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Differences in object sharing between infants at risk for autism and typically developing infants from 9 to 15 months of age

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ABSTRACT

Object sharing abilities of infants at risk for autism (AR infants) and typically developing (TD) infants were compared from 9 to 15 months of age. Specifically, we examined the effects of infants' locomotor abilities on their object sharing skills. 16 TD infants and 16 AR infants were observed during an "object sharing" paradigm at crawling and walking ages. Overall, AR walking infants demonstrated lower rates of object sharing with caregivers compared to TD walking infants. Specifically, AR walking infants had lower rates of giving and approaches toward caregivers compared to TD walking infants. AR walking infants also had lower step rates toward task-appropriate targets, i.e. caregivers and objects compared to TD walking infants. No group differences in object sharing were observed at crawling ages. Object sharing could be a valuable context for early identification of delays in infants at risk for developing Autism spectrum disorder.

1. Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by social communication impairments such as lack of eye contact or response to name, reduced sharing of interests with others, and delayed or atypical language development as well as presence of repetitive and stereotyped behaviors and interests (American Psychiatric Association, 2013). In addition, children demonstrate comorbidities in the perceptuo-motor domains (Bhat, Landa, & Galloway, 2011) including poor postural control, clumsy walking patterns, and poor manual dexterity skills (Esposito, Venuti, Apicella, & Muratori, 2011; Minshew, Sung, Jones, & Furman, 2004; Sacrey, Germani, Bryson, & Zwaigenbaum, 2014; Bhat et al., 2011). Currently, ASD is the most common pediatric developmental disorder in the United States, with a prevalence of 1 in every 68 children (Baio, 2014). Therefore, there is a growing emphasis on early detection of and interventions for infants presenting with early signs of ASD in order to facilitate positive future outcomes (Robins, Fein, Barton, & Green, 2001; Messinger et al., 2013). Recent research on early detection has involved prospective studies that follow the development of infant siblings of children diagnosed with ASD who are at a greater risk to develop autism and other related delays (Messinger et al., 2013).

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For example, approximately 18.7% of the infant siblings develop ASD at 3 years of age (Ozonoff et al., 2011). Moreover, an additional 20–30% of the infant siblings exhibit subtle delays and difficulties consistent with a Broader Autism Phenotype including multiple motor, social, and language delays (Landa, Gross, Stuart, & Bauman, 2012; Yirmiya, Gamliel, Shaked, & Sigman, 2007; Bhat et al., 2011). Another special population at risk for developing ASD includes preterm infants with 26% receiving an ASD diagnosis and up to 59% presenting with general developmental delays (Limperopoulos et al., 2008; Mwaniki, Atieno, Lawn, & Newton, 2012). Currently, ASD can be diagnosed as early as the end of the second year of life (Robins et al., 2001; Shattuck et al., 2009). Given the aforementioned evidence among various sub-groups at risk for ASD, there is growing recognition for developmental surveillance of at-risk (AR) infants in the first year of life to identify early markers of autism risk and other developmental delays.

1.1. Social communication delays in AR infants

Prospective studies have identified several social communication delays within the first two years in AR infants, including reduced social smiles, poor social engagement, impaired joint attention skills, and difficulties engaging in social interactions (Presmanes, Walden, Stone, & Yoder, 2007; Goldberg et al., 2005; Stone, McMahon, Yoder, & Walden, 2007; Cassel et al., 2007; Ibanez, Messinger, Newell, Lambert, & Sheskin, 2008; Toth, Dawson, Meltzoff, Greenson, & Fein, 2007; Chawarska, Klin, Paul, & Volkmar, 2007; Landa & Garrett-Mayer, 2006; Ozonoff et al., 2010; Bhat, Galloway, & Landa, 2010). For example, during an associative learning task, 6-month-old AR infants engaged in greater bouts of non-social attention and spent less time looking at their caregivers compared to typically developing (TD) infants (Bhat et al., 2010). Similarly, in contrast to TD infants who demonstrated an increase in frequencies of social attention, smiling, and directed vocalizations from 12 to 18 months, AR infants demonstrated a decline in all three behaviors over time (Ozonoff et al., 2010). By 14 months, AR infants diagnosed with ASD demonstrated robust impairments in joint attention (JA), the ability to share attention about interesting events or objects with social partners using eye gaze and gestures (Landa, Holman, & Garrett-Mayer, 2007). Specifically, AR infants demonstrated difficulties in both initiating as well as responding to joint attention bids compared to TD infants in the second year of life (Cassel et al., 2007; Goldberg et al., 2005). In a different study, AR toddlers between 18 and 27 months demonstrated delays in expressive and receptive language, used fewer communicative words and gestures, and had lower IQ scores compared to TD peers (Toth et al., 2007). Specifically, parents reported social impairments in their infants as early as 13 months of age (Toth et al., 2007). Overall, as a group, AR infants demonstrate significant delays in social interaction skills within the first 2 years of life.

1.2. Perceptuo-motor delays in AR infants

There is growing research on perceptuo-motor delays in gross and fine motor skills in AR infants. Some of the earliest delays in AR infants who later developed ASD have been reported in the perceptuo-motor domain and not the diagnostic social communication domain (Bhat et al., 2011; Bryson et al., 2007; Landa & Garrett-Mayer, 2006). AR infants demonstrate gross and fine motor delays including hypotonicity, poor postural control, reduced movement repertoire, poor object exploration skills, and perseverative object play (Flanagan, Landa, Bhat, & Bauman, 2012; Bhat, Galloway, & Landa, 2012; Libertus, Sheperd, Ross, & Landa, 2014; Nickel, Thatcher, Keller, Wozniak, & Iverson, 2013; Ozonoff et al., 2008; Kaur, Srinivasan, & Bhat, 2015). For example, at 3 and/or 6 months, AR infants demonstrated poor head control during a pull-to-sit task (Flanagan et al., 2012) and poor postural skills on a standardized motor assessment (Bhat et al., 2012) compared to low-risk TD infants. Similarly, a longitudinal assessment of postural skills of AR and TD infants during naturalistic play-based activities from 6 to 14 months suggested that AR infants showed delays in the acquisition of sitting and standing skills compared to TD infants (Nickel et al., 2013). Moreover, AR infants who went on to develop ASD diagnoses initiated fewer postural changes and were delayed in acquiring more advanced postures compared to TD peers (Nickel et al., 2013). In terms of fine motor skills, AR infants also demonstrated poor grasping and immature object manipulation skills within an object play context as well as on a standardized developmental assessment (Libertus et al., 2014). Overall, there is growing evidence for the presence of delayed and atypical gross and fine motor skills in AR infants within the first year.

1.3. Links between motor and social development in infancy

Although there is substantial evidence on delayed/atypical motor and social skills in AR infants, interestingly, there is a lack of literature exploring links between motor and social domains in AR infants over the first two years of life. In contrast, there is a large body of developmental literature in TD infants exploring how motor development impacts social and communication development (Biringen, Emde, Campos, & Appelbaum, 2008; Campos, 1990; Campos et al., 2000; Campos, Kermoian, Witherington, Chen, & Dong, 1997; Campos, Kermoian, & Zumbahlen, 1992; Clearfield, 2011; Karasik, Tamis-LeMonda, & Adolph, 2011; Walle & Campos, 2014). Toward the end of the first year, as infants expand their motor repertoire in terms of their postural and locomotor skills as well as grasping and object manipulation abilities, they are able to explore their physical and social environment in novel and diverse ways, thereby facilitating concurrent advances in social communication skills. For example, compared to prelocomotor infants, parents of locomotor infants reported that infants showed greater instances of engagement in interactive play, increased back-and-forth checking back with caregivers during exploratory play, frequent displays of intense forms of affection toward caregivers, and greater attention to distal events in the