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# Infant regulatory problems, parenting quality and childhood attention problems



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ARTICLE INFO	A B S T R A C T
Keywords: Infant regulatory problems Parenting Attention problems Maternal mental health Cohort study	<i>Background and aims</i> : To determine the combined impact of infant multiple/persistent regulatory problems (RPs), parenting quality and maternal mental health on childhood attention problems. <i>Study design</i> : A prospective, population-based cohort study including 16 paediatric hospitals in Southern Bavaria (Germany). <i>Subjects</i> : 1459 infants were followed from birth to 8 years of age. <i>Outcome measures</i> : RPs were assessed at 5 and 20 months using interviews by trained paediatricians; parenting quality was assessed between birth and 5 months using parent interviews and nurses' observations; maternal mental health was assessed at birth and 5 months using standardized parents' interviews; childhood data on attention problems were collected at 8 years, using parent reports and expert behaviour observation ratings. <i>Results</i> : After correction for gestational age, sex, and socioeconomic status, early RPs (β = 0.079) and low parenting quality (β = 0.175) predicted later attention problems (R <sup>2</sup> = 0.272). Their impact was additive, such that infants with both multiple/persistent RPs and poor parenting quality showed the highest attention problems. 8 years later. However, the impact of RPs on attention was strongest for preterm children. Maternal mental health was a significant moderator of the relationship between parenting quality and attention problems. With adequate maternal mental health, good parenting quality was related to lower attention problems, yet with mental health problems present, the effect of good parenting on attention problems diminished. <i>Conclusions</i> : Guidance and support for parents of infants with multiple/persistent crying, sleeping or feeding problems may be essential to prevent the development of childhood attention problems, especially when maternal mental health problems are present.

Infants who fuss and cry excessively [1], or who have problems with feeding or sleeping are considered to have regulatory problems (RPs) [2, 3]. Infants with RPs are unable to inhibit a current state such as crying or waking and regulate back to a soothed state, or back to sleep [2, 4]. These infants are thought to be hypersensitive to environmental stimuli while experiencing difficulties regulating their behaviour and adjusting to their environment [5]. It has been shown that RPs predict attention problems in children up to eleven years, yet outcomes were

worse for children who also had poor parent-infant relationships and parental psychosocial stress [6, 7]. Infants with multiple/persistent RPs are challenging to parents as their behaviour difficulties increase parental burden. Parents of infants with multiple/persistent RPs often report more mental health problems such as increased distress and depressive symptoms [8–11]. Maternal mental health problems such as depression and anxiety may affect parenting and may be a precursor for RPs [11–13] and important for the child's optimal development of self-

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Abbreviations: RPs, regulatory problems; PIRI, parent-infant relationship index; CBCL, Child Behaviour Check List; TRCB, Tester's Rating of Child Behaviour; FIML, full information maximum likelihood

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regulation [4, 11]. On the other hand, multiple/persistent RPs are stressful for parents due to sleep deprivation, insecurity about parenting skills, feelings of helplessness, and frustration with the child [9, 14, 15]. A recent systematic review suggests that maternal depression may be more likely a result of infant RPs, while maternal anxiety is more likely a precursor [16]. The presence of mental health problems may be associated with a higher risk of parents not responding to their dysregulated child in a sensitive and caring manner [9], although the evidence is controversial [3]. Parenting quality, i.e., parents' ability to be in tune with their infant's cues and signals and to respond appropriately and consistently may thus be influenced by child characteristics [17]. In addition, infants with RPs may be more vulnerable to poor parenting than infants with none or single RPs [18, 19]. Taken together, we hypothesize that multiple/persistent RPs, suboptimal parenting and maternal mental health problems in infancy will all be related to higher attention problems in childhood. However, it is possible that these effects are not cumulative, i.e. additive, but alternatively, that these effects interact in a way that those infants with RPs may be particularly vulnerable to poor parenting and maternal mental health problems and thus show a disproportionally increased risk for childhood attention problems [18]. We will thus also examine interaction effects between RPs, parenting and maternal mental health exploratively.

Although the link between early RPs and later attention problems has been replicated across studies, several conceptual and methodological considerations need to be taken into account to advance current knowledge. First, only a few studies have included both early RPs and parenting factors as predictors of later childhood behaviour problems [6, 8, 10]. Second, only one of these studies examined the moderating effect of parenting on the association between infants' RPs and later behaviour problems [6]. Third, most of these studies had short followup periods, prohibiting the longitudinal prediction of attention problems at a time when these are most likely to be recognised (i.e., first years of elementary school). Fourth, most of these studies only included parent-reported measures of behaviour problems that may be biased due to continued perception of the child as "difficult". Therefore, the aim of this large prospective cohort study was to examine the combined effects of early multiple/persistent RPs, parenting quality, and maternal mental health on later attention problems assessed by multiple informants at 8 years of age.

#### 1. Methods

#### 1.1. Design and participants

The Bavarian Longitudinal Study is a prospective whole population study of infants born between January 1985 and March 1986, who required admission to one of 16 paediatric hospitals in Southern Bavaria (Germany) within the first 10 days after birth (n = 7505; 10.6%) of all live births) [20]. Additionally, 916 full-term comparisons were recruited in obstetric units in the same catchment area during the same period. After the first phase of the study (birth to 56 months) the decision was made to reduce the sample to allow for a continuation of more intensive psychological and neurological assessments. From the initial sample; all survivors born < 32 weeks and/or < 1500 g birth weight, and a subsample of hospitalized children born  $\geq 32$  weeks (randomly drawn within the stratification factors sex, family socioeconomic status (SES) and degree of neonatal risk) and 343 healthy term-born control children were selected for assessment at age 8 years (n = 1495). More details on the sampling criteria and infancy dropout rates are provided elsewhere [21]. The sample was further reduced due to missing RPs data in infancy (n = 36) resulting in a final study sample of 1459 children. Ethical approval was obtained from the University of Munich Children's Hospital and the Landesärztekammer Bayern. Informed written consent was provided by parents within 48 h of their child's birth.

#### 1.2. Measures

#### 1.2.1. Multiple or persistent regulatory problems

An interview concerning crying, feeding, and sleeping problems was conducted with parents at 5 and 20 months by trained paediatricians. This interview was evaluated as a reliable and valid assessment of infant regulatory problems [1, 22, 23]. Children who were classified as having multiple RPs had at least 2 problems at 5 months or 20 months: A *crying problem*, a *sleeping problem*, or a *feeding problem*. Persistent RPs were defined as having at least one type of RP at 5 and at 20 months of age. For this study, the variable RPs was dummy coded (0 = no/single RP; 1 = multiple/persistent RPs). For more information see supplement S1.

#### 1.2.2. Parenting quality

Parenting quality was assessed with the Parent–Infant Relationship Index (PIRI) [20, 24], a measure similar to the Boston City Hospital Assessment of Parental Sensitivity [25]. The PIRI contains 8 yes/no items on parenting behaviours and attachment-related parental concerns and feelings, based on a standardized interview with the parent by trained paediatricians and nurses' observations assessed in the neonatal period and at 5 months. Items were summed up so that PIRI-scores could range from 0 to 8 with higher scores indicating poorer parenting quality. For more information see supplement S1.

#### 1.2.3. Maternal mental health

Maternal mental health was assessed neonatally and at 5 months with 1 item 'maternal mental health' of the Psychosocial Stress Index (PSI), a 14 item interview-based measure administered by trained paediatricians [20, 24]. During both assessments, maternal mental health was rated as 0 = no problems; 1 = hardly any problems; 2 = mental health problems present. A dummy variable was created with 0 = no/hardly problems (i.e., adequate mental health) and 1 = mental health problems present, in such a way that when mental health problems were present at either or both assessments, it was coded as 1.

#### 1.2.4. Parent-rated attention problems

Parent-rated attention problems were assessed at 8 years using the German version of the Child Behaviour Check List (CBCL) [26, 27]. The attention problems subscale consists of 11 items (e.g., can't concentrate, can't pay attention for long). Each item was rated on a scale from 0 to 2, and then summed across all items, with higher scores indicating more problems (Cronbach's  $\alpha = 0.72$ ).

#### 1.2.5. Observer-rated attention problems

Psychologists rated the child's behaviour during a comprehensive cognitive assessment (i.e., the Kaufman Assessment Battery for Children) [28] lasting over 1 h using the Tester's Rating of Child Behaviour (TRCB) at 8 years [29]. The task orientation index scale was constructed using the mean of 6 scales (Cronbach's  $\alpha = 0.85$ ): Attention, robustness and endurance, demandingness (recoded), cooperativeness, compliance, and difficulty (recoded), rated 1 = very low to 9 = very high. The interrater reliability as measured with the intraclass correlation (ICC) ranged from 0.63–0.97 for the 6 task orientation subscales [30].

In addition, the whole research team (psychologist, assistant psychologist, and paediatrician) evaluated the child's attention span using 3 TRCB subscales (attention, robustness and endurance, and demandingness (recoded)), adopting a consensus model based on their observations across the whole assessment day comprising various activities including neurological assessments, motor tasks, interviews, mother-child interaction observations, and tests. This mean TEAM attention index ranged from 1 = very short to 9 = very long attention span (Cronbach's  $\alpha = 0.85$ ) [29].

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