



Emotional reactivity at 12 months in very preterm infants born at <29 weeks of gestation



N. Langerock^{a,*}, L. van Hanswijck de Jonge^b, M. Bickle Graz^c, P.S. Hüppi^b,
C. Borradori Tolsa^b, K. Barisnikov^a

^a Child Clinical Neuropsychology Unit, University of Geneva, Switzerland

^b Division of Child Development and Growth, Department of Pediatrics, University Hospital, Geneva, Switzerland

^c Division of Neonatology, University Hospital, Lausanne, Switzerland

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ABSTRACT

The present study evaluated the socio-emotional development of very preterm born infants at 12 months corrected age. Forty-one infants born very preterm (<29 weeks of gestation) were compared to 22 infants born full term on a standardized behavioral assessment and a parental temperament questionnaire, both measuring emotional reactivity to joy, anger and fear, as well as sustained attention.

The behavioral assessment showed that very preterm infants exhibited as much joy as full term infants during a joy-eliciting episode. However, they expressed a significantly higher reactivity in anger-eliciting situations and a reduced reactivity toward fear-eliciting situations. For all three emotion-eliciting situations, the preterm infants reacted with a higher level of motor activity. The preterm infants also exhibited a distinct attention pattern with a significantly higher initial attention level which declined rapidly throughout the episode. The questionnaire did not show any group differences.

The clinical relevance of these results in terms of preliminary hallmarks of later behavioral difficulties such attention deficit/hyperactivity disorder are discussed as well as the inconsistencies observed between the questionnaire and the behavioral assessment.

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1. Introduction

Preterm birth has often been shown to have a negative impact on the child's development. An elevated risk for poor outcomes has been shown at different ages, although most research concentrates on children around school age up to adolescence. At school age, children normally have acquired a large range of cognitive, motor and social skills, so developmental delays or atypical development are more pronounced and readily observable than at a younger age. Research on preterm children around school age and adolescence has highlighted several problem areas such as poorer motor skills (e.g., de Kieviet, Piek, Aarnoudse-Moens, & Oosterlaan, 2009), cognitive delays (e.g., Bhutta, Cleves, Casey, Cradock, & Anand, 2002), attention and executive function difficulties (e.g., Mulder, Pitchford, Hagger, & Marlow, 2009), and behavioral and socio-emotional difficulties (e.g., Anderson & Doyle, 2003; Bhutta et al., 2002). In the few studies targeting preterm born children at younger ages, several cognitive and motor problems have already been reported as young as at 12 months of age (e.g., Charkaluk, Truffert, Fily, Ancel, & Pierrat, 2010; Grunau et al., 2009;

* Corresponding author at: Université de Genève, Faculté de Psychologie et de Sciences de l'Éducation, 40, Boulevard du pont d'Arve, 1205 Genève, Switzerland. Tel.: +41 22 379 92 41; fax: +41 22 379 90 20.

E-mail address: Naomi.Langerock@unige.ch (N. Langerock).

Kiechl-Kohlendorfer, Ralsler, Pupp Peglow, Reiter, & Trawoger, 2009). Concerning the behavioral and socio-emotional development of preterm born children at a young age, the literature is sparser and less homogeneous; however, several studies already show evidence for a differential socio-emotional development (e.g., Hughes, Shults, McGrath, & Medoff-Cooper, 2002; Spittle et al., 2009).

An important factor in the development of preterm children is gestational age (GA) at birth. It is related to the level of cognitive as well as motor functioning, with lower GAs at birth leading to poorer outcomes (e.g., Cooke, 2005; Saigal & Doyle, 2008). This relation with GA at birth has also been observed for the socio-emotional development of preterm children (e.g., Clark, Woodward, Horwood, & Moor, 2008; Maclean, Erickson, & Lowe, 2009). Socio-emotional behavioral differences between children born very preterm and children born full term have been reported from as young as 6 weeks (Hughes et al., 2002) until late into adolescence (Gardner et al., 2004). Around school age and adolescence, the most commonly reported problems in this population are attention deficit/hyperactive disorders (ADHD), and internalizing/externalizing behavior difficulties (Bhutta et al., 2002). As in younger children these behaviors are hard to measure, emphasis is more often directed toward differences in temperamental characteristics rather than the criteria of attention, hyperactivity and internalizing/externalizing behavioral problems. Temperament is defined as the biologically based individual difference toward the experience and expression of certain emotions (Rothbart & Derryberry, 1981). Many temperament questionnaires are available and these questionnaires are a popular tool for studying temperament in young populations. Studies using questionnaires have characterized the temperament of infants born very preterm at 6 weeks corrected age as less regular, less intense, less approaching but more soothable (Hughes et al., 2002). Around 6–12 months corrected age, differences on temperamental questionnaires were rarely found or only minimal (Hughes et al., 2002). Later on, at 2 years corrected age, questionnaires again reveal differences, although the results are ambiguous. A study by Stoelhorst et al. (2003) characterized very preterm born infants at 2 years corrected age as less anxious/depressed as well as showing less aggressive behavior. On the contrary Spittle et al. (2009) found very preterm born infants at 2 years corrected age to show more internalizing problems, more dysregulated behavior and lower socio-emotional competences.

Only a small number of studies have used standardized laboratory paradigms as opposed to temperament questionnaires to assess emotional reactions of very preterm born infants. At six months, very preterm born children showed significantly lower emotional regulation scores as measured by the Bayles Scales of Infant Development (Bayley, 1993; Wolf et al., 2002). Using explicitly emotionally loaded paradigms, infants born very preterm at 4 months corrected age exhibited less positive and more negative arousal during a peek-a-boo game (Eckerman, Hsu, Molitor, Leung, & Goldstein, 1999). At 7 months corrected age, they also exhibited less smiling during a still face paradigm (Segal et al., 1995). Additionally at 2 years corrected age, infants born very preterm were classified as displaying poorer self-regulation in comparison to full term infants in several different problem solving games (Clark et al., 2008).

As such it is clear that temperamental differences are found well before the age of 12 months and also at later ages. However at the age of 12 months, studies using questionnaires showed no or minimal temperamental differences. Unfortunately standardized behavioral assessments to objectively validate these findings are lacking at this age.

The aim of the present study is thus to compare very preterm born infants to full term born infants at 12 months corrected age in respect to their reactivity to different emotion-eliciting situations. As indicated above, the gestational age at birth is linked to level of emotional reactivity, and as such the present study includes only very preterm infants with a GA < 29 weeks. Both a questionnaire and a standardized behavioral assessment are used to evaluate emotional reactivity to the emotions joy, anger and fear. In addition, as emotional regulation capacities of infants have often been linked to their attentional capacities (Kochanska, Coy, Tjebkes, & Husarek, 1998; Sheese, Voelker, Posner, & Rothbart, 2009), both the questionnaire and the standardized behavioral assessment also include a measure of sustained attention. Based on the literature, we expect very preterm infants with a GA < 29 weeks to be less reactive to positive stimulations and more reactive to negative stimulations at 12 months corrected age. Furthermore, we predict that the standardized behavioral assessment will better differentiate between the emotional reactivity of very preterm and full term born infants than the questionnaire.

2. Method

2.1. Participants

Enrollment of very preterm infants born before 29 weeks of GA was done at birth at the University Hospital of Geneva and the University Hospital of Lausanne, in the context of a larger follow-up study. Between September 2007 and September 2009, 126 infants were born before 29 weeks of gestation. Of these 126 infants, 12 were excluded from the study because of congenital malformations, 16 refused to participate, and 22 died. The remaining 76 infants were contacted for participation in this part of the study when they almost reached 12 months corrected age. Eleven had moved away and for 24 infants an appointment could not be made close to the age of 12 months. As such, forty-one infants (52% girls) participated in this part of the study. They were evaluated in a time interval between 11.24 months and 13.15 months corrected age. The population characteristics, derived from medical records, are presented in Table 1.

A control group of full term born infants (GA > 37 weeks) was recruited through day care centers and by friends and family of the research team. Twenty-two infants (59% girls) were evaluated within the same age interval as the preterm born population, but calculated according to their chronological age. There was no difference in sex ratio ($p > .05$) or age at testing ($p > .05$) between the preterm and full term born population. The socio-economic status (SES) of the families of

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