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Assessing progress and outcome of early intensive behavioral intervention for toddlers with autism

Rebecca MacDonald *, Diana Parry-Cruwys, Sally Dupere, William Ahearn

The New England Center for Children, Southborough, USA

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ABSTRACT

Intensive behavioral intervention for young children diagnosed with autism can produce large gains in social, cognitive, and language development. Although several studies have identified behaviors that are possible indicators of best outcome, changes in performance are typically measured using norm-referenced standardized scores referencing overall functioning level rather than via repeated observational measures of autism-specific deficits (i.e., social behavior). In the current study, 83 children with autism (CWA), aged 1, 2 and 3 years, and 58 same-aged typically developing children (TDC) were directly observed in the areas of cognitive skills, joint attention (JA), play, and stereotypic behavior using a measure called the Early Skills Assessment Tool (ESAT; MacDonald et al., 2006). CWA were assessed at entry into an EIBI program and again after 1 year of treatment. Changes in performance were compared pre- and post-treatment as well as to the normative data by age. Results indicate significant gains on the ESAT across all age groups with the greatest gains seen in the children who entered treatment prior to their second birthday. Increases were seen on direct measures of JA, play, imitation and language while decreases were seen in stereotypy regardless of level of performance at entry into EIBI. The ESAT, a direct measurement tool, served as a sensitive tool to measure changes in autism symptomatology following EIBI treatment.

1. Introduction

Early intensive behavioral intervention (EIBI) for young children diagnosed with autism (CWA) can produce large gains in cognitive, language, and social development (Howlin, Magiati, & Charman, 2009). EIBI uses the principles of behavior analysis (ABA) to increase behavior in the areas of imitation, receptive and expressive language, gross and fine motor skills, play, and JA, as well as decrease behavioral excesses, such as tantruming, aggression, self-injury, and vocal and motor stereotypic behavior (see Howard, Sparkman, Cohen, Green, & Stanislaw, 2005 for a detailed description of EIBI implementation). When compared to other groups of CWA receiving eclectic intervention or minimal treatment, groups receiving EIBI achieved significantly larger gains (e.g., Eldevik, Hastings, Jahr, & Hughes, 2012).

In individual studies examining the efficacy of EIBI, standardized measures such as IQ and adaptive behavior composite (ABC) scores are often used to determine outcome. Common examples include tests of IQ (e.g., from the *Stanford-Binet*, the

* Corresponding author at: New England Center for Children, 33 Turnpike Road, Southborough, MA 01772, USA. Tel.: +1 508 658 7526.
E-mail address: bmacdonald@necc.org (R. MacDonald).

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Bayley, the *Cattal*, the *WISC* and *WPPSI*, the *Merrill-Palmer*) and measures of overall functioning (e.g., the *Vineland Adaptive Behavior Scale*). Although these tests can identify improvements in functioning for CWA, changes in these scores are indicative of more global changes in functioning. Smaller-scale changes in the behavior of CWA, particularly changes in social behavior, may be more difficult to detect using a test of overall functioning level. The current study provides an important addition to the EIBI literature by using a measurement tool that examines changes in behavior on a micro-analytic scale, where response classes of behavior of most importance to the social functioning of CWA can be examined for changes over time. The focus of the current study is CWA who began EIBI services by the age of 3.

A small number of studies have examined or included a direct observation measure in their analysis of EIBI treatment. These measures are characterized by direct observation of specific, operationally defined behavior, with the data remaining in per-opportunity or percentage correct form versus being compiled or extrapolated into an overall score. These measures are also not standardized to the TDC population. Smith, Buch, and Gamby (2000) used a direct observation tool titled the Early Learning Measure (ELM) to measure skill acquisition for six CWA receiving home-based EIBI. The ELM included following directions, gross motor imitation, verbal imitation, and answering social questions. Researchers measured the number of correct responses and rate of skill acquisition through direct observation over the first five months of treatment. Vocal imitation skills on the ELM at intake were a predictor of best outcome. MacDonald et al. (2006) developed a direct observation tool called the ESAT to measure change in cognitive, as well as autism-specific behaviors in CWA receiving EIBI. This assessment is a variation on the ELM and incorporates adapted items from Seibert, Hogan, and Mundy's (1982) Early Social Communication Scales (ESCS, used to measure JA). Direct measures such as this, which examine autism-specific behavior change, may aid in painting a more complete picture of the types of change EIBI produces for this population.

Additional types of behavioral change, such as changes in interpersonal social skills, play behavior, or a reduction in socially stigmatizing behavior, may be harder to categorize with a test predominantly measuring changes in developmental functioning (e.g., Dawson et al., 2010; *MSEL*, *VABS*). For this, pairing a repeated-measures analysis of operationally defined and observationally measured autism-specific deficits, such as eye contact, JA, imitation, and play, may be useful in determining what type of behavior corresponds to a change in developmental functioning. The *Autism Diagnostic Observation Schedule* (*ADOS-2*; Lord, Luyster, Gotham, & Guthrie, 2012; Lord, Rutter, et al., 2012) is currently the most widely used assessment of social behavior for children with autism. The *ADOS-2* is a semi structured assessment designed to assess communication and play skills, as well as repetitive behaviors. Examiners use a 3-point rating scale to evaluate overall performance. These ratings are then applied to an algorithm which contributes to a diagnosis of autism spectrum disorder (ASD). The ESAT contributes to the overall profile of a child by providing a direct measure of a wide range of skills across social, cognitive, and play domains, resulting in a sensitive and objective assessment of treatment effects.

1.1. Potential autism-specific measures of performance

Behavioral deficits that categorize an autism diagnosis include deficits in social behavior (e.g., eye contact, JA), and play when compared to TDC and developmentally disabled populations (Adamson, Bakeman, Deckner, & Romski, 2009). Careful examination of these variables may benefit researchers in determining whether gains made by CWA reflect a reduction in symptom severity.

Deficits in JA are noted in CWA (Adamson et al., 2009; Carpenter, Pennington, & Rogers, 2002) and have been correlated with delays in language development (Mundy, Sigman, & Kasari, 1990). Mundy, Sigman, and Kasari (1994) discuss JA as the initiation of a gaze shift or gesture on the part of the child to share an experience or object with an adult. JA can also refer to the responding of a child to a bid (either a gaze shift or a gesture) for JA by the adult. MacDonald et al. (2006) used the ESAT to examine responding to and initiating JA bids. When compared to TDC, CWA showed decreased levels of responding to joint attention (RJA), specifically following a point. CWA also showed substantial deficits in initiating joint attention (IJA; including initiating gaze shifts, gestures, and/or vocalizations) when compared with TDC.

Appropriate play is an important variable in the social development of CWA, but one that is rarely included in analyses of EIBI (Wolery & Garfinkle, 2002). CWA often do not develop play skills beyond the repetitive manipulation of objects. This deficit in functional toy manipulation prohibits them from engaging in more complex pretend play, alone or with other children (Lifter, 2000; Rutherford, Young, Hepburn, & Rogers, 2007). A standard teaching target of EIBI for preschool-aged CWA is increasing the repertoire of play skills, both alone and with peers. Changes in play behavior have rarely been analyzed in relation to EIBI outcome, although increasing measurable play behavior is a socially valid outcome of treatment (Wolery & Garfinkle, 2002).

An important area of continued research is response to treatment for CWA younger than age 3. In comparison to preschool-aged CWA, studies examining the response of CWA under 3 to EIBI have been sparse (Ben Itzchak & Zachor, 2009, 2011; Dawson et al., 2010). The limited research focusing exclusively on EIBI for children entering treatment before 3 years of age has shown positive results similar to those seen for groups of children over 3 years. Examining the effects of EIBI on this extremely young population is an important area for continued research.

When analyzing factors at intake that were correlated with functioning at follow-up, increased IQ and adaptive score at entry are the most common predictors of best outcome, as well as younger age at entry (Helt et al., 2008). Increased performance across imitation, social, and language skills at the onset of treatment, as measured by standardized tests to determine age equivalence, were also found to be predictive of positive post-treatment outcome (e.g., Fewell & Glick, 1996; Liss et al., 2001). Higher language scores at follow-up have been linked to both higher RJA scores (Siller & Sigman, 2008) and