

File ID uvapub:56793
Filename DeSchipper_etal_SD08_Attachment_in_daycare.pdf
Version unknown

SOURCE (OR PART OF THE FOLLOWING SOURCE):

Type article
Title Children's attachment relationships with daycare caregivers: Associations
 with positive caregiving and the child's temperament.
Author(s) J.C. Schipper, de, L.W.C. Tavecchio, M.H. IJzendoorn, van
Faculty UvA: Universiteitsbibliotheek
Year 2008

FULL BIBLIOGRAPHIC DETAILS:

<http://hdl.handle.net/11245/1.427042>

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Children's Attachment Relationships with Day Care Caregivers: Associations with Positive Caregiving and the Child's Temperament

J. Clasien De Schipper, *VU University Amsterdam*,
Louis W. C. Tavecchio and Marinus H. Van IJzendoorn, *Leiden University*

Abstract

In this study, children's attachment relationships with their professional caregivers in center day care were observed for 48 children. We explored whether more positive caregiving was associated with a more secure attachment relationship and whether this association was stronger for more temperamentally irritable children compared to less irritable children. Trained observers coded the attachment relationship in the day care setting using the attachment Q-sort. The observational record of the caregiving environment was used to assess children's individual experience of positive caregiver-child interaction in the classroom. When caregivers showed more frequent positive caregiving behavior, children showed more secure attachment behavior toward their primary professional caregiver. Temperament was not related to attachment security, nor did it serve as a moderator. Consequently, no support for Belsky's susceptibility hypothesis was found.

Keywords: attachment; caregiving; day care; temperament

Studies of children's attachment behavior in a day care context suggest that professional caregivers might be alternative attachment figures for a child at times when parents are temporarily unavailable (Howes, 1999, p. 677). When children enter day care, they direct attachment behaviors to the caregivers (Barnas & Cummings, 1994; Cassibba, Van IJzendoorn, & D'Odorico, 2000; Elicker, Fortner-Wood, & Noppe, 1999; Howes & Hamilton, 1992; Howes & Smith, 1995), and they develop relationships with the caregivers that may be of a different quality to the attachment relationship with their own parents (Ahnert, Pinquart, & Lamb, 2006; Goossens & Van IJzendoorn, 1990). The formation of attachment relationships in childcare settings, however, appears to be a similar process to that of infant-mother attachment formation (Howes, 1999, p. 677), and the nature of these relationships can be described using measures of child-mother attachment that assess secure base behavior (Ahnert et al., 2006).

Correspondence should be addressed to J. Clasien De Schipper, Department of Clinical Child and Family Studies, VU University Amsterdam, Van de Boechorststraat 1, 1081 BT Amsterdam, the Netherlands. Email: jc.de.schipper@psy.vu.nl

Another important indication of the professional caregiver being an attachment figure for the child would be if more sensitivity on the part of the caregiver promoted a more secure caregiver–child attachment relationship. In numerous studies on infant–mother attachment relationships, support was found for this major hypothesis of attachment theory (Bowlby, 1969/1982) known as the sensitivity hypothesis. Higher parental sensitivity is related to more secure attachment relationships in correlational (De Wolff & Van IJzendoorn, 1997) as well as experimental studies (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003). Far fewer studies have addressed the association between sensitivity and attachment within a day care setting, but results indicate that higher caregiver sensitivity is also associated with more attachment security (Ahnert et al., 2006; Van IJzendoorn, Vereijken, Bakermans-Kranenburg, & Riksen-Walraven, 2004). Finally, a strong association between a child’s temperament and the attachment security with the professional caregiver would be an indication that the professional caregiver might not really be a special attachment figure for the child. In such a case, the child’s so-called attachment behavior is more likely to be an expression of a general behavioral style (‘sociability’, ‘shyness’, or ‘dependency’) rather than the expression of attachment toward this specific person. In this study, we will test the sensitivity hypothesis in a center day care context and explore its associations with children’s temperament.

If differences in a child–professional caregiver attachment relationship can be explained by the caregiver’s sensitivity, this provides support for the assumption that the building of attachment relationships is based on caregiving and mutual interaction between child and caregiver rather than on genetic disposition. Indeed, with regard to attachment to mothers, Bokhorst et al. (2003) found little evidence in their twin study for a genetic component explaining differences in the quality of children’s attachment to their mother. Belsky (1997, 2005) further elaborated on the sensitivity hypothesis of attachment theory and proposed that children may vary in their susceptibility to child-rearing influences. Some children may be more influenced by caregiving interactions than others. In particular, he suggested that children who show more negative emotionality might be more susceptible to caregiving influences. If children vary in their susceptibility to environmental influences, one might expect the sensitivity of caregivers to be more important for the emotional security of certain groups of children in day care than for other children. For example, children who have more difficulty with new or changing environments might be more in need of an attentive and responsive caregiver to help them cope with these changes. Results of a study by Suomi (1995) suggest that Belsky’s susceptibility hypothesis might also be of relevance in a non-parental day care setting. In his studies with rhesus monkey infants, Suomi found that the caregiving style of unrelated foster mothers was of more importance for behaviorally inhibited infants than for those with less behavioral inhibition. Infants who were behaviorally inhibited and were reared by a nurturant foster mother developed secure attachment relationships with their foster mother. Behaviorally inhibited infants who were reared by a more punitive foster mother developed insecure attachment relationships. However, rhesus monkey infants with uninhibited early temperaments seemed relatively unaffected by the type of foster mother rearing them. Center day care is a non-parental care context to which some children might more easily adapt than others. For example, De Schipper, Tavecchio, Van IJzendoorn, and Van Zeijl (2004) found that for children who show more irritable distress, several parallel care arrangements interfere with the process of adapting to the day care setting. The current study will apply Belsky’s susceptibility hypothesis in a day care context and we will

explore whether for children who show more irritable distress, the association between sensitive caregiving and attachment security is stronger than for children showing less irritable distress.

In several studies exploring the sensitivity hypothesis in a day care context (Elicker et al., 1999; Howes & Hamilton, 1992; Howes & Smith, 1995), it was not the quality but rather the *frequency* of positive caregiving that was related to more secure attachment relationships. Howes and colleagues found that involvement of the caregiver but not the sensitivity scale was related to more secure child–professional caregiver attachment relationships (Howes & Hamilton, 1992; Howes & Smith, 1995). When caregivers were more frequently positively involved with a child, the child in question was more securely attached to the caregiver. A characteristic aspect of center day care is that in this group-care setting, caregivers have to divide their attention between several children. Ahnert et al. (2006) report differential predictive validity of group-based vs. dyadic-based sensitivity measures. Especially in center day care, group-level sensitivity was more strongly associated with attachment security than dyadic-level sensitivity. A caregiver cannot always be prompt and adequate in reacting to every child's signals. The results of these previous studies indicate that in group-care situations, one might expect that not only quality but also frequency of positive caregiving plays a role in establishing secure child–caregiver attachment relationships. If a caregiver has only a few opportunities to act sensitively toward a child's signals, this might not always be sufficient for a child to develop a sense of confidence in a caregiver's availability as a safe haven and a secure base. In this study, we will investigate the association between the quality and frequency of caregiver sensitivity and toddlers' attachment relationships with their caregivers in center day care. Based on the assumption that both amount and quality of sensitive caregiving promote the development of more secure attachment relationships, we expect that a higher quality of positive caregiving and a higher frequency of positive caregiving by professional caregivers in day care centers is related to higher security in children's attachment relationships with their primary professional caregivers.

We will test our hypotheses in the ecologically valid context of a day care center. We will use the observational record of the caregiving environment (ORCE; National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network, 1996, 2000) as an indicator of caregivers' sensitivity and the attachment Q-sort (AQS; Waters, 1987) as an indicator of the child's attachment relationship with the primary professional caregiver. In the NICHD Early Child Care Research Network study, a valid assessment of a child's experience of positive caregiving in non-maternal care was developed. Both the quality and the frequency of caregivers' interactions with an individual child were evaluated with the ORCE, which will enable us to explore differences in the association of quality and frequency of positive caregiving with the child's attachment security. The AQS (Waters, 1987) was originally developed for observation of an attachment relationship in the home environment. To describe a child with the AQS, it is necessary to collect a representative sample of child behaviors. Waters indicates that the quality of data collection is likely to improve when a few structured activities take place, such as introducing new or mildly stress-inducing activities, or if the observer interacts with the child. To optimize the quality of our assessment of children's attachment relationships in center day care, we chose to combine naturalistic, unobtrusive observations in the classroom with 20–30 minutes of observation with structured activities focusing on caregiver–child interaction, the child's response to a brief separation and reunion, and the child's

reaction toward strangers. In this way, we hope to optimize our testing of the sensitivity and susceptibility hypothesis in a day care context.

In sum, in this study we will explore the role of caregivers' positive and sensitive interactions and a child's irritable distress in the development of attachment relationships between children and their professional caregivers in center day care. We expect more and higher quality positive caregiving to be associated with more security in children's attachment relationships with their primary professional caregivers. Furthermore, we expect this association between positive caregiving and attachment security to be stronger for more temperamentally irritable children than for less irritable children.

Methods

Participants

In this study, 48 children aged 26–50 months ($M = 36.7$, standard deviation [SD] = 7.2) were observed for one morning in their group at the day care center. The children (24 girls, 50 percent) were enrolled in 41 different day care centers in the Netherlands, each child attending a separate group. Children came from lower-middle- to middle-upper-class families. The mean score for family socioeconomic status (SES) was 5.06, $SD = .89$ (on a scale from 1 to 6) based on a combination of the educational and vocational backgrounds of both parents using the sample specific loadings and SD s of the four factors (see also Bernstein & Brandis, 1970). The average number of mornings or afternoons (half days) the children attended the center per week was 5.08 ($SD = 1.47$), which is comparable to 20–25 hours per week with a minimum of 2 half days and a maximum of 10 half days. The average number of months the professional caregiver involved had taken care of the child was 15.6 ($SD = 10.4$). The percentage of caregivers at the center who had quit their jobs over the last three months (staff turnover rate) varied from .00 to 1.00 ($M = .16$, $SD = .22$).

Participants were recruited from a day care sample used in an earlier survey (De Schipper, Tavecchio, Van IJzendoorn, & Linting, 2003). The mothers and the primary professional caregivers of 186 children (6–30 months) from 113 day care centers in three provinces of the Netherlands (Noord-Holland, Zuid-Holland, and Utrecht) participated in this survey. The directors of the day care centers were asked to select two groups. In each group they were asked to select a child born on or very close to a specific birth date. For the current observational study, a subsample of children was selected from the survey, approximately 18 months after the first data-collection period. Our aim was to maximize variance in the center's provision of daily stability in caregiving, resulting in stratified sampling and the exclusion of children who had left the center (De Schipper et al., 2003). When a child or center could not participate, another child from the survey sample matching in age and gender was selected. In this way, a total of 97 children of the original survey sample was selected, of which 52 took part in the observational study. Main reasons for non-participation were: (1) the child had left the day care center (42 percent); (2) centers were too busy (22 percent); and (3) parents did not want to participate (18 percent). After data collection and coding, observers of the attachment relationship were uncertain whether the professional caregiver was an attachment figure for the child in case of four children (see section on the measures below). The validity of the assessment of the attachment relationship for these four children is therefore unclear, and they were excluded from further analyses,

resulting in a final sample of 48 children. To test the potential influence of non-response and exclusion, we compared sex, age, family characteristics, and structural aspects of quality of care of the 48 included children and the 49 potential participants who were not included. No significant differences in sex, age, age of entry, family SES, parents' hours of work outside the home, caregiver-child ratio, staff turnover rate, or group size were found. Also, no significant differences in these variables were found between the 48 observed children and the 138 survey children who were not invited to participate.

Procedure

Video recording (by the first author or a trained research assistant) took place during one morning visit at the day care center. Each child was followed with a small camera during his or her daily activities at the center for three hours. Special care was taken to record both child and caregiver(s) at the same time. The video makers remained as unobtrusive as possible. In addition to these classroom observations, interactions between the child and his or her primary professional caregiver were videotaped in a structured task setting. This setting consisted of several tasks or games for child and caregiver in which the video maker was sometimes involved. It was designed to improve the validity of the attachment relationship assessment by increasing the possibility that a range of (attachment) behaviors in varying situations would be tapped. Video recording of this structured task setting started when the primary caregiver invited the child to join her or him in a separate room (usually the staffroom), followed by eight different tasks or settings (see also the measures section on the child-caregiver attachment relationship). Video observations were chosen over live observation (1) to minimize interference of the group process, in particular the child's interactions; (2) to be able to review key moments in interaction; and (3) to minimize imprecision in coding due to concentration problems or dual tasking. The video makers were trained in six sessions to record on video, learn the protocol and procedures of the classroom observations and the structured task setting, learn about attachment behavior and caregiving behavior, and identify significant key moments to focus on during videotaping and during the structured task setting. In addition, each video maker was given feedback on two pilot observations. Video makers were not aware which part of the classroom observations would be used for which variable in the data-coding procedures.

The primary caregiver was given a questionnaire on the child's temperament to be completed the same week. The director of the childcare center was interviewed by phone, and questionnaires were sent to the parents.

After data collection, the videotapes were used for coding the child's attachment security with the AQS (Waters, 1987) and the caregivers' behavior toward the target child in the classroom with the ORCE (NICHD Early Child Care Research Network, 1996, 2000). Attachment security, frequency of positive caregiving, and quality of positive caregiving were coded independently by different raters who had not videotaped the interactions. The raters were familiar with the overall research design of our study as described in De Schipper et al. (2003), but not with the specific sensitivity and susceptibility hypothesis of the current analyses.

The visit to the center took place after we received written consent from both the parents and the director of the center agreeing to the participation of the target child and professional caregivers in this observation study. In addition, the parents of the

other children in the child's group were informed by letter that video recording would take place. Prior to data collection, the child's professional caregivers were asked several questions to identify the primary caregiver. After sorting the AQS, the raters indicated their degree of certainty that this caregiver was an attachment figure for the child.

Measures

Attachment Relationship with Caregiver. The child's attachment security with the primary caregiver was assessed using the observer AQS (Waters, 1987). The AQS was originally developed for observing children's attachment relationship with their parent in the home setting. In contrast to the strange situation procedure, secure base behavior toward a parent or a caregiver is observed in an ecologically valid context by naturalistic observation. The AQS consists of 90 items describing a range of children's attachment behaviors as well as other behaviors (e.g., dependency, sociability). The items are sorted into nine piles according to whether the behavior described is considered characteristic or uncharacteristic of the child. The resulting profile is correlated with the profile of a prototypically securely attached child, the security criterion. The security criterion (Waters, 1987) was based on experts' sorts of an ideally securely attached child. This correlation is the attachment security score for a child, with high scores indicating a more secure attachment relationship. The AQS makes a within-child comparison: each behavior of the AQS is given a weight depending on how characteristic or uncharacteristic other behaviors of the child are.

Based on our pilot observations, we noticed that some aspects of center day care might hinder adequate measurement of attachment behavior. Firstly, because of group size and child-to-adult ratios, the frequency of caregiver-child interactions might be limited. Secondly, in some cases, there might be limited opportunity to observe the child using the caregiver as a safe haven in times of distress. Waters (1987) indicates that data collection improves if a few structured activities take place apart from naturalistic observations. We therefore designed a structured task setting to elicit a range of (attachment) behaviors described in the AQS. In a separate room, we presented eight activities to the child and his or her primary caregiver in a fixed order. The activities started with the experimenter (the video maker) interacting with the child to tap the first response of a child to a stranger (not to be mistaken with later sociability). This was followed by mildly stress-inducing tasks which might elicit safe-haven behavior (strange and scary toys, reading a book with experimenter, difficult puzzle, caregiver leaves room) as well as less stressful tasks together with the caregiver which might elicit secure base behavior (reading a book, playing without toys, game). The caregiver only leaves the room after the child is somewhat familiar with the experimenter. In Table 1, a detailed description of the eight activities is given. The sorting of a behavior of the AQS was based on behavior in both the classroom and the structured setting.

Each child was observed on videotape in the day care environment (2.5 hours) and in the structured task setting (20–30 minutes) by two coders. Each coder sorted the Q-sort independently, following these three-hour observations. After sorting the AQS, each observer assigned a certainty rating to indicate how sure they were that the appointed primary caregiver was also the *actual* primary professional caregiver. They based their ratings on (1) whether the child had a primary focus toward this caregiver or mainly toward another caregiver during the observations, and (2) whether they

Table 1. Description of the Activities Presented in the Structured Task Setting in Day Care as Part of the Assessment of the Attachment Q-sort

Activity	Description	Domain(s) of behavior
1. Introduction by experimenter (E) (video maker)	E asks the child (C) several questions. This is the first time that morning the video maker addresses C.	Response to strangers Orientation towards caregiver (CG)
2. Strange and scary toy	E asks C to touch a sweet-looking spider with soft hair. If child does not appear scared, E makes spider jump. E ends by explaining how the spider can jump or—if C still wary—by removing spider in cage.	Fearfulness Behavior toward new toy Behavior toward stranger Orientation toward CG
3. Reading book with E	E invites C to sit on her lap (C is not forced), shows the child a book with animals whose skin you can touch (koala bear, frog, etc.). While reading, E asks C to touch own skin or hair, that of CG, and that of E.	Sociability Physical contact with CG and strangers
4. Difficult puzzle (three minutes)	E asks C to do a difficult puzzle. E has instructed CG beforehand to help in ways she/he usually does but not to take over.	Response to difficult task Asking help from CG
5. Reading a book with CG (three minutes)	E asks C and CG to read a book (not a story, but several pictures with lots to see and name).	Physical contact with CG Interaction and attunement between C and CG
6. Playing with CG without toys (three minutes)	E invites C and CG to play without use of any toys.	Interaction and attunement between C and CG
7. CG leaves room (two minutes)	E asks CG to get her something. E has instructed CG beforehand to leave the room for two minutes. E does not initiate interaction with C unless C is clearly upset.	Response to brief separation and reunion with CG when alone with stranger
8. Game/play with CG (three minutes)	Football with straws and ping-pong ball. E gives straws to C and CG, invites to play. No rules are given how to play the game.	Interaction between C and CG in a (new) play situation

observed a sufficient minimal amount of caregiver–child interaction to rate attachment-related items in the AQS. In seven cases, the coders were not sufficiently confident to rate the appointed caregiver as the primary caregiver. They observed that the child was not primarily oriented toward this caregiver and/or there was hardly any interaction between the two during the group observations. In three of these seven ‘uncertain’ cases, a different caregiver was identified as the primary caregiver for the child. For these three children, we chose to rate their attachment relationships with the persons thus later assigned as primary caregivers. In these three cases, the AQS sorting, rated by two other trained coders, was based on the videotaped group observations of 2.5 hours only. In the remaining four cases no other caregiver could be identified as the primary caregiver. As a result, these four children were excluded from the analyses.

The attachment security scores of the two coders were averaged ($M = .42$, $SD = .14$) and ranged from .08 to .70. Four graduate students were trained extensively by the first author in observing attachment behavior in a day care context using videotaped observations. Over a period of two months, the graduate students and the first author reviewed the items and instructions of the AQS (Waters, 1987), independently coded video-recorded (pilot) observations, and then reviewed the video and codings together on a weekly basis. Inter-pair coder reliabilities on attachment security, based on nine three-hour (pilot) observations in day care, ranged from .89 to .93. After reaching this level of reliability, all children were double coded over a two-month period. Inter-pair observer agreement was not measured again during this period. Agreement between coders was .64 in the total sample. Means of coder pairs on attachment security varied from .36 to .50, indicating few differences in scores between coder pairs. The first author was trained in sorting AQS in a toddler’s home setting by Dr. S. C. Mangelsdorf and Dr. J. Zevalkink; in addition, she was trained by Dr. J. E. Elicker in applying the AQS in a day care setting.

Positive Caregiving. The ORCE (NICHD Early Child Care Research Network, 1996, 2000) was used to assess the positive caregiving received by the individual child. Both behavior frequencies and qualitative ratings were used to differentiate between *quantity* or the amount of positive caregiving experienced by each child and the *quality* or nature of that positive caregiving. Each child was rated twice using video recording of two half-hour episodes in the classroom. To obtain independent ratings of positive caregiving and the attachment relationship, only one half-hour episode, videotaped 15 minutes after the child’s parent had left, was used for this study. The manuals of the ORCE for ages 24 and 36 months were translated into Dutch and integrated into one manual for the purpose of this study. The second author trained the research assistants separately for the behavior frequencies and the qualitative ratings after carefully reviewing the original written materials, watching pilot observations and consulting with Dr. K. A. Clarke-Stewart.

The *frequency of positive caregiving* was coded using 12 behavior scales. A trained research assistant, who was not one of the observers assigning the quality ratings, coded the frequency of caregiving behavior over a period of 30 minutes using one-minute time sampling (observing for 30 seconds and recording for 30 seconds). Analogous to the NICHD Early Child Care Research Network (2000) study, the composite variable was generated by the sum of 12 individually standardized categories of behavior toward the child. High scores indicated more positive behaviors of caregivers ($M = .21$, $SD = 6.18$). Cronbach’s alpha was .74. In training, the second author reviewed the Dutch manual with the research assistant and they independently

Table 2. Description of Behavior Scales for Frequency of Positive Caregiving: Incidence of Caregiving Behavior and Observer Agreement (N = 48)

Behavior Scale	<i>M</i> ^a	<i>SD</i>	Range ^b	Agreement ^c (%)
1 Positive physical contact	.043	.075	.00–.34	99
2 Talks	.329	.185	.00–.69	88
3 Speaks positively	.043	.058	.00–.23	96
4 Responds to child's talk	.190	.183	.00–.77	95
5 Reads	.005	.021	.00–.10	100
6 Asks questions	.206	.167	.00–.63	95
7 Teaches academic skills	.043	.078	.00–.33	100
8 Teaches social skills	.028	.050	.00–.27	100
9 Has mutual exchange with child	.005	.014	.00–.07	99
10 Exhibits negative-restrictive actions ^d	.006	.017	.00–.10	98
11 Speaks negatively ^d	.001	.007	.00–.03	100
12 Does not interact with child (the child watches, is unoccupied, or makes transition) ^d	.401	.202	.10–.90	80

^a Mean proportion of time behavior is observed (range 0–1).

^b Minimum and maximum proportion of time behavior is observed.

^c Percentage observer agreement.

^d This variable was reversed after standardization before being used in the composite variable 'Frequency of positive caregiving'.

coded half-hour videotaped observations (used only for training purposes) and reviewed and discussed the codings together in five sessions. Inter-observer reliability was based on 170 episodes over seven children. Percentage agreement for each category of behavior per episode of 30 seconds was high: 80–100 percent. Because the frequencies of several behavior categories were very low, kappas could not be used as alternative reliability measures. The 12 behavior categories, the relative frequencies of these categories, and observer agreement are presented in Table 2.

The *quality of positive caregiving* was coded with eight rating scales by trained raters. Analogous to the NICHD Early Child Care Research Network (2000) study, the composite variable was generated by the mean scores on six 4-point quality ratings: sensitivity/responsiveness to the child's non-distress expressions, positive regard, stimulation of cognitive development, detachment (reversed), flat affect (reversed), and intrusiveness (reversed). The first five scales were used in composites at 24 as well as 36 months in the NICHD study, the scale for intrusiveness only at 36 months. In Table 3, we present a description of these six quality ratings and their inter-correlations. Cronbach's alpha for the composite variable in the current study was .80. A higher score on this composite variable ($M = 3.19$, $SD = .42$) indicated higher quality of positive caregiving. This composite could also be computed for the primary caregiver only. Usually, only one caregiver was rated during a half hour, but sometimes two ($N = 19$). The correlation between the composite for all caregivers and the composite for the primary caregiver was .95 ($p < .001$, $N = 42$). Similar to the NICHD

Table 3. Description of Rating Scales for Quality of Positive Caregiving and Pearson Correlations between Scales (N = 48)

Rating Scale	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 Sensitivity to non-distress	3.09	.58					
2 Positive regard	3.03	.66	.68***				
3 Stimulation of cognitive development	1.75	.86	.41**	.37**			
4 Detachment (reversed)	3.67	.56	.56***	.57***	.39**		
5 Flat affect (reversed)	3.74	.49	.50***	.60***	.40**	.82***	
6 Intrusiveness (reversed)	3.84	.34	.29*	.16	-.01	.25	.16

* $p < .05$, ** $p < .01$, *** $p < .001$.

Early Child Care Research Network study, two rating scales were excluded from the composite: *caregiver's sensitivity to distress* (observed for only eight children in this study) and *negative regard* (no variance was found on this scale). In training, the Dutch manual was reviewed and the research assistants and the second author independently coded half-hour videotaped observations (used only for training purposes) and reviewed and discussed the codings together in seven sessions. Inter-observer agreement for quality of caregiver-child interactions, based on 19 observations, was .81 between the two research assistants, and with the trainer it was .87 and .84. After reaching this level of reliability, two episodes were coded for all children over a two-month period. Observer agreement was not measured again during this period.

Temperament (Infant Characteristics Questionnaire). The infant characteristics questionnaire (ICQ; Bates, Freeland, & Lounsbury, 1979) was selected to assess the child's temperament as perceived by the child's professional caregiver. A mean score for difficultness was computed based on 17 items ($M = 2.99$, $SD = .73$). Cronbach's alpha was .84 ($N = 37$). A high score on the scale indicated that the child had more difficulty adapting to novelty and showed more irritable distress (no items concerning resistance to control were included in the composite).

Statistical Analyses. Multiple regression analyses were used to test our hypotheses. Nested analyses were not necessary because 34 of the 41 day care centers participated with only one child and seven with only two children, each attending separate groups. Thus, no independent variables in the analyses were nested.

Results

Preliminary Analyses

In preliminary analyses, no significant Pearson correlations were found between temperament, frequency and quality of positive caregiving, or quality of the attachment relationship and any SES, age of entry, number of half days attending the center, and number of months the caregiver has been taking care of the child. Age of the child was

Table 4. Pearson Correlations between the Child's Temperament, Positive Caregiving, and Quality of Attachment Relationship with Caregiver (N = 48)

Variables	<i>M</i>	<i>SD</i>	1	2	3
1. Temp. irritability	2.99	.73			
2. Frequency of pos. caregiving	.21	6.18	-.17		
3. Quality of pos. caregiving	3.19	.42	-.29*	.50***	
4. Attachment	.42	.14	-.27	.38**	.10

* $p < .05$; ** $p < .01$; *** $p < .001$.

associated with temperament ($r = -.33$, $p < .05$). Older children showed less irritable distress according to their caregivers. Staff turnover rate was associated with quality of positive caregiving ($r = -.37$, $p < .05$). When the percentage of caregivers leaving the center was higher, the quality of care was lower. Sex differences were only found for children's attachment relationship with their professional caregiver. Boys were less securely attached to their caregiver ($M = .38$, $SD = .16$) than girls ($M = .47$, $SD = .10$), $t(46) = -2.38$, $p = .02$.

Bivariate Correlations between Positive Caregiving, Temperament, and Attachment

Table 4 presents the correlations between the child's temperament, frequency and quality of positive caregiving, and attachment security with the professional caregiver. Frequency of positive caregiving was significantly associated with attachment security. When caregivers showed positive interaction with the child more often, the child had a more secure relationship with his/her primary caregiver. No association was found between quality of positive caregiving and the child-caregiver attachment relationship.

The child's temperament was significantly associated with positive caregiving quality, indicating that children with a more difficult temperament experienced lower quality of caregiving.

The Sensitivity and Susceptibility Hypotheses: A Multivariate Approach

To explore our hypotheses, we used a hierarchical regression approach in which the child's sex, temperament, and frequency and quality of positive caregiving were included (see Table 5). In the first step, the background variable sex was entered because it was associated with child-caregiver attachment in bivariate analyses. In the second step, the child's temperament was entered, and in the third step, the two positive caregiving variables were included. In the final step, the interaction between frequency of positive caregiving and temperament and the interaction between quality of positive caregiving and temperament were included, using a product-term of the centered variables for each interaction. Two variables contributed significantly to the equation. Sex was associated with attachment security. Girls showed more secure relationships with their day care providers than boys. Furthermore, frequency of positive caregiving was associated with attachment security. Children who experienced positive behavior from their professional caregivers more often had more secure relationships with their caregivers. No significant interaction effects were found. Overall, the regression

Table 5. Multiple Hierarchical Regression Analysis of Child Sex, Temperamental Irritability, Frequency and Quality of Positive Caregiving and the Child's Attachment Relationship with Daycare Caregiver^a (N = 48)

	B	β	R	R ²	R ² change	F change
1. Sex	.11	.38**	.33	.11	.11	5.65*
2. Temp. Irritability	-.02	-.13	.39	.15	.04	2.33
3. Frequency of Pos. Caregiving	.01	.50**	.58	.33	.18	5.84**
Quality of Pos. Caregiving	-.05	-.16				
4. Frequency X Irritability	.03	.08	.58	.34	.00	.12
Quality X Irritability	.00	.00				

* $p < .05$, ** $p < .01$, *** $p < .001$.

^a $F(6, 41) = 3.49$, $p < .01$ for the total model.

equation explained 34 percent of the variance of the child's attachment security. Because sex was associated with attachment security, we tested in additional analyses whether the interaction of sex with positive caregiving could further explain these results. However, the interaction terms were not associated with attachment security.

In addition, we tested the same regression analysis, but with the two positive caregiving variables based on two half-hour ORCE episodes instead of one. This analysis, in which the positive caregiving variables were partly based on video episodes that were also included for the attachment security measure, yielded comparable results (β for frequency of positive caregiving: .63, $p < .001$; β for quality of positive caregiving: $-.11$, $p = .48$, no interaction effects). Finally, we tested the same regression analysis, but with only 10 behavior categories included for the frequency of positive caregiving variable. Two categories were excluded, namely 'caregiver responds to child's talk' and 'caregiver does not interact with child', because observing these behaviors might be affected by the child's behavior, although the observations for positive caregiving and attachment security were based on different episodes. This analysis yielded comparable results (β for frequency of positive caregiving: .43, $p < .01$; β for quality of positive caregiving: $-.11$, $p = .49$, no interaction effects).

Further Exploration of the Susceptibility Hypothesis

Although no significant interaction effects of temperament and positive caregiving on the child's attachment relationship were found in the regression analysis, we further explored Belsky's (1997) susceptibility hypothesis in more extreme groups based on children's temperament scores. A comparison was made between the Pearson correlation of positive caregiving and attachment security in the group of children with more irritable distress (children with temperament scores in the highest quartile, $N = 12$), on the one hand, and the correlation in the group of children with less irritable distress (children scoring in the lowest three quartiles, $N = 36$), on the other. The association between frequency of positive caregiving and attachment security appeared stronger in the group of children with more irritable distress ($r = .57$, $p = .05$) compared to children with less irritable distress ($r = .29$, $p = .09$), but the two correlations did not

differ significantly ($z = .93, p = .35$). No difference in association was found for the quality of positive caregiving variable ($r = .18, p = .57$ for children with more irritable distress; $r = .01, p = .98$ for children with less irritable distress).

Discussion

In this study, we explored the role of a child's temperament and quality and frequency of positive caregiving in relation to children's attachment relationships with their primary professional caregivers in center day care. We put effort into optimizing the assessment of attachment security using both classroom observations and observations of child and professional caregiver in a structured setting with a few mildly stress-inducing activities such as a scary toy, a difficult puzzle, and a brief separation–reunion (see Table 1).

The results show that the quality of professional caregivers' positive interactions with children was not associated with secure child–caregiver attachment relationships. The absence of a significant association between quality of positive caregiving and attachment security might be due to limited variation in our caregiving rating. Earlier, we reported on a comparison between our assessment of quality of positive caregiving and that of the large-scale American NICHD study (NICHD Early Child Care Research Network, 2000). Dutch day care centers appear to provide significantly higher quality of care (Van IJzendoorn, Tavecchio, et al., 2004). In addition, our observational measures were based on videotaped interactions. Although both filmers and coders were extensively trained, we do not know how our results compare to live classroom observations of positive caregiving and attachment security. However, the absence of a significant association is in line with the results of Ahnert et al. (2006), reporting that children's relationships with care providers in larger group settings such as center day care were not predicted by dyadic sensitivity measures. Ahnert et al. suggest that in day care settings, group interaction is the modal interaction and it is difficult for care providers in larger groups to monitor each child's emotional needs, resulting in an attenuation of the association of dyadic sensitivity with attachment security.

In our study, we not only observed quality of positive caregiving measured with the ORCE (NICHD Early Child Care Research Network, 1996, 2000), but also frequency of positive caregiving, measured with the same ORCE instrument. The association between frequency of positive caregiving and the child's attachment relationship with the professional caregiver was significant. Higher frequencies of positive caregiving were associated with more security in the child–caregiver attachment relationship. This finding is in congruence with previous studies focusing on individual children's experiences in day care that found caregivers' positive involvement rather than quality of positive caregiving to be associated with more attachment security (Elicker et al., 1999; Howes & Hamilton, 1992; Howes & Smith, 1995). The measure of positive involvement in these studies, adopted from Howes and Stewart (1987), was based on *frequency* counts of interactive or elaborative involvement of the caregiver(s) with the target child in 20-second to five-minute time samples. The involvement measure resembles our ORCE frequency measure of positive caregiving. Our results add to these studies and suggest that in group-care settings, the *frequency* of caregivers' positive interactions might be particularly important for a child to gain confidence in the primary caregiver's availability as a safe haven and a secure base. Sensitive interactions of caregivers may not in themselves be enough for a child to develop such confidence in a caregiver who is obliged to divide his/her attention among several

children at the same time. The positive interactions with a specific child should occur in a sufficiently frequent manner to be effective in stimulating a secure relationship.

In their meta-analysis, Ahnert et al. (2006) concluded that in center day care, group-related sensitivity rather than providers' individual child-focused sensitivity is a reliable predictor of attachment security. Group-related sensitivity refers to 'the care providers' child-oriented attitudes and the amounts of time they spent in positive proximate interactions with children while supervising the entire group' (Ahnert et al., 2006, p. 667). Studies using the involvement measure of Howes and Stewart (1987) as an indicator of sensitivity were classified under the group-related sensitivity measure. Our results therefore appear to be in congruence with the conclusion of Ahnert et al. of differential effects of group- and frequency-oriented sensitivity measures vs. dyadic sensitivity measures. That is, dyadic sensitivity measures—usually derived from the Ainsworth sensitivity scale (Ainsworth, Bell, & Stayton, 1974)—show less predictive validity in understanding attachment security to care providers in group-care settings, maybe because a certain minimum number of interactions is necessary for sensitivity to affect the caregiver's attachment relationship with an individual child.

We did not find an association between children's temperament and their attachment security. Although our measure of temperament was limited, this result suggests that the assessment of attachment security reflected the child's attachment pattern toward his/her primary professional caregiver rather than an expression of a general behavioral style. The discriminant validity of the AQS in a childcare context is therefore supported. In his susceptibility hypothesis, Belsky (1997, 2005) proposed that some children may be more influenced by caregiving interactions than others. We explored whether for children who show more irritable distress, the association between positive caregiving and attachment security is stronger than for children who show less irritable distress. No significant differences in the caregiving–attachment association between children with more irritable distress compared to children with less irritable distress were found. Thus, we did not find support for Belsky's differential susceptibility to caregiving influences hypothesis. In view of our limited sample size and given the scarcity of research addressing the role of a child's temperament in a day care context, we recommend that more research be carried out to study the impact of child characteristics when children participate in non-parental care arrangements such as center day care. In particular, temperamental reactivity should be observed instead of inferred from reports by parents or caregivers.

In contrast with research from child–parent attachment relationships, we found sex differences in attachment security. Girls were more securely attached to their professional caregivers than boys. Ahnert et al. (2006) also report a small but significant association between sex of child and attachment security to care providers in group care. The setting of group care itself might promote early sex differences, with boys tending to be more vulnerable to a day care context. Comparable differential results in day care settings have been found in problem behavior. Several studies have reported that boys up to three years old tend to show more problem behavior in a day care context than girls (Crowther, Bond, & Rolf, 1981; De Schipper et al., 2004; Luk, Leung, Bacon-Shone, & Lieh-Mak, 1991) whereas usually, at this age, few differences are found in problem behavior between boys and girls (Campbell, 1995; Keenan & Shaw, 1997; NICHD Early Child Care Research Network, 1998; but see Alink et al., 2006 for sex differences in aggression). When studies on children's stress-reactivity in day care are considered, no sex differences have been found in cortisol levels (Vermeer & Van IJzendoorn, 2006), but research by Tout, De Haan, Campbell, and Gunnar

(1998) has indicated significant cortisol–behavior correlates for boys but not for girls, with a rise in cortisol in childcare being associated with more internalizing behaviors in boys. In our study, neither sex differences in caregiving nor interaction effects of caregiving and sex on attachment security were found, indicating that a possible gender-biased orientation of—predominantly female—professional caregivers could not be found in the caregiving behaviors we observed.

In the current study, support was found for the sensitivity hypothesis of attachment theory in a center day care context, indicating that professional caregivers may be alternative attachment figures for children at times when their parents are unavailable. In particular, the frequency but not the quality of positive caregiving is associated with attachment security. In center day care, children not only need sensitive caregivers but, more importantly, they need sensitive caregivers who find the time to display their sensitivity frequently enough to create a sense of confidence in their availability as a safe haven and a secure base.

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Acknowledgments

This study was supported by a grant from Stichting Kinderopvang Nederland, a Dutch foundation for childcare, awarded to Marinus H. Van IJzendoorn and Louis W. C. Tavecchio. The Dutch Consortium for Research in Child Care supported the preparation of this manuscript. The authors wish to thank Sarah C. Mangelsdorf for her help in developing the structured task setting to measure the child–caregiver attachment relationship; Jantien van Zeijl, Eveline van Beckhoven, Laura Koomen, Janneke van de Laar, Suzanne Vergeer, Emily Cavelaars, Katharina Engels, Relinde Neerincx, Mariëlle Linting, Helma Streng, Wieneke Zijlstra, Marije de Heus, Julia Mouthaan, and Susan Polak for their help in collecting and coding the data; and Annette Mills for the linguistic editing of the text.