

Infants' interactions with professional caregivers at 3 and 6 months of age: A longitudinal study

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Abstract

This study longitudinally investigated the quality and stability of 64 infants' interactions with their professional caregivers in child care centers at 3 and 6 months of age, i.e., across the first 3 months after they entered child care. It was also examined whether the infants' negative emotionality (as rated by the mother) predicted the quality of the caregiver–infant interaction. The interactive behavior of the professional caregivers (sensitivity, cooperation) and the infants (responsiveness, involvement) was rated from videotapes recorded in three different caregiving situations, lasting about 25 min in total. In contrast to our expectation, the quality of the caregiver–infant interaction did not significantly increase across the first 3 months in child care. As expected, significant rank order stability was found for the quality of the caregivers' behavior over time. Also in accordance with our expectations, infants with higher negative emotionality scores experienced less sensitivity and cooperation in interactions with their primary professional caregivers at both ages.

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Nonparental child care is nowadays an ordinary part of life for many children in most western countries. Infants often attend child care centers from a very early age onwards and for substantial amounts of time. Despite the general acknowledgement that well-attuned interactions with adult caregivers are of vital importance for a healthy development of very young infants, surprisingly little is known about the quality of the interactions these infants have with their professional caregivers in child care. The present study aimed to shed more light upon this matter. We observed the quality of infants' interactions with their primary professional caregivers in child care centers at 3 months of age when the infants had first entered child care, and again 3 months later when the infants were 6 months of age. We examined (1) whether the quality of the caregiver–infant interactions changed or remained stable across the first 3 months after entering child care, and (2) whether the infants' negative emotionality predicted the quality of these early caregiver–infant interactions.

1. The importance of well-attuned early caregiver–infant interactions

In the Netherlands, as in the U.S. and many other countries, it is very common for infants to attend child care centers from as early as 3 months of age. It is exactly around this age that infants begin to actively engage themselves in

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face-to-face interactions with their caregivers (e.g., Fogel, 1988; Stern, 1995). Well-attuned face-to-face interactions with familiar and sensitive caregivers have been found to foster infant development in various domains. First of all, sensitive caregivers are assumed to ‘co-regulate’ infants’ behavior, emotions, and physiological arousal, and thereby foster the children’s emergent capacity for self-regulation (Fogel, 1993; Hofer, 1994; Kopp, 1982; Schore, 2001a; Tronick, 1989). Empirical studies have indeed shown well-attuned parent–infant interactions to be associated with indicators of self-regulation in the children, e.g., better physiological self-regulation in infancy (Haley & Stansbury, 2003), more self-control (Feldman, Greenbaum, & Yirmiya, 1999) and compliance (Martin, 1981) in toddlerhood, and enhanced ego-resiliency or a greater capacity to adapt to novel and stressful situations in middle childhood (Riksen-Walraven & van Aken, 1997). In addition to better self-regulation, well-attuned early parent–child interactions have also been found to predict children’s cognitive and language development (Feldman, Greenbaum, Yirmiya, & Mayes, 1996; Jaffe, Beebe, Feldstein, Crown, & Jasnow, 2001; Nicely, Tamis-LeMonda, & Bornstein, 1999) as well as the security of parent–infant attachment (De Wolff & Van IJzendoorn, 1997; Van den Boom, 1997).

The above evidence suggesting beneficial effects of well-attuned caregiver–infant interactions on children’s cognitive and socio-emotional development stems from studies focusing on the *parent–infant* interaction. It may be assumed, however, that for infants who spend much of their time in child care from a very early age onwards, interactions with professional caregivers in child care have similar effects on their development. This is all the more true because the transition to group care in a child care center, implying a separation from the primary caregiver and exposure to a novel – often more noisy and unpredictable – environment, can be a stressful experience for very young infants. And given that recent neurobiological studies strongly suggest that exposure to high levels of stress in the first year of life may negatively affect the development of children’s capacity for self-regulation and coping with stress (Schore, 2001b), professional caregivers may play a very important role as ‘co-regulators’ of arousal particularly for young infants in group care.

In the present study, two dimensions of professional caregivers’ interactive behavior were observed that were deemed to be characteristic of well-attuned interactions, namely *sensitivity* and *cooperation* (vs. intrusiveness). Sensitivity to infants’ signals and needs is generally recognized as the core feature of well-attuned, adequate caregiving in infancy; the contribution of parental sensitivity to children’s development and adjustment is well-documented (see De Wolff & Van IJzendoorn, 1997). Another key feature of adequate caregiving in infancy is a cooperative, non-intrusive interaction style. Maternal intrusiveness during interactions with their 6-month-old infants has been shown to contribute to child maladaptation in the early school years, beyond maternal insensitivity (Egeland, Pianta, & O’Brien, 1993). We not only observed the caregiver’s behavior toward the child, but also the child’s behavior toward the caregiver. Our observations focused on the two qualities of the child’s behavior toward the caregiver, namely *responsiveness* or the eagerness and pleasure with which the child reacts to the caregiver’s bids for exchange, and *involvement* or the degree to which the child attends to the caregiver and invites her into interaction (Biringen, Robinson, & Emde, 1998). Children’s responsiveness and involvement of the parent have been shown to be related to attachment as well as to other meaningful aspects of the parent–child relationship (see Biringen, 2000).

2. Quality of caregiver–infant interactions over time

It was the first aim of the present study to examine the quality and stability of infants’ interactions with their professional caregivers in child care across the first 3 months after the infants had entered child care. At the time of the first observations in child care, the professional caregivers and infants were still unacquainted. We expected that the quality of the caregiver–infant interactions would improve when the caregiver and the infant became more familiar with each other. With experience, the professional caregiver may learn to recognize the infant’s signals and needs better. She may also become more emotionally involved with the infant and learn to anticipate the infant’s behavior and reactions. As a result, not only would the sensitivity of the caregiver’s responses to the infant’s signals and needs improve but also the caregiver’s readiness and ability to cooperate with the infant. On the part of the infant, better acquaintance with the professional caregiver may lead to a greater recognition of the caregiver, and therefore to more involving and responsive behavior toward the caregiver. It has indeed been shown that children show a preference for stable and familiar caregivers over unstable caregivers in child care centers (Lamb & Ahnert, 2006). Therefore, it has been assumed by several child care researchers that infants’ enrollment in child care offers opportunities to form significant relationships with their primary professional caregivers. And as a recent meta-analysis shows, it was indeed found that young children develop attachment relations with their primary professional caregivers in child care (Ahnert, Pinquart, & Lamb, 2006).

In the present study, we examined whether the quality of the caregiver–infant interactions changed or remained stable across the first 3 months after entering child care. Two different types of stability were examined: (1) mean level (i.e., absolute) stability or the constancy in the average level of particular behaviors in the sample over time, and (2) rank order (i.e., relative) stability which refers to the stability of inter-individual differences over time. With respect to the mean level stability, we expected the average quality of caregiver–infant interactions to increase over time. Because we expected – as argued above – that getting to know each other better will lead to improvement of the quality of the caregiver–infant interaction, we hypothesized to find such an improvement particularly in infants who retained the same primary caregiver over the first 3 months in child care.

With regard to rank order stability in the quality of the caregiver–infant interaction, we had to base our expectations on earlier studies on *parent*–infant interaction, because longitudinal studies on the stability of interactions between infants and their professional caregivers are lacking. Given that the quality of parental caregiving behavior has been found to be relatively stable across the first years of the child’s life (Horvath Dallaire & Weinraub, 2005; Meij, Riksen-Walraven, & Van Lieshout, 2000), we expected the quality of the caregiving infants receive from their professional caregivers in child care centers to show significant inter-individual stability over time as well.

3. Infant negative emotionality and the quality of the early caregiver–infant interactions

The second aim of the present study was to examine whether infants scoring higher on the temperamental dimension of *negative emotionality* were more at risk for experiencing lower quality interactions with their professional caregivers than their more “easy” peers. This question was addressed because these temperamentally more “difficult” infants may be more vulnerable to the effects of lower quality caregiving than infants with more “easy” temperaments (Belsky, 1997; Gallagher, 2002). And longitudinal research has indeed shown that well-attuned early parent–infant interactions are more predictive of later self-regulation in more fussy/difficult infants as compared to easier infants (Feldman et al., 1999).

Studies examining the link between infant temperament and caregiving have focused particularly on the temperamental dimension of negative emotionality, which appears to have the most impact on caregiver–infant interactions (Sanson, Hemphill, & Smart, 2004). The negative emotionality dimension of temperament refers to irritability, negative mood and high-intensity negative reactions.

Studies that examined the relation between infants’ negative emotionality and the quality of their interactions with professional caregivers in child care centers are lacking. The link between infant negative emotionality and *parenting*, however, has been examined extensively. Studies of the relation between infant negative emotionality and maternal behavior have produced inconsistent results, including negative, zero, and positive correlations between infant negative emotionality and the quality of maternal behavior (for reviews see Pauli-Pott, Mertesacker, Bade, Bauer, & Beckman, 2000). One possible explanation for the inconsistent results, proposed by Crockenberg (1986), is that infant negative emotionality leads to lower quality maternal behavior only in the presence of other negative influences, such as low socioeconomic status, stress, low social support, and maternal depression; this assumption has been confirmed in various studies (e.g., Pauli-Pott et al., 2000). For the quality of infants’ interactions with their caregivers in the child care center, it was not deemed unlikely that a negative association with infant negative emotionality would be found. The reason for this is that professional caregiving of infants in a group setting may be more stressful than caring for a single infant at home, because the caregivers constantly have to distribute their attention across a number of infants and toddlers.

4. The present study

In sum, in the present study we examined the quality and stability of infants’ interactions with their professional caregivers over the first 3 months after entering child care, and we examined whether the infants’ negative emotionality predicted the quality of the caregiver–infant interactions. We expected (1) a significant improvement of the quality of infants’ interactions with their professional caregivers across the first 3 months after entering child care, particularly for children who retained the same primary caregiver; (2) a significant rank order stability in the quality of caregiver–infant interactions for infants who retained the same primary caregiver; and (3) a significant negative correlation between infant negative emotionality and the quality of the caregiver–infant interactions.

5. Method

5.1. Participants

The infants were recruited in several stages. A total of 77 child care centers in the cities of Nijmegen and Arnhem and the surrounding areas (i.e., the middle-east of the Netherlands) were randomly chosen using telephone books and the Internet. The child care centers were invited by letter to participate in the study and telephoned to give additional information. A total of 66 child care centers (or 86%) agreed to participate. Non-participation was mainly due to having no new enrollments of infants, or being “too busy” for several reasons (moving or merging).

In the next step, the child care organizations were asked to send a brief letter to all parents who had signed up for child care, meeting the following criteria. The infants had to be 3 or 4 months of age at the time of their enrollment in child care and they had to attend child care for at least 2 days a week. A total of 113 parents were contacted by post and 64 (or 57%) agreed to participate. Those who did not want to participate indicated that they were “too busy”, mostly by caring for the newborn baby. The final sample included 34 boys and 30 girls with a mean age of 14.6 weeks (S.D.=2.8) when entering child care, and 5.9 months (S.D.=.65) after 3 months in child care. All infants were in good health and had normal 5-min Apgar-scores at birth ($M=9.57$, S.D.=.65, range 7–10). The mean birth weight of the infants was 3587 g (S.D.=.72). Approximately half (53%) of the sample were firstborn. All but one of the infants’ parents were married or cohabiting with a partner, with the mother being the primary caretaker. The mothers’ mean age was 35.0 years (S.D.=3.2). The average educational level of the mothers was 6.22 (S.D.=.97) on a scale ranging from 1 (elementary school) to 7 (university degree), indicating an overrepresentation of higher educated parents. This is in line with the general overrepresentation of children from high SES families in Dutch child care centers (OECD, 2000; see also Gevers Deynoot-Schaub & Riksen-Walraven, 2005). The 64 infants in the sample attended 53 different care groups distributed across 38 child care centers.

5.2. Procedure

At about 2 weeks before the infants entered child care, the infants’ mothers were sent a questionnaire to assess infant temperament. The infants were visited twice at the child care center: during their first week in child care, and again after being in child care for 3 months. Because we aimed to observe the infant’s everyday interactive experiences with their primary professional caregivers in child care, we videotaped the infant and its primary caregiver in the natural child care setting during three different caregiving episodes at both ages. The episodes were (1) changing diapers; (2) putting to bed and taking out of bed; and (3) individual feeding (i.e., bottle-feeding), lasting about 25 min in total. The professional caregivers were instructed to go about these everyday routines with the infants as they would normally do, and to ignore the observer as much as possible. Child care visits started when the infants arrived at the child care center at around 8.00 a.m. in the morning.

At the time of the first child care visit, all 64 infants had different primary caregivers. All of the 64 infants participated again in the second assessment; for 46 infants the primary caregiver was the same as 3 months earlier, while 18 infants had a different primary caregiver at the time of the second assessment. At both ages, none of the caregivers was observed with more than one infant participating in the study.

5.3. Instruments and measures

5.3.1. Caregiver–infant interaction

The behavior of the professional caregivers was rated from the videotapes using two 9-point rating scales developed by Ainsworth (cf. Ainsworth, Blehar, Waters, & Wall, 1978). Behavior was rated for (1) *sensitivity* or the degree to which caregiver behavior reflects awareness of infant signals, and communications and the ability to respond appropriately and promptly to infant cues and signals; and (2) *cooperation versus interference* with ongoing behavior of the infant or the extent to which interventions and initiations of interactions break into, interrupt or cut across the infant’s ongoing activity. Higher scores on these scales reflect more sensitive and cooperative behavior. The 9-point sensitivity rating scale has been used worldwide in the past decades. Moreover, as judged by a wealth of studies on sensitivity assessed

with this rating scale in both attachment and affective interaction areas (e.g., De Wolff & Van IJzendoorn, 1997; Isabella, 1993; Smith & Pederson, 1988; Van IJzendoorn, Juffer, & Duyvesteyn, 1995), the construct has proved to be an important aspect of the caregiver–child relationship. And, as already mentioned in the introduction, a cooperative, non-intrusive interaction style is another key feature of adequate caregiving in infancy; maternal intrusiveness during interactions with their infants has been shown to contribute to child maladaptation in the early school years, beyond maternal insensitivity (Egeland et al., 1993).

Infant behavior toward the caregiver was rated using two 7-point scales of the Emotional Availability Scales, third edition (Biringen et al., 1998). Infant behavior was rated for (1) *responsiveness* or the eagerness and/or willingness to interact with the caregiver (i.e., responding to bids), and showing pleasure in doing so; and (2) *involvement* or the degree to which the child initiates contact with the caregiver. Higher scores on these scales indicate more responsiveness and involvement. The validity of the rating scales used to evaluate the quality of infant interactive behaviors has been documented in previous research (e.g., Biringen, 2000, 2005; Bornstein et al., 2006).

The videotapes of the caregiver–infant interactions at 3 and 6 months of age were coded by different groups of trained raters who were blind to the other scores. For both ages, caregiver and child behaviors were rated once, based on observation of all videotaped interactions, i.e., the three caregiving routines for the caregiver–infant interaction. Inter-rater reliabilities (Cohen's kappa) were calculated on 20% of the sample and ranged from .74 to .93 ($M = .85$) for the different scales.

5.3.2. *Infant negative emotionality*

The mothers completed the Infant Behavior Questionnaire – Revised (IBQ-R; Gartstein & Rothbart, 2003) to assess infant temperament. The IBQ-R is a 191-item questionnaire that asks about the relative frequency of specific behaviors in the past week (or past 2 weeks) in concrete situations such as: “Fussing and protesting when placed on his/her back” or “Showing pleasure when playing quietly with his/her toys”. Mothers rated all 191 items on a 7-point scale ranging from 1 (never) to 7 (always). The IBQ-R consists of 14 subscales. All scales demonstrated satisfactory internal consistency (Cronbach's alpha = .63–.91). Factor analysis on the subscales (PCA with oblique rotation via oblimin) yielded a three-factor solution that was very similar to the three-factor structure Gartstein and Rothbart (2003) reported for their U.S. sample. The second factor to emerge in the current sample was very similar to the *negative emotionality* factor found by Gartstein and Rothbart. In the present sample, this factor, with an eigenvalue of 2.27 explaining 16.2% of the variance, was defined by high loadings of activity level (.60), distress to limitations (.74), fear (.49), sadness (.76), and loading negatively, falling reactivity (–.62). In Gartstein and Rothbart's (2003) study, activity level did not load on the *negative emotionality* factor. In the present study, factor scores were used to indicate the infant's *negative emotionality*.

6. Results

6.1. *Preliminary analyses*

All study variables were found to be normally distributed. Gender differences were found with regard to the infants' responsiveness and involvement during interactions with the professional caregivers, with girls scoring lower than boys both on responsiveness ($M_{\text{girls}} = 3.47$, S.D. = 1.36; $M_{\text{boys}} = 4.21$, S.D. = 1.50; $t = 2.06$, $p < .05$) and involvement ($M_{\text{girls}} = 3.77$, S.D. = 1.48; $M_{\text{boys}} = 4.65$, S.D. = 1.60; $t = 2.28$, $p < .05$). A gender difference was also found for infant negative emotionality, with girls scoring higher than boys ($M_{\text{girls}} = .29$, S.D. = .92; $M_{\text{boys}} = -.30$, S.D. = 1.01; $t = 2.28$, $p < .05$).

Furthermore, the quality of infants' interactions with their professional caregivers proved to be unrelated to the number of days the child attended child care, as well as to the caregiver–child ratio and the number of children in the infant's care group.

In Table 1 the intercorrelations between the ratings of the caregiver–infant interactions at 3 and 6 months are presented. The scores for different aspects of the same person's behavior were significantly intercorrelated. The correlations between caregiver sensitivity and cooperation were $r = .84$ ($p < .001$) and $r = .88$ ($p < .001$) at 3 and 6 months, respectively. The correlations between infants responsiveness and involvement were $r = .84$ ($p < .001$) at 3 months, and $r = .69$ ($p < .001$) at 6 months of age. In general, the correlations between caregiver and infant behavior were lower at 6 months than at 3 months of age.

Table 1

Intercorrelations of caregiver–infant interaction ratings at 3 months (below diagonal, $N=64$) and 6 months (above diagonal, $N=64$)

	Caregiver behavior		Infant behavior	
	1	2	3	4
Caregiver behavior				
1. Sensitivity	–	.88***	.27*	.19
2. Cooperation	.84***	–	.22	.13
Infant behavior				
3. Responsiveness	.60***	.45***	–	.69***
4. Involvement	.47***	.30*	.85***	–

*** $p < .001$, two-tailed* $p < .05$, two-tailed

6.2. Quality of the caregiver–infant interactions over time

The first research question concerned the stability versus change of the caregiver–infant interactions between 3 and 6 months of age. With respect to the mean level stability, we expected the quality of the caregiver–infant interactions to improve across the infants first 3 months in child care, particularly for infants who retained the same primary caregiver. This hypothesis was tested in a multivariate mixed model MANOVA with the four scores for caregiver and infant interactive behavior as the dependent variables and age as the within-subjects factor. Caregiver stability (i.e., whether or not the infant was observed with same caregiver at the second assessment) was entered as a between-subjects factor. The mean scores and associated F -values for the univariate comparison are depicted in Table 2. For the quality of the caregiver–infant interactions over time, the overall model was not significant ($F(4.59) = 2.26$, $p > .05$), which means that the average quality of the caregiver–infant interactions did not change over time. The interaction effect was also not significant ($F(4.59) = .43$, $p > .05$), indicating that the finding that the quality of the caregiver–infant interactions did not change over time was not different for infants who did or did not have the same caregiver over time.

Because normative data for the interaction rating scales are not available, conclusions with regard to the absolute level of the quality of the caregiver–child interactions can only be based on comparison of the score distributions with the descriptions of the different scale points. For the sensitivity scale – the key dimension of the quality of caregiving (see Ainsworth, Bell, & Stayton, 1974) – the average score (and the modal score) of the professional caregivers at both ages was just above 5, the midpoint of the 9-point scale, which is labeled “inconsistently sensitive”; the description of this scale point includes the following: “She may be prompt and appropriate in response to his communications at some times and in most respects, but either inappropriate or slow at other times and in other respects. On the whole,

Table 2

Mean ratings, standard deviations, and F -values for the differences in the quality of caregiver–infant interaction at 3 and 6 months of age, as well as stability of caregiver–infant interaction ratings between 3 and 6 months of age (Pearson correlations)

	Mean level stability				F	Rank order stability	
	Age 3 months ($N=64$)		Age 6 months ($N=64$)			Total sample ($N=64$)	Same caregiver ($n=46$)
	M	S.D.	M	S.D.		r	r
Caregiver behavior							
Sensitivity ^a	5.14	1.73	5.19	1.70	.15	.41**	.57***
Cooperation ^a	5.50	1.43	5.09	1.75	1.65	.33**	.51***
Infant behavior							
Responsiveness ^b	3.86	1.47	4.20	1.54	1.06	.30*	.25
Involvement ^b	4.23	1.59	4.38	1.68	.00	.23	.13

^a 9-point scales.^b 7-point scales.*** $p < .001$, two-tailed.** $p < .01$, two-tailed.* $p < .05$, two-tailed.

Table 3
Correlations between ratings of the quality of caregiver–infant interaction at 3 and 6 months and infant negative emotionality

	Infant negative emotionality		
	Age 3 months (<i>N</i> = 55)	Age 6 months	
		Total sample (<i>N</i> = 55)	Same caregiver (<i>n</i> = 41)
Caregiver behavior			
Sensitivity	−.37**	−.21	−.30*
Cooperation	−.32*	−.22	−.34*
Infant behavior			
Responsiveness	−.14	.03	.10
Involvement	−.21	.03	−.08

* $p < .05$, one-tailed.

** $p < .01$, one-tailed.

however, she is more frequently sensitive than insensitive. What is striking is that a mother who can be as sensitive as she is on so many occasions can be so insensitive on other occasions. . .” (Ainsworth et al., 1974, p. 132). At the 3-month assessment, 20.3% of the caregivers had scores at or beyond the scale point of 7 (“sensitive”), and 18.8% of the caregivers had scores at or below 3 (“insensitive”), which is clearly stated to reflect an inadequate level of sensitivity: “This mother frequently fails to respond to B’s communications appropriately and/or promptly . . .” (Ainsworth et al., 1974, p. 132). At the 6-month assessment, 23.5% of the caregivers scored at or beyond 7 (“sensitive”), and 18.7% of the caregivers scored at or below 3 (“insensitive”).

Our hypothesis that the quality of the caregiver–infant interaction would show significant rank-order stability over time for infants who remained with the same primary caregiver was examined with Pearson correlations. For the infants whose primary caregiver remained the same, significant rank order stability was found for the caregivers’ interactive behavior toward the child (see Table 2). Correlations were $r = .57$ ($p < .001$) and $r = .51$ ($p < .001$) for caregiver sensitivity and cooperation, respectively. The infants’ interactive behavior was not stable over time.

6.3. Infant negative emotionality and the quality of the caregiver–infant interactions

Correlations were calculated to test the hypothesis that higher levels of infant negative emotionality, as reported by the mother, would be associated with lower quality caregiver–infant interactions (see Table 3). At 3 months, the results show that infants who received higher negative emotionality scores experienced less sensitivity ($r = -.37$, $p < .01$) and less cooperation ($r = -.32$, $p < .05$) in interactions with their professional caregivers. The infants’ interactive behavior, however, was not significantly associated with their negative emotionality. Three months later (at 6 months of age), infants who had received higher negative emotionality scores at 3 months of age, and retained the same primary caregiver, were still observed to have lower quality caregiver–infant interactions; more in particular, they still experienced less sensitivity ($r = -.30$, $p < .05$) and less cooperation ($r = -.34$, $p < .05$) in interactions with their professional caregivers. To explore whether infant gender moderated the relation between negative emotionality and the quality of the caregivers’ interactive behavior toward the child, four multiple regression analyses were performed with the caregivers’ interaction ratings as the dependent variables and infant negative emotionality, infant gender, and a negative emotionality \times gender interaction term (computed according to the procedure outlined by Aiken & West, 1991) as the predictors. The interaction term was not a significant predictor in any of the analyses, indicating that the relation between infant negative emotionality and the quality of the caregiver–infant interaction was not moderated by infant gender.

7. Discussion

The present study longitudinally observed infants’ interactions with their primary professional caregivers in the “natural” child care setting at three and 6 months of age. The quality of the caregiver–child interactions was moderate, on average, and did not increase between 3 and 6 months of age, which was in contrast to our expectation. As

expected, significant rank order stability in the quality of caregiver behavior over age was found for infants who were observed with the same caregiver at both ages. Also in accordance with our expectation, infants scoring higher on the temperamental dimension of *negative emotionality* were more at risk for experiencing lower quality interactions with their professional caregivers than infants who were rated lower on negative emotionality.

Contrary to our expectation, the quality of the caregiver–infant interaction did *not* increase between 3 and 6 months of age for infants who retained the same primary caregiver. This suggests that getting to know each other better did not (yet) lead to an increase of the caregivers' sensitivity and cooperation toward "their" infants, nor to an increase of the infants' responsiveness and involvement of the caregivers in question. The lack of increase in the quality of caregiver behavior over time also contrasts with the conclusion that older children may be more easy to "read" and care for than younger children, a conclusion that was drawn in two other recent Dutch child care studies, where the quality of professional caregivers' interactive behavior toward the children (rated with similar scales as in the present study) was found to increase with the age of the children (De Schipper, Riksen-Walraven, & Geurts, 2006; Gevers Deynoot-Schaub & Riksen-Walraven, 2004). In the latter studies, however, the ages of the children that were observed during interactions with their professional caregivers were higher and the age range of the children larger than in the present study, namely 10 months–4 years (De Schipper et al., 2006) and 15–23 months (Gevers Deynoot-Schaub & Riksen-Walraven, 2004), respectively. Moreover, in the two latter studies the caregiver–child interaction was observed while the caregivers were interacting with small *groups* of children, while in the present study the caregivers were observed during one-to-one interactions with the children. Anyhow, longitudinal follow-up of the present sample may reveal whether the expected increase in the quality of the caregiver–child interaction will emerge as the time between the assessments increases.

Another explanation for the unexpected absence of an increase in the quality of the caregiver–infant interaction between 3 and 6 months of age might be that the quality of the caregiver–infant interaction was already at such a high level at 3 months of age that an increase was simply not possible. This explanation seems unlikely, however, given that the average caregiver sensitivity and cooperation ratings were only moderate, i.e., just above 5 on a 9-point scale, while the average infant responsiveness and involvement ratings were not optimal as well, i.e., hovering around 4 on a 7-point scale. Moreover, about 19% of the professional caregivers were rated as insensitive (i.e., at or below 3) at the time of the first assessment, which clearly indicates that there is room for improvement.

As expected, for those infants whose primary caregivers remained the same, considerable rank order stability was found for the quality of the caregivers' behavior toward the infants. This suggests that the caregivers' interactive behavior, just like parents' behavior during interactions with their children, reflects a stable behavioral style, that is to a large extent determined by enduring personality characteristics (see Van Bakel & Riksen-Walraven, 2002). Despite its relative stability, however, the interactive behavior of the professional caregivers was found to be affected by infant *negative emotionality*. Infants who were rated as higher on negative emotionality by their mothers were treated with less sensitivity and cooperation by their professional caregivers at 3 months of age than infants with lower ratings on negative emotionality. For infants who retained the same primary caregiver, higher levels of negative emotionality at 3 months even predicted lower caregiver sensitivity and cooperation when the children were 6 months of age. These findings suggest that negative emotionality is a risk factor for infants in child care centers to get involved in lower quality caregiver–child interactions. Further research – particular intervention studies – may reveal whether it is possible to reduce this risk for temperamentally more "difficult" infants, for example by providing specialized training to professional caregivers working with infants or by reducing the number of children per caregiver in case of center-based group care for infants. A recent experimental study in Dutch child care centers (De Schipper et al., 2006) demonstrated the beneficial effect of decreasing the child–caregiver ratio from 1:5 to 1:3, particularly for the youngest children, but the childrens' temperament was not taken into account; further research may shed more light on this matter.

The present study has some limitations. For example, a considerable number of contacted parents (43%) declined participation. Although we have no further information on these parents, this could very possibly mean that the most stressed parents were underrepresented in our sample and that the infants in our sample may therefore not have been representative for all infants in child care centers in the Netherlands. Furthermore, the outcomes of the present study may not be automatically generalized to other countries, given the typical characteristics of the system of center-based child care in the Netherlands. In the Netherlands, for example, there is an overrepresentation of children of highly educated parents in center-based child care; moreover, most infants attend child care centers for only 3 or 4 days a week because many Dutch mothers choose to work only part-time when they have small children. In addition, most

professional caregivers in Dutch child care centers have received vocational training which is very general and does not specifically prepare them to work with very young children (OECD, 2000; see also Gevers Deynoot-Schaub & Riksen-Walraven, 2005). Further research may highlight whether the present results also apply to infants attending center-based child care in other countries.

Another question that remains to be answered is what the quality of the professional caregiving that we observed in the child care centers contributes to the children's development. The quality of the observed caregiver–child interactions was not high, in terms of the descriptions of the relevant scale points on the observation rating scales, and this was particularly true for infants scoring high on negative emotionality. But to what extent these experiences affect the children's development, beyond and possibly also in interaction with their experiences at home, can only be revealed through further longitudinal study.

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