



Socialization and nonverbal communication in atypically developing infants and toddlers



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ABSTRACT

Emphasis on early identification of atypical development has increased as evidence supporting the efficacy of intervention has grown. These increases have also directly affected the availability of funding and providers of early intervention services. A majority of research has focused on interventions specific to an individual's primary diagnoses. For example, interventions for those with cerebral palsy (CP) have traditionally focused on physiological symptoms, while intervention for individuals with Autism Spectrum Disorder (ASD) focus on socialization, communication, and restricted interests and repetitive behaviors. However deficits in areas other than those related to their primary diagnoses (e.g., communication, adaptive behaviors, and social skills) are prevalent in atypically developing populations and are significant predictors of quality of life. Therefore, the purpose of the current study was to examine impairments in socialization and nonverbal communication in individuals with Down's syndrome (DS), CP, and those with CP and comorbid ASD. Individuals with comorbid CP and ASD exhibited significantly greater impairments than any diagnostic group alone. However, individuals with CP also exhibited significantly greater impairments than those with DS. The implications of these results are discussed.

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As a class of disorders, cerebral palsy (CP) is a neurodevelopmental condition resulting in non-progressive impairment caused by damage to the fetal or infant brain (Bult, Verschuren, Jongmans, Lindeman, & Ketelaar, 2011; Rosenbaum et al., 2007). The worldwide incidence is approximately 2.5 per 1000 live births (Rosen & Dickinson, 1992). Historically, CP has been defined as a set of conditions affecting movement and posture, though the degree and nature of impairment may vary widely (Østensjø, Brogren Carlberg, & Vøllestad, 2003). In 2004, clinicians and researchers attending the International Workshop on Definition and Classification of Cerebral Palsy in Bethesda, Maryland (USA) concluded that previous definitions of CP were insufficient, because impaired motor development is frequently associated with other disabilities (Rosenbaum et al., 2007). Himmelmann, Beckung, Hagberg, and Uvebrant (2006) found that approximately half of individuals with CP exhibited major impairment in at least one developmental domain other than motor skills, further impacting overall functioning and quality of life. Though motor impairment is a hallmark of CP and is often the initial cause for medical attention, researchers and clinicians are increasingly cognizant of the non-motor neurodevelopmental issues that often accompany CP including problems with cognition, expressive and/or receptive communication, social skills, and psychiatric or comorbid conditions such as Autism Spectrum Disorder (ASD), epilepsy, intellectual disability (ID), sleep disturbances,

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and mood disorders (Rosenbaum et al., 2007). Intellectual disability occurs in about 60% of CP cases, and is correlated with increased risk for receptive and expressive language deficits (Cherry, Matson, & Paclawskyj, 1997; Matson & Smirolido, 1997; Matson, Smirolido, Hamilton, & Baglio, 1997; Paclawskyj, Matson, Bamburg, & Baglio, 1997; Sankar & Mundkur, 2005). Social skill deficits are also common in individuals with comorbid ID as are a variety of different psychopathologies (Smith & Matson, 2010).

In CP, motor difficulties including apraxia may impede verbal communication, leading more severely affected individuals to rely more heavily on non-verbal communication (Shevell, Dagenais, & Hall, 2009). However, ID may further inhibit the development of verbal and nonverbal communication, leading to difficulty interpreting nonverbal social cues of others and negatively impacting socialization (Grove, Bunning, Porter, & Olsson, 1999; Matson et al., 1997; Matson, Kiely, & Bamburg, 1997; Matson, Smirolido, et al., 1997). In a study of 9- to 13-year old children with CP, Voorman and colleagues (2006) found that co-occurring cognitive impairment was a major factor associated with both social life and communication skills. Children with decreased social communication skills are at significantly increased risk of decreased academic achievement, depression, and other mood or conduct disorders (Gilmour, Hill, Place, & Skuse, 2004; Matson, Carlisle, & Bamburg, 1998; Matson, Smirolido, & Bamburg, 1998; Matson, Leblanc, & Weinheimer, 1999; McClelland, Morrison, & Holmes, 2000; Segrin, 2000), suggesting a need for intervention applied earlier, rather than later, in development. Communication and social deficits in CP may be affected by motor difficulties or other commonly co-occurring conditions including ASD and ID (Matson, Leblanc, et al., 1999; Njardvik, Matson, & Cherry, 1999).

The prevalence of concomitant ASD in CP populations is variable with estimates ranging from 1% to 10.5% (Kirby et al., 2011; Nordin & Gillberg, 1996; Surén et al., 2012). ASD is a neurodevelopmental disorder, by definition marked by significant impairments in socialization and communication in addition to restricted and repetitive behaviors and interests (Gabriels, Cuccaro, Hill, Ivers, & Goldson, 2005; Hattier, Matson, Tureck, & Horovitz, 2011; Horovitz & Matson, 2010; Matson, Dempsey, & Fodstad, 2009; Matson, Boisjoli, Hess, & Wilkins, 2010; Matson et al., 2011). Social and communication deficits in individuals with ASD are often major targets of intervention. Early intensive behavior intervention (EIBI) uses applied behavior analysis methods and has been found effective in improving deficits in multiple developmental domains, including social, nonverbal, and verbal communication for children with ASD (Eikeseth, 2011), particularly when intervention begins early in development, addresses multiple developmental domains in a normal developmental sequence using behavior analytic procedures, and involving parents as co-therapists across environments to promote generalization (Eikeseth, 2011; Matson, Mahan, & LoVullo, 2009). EIBI has proven effective for children with ASD both with and without concomitant ID. EIBI is often initiated in toddlerhood, and has also been found effective in improving adaptive behaviors for children with ID without ASD (Eldevik, Jahr, Eikeseth, Hastings, & Hughes, 2010; Smith, Eikeseth, Klevstrand, & Lovaas, 1997). Researchers investigating the efficacy of EIBI interventions in ASD populations have observed that earlier intervention (e.g., beginning at age 3) had a significantly greater effect than interventions begun after age 5 (Woods & Wetherby, 2003).

Down syndrome (DS) is a chromosomal disorder typically resulting in mild to moderate ID, characteristic facial features, and hypotonia (Korenberg et al., 1994). The disorder does not typically involve the motor difficulties of CP or the severe difficulty with comprehending social information found in ASD, though social and communication skills are impacted by ID. Individuals with DS have been found to have both relative strengths and weaknesses in nonverbal communication when compared to children of matched mental age. Mundy, Sigman, Kasari, and Yirmiya (1988) found children with DS were skilled in nonverbal social interaction skills, but displayed deficits in certain nonverbal skills such as nonverbal object-requesting skills, related to overall deficits in expressive communication. Other researchers have found that individuals with DS often exhibit significant delays in nonverbal cognitive development, though they often have fewer social problems and challenging behaviors than individuals with other cognitive disabilities (Chapman & Hesketh, 2000). These tendencies may be evident as early as toddlerhood (Fidler, Hepburn, & Rogers, 2006).

Both social skills and communication skills are closely linked to quality of life (Cummins & Lau, 2003; Verdugo, Schalock, Keith, & Stancliffe, 2005). Multiple researchers have also previously demonstrated the positive correlation between the presence of communication deficits and challenging behaviors in developmentally disabled populations (Chadwick, Walker, Bernard, & Taylor, 2000; Durand, 1993; Matson & Boisjoli, 2007; Matson et al., 2005; Matson, Minshawi, Gonzalez, & Mayville, 2006; Matson, Boisjoli, & Mahan, 2009). These skills are impacted by many factors, including the presence of intellectual and/or neurodevelopmental disorders (Matson, Dempsey, & LoVullo, 2009). Deficits in motor skills can also negatively impact quality of life and participation in normative experiences and opportunities important to development in other areas; accordingly motor skills are often the primary focus of treatment for individuals with CP. However, given the high frequency of co-occurring disorders or deficits in the context of both CP and DS, it is important to assess for the presence of deficits in other domains such as communication and social skills that may benefit from intervention early in development.

The focus of the current manuscript centered upon the Socialization/Nonverbal Communication domain of the *BISCUIT-Part 1*. This domain consists of items that examine non-verbal communication skills and socialization deficits (Matson et al., 2010). Although items in this domain are consistent with symptoms commonly observed in ASD populations, these impairments are not unique to those with ASD. Researchers have previously observed communication (e.g., dysarthria) and social deficits in individuals with CP and DS (Chapman & Hesketh, 2000; Clement & Twitchell, 1959; Kennes et al., 2002; Mundy et al., 1988; Pennington, 2008). The authors utilized the Socialization and Non-Verbal Communication domain of the *BISCUIT-Part 1* to compare the degree of impairment across diagnostic groups (i.e., DS, CP, and CP/ASD). It was hypothesized that individuals with CP and comorbid ASD would be significantly more impaired than the remaining groups. Further, the

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