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# How are social-emotional and behavioral competences and problems at age 1 year associated with infant motor development? A general population study

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ABSTRACT

Based on limitations in previous research evidence, we concluded that more research is needed for deeper understanding of how social-emotional and behavioral (SEB) outcomes among infant-toddler-aged children in the general population are associated with early motor development. In this study, we investigated associations between early competencies and problems, as measured by the Brief Infant-Toddler Social and Emotional Assessment (BITSEA), and the timing of achievement of the main gross and fine motor milestones usually attained during the first year of life in a general population context. The study sample consisted of 515 infants (mean age 12.9 [SD 0.9] months) and their parents (514 mothers, 434 fathers), who were recruited in child health centers in Northern Finland. The infants were divided into two groups, based on their BITSEA screen status, and motor milestone achievement ages were compared across BITSEA screen status *No Concern* and *Of-Concern* infants. An Of-Concern screen status on the maternal and paternal Competence scale and Autism spectrum disorder (ASD) item cluster was associated with later infant achievement ages for gross motor milestones. By contrast, infants who were screened to be in the Of-Concern range on the maternal Problem scale achieved gross motor milestones earlier than infants with the corresponding No Concern screen status. No significant associations were found between the paternal Problem scale screen status and infant motor development. In further analyses, the strongest associations were found between an Of-Concern screen status on the paternal Competence scale and ASD item cluster and infant motor development. The findings indicate that the inclusion of infant motor developmental information may assist early identification and the clinical interpretation of parental reports of early SEB problems. Clinical implications of the current findings are discussed in the paper.

There is growing understanding in the field of infant mental health about the clinical significance of behavioral problems and social-emotional maladjustment in infancy and toddlerhood (Briggs-Gowan & Carter, 2008; Briggs-Gowan, Carter, Bosson-Heenan,

*Abbreviations:* ASD, autism spectrum disorder; BITSEA, brief infant-toddler social and emotional assessment; CHC, child health center; SEB, social-emotional and behavioral

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Guyer, & Horwitz, 2006; Guedeney, Pingault, Thorr, Larroque, & The EDEN Mother-Child Cohort Study Group, 2014; Hemmi, Wolke, & Schneider, 2011). For improving early recognition and intervening, it is important to screen social-emotional and behavioral (SEB) problems and related factors in primary care settings, especially at well-child visits, where professionals first encounter children with these problems.

## 1. Early SEB problems and related environmental and developmental factors

In studies relying on parent-report measures, prevalence rates of SEB problems have varied from 4 to 33% in infants younger than 2 years of age (Baillargeon, Sward, Keenan, & Cao, 2011; Bayer, Hiscock, Ukoumunne, Price, & Wake, 2008; Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Mathiesen & Sanson, 2000; Möricke, Lappenschaar, Swinkels, Rommelse, & Buitelaar, 2013). In Denmark, diagnosed mental health problems were reported in 16–18% of the 18-month-old children in a random population-based sample ($N = 211$) in a Copenhagen Child Cohort 2000 study (Skovgaard, Houmann, & Christiansen, 2007). The prevalence rates of mental health problems in 1–2-year-olds are in line with the prevalence rates of subsequent psychopathology among older preschoolers and children (Egger & Angold, 2006; Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015).

To distinguish normative, transient problems from possible risk of serious neurodevelopmental disorders and early psychopathology, misbehaviors and a lack of competencies should be proportioned with relational, contextual and developmental data (Carter, Godoy, Marakovitz, & Briggs-Gowan, 2009; Mouton-Simien, McCain, & Kelley, 1997). Based on their CCC 2000 study findings, Skovgaard et al. (2007) suggested that difficulties in parent-infant relationships might have a key position in the risk mechanisms in early child psychopathology. In addition to relationship factors (e.g. lack of emotional warmth and comforting, inappropriate expectations [Zeanah. and Gleason, 2009]), several other risk factors have been recognized. Parent/caregiver factors, such as low parental education status (Briggs-Gowan et al., 2001; Sourander., 2001), relatively young and old parental age (Van Zeijl et al., 2006; Cruise & ÓReilly, 2014) and parental mental health problems, especially maternal depression and parenting stress (Palmer et al., 2013; Wake et al., 2006), have been found to be associated with early problems in the SEB domain. Other environmental factors, for example urban residence (Cruise & ÓReilly, 2014; Erol, Simsek, Oner, & Munir, 2005) and poverty/economic disadvantage (Briggs-Gowan et al., 2001; Zeanah & Gleason, 2009), have also been reported to be related with problems in early SEB development. Regarding infant factors, more SEB problems and fewer SEB competencies have been observed in boys compared to girls among as young as 1–2-year-olds (Alakortes, Fyrsten, Carter, Moilanen, & Ebeling, 2015; Kruizinga et al., 2012). Low birth weight has been shown to be associated with a range of morbidities (United Nations Children's Fund and World Health Organization, Low Birthweight, 2004), including early SEB problems and delays in competencies (Briggs-Gowan et al., 2001; Cruise & ÓReilly, 2014), as well as high birth weight/macrosomia may be a risk factor for SEB development. For example, macrosomia has been reported to correlate with fetal distress such as perinatal asphyxia (Araujo, Peixoto, Zamarian, Elito, & Tonni, 2017) and relate to long-term developmental risks (Froehlich-Santino et al., 2014). However, there is a lack of current research knowledge about connections between early problems in the SEB domain and other developmental trajectories, such as motor development, in infancy.

Considering the complex nature of infant development, it is important to investigate associations between early SEB problems and infant motor development (Bhat, Landa, & Galloway, 2011). According to Bhat et al. (2011), "a child requires a full movement repertoire of functional actions to engage in social interactions". In addition, motor delays/deficits have shown to be relatively frequent with respect to other developmental areas, such as communication and social ability in infancy. In a recent Norwegian population study ($N = 1555$), the highest prevalence of suspected developmental delays was identified in the gross motor area throughout the age groups 4–12 months, being 2.3–8.7% (0.4–4.6% in the fine motor area), whereas the overall prevalence rates of suspected developmental delays varied from 5.7 to 12.3% (Valla, Wentzel-Larsen, Hofoss, & Slinning, 2015).

## 2. Associations between infant motor development problems and mental health impairments later in life

Previously, poor infant motor development has been found to be associated with subsequent severe neurodevelopmental and mental health disorders. Longitudinal and retrospective studies of risk populations have added knowledge of early motor abnormalities, such as delays in achievement of motor milestones and movement abnormalities, to the prediction of ASD (Baraneck, 1999; Landa, Gross, Stuart, & Faherty, 2013; Ozonoff et al., 2008; Zwaigenbaum, Bryson, & Garon, 2013). For example, infants who were later diagnosed as having ASD have been found to show gross motor delays in prone, supine and sitting gestures when compared to typically developing children (Ozonoff et al., 2008). In a prospective high-risk sibling study, parental worry concerning infant motor development as early as at age of 6 months was associated with a subsequent diagnosis of ASD (Sacrey et al., 2015). However, it appears that delays in fine motor development are seldom observed before the first birthday in children with a later diagnosis of ASD (Bhat et al., 2011; Landa & Garrett-Meyer, 2006). As to general population findings, cut-off point sulut poisa poistuu.h weight correlate very strongly, our finding finjatkossa käyttää?sessä.for example in the CCC 2000 study, abnormal overall development (including gross motor developmental problems) at ages 1 week to 10 months predicted recognition of ASD at ages 5–7 years (Elberling et al., 2014). Furthermore, birth cohort studies have evidenced associations between delayed infant motor development and adulthood schizophrenia (Isohanni et al., 2001; Jones, Rodgers, Murray, & Marmot, 1994; Sorensen et al., 2010). In a recent meta-analysis, delays in infant gross and fine motor development were reported in youths at high familial risk for schizophrenia (Burton et al., 2016).

Infant motor developmental problems have also been shown to be associated with subsequent milder mental health impairments. A recent birth cohort study in Denmark revealed an association between delayed gross motor development in infancy and high levels of neuroticism in young adulthood (Flensborg-Madsen, Sorensen, Revsbech, & Mortensen, 2013). Piek, Barrett, Smith, Rigoli, &