainment best predicted cognitive gains. Less severe autism symptoms, younger child's age at start of intervention, older maternal age and higher maternal education predicted greater cognitive gains with intervention. The study suggests biological factors including age, language abilities and autism severity and environmental factors including maternal age and education, impact the ability to benefit from early intervention in ASD.

1. Introduction

An important and unresolved question in autism intervention research is what specific child and family factors might be related to treatment outcome. Research in autism spectrum disorders (ASD) described individual differences in response to intervention. As ASD is a complex disorder that affects a myriad of developmental domains, post-intervention progress should be evaluated using various outcome measures (Matson, 2007). Those outcomes might be differentially affected by several pre-intervention variables. Previous studies looked at variables and predictors that might affect outcome in cognitive ability, adaptive skills, language acquisition and improvement in autism symptoms. Eaves and Ho (2004) reported that autism severity at baseline predicted overall cognitive ability outcome. Progress in adaptive socialization skills was predicted by the baseline ASD diagnosis and progress in adaptive communication skills by the baseline language ability (Szatmari, Bryson, Boyle, Streiner, & Duku, 2003). Specific aspects of neurocognitive abilities appeared to be good predictors of outcome in both communication and socializations adaptive skills (Munson, Faja, Meltzoff, Abbott, & Dawson, 2008). Most of the studies focused on verbal abilities outcome. Baseline cognitive ability (Ben Itzchak & Zachor, 2007; Gabriels, Hill, Pierce, Rogers, & Wehner, 2001), non-verbal cognitive level at age 2 (Eaves & Ho, 2004; Thurm, Lord, Lee, & Newschaffer, 2007), baseline social deficits

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(Ben Itzchak & Zachor, 2007; Charman et al., 2003), communication adaptive skills at age 3 (Thurm et al., 2007) and motor imitation ability (Stone & Yoder, 2001) were found to be good predictors of verbal skills outcome. Change in autism diagnostic classification was predicted by baseline cognitive ability and autism symptoms severity (Turner & Stone, 2007; Zachor, Ben Itzchak, Rabinovitch, & Lahat, 2007), receptive and expressive language scores difference (Ben Itzchak & Zachor, 2009; Chawarska, Klin, Paul, Macari, & Volkmar, 2009), and by baseline non-verbal IQ level (Szatmari et al., 2003).

Since ASD is now diagnosed early before the age of 2 years, understanding of the symptoms expression and the developmental trajectory with intervention is highly important for clinical practice and for research. The use of standardized diagnostic tools for ASD, specifically the recent changes in the autism Diagnostic Observation Schedule (ADOS) that specifies algorithms that include all the behavioral symptoms in ASD for young verbal and non-verbal children allow for better differentiation between different clinical profiles at this young age (Gotham et al., 2008; Gotham, Pickles, & Lord, 2009). In addition, the new calibrated autism severity metric measure based on ADOS raw totals offers a method of quantifying ASD severity with relative independence from individual characteristics such as age and verbal IQ (Gotham et al., 2009). Although previous research has examined cognitive outcome in ASD, only a paucity of studies focused on predictors of cognitive and adaptive skills outcomes. It is important to expand our understanding of who benefits from early intervention in these developmental realms. In the current research we focus on identifying child and parental characteristics at baseline that might predict acquisition of better cognitive gains and outcomes in adaptive skills.

2. Methods

Participants: 78 (71 boys and 7 girls) aged 15–35 months were included in the current study. The diagnostic process included a clinical evaluation by a neurodevelopmental pediatrician, and the use of two standardized autism diagnostic tools, the Autism Diagnosis Interview-Revised (ADI-R) (Lord, Rutter, & LeCouteur, 1994) and the Autism Diagnostic Observation Schedule (ADOS) (Lord, Rutter, DiLavore, & Risi, 1999). All the professionals involved in the diagnosis process established reliability as required. All the participants met criteria for autism based on DSM-IV (APA, 1994) and the cut-off points on the ADI-R and the ADOS. After receiving a diagnosis of autism all the children were referred to either an applied behavior analysis (ABA) or eclectic (integration of several treatment approaches) center-based intervention programs. A detailed and comprehensive description of the treatment approaches was provided in our previous intervention study (Zachor & Ben Itzchak, 2010).

3. Measures

3.1. Autism Diagnostic Interview-Revised (ADI-R)

A semi-structured interview administered to parents was designed to make a diagnosis of autism according to both DSM-IV (Lord et al., 1994) criteria.

3.2. Autism Diagnosis Observation Schedule (ADOS)

A semi-structured, interactive schedule designed to assess social and communicative functioning. The new ADOS diagnostic algorithm that classifies children into categories of autism, ASD or non-spectrum was used (Gotham et al., 2008; Lord et al., 1999). For the severity of ASD the ADOS standardized measure of severity was used (Gotham et al., 2009).

3.3. Vineland Adaptive Behavior Scales

The test assesses functioning in four adaptive skills domains: Communication, Daily Living skills, Socialization and Motor skills (Sparrow, Balla, & Cicchetti, 1984). Vineland composite standard scores were used for the statistical analyses.

3.4. Mullen Scales of Early Learning

The test evaluates cognitive abilities in visual reception, fine motor, expressive language and language comprehension domains. We defined a non-verbal cognitive measure composed of visual reception plus fine motor standard scores [both domains were highly correlated ($r = .63$, $p < .001$)], and a verbal measure composed of expressive plus receptive language standard scores [both domains were highly correlated ($r = .70$, $p < .001$)] (Mullen, 1995).

4. Procedure

Children underwent comprehensive evaluations at pre-intervention (T1) and after one year of intervention (T2). Of the 78 children who completed the ADOS at T1, 71 had the Vineland and the Mullen. At T2, 77 children completed the ADOS, of whom 75 had the Vineland and 69 the Mullen. Data on paternal and maternal ages ($M = 36.5$ years, SD = 6.1; $M = 33.2$ years, SD = 5.1) and educational attainment (Paternal $M = 14.6$, SD = 2.9; Maternal $M = 14.6$, SD = 2.4)