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Quality in home-based childcare : Impact and improvement

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Quality in Home-based Childcare

Impact and Improvement

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Quality in Home-based Childcare

Impact and Improvement

PROEFSCHRIFT

ter verkrijging van
de graad van Doctor aan de Universiteit Leiden,
op gezag van Rector Magnificus prof. mr. P. F. van der Heijden,
volgens besluit van het College voor Promoties
te verdedigen op donderdag 4 november 2010
klokke 15.00 uur
door

Marilene Gerarda Groeneveld

geboren te Oud-Beijerland
in 1984

Promotiecommissie

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1 Introduction

In the Netherlands, the number of children visiting childcare has been increasing rapidly in the last decade. The number of children attending childcare centers, childcare homes, and after school care, is shown in Figure 1.1 (Netwerkbureau Uitbreiding Kinderopvang, 2003; Statistics Netherlands, 2008). Whereas in 2006, in total 490,000 children visited childcare, this number had increased to 625,000 children one year later. This increase in childcare is mainly attributable to the increase in home-based childcare. Although most children attend center-based childcare (38% of all children in childcare in both 2006 and 2007), more and more Dutch parents prefer home-based child care, especially for younger children. In 2006, 14% of all children in childcare attended home-based childcare, whereas in 2007 this percentage had increased to 22% (Statistics Netherlands, 2008).

In both childcare homes and childcare centers, a group of children up to four years of age are taken care of by one (childcare homes) or more (centers) caregivers. In Dutch childcare centers, the ratio of children per caregiver ranges from 4:1 to 8:1, depending on the ages of the children. In each group, two or three caregivers are present. Most childcare centers offer full-day care, with restricted periods of bringing and picking up the children. Caregivers in childcare centers are all certified in childcare. Home-based childcare is provided from a caregiver's personal home, which makes the daily environment more similar to a child's home than center-based childcare. In Dutch childcare homes, each caregiver

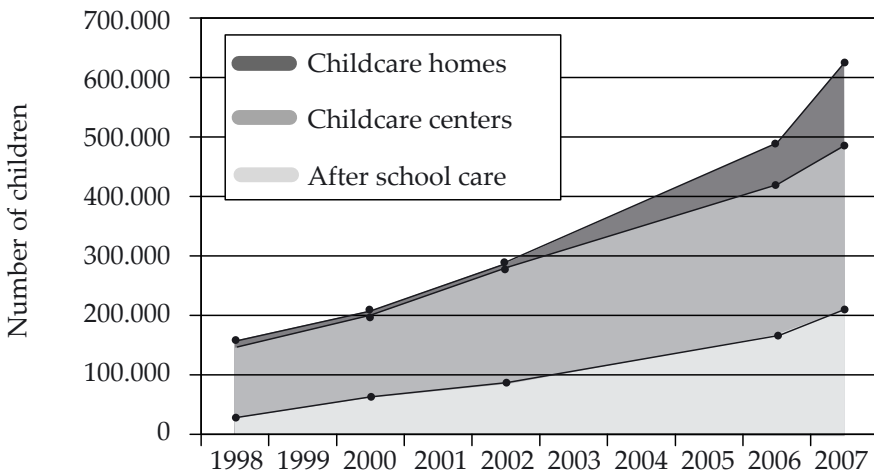


Figure 1.1 Number of children in childcare homes, childcare centers, and after school care (Netwerkbureau Uitbreiding Kinderopvang, 2003; Statistics Netherlands, 2008)

takes care of a small group of children, with a maximum of six children under the age of 4. This type of childcare is more flexible in bringing and picking up times and thus in adjusting working hours to the parent's schedules. Since January 1st 2010, caregivers in home-based childcare are legally bound to formal training (including first aid training) and/or experience.

Regulations

The Dutch childcare system recognizes two primary types of childcare: informal and formal childcare. Childcare is called formal if it adheres to the rules and regulations of the Dutch Childcare Act that came into effect in 2005. Home-based childcare registered at a childcare agency and center-based childcare are considered formal types of childcare, whereas occasional babysitters and unregistered home-based childcare are considered informal types of care. Formal childcare is jointly financed by parents, employers and the government. Besides finances, the Dutch Childcare Act also establishes quality and supervision standards in childcare, in which is stated that a childcare organization should have a pedagogical policy plan, and in which rules have been set for the group size, caregiver-child ratio, educational level of caregivers, and the (safety of) the childcare environment.

Childcare quality

The aforementioned regulative aspects such as group size, ratio and caregiver education refer to the so-called structural elements of childcare quality. Childcare quality however also covers children's actual experiences in childcare, in this thesis referred to as global quality and caregiver sensitivity.

Global quality refers to the stimulation and support available to children in the childcare environment. Several elements of global quality are important for children's development, for example organization of the environment, (learning) materials available for the children, and variety in events and environments. In general, children who visit higher quality childcare tend to have better cognitive and social skills than children experiencing lower quality childcare (NICHD ECCRN, 2002; Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000). In a recent publication, the NICHD ECCRN showed that even at age 15, former higher quality childcare predicted higher cognitive-academic achievement and less self-reported externalizing behavior (Vandell, Belsky, Burchinal, Steinberg, Vandergrift, & NICHD ECCRN, 2010).

Besides global quality, sensitive caregiving is one of the most fundamental aspects of childcare quality. For children, a sensitive caregiver is important as a base for the exploration of the environment, and for opportunities to develop. According to attachment theory, children use their caregivers as a haven of safety, from which they can explore the environment (Bowlby, 1969). Parental sensitivity is a determinant of children's attachment security (De Wolff & Van IJzendoorn, 1997) and can be defined as the ability to accurately perceive the child's signals and to respond promptly and adequately to these signals (Ainsworth, Blehar, Waters, & Wall, 1978). Several studies have shown that children do not only form attachment relationships with their parents, but also with professional caregivers

in childcare (Elicker, Fortner-Wood, & Noppe, 1999; Goossens & Van IJzendoorn, 1990; Howes, Hamilton, & Matheson, 1994). Elicker et al. (1999) and Goossens and Van IJzendoorn (1990) found that caregiver sensitivity was a significant predictor of children's attachment security to those caregivers.

Childcare quality and cortisol

Recently, several studies have focused on children's cortisol (a stress related hormone) levels during childcare. Vermeer and Van IJzendoorn (2005) showed in their meta-analysis that children display higher cortisol levels at childcare compared to the home setting. In addition, results from several cortisol studies point in the direction of an association between lower global childcare quality and higher cortisol levels in childcare (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Sims, Guilfoyle, & Perry, 2006; Tout, de Haan, Kipp Campbell, & Gunnar, 1998). Besides global childcare quality, caregiver sensitivity is associated with children's cortisol levels as well. Studies showed that the availability of sensitive caregivers beyond the parents can act as a buffer against stress responses (Gunnar, Larson, Hertsgaard, Harris, & Brodersen, 1992; Gunnar, Talge, & Herrera, 2009). In a laboratory study, Gunnar, Larson, Hertsgaard, Harris, and Brodersen (1992) found that infants cared for by babysitters who sensitively interacted with them showed no cortisol elevations, whereas infants cared for by less sensitive babysitters showed cortisol elevations. At the start of this PhD study, no studies concerning cortisol levels of children in childcare and associations with childcare quality were conducted in the Netherlands.

Childcare quality in the Netherlands

Since 1995, center-based childcare quality in the Netherlands has been assessed four times by the Dutch Consortium for Research in Childcare: in 1995 (Van IJzendoorn, Tavecchio, Stams, Verhoeven, & Reiling, 1998), 2001 (Gevers Deynoot-Schaub & Riksen-Walraven, 2005), 2005 (Vermeer et al., 2008), and 2008 (De Kruif et al., 2010). Assessments were done in nationally representative samples using the Infant/ Toddler Environment Rating Scale (ITERS; Harms, Cryer, & Clifford, 1990), the Infant/ Toddler Environment Rating Scale-Revised (ITERS-R; Harms, Cryer, & Clifford, 2003), the Early Childhood Environment Rating Scale (ECERS; Harms, Cryer, & Clifford, 1980) and the Early Childhood Environment Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 1998).

Although the first assessment led to the conclusion that, from an international perspective, the quality of Dutch childcare centers was relatively high (Van IJzendoorn et al., 1998), results of the second assessment showed a significant decline in global quality. In 1995, no centers showed low childcare quality, whereas in 2001, low childcare quality was encountered in 6% of the centers (Gevers Deynoot-Schaub, & Riksen-Walraven, 2005). In the third assessment, in 2005, again a significant decline emerged in global quality of care: 36% of the centers showed low childcare quality (Vermeer et al., 2008). Lastly, in the 2008 assessment, global childcare quality had significantly declined again. The authors do not report percentages of low quality for the total ITERS-R and ECERS-R scales (De Kruif et al., 2010). In Figure 1.2, the decline of childcare quality in

Dutch childcare centers is shown. Although quality of home-based childcare is included in the Dutch Childcare Act, quality of this type of childcare has not yet been studied in the Netherlands. In the first study reported in this thesis we assess childcare quality in home-based childcare and center-based childcare, comparing the two types of care on the following aspects: childcare quality, children's wellbeing, and children's and caregivers' cortisol levels. In addition, we not only focus on associations between childcare quality and child outcomes, but also on associations between childcare quality and caregiver stress. For home-based childcare, we also investigate whether caregiver stress (cortisol levels and perceived stress) are associated with child outcomes.

As described earlier, Dutch caregivers in home-based childcare have limited or no education in childcare. International studies showed that caregiver education is a predictor of childcare quality in childcare homes (Clarke-Stewart, Lowe Vandell, Burchinal, O'Brien, & McCartney, 2002; Doherty, Forer, Lero, Goelman, & LaGrange, 2006), and that informal caregiver training sessions result in higher childcare quality *beyond* education (Burchinal, Howes, & Kontos, 2002; NICHD ECCRN, 1996; Clarke-Stewart, Lowe Vandell, Burchinal, O'Brien, & McCartney, 2002). In the second study, we report on the results of a focused training using a video-feedback intervention, that we implemented in home-based childcare to enhance childcare quality.

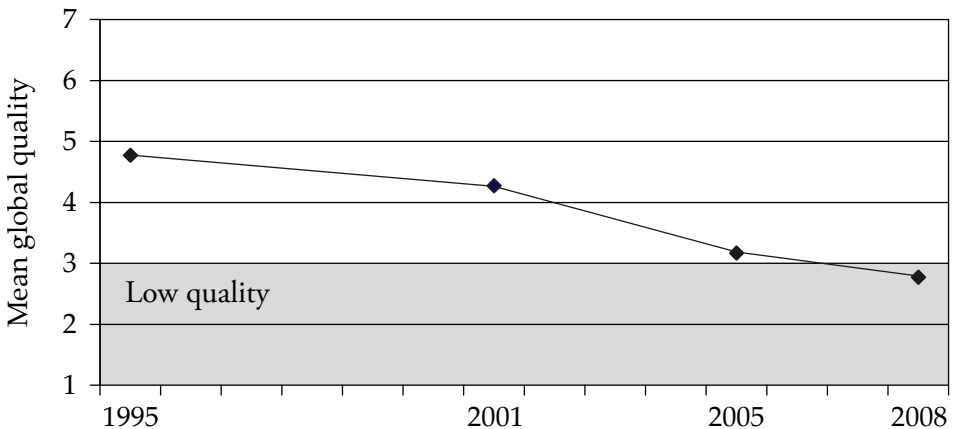


Figure 1.2 Global quality of Dutch childcare centers in 1995 (Van IJzendoorn et al., 1998), 2001 (Gevers Deynoot-Schaub, & Riksen-Walraven, 2005), 2005 (Vermeer et al., 2008), and 2008 (De Kruif et al., 2010).

Note. Global childcare quality is measured with the ITERS-(R)/ ECERS-(R). Centers can be classified according to the mean quality levels *low* (< 3), *moderate* ($3 \leq$ and < 5), and *high* (≥ 5)

Intervention

Previous intervention studies performed in families, center care and home-based childcare suggest that interventions are more effective when they have a narrow focus, a fixed-curriculum, make use of video feedback, and are short term (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003; Fukkink & Lont, 2007).

The short-term, behaviorally focused Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD; Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2008) satisfies these criteria. The VIPP-SD aims at enhancing (parental) sensitivity and disciplining through providing personal video-feedback, combined with written information on sensitive responding in daily situations. The intervention program is home-based and short-term: interventions are implemented in the home of the caregiver in a modest number of sessions (six sessions). The VIPP-SD has already shown positive effects on parental sensitivity in various settings (see Juffer et al., 2008) and was recently recognized as demonstrably effective in the Database of Effective Youth Interventions developed by the Netherlands Youth Institute (Nederlands Jeugdinstituut, 2009)

In the second study presented in this thesis, the VIPP-SD (Juffer et al., 2008) is (minimally) adapted for home-based childcare: Video-feedback Intervention to promote Positive Parenting – Child Care (VIPP-CC). As in the VIPP-SD, caregiver and children are videotaped during daily situations in childcare. Videotaped episodes are discussed with the caregivers, focusing on caregiver sensitivity. The effectiveness of the VIPP-CC is tested in caregivers in home-based childcare in a randomized controlled trial.

Aims of the studies

This thesis consists of two studies. The general aim of the first study is to examine children's stress levels and wellbeing, and the role of caregiver stress and childcare quality. In the second study we test the effectiveness of the VIPP-CC in enhancing childcare quality in home-based childcare. The design of both studies is shown in Figure 1.3.

In the first study we focus on children and caregivers in center-based childcare and home-based childcare. Caregivers and (parents of) children are asked to collect (their child's) saliva at home to measure cortisol levels. During the visit at the childcare setting, caregivers' and children's cortisol samples are collected again. In addition, global quality is observed, caregivers' and children's behavior are videotaped, and rated for caregiver sensitivity and child wellbeing afterwards. After the visit, parents are asked to complete questionnaires on children's temperament, and caregivers are asked to report on children's wellbeing and their own perceived stress. Research questions of this first study are:

1. Are there differences in cortisol levels (of children and caregivers) between a childcare day and a day at home?
2. Are there differences in cortisol levels (of children and caregivers), wellbeing (children), and perceived stress (caregivers) in childcare homes versus childcare centers?
3. Is childcare quality associated with cortisol levels (of children and caregivers), wellbeing (children), and perceived stress (caregivers)?
4. Are caregivers' cortisol levels and perceived stress associated with children's wellbeing and cortisol levels? Does temperament moderate these associations?

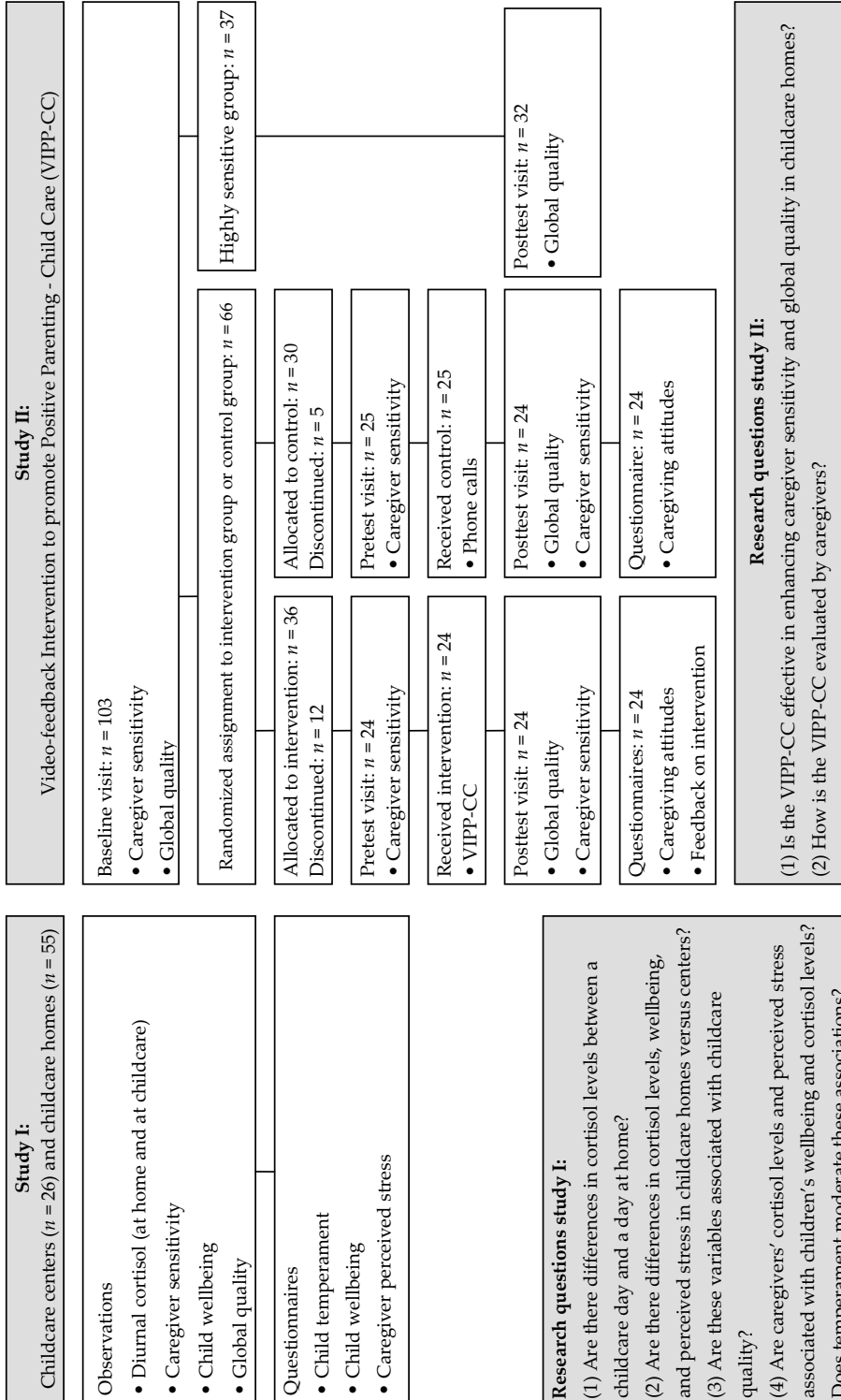


Figure 1.3 Design and research questions

In the second study, the effectiveness of the intervention program VIPP-CC is tested in a randomized controlled trial (Figure 1.3). During a baseline visit, caregiver sensitivity and global quality are measured. Caregivers scoring the highest on caregiver sensitivity are assigned to the 'high sensitivity' group. The rest of the caregivers are randomly assigned to the intervention group or the control group. These caregivers receive a pretest in which their behavior is videotaped to code caregiver sensitivity. Caregivers in the intervention group receive the VIPP-CC and caregivers in the control group receive six phone calls, parallel to the intervention visits. During the posttest, global childcare quality is measured in all three groups. Caregiver sensitivity is again measured in the intervention group and control group. After this visit, caregivers are asked to fill out questionnaires concerning their caregiving attitudes and feedback on the intervention. Research questions of the second study are:

1. Is the VIPP-CC effective in enhancing caregiver sensitivity and global quality?
2. How is the VIPP-CC evaluated by caregivers?

Outline of the thesis

The first study is described in chapters 2, 3, and 4, and results of the second study are outlined in chapter 5. Chapter 2 addresses the question whether children's cortisol levels (and wellbeing) differ between contexts (childcare day or at home day) and setting (childcare homes and childcare centers), and associations with childcare quality are examined. Chapter 3 reports on caregivers' cortisol levels (and perceived stress) between contexts (work day, non-work day) and setting (childcare homes and childcare centers). In addition, associations between caregiver stress and childcare quality are examined. Chapter 4 investigates associations between caregivers' cortisol levels (and perceived stress) and children's wellbeing and cortisol in home-based childcare. Also, children's temperament is taken into account. Chapter 5 focuses on the effectiveness of the VIPP-CC in enhancing childcare quality. In chapter 6 the results of the studies are integrated and discussed, and implications for future research and childcare practice are presented.

Children's wellbeing and cortisol levels in home-based and center-based childcare

Marleen G. Groeneveld, Harriet J. Vermeer, Marinus H. van IJzendoorn, & Mariëlle Linting
Early Childhood Research Quarterly (2010), in press

ABSTRACT

The central question in this study is whether individual variability in children's cortisol levels and wellbeing at childcare can be explained by indices of quality of care and child characteristics. Participants were 71 children from childcare homes and 45 children from childcare centers in the age range of 20–40 months. In both types of settings equivalent measures and procedures were used. In home-based childcare, children experienced higher caregiver sensitivity, lower noise levels, and showed higher wellbeing compared to children in childcare centers. Caregiver sensitivity in home-based childcare – but not in center care – was positively associated with children's wellbeing. Additionally, children displayed higher cortisol levels at childcare than at home, irrespective of type of care. In home-based childcare, lower caregiver sensitivity was associated with higher total production of salivary cortisol during the day. In center-based childcare, lower global quality of care was associated with a rise in cortisol between 11 AM and 3 PM during the day. Quality of care is an important factor in young children's wellbeing and HPA stress reactivity.

Keywords: home-based childcare, center-based childcare, salivary cortisol, wellbeing, quality of care, caregiver sensitivity

INTRODUCTION

In the Netherlands, the number of children visiting childcare has been increasing rapidly. This increase encompasses both center-based childcare, with large groups of children with more than one caregiver present, and home-based childcare, with less children and one caregiver present. In the out-of-home environment as well as in the home environment, caregivers and parents strive to make children feel at ease to explore the environment and to provide opportunities for cognitive and social-emotional development. In our view, providing children with a feeling of security is one of the most fundamental aspects of all types of childcare. In the present study, the children's feeling of security in childcare is operationalized in two different ways: We focus on both their social-emotional wellbeing and their stress levels as indexed by their cortisol production during a day at childcare.

Meta-analytic results have shown that children in childcare centers display higher cortisol levels during a day in childcare than during a day at home (Geoffroy, Côté, Parent, & Séguin, 2006; Vermeer & Van IJzendoorn, 2006). Cortisol is a well known stress hormone which in humans is the final product of the hypothalamic-pituitary-adrenal (HPA) axis. Cortisol can be measured from urine, plasma, and saliva. Salivary measurement is preferred in children because it is a practical, reliable, and noninvasive approach (Shimada, Takahashi, Ohkawa, Segawa, & Higurashi, 1995). Normally, cortisol levels peak about half an hour after waking up and gradually reach their lowest point around midnight (Kirschbaum & Hellhammer, 1994). In childcare centers however, diurnal patterns revealed significant increases from morning to afternoon (Vermeer & Van IJzendoorn, 2006). For the same children, these patterns were not observed during a day at home.

Although stress responses are necessary for survival, long-term stressors are assumed to have a negative influence on the development of children (Gunnar & Donzella, 2002). The hormones secreted by the adrenal cortex are essential to cognitive performance and improve the immune response by increasing the natural-killer cell activity and the numbers of some types of leukocytes (Segerstrom & Miller, 2004). However, when there is chronic exposure to stress the effects of these hormones can change from adaptive into maladaptive (De Kloet, Oitzl, & Joëls, 1999). In adults, stress may affect brain function, especially of the hippocampus, which is important for verbal memory and memory of the context of experiences (Eigenbaum, Otto, & Cohen, 1992). Furthermore, long-term stressors decrease the immune response by decreasing the number and activity of natural-killer cells (Glaser & Kiecolt-Glaser, 2005). Possible long-term impacts of stressors on the developing brain and the endocrine and immune system of young children have not yet been thoroughly studied. Also, it is still unclear what elements in the childcare environment may activate the HPA axis in children.

Childcare quality

Although cortisol levels have been reported to increase in childcare, we do not know yet what the underlying mechanisms are for these elevated cortisol levels. It is assumed that both childcare quality and child characteristics may contribute to individual differences in children's cortisol levels. As for childcare quality, structural features of childcare are assumed to influence children's cortisol levels and wellbeing. Legendre (2003) for instance showed that cortisol increases were related to large group sizes ($n > 15$), large age differences among children within the group (> 6 months), less available area per child in the playrooms ($< 5 \text{ m}^2$), and large numbers of adults in the room (> 4 adults). The children's actual experiences in childcare (process quality) may also influence their cortisol levels. The children in most studies included in the Vermeer and Van IJzendoorn meta-analysis (2006) were recruited from high-quality centers, resulting in a rather homogeneous group which did not allow an analysis of variations in quality. However, results from studies in which children's cortisol levels were investigated in relation to quality of care point in the direction of an association between lower-quality care and higher cortisol levels in children (Dettling, Parker, Lane, Sebanc, & Gunnar,

2000; Sims, Guilfoyle, & Perry, 2006; Tout, de Haan, Kipp Campbell, & Gunnar, 1998).

The core feature of process quality—caregiver sensitivity—may also contribute to individual differences in children’s cortisol levels. As for parent-child relations, it was shown that children with insecure relationships and less sensitive mothers showed more increases in cortisol levels during a stressful period (Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996). Even maternal sensitivity at a young age (6–36 months) affected the average awakening response of children at age 15 (Roisman et al., 2009). Moreover, the availability of sensitive caregivers besides the parents can act as buffer against stress responses (Gunnar, Larson, Hertsgaard, Harris, & Broderson, 1992; Gunnar, Talge, & Herrera, 2009). In a laboratory study Gunnar et al. (1992) showed that infants cared for by sensitively interacting babysitters showed no cortisol elevations, whereas infants cared for by less sensitively interacting babysitters showed cortisol elevations. In home-based childcare, more focused attention and stimulation of the caregiver was related to a decrease in cortisol during a day in childcare, whereas less focused attention and stimulation resulted in an increase in cortisol (Dettling et al., 2000).

Children’s wellbeing in childcare is related to the quality of care as well. De Schipper, Van IJzendoorn, and Tavecchio (2004) investigated whether daily stability in childcare centers was related to children’s wellbeing. They found that children who were enrolled in fewer care arrangements and experienced more stable program features of the childcare environment felt more at ease in the center as reported by their caregivers. Also, children were rated higher on wellbeing when trusted caregivers were more available. Caregiver-child ratios, educational level of the caregivers, and staff turnover rate were not associated with the wellbeing of children. Attunement between parents and professional caregivers is also important for children’s wellbeing. When caregivers were more authoritarian or less supportive than mothers, children showed lower wellbeing in the childcare setting (Van IJzendoorn, Tavecchio, Stams, Verhoeven, & Reiling 1998). Thus far, little is known about the impact of global quality and caregiver sensitivity on the wellbeing of children in childcare. The few studies that examined children’s wellbeing have used questionnaires that were completed by caregivers or parents. However, an independent and context-specific measure of wellbeing is important, especially if the association between caregiver sensitivity and wellbeing is examined. Therefore, observed wellbeing (by independent observers) during a day at childcare was included in the present study as well.

In the current study, children’s wellbeing and cortisol levels in home-based childcare and center-based childcare are compared, because these two types of care vary substantially in structural features of childcare quality. In home-based childcare, fewer children and caregivers are present than in center-based childcare. Howes (1983) reported that caregivers in home-based childcare spent more time with the children during childcare than caregivers in center-based childcare. Furthermore, center-based childcare was characterized by less stable child-caregivers relationships and larger group sizes than home-based childcare, but the caregiver-child ratio was comparable. These variations in structural features across home-based childcare and center-based childcare may contribute

to individual differences in children's wellbeing and stress levels. Young children may not yet have the social skills to deal with a large number of children, they cannot communicate easily, and they may experience difficulties concentrating on play for a long period (Clarke-Stewart & Allhusen, 2005). Dettling et al. (2000) compared the cortisol levels of children in home-based and center-based childcare. Results showed a rise in cortisol levels over the day for children in home-based childcare of low-quality (less focused attention and stimulation from the caregiver) and for children in center-based childcare, irrespective of quality. In the present study, we measured process quality in both types of care, distinguishing between global childcare quality, caregiver sensitivity, and noise levels.

Noise as indicator of process quality?

We propose to consider noise – an important aspect of environmental chaos theory – to be an indicator of process quality in childcare. Environmental chaos theory (Evans, Maxwell, & Hart, 1999; Wachs, 1989) was originally developed for home settings. Chaotic environments are characterized by high levels of noise, crowding, environmental traffic, and a lack of physical and temporal structure (Wachs, Gurkas, & Kontos, 2004).

For home settings, it has been demonstrated that environmental chaos is associated with a variety of adverse consequences, including impairments in cognitive performance, attention, and motivation in children, and less responsiveness, involvement, and verbal stimulation in caregivers (Corapci & Wachs, 2002; Evans et al., 1999; Wachs & Camli, 1991; Wachs & Corapci, 2003). Evans, Bullinger, and Hygge (1998) showed that chronic noise exposure after the inauguration of an airport significantly elevated cortisol levels of children. Furthermore, children in the noisier areas, due to local road and rail traffic, showed elevated resting overnight urinary cortisol levels, and rated themselves higher in perceived stress symptoms after exposure to a discrete stressor in the laboratory (Evans, Lercher, Meis, Ising, & Kofler, 2001). In childcare, social withdrawal in children was higher when interacting under more crowded conditions (e.g., Liddell & Kuger, 1989), and children were less compliant in a more chaotic setting (Wachs et al., 2004). Although indices of environmental chaos on children's development have been studied for many years, little is known about the impact of noise levels in childcare environments on children's wellbeing and cortisol levels. Therefore, noise levels as an indicator of quality of care were included in the present study as well.

Child characteristics

It is important to bear in mind the child characteristics (e.g., age, gender) that might affect wellbeing and cortisol levels of children in childcare. De Schipper, Tavecchio, Van IJzendoorn, and Van Zeijl (2004) reported no gender or age differences in children's wellbeing in childcare centers. Two meta-analyses (Geoffroy et al., 2006; Vermeer & Van IJzendoorn, 2006) showed that the effect of day care attendance on cortisol excretion was especially notable in children younger than 36 months with a peak around 2–3 years of age. Thus far, in most

studies in which gender was examined in relation to cortisol levels, no significant differences in boys' and girls' cortisol levels were reported. In a recent publication however (Roisman et al., 2009) it was reported that 15-year-old males showed higher awakening cortisol levels than females.

Aims of this study

In this study, we (1) compared children's cortisol levels during a childcare day (home-based care versus center-based care) and during a day at home, (2) examined differences in children's wellbeing and cortisol in home-based childcare versus center-based childcare, and (3) investigated which quality of care indices and child characteristics were associated with children's wellbeing and cortisol levels.

Derived from the meta-analytic results reported earlier, we expect higher cortisol during a childcare day compared to a day at home (aim 1). As for the comparison between home-based childcare versus center-based childcare, we propose the following hypotheses. Home-based childcare settings are more similar to the home setting than center-based childcare, because of the fewer children present and the home-like environment (childcare in the caregivers' home). In addition, taking into account the higher cortisol increases that have been reported for larger group sizes (Legendre, 2003), we hypothesize higher cortisol levels in children attending childcare centers compared to children attending home-based childcare (aim 2). Drawing on the study by De Schipper, Tavecchio, et al. (2004), in which positive associations were shown between wellbeing and the availability of a trusted caregiver, we hypothesize higher wellbeing in children attending home-based childcare, compared to their peers in center-based childcare (aim 2).

We further expect that children in lower-quality childcare (lower global quality, lower caregiver sensitivity, and higher noise levels) show higher cortisol levels and lower wellbeing than their peers in higher-quality childcare (aim 3). We expect no associations between gender, age and children's wellbeing and cortisol levels (aim 3).

METHOD

Participants

A total of 116 children and 102 caregivers participated in this study. Twenty-six childcare centers and 55 childcare homes were involved. Similar recruitment strategies were used in both childcare settings.

From a national sample, 250 childcare centers were randomly selected. Twenty-six centers agreed to participate in the study. Parents of one randomly selected group per childcare center were approached for permission, and depending on their response, one to four children per center were randomly selected to participate. Children in the Netherlands attend on average only 2–3 days per week childcare. During the other days, parents – most of the time mothers – take care of their children. Because observations were scheduled during one day at childcare, not all children from whom we received permission could participate

in the study. A total of 45 children between 20 and 40 months were selected; their mean age was 32.0 months ($SD = 4.4$). The sample consisted of 23 boys and 22 girls. Forty-seven caregivers participated in the study. The number of children in each group varied from 4 to 15 ($M = 10.8$, $SD = 2.7$).

One hundred and forty-seven home-based child care organizations in the Netherlands were randomly selected from a national sample. Twenty-one of these organizations agreed to participate in the study. The number of host parents registered in these organizations ranged from 43 to 500 ($M = 305.3$, $SD = 184.5$). Host parents were approached for permission, and 110 of them agreed to participate. Eventually, the parents of the children were approached for permission. In total, 71 children between 20 and 40 months of age ($M = 29.2$, $SD = 6.3$) and their 55 host parents participated in the study. The sample consisted of 39 boys and 32 girls.

The low participation rate can be attributed to the following reasons: (1) childcare providers felt uncomfortable with the video recordings, (2) childcare providers and parents disliked the idea of saliva samples taken from the children, and (3) disappointing results indicating low-quality of center care in the Netherlands had just been published (see Vermeer et al., 2008).

The educational background of the parents of children cared for in home-based childcare and center-based childcare was comparable. Mothers of children in home-based childcare had on average 13.70 years ($SD = 1.90$) of education after primary school entrance, and mothers of children in center-based childcare had on average 13.58 years of education after age 6 ($SD = 2.26$, $t(98) = -.36$, $p = .72$, $d = .06$). For fathers, no differences in level of education between the two types of care were present either (home-based childcare $M = 13.25$, $SD = 2.40$; center-based $M = 13.39$, $SD = 2.72$, $t(98) = -.26$, $p = .80$, $d = -.14$). The mean age of the mothers differed between settings (home-based: $M = 33.86$, $SD = 3.95$, centers: $M = 35.81$, $SD = 3.78$, $t(98) = -2.43$, $p < .05$, $d = -.51$). There was no age difference for the fathers in both types of settings (home-based: $M = 37.32$, $SD = 6.41$, centers: $M = 37.24$, $SD = 4.13$, $t(98) = .06$, $p = .95$, $d = .02$). The family structure across the two groups of children was also similar: All children were raised in two-parent families. In home-based childcare 77.5% of the children had one or more siblings, and in center-based childcare 73.3% of the children had one or more siblings ($t(98) = .84$, $p = .40$, $d = .16$). The nationality of almost all parents was Dutch (in home-based childcare: mothers 98.4% and fathers 93.7%; in center-based childcare: mothers 100% and fathers 97.3%).

Demographic information for both center-based childcare and home-based childcare is summarized in Table 2.1. Caregiver-child ratios differed significantly between the two types of settings, and were in favor of the childcare homes ($t(79) = -7.07$, $p < .01$, $d = -1.70$). In home-based care, one caregiver was on average responsible for almost three children, whereas in center-based care one caregiver was responsible for more than five children. Mean age of the caregivers differed significantly as well: Caregivers in home-based childcare were older than caregivers in center-based childcare ($t(77) = 7.44$, $p < .01$, $d = 1.71$). Caregiver educational level was coded as the number of years of education after primary school entry (from age 6). Although caregivers in the two types of care had

comparable educational levels, a difference was present in the type of education. All the caregivers in center-based childcare completed a vocational education directed at various domains of care with various age groups, whereas only 30% of the caregivers in home-based childcare completed an education in the field of (child)care. Children in both types of care did not differ in age and time spent at childcare. Furthermore, gender was equally distributed across both types of childcare (51.1% of boys in center-based childcare and 54.9% of boys in home-based childcare).

Table 2.1
Information on childcare settings and subject demographics

Characteristics	Childcare Centers		Childcare Homes	
	M	SD	M	SD
Child care settings	(n = 26)		(n = 55)	
Group size	10.8	2.7	2.9**	1.4
Caregiver-child ratio	1:5.3	1.5	1:2.9*	1.4
Caregivers	(n = 47)		(n = 55)	
Age ^a	29.5	7.7	44.3**	9.3
Education ^a	12.9	1.4	12.3	2.1
Children	(n = 45)		(n = 71)	
Age ^b	32.0	4.4	29.2	6.3
Time spent at childcare ^c	21.0	7.3	19.4	7.0
Quality of care				
Global quality	3.38	.47	36.98	3.35
Sensitivity	3.97	.83	4.89**	.86
Noise	62.65	3.58	56.49**	2.93

Note: Global quality was measured using two different instruments: in center-based childcare the ECERS-R was used, in home-based childcare the IT-CC-HOME was used.

^ain years; ^bin months; ^cin hours per week.

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

Procedure

Data collection took place in 2006 and 2007. All procedures were carried out with the adequate understanding and written consent of the children's caregivers and parents. Each setting was visited by an observer who spent a morning in the childcare homes or three-quarter of the day in the childcare centers. The observers administered either the Early Childhood Environment Rating Scale-Revised (ECERS-R; Harms, Clifford, & Cryer, 1998) or the Infant Toddler Child Care Home Observation for Measurement of the Environment inventory (IT-CC-HOME; Caldwell & Bradley, 2003) to measure global childcare quality. Furthermore, the observer video-taped three different 10-minute episodes at predetermined time points for each child and each caregiver that participated in the study. The children's saliva was collected four times during the observation

day (including two measures at home and two measures at childcare) to measure their cortisol levels. The visit was completed with an interview with (one of the) caregivers, to obtain information on either the ECERS-R or the IT-CC-HOME items that could not be coded by direct observation.

Parents were asked to collect their child's saliva at home as well, resulting in cortisol measurements during two different days, one childcare day and one day at home. Parents and caregivers were asked to complete a questionnaire about the child's illnesses, use of medicine, mood, naps, and food on the collection days.

Video-taped episodes of the children and caregivers were rated afterwards on child wellbeing and caregiver sensitivity respectively by coders who met the criteria to reliably assess these scales. To obtain independency in ratings, observers who visited the childcare setting did not rate caregiver sensitivity or child wellbeing in this specific setting, and coders who rated the caregiver fragments did not rate the child fragments, and vice versa.

Measures

Cortisol levels. Children's stress levels were assessed by measuring their salivary cortisol levels. Based on results of the study of Strazdins et al. (2005), in which three saliva collection methods for measuring cortisol were compared, cellulose-cotton tip sorbettes were used. Saliva samples were collected during one day at home and during one childcare day at four time points during these days (7 AM; 11 AM; 3 PM; 6 PM). Parents were mailed sampling kits including the material needed for collection and detailed written instruction how to obtain the samples. Parents were asked to collect their child's saliva four times at home: immediately after awaking, at 11 AM, at 3 PM, and just before dinner (around 6 PM). During the observation day, parents were asked to collect their child's saliva at two times: immediately after awaking and half an hour after having picked up their child (around 6 PM). Caregivers were asked to collect the children's saliva on the observation day at 11 AM and 3 PM. Mean cortisol sampling times at home were 6:57 AM ($SD = 0:28$), 10:59 AM ($SD = 0:05$), 3:10 PM ($SD = 0:22$), and 6:06 PM ($SD = 0:38$). Mean cortisol sampling times at childcare were 7:32 AM ($SD = 0:44$), 11:10 AM ($SD = 0:28$), 3:19 AM ($SD = 0:35$), and 6:16 PM ($SD = 0:37$). Correlational analyses revealed no significant associations between mean cortisol sampling time and cortisol values within these time points. In total, 51.7% of the children took a nap at home and 70.2% of the children took a nap at childcare before sampling in the mid-afternoon. Mean cortisol levels of these children did not differ from the cortisol levels of children who did not take a nap in the afternoon, neither in childcare nor at home. In addition, mean time between the nap and cortisol sampling in the mid-afternoon did not correlate with cortisol levels (home $r = -.13$, $p = .29$; childcare $r = -.02$, $p = .87$). Parents of 18.1% of the children reported that their child was feeling unwell (e.g., having a cold) on the collection day at home, compared to 25.9% of the children on the childcare day. Mean cortisol levels did not differ between the group of healthy children and the group of children feeling unwell, neither in childcare nor at home.

Children were not allowed to eat or drink at least 30 minutes before sampling. The children mouthed the sorbette under the tongue for at least 1 minute. Once

the sorbette was saturated, it was placed in a 2-ml plastic cryovial and sealed. Samples were stored at -18°C until being assayed by the Research Center for Psychobiology at the University of Trier.

Parents and caregivers returned the cortisol samples by mail, which should not affect the cortisol levels (Kirschbaum & Hellhammer, 1994). To increase compliance in collecting cortisol samples on the observation day, research staff telephoned parents and caregivers the day before the observation day to remind them of the collection.

Cortisol was assayed using a time-resolved fluorescence immunoassay. The intra-assay coefficient of variation of this immunoassay was between 4.0% and 6.7%, and the corresponding inter-assay coefficients of variation were between 7.1% and 9.0%. Samples were run in duplicate and mean values were calculated for each sample. The detection limit for cortisol ranged from 0.1 to 100 nmol/L. More than 99% of salivary cortisol measures were within this assay detection limit. Samples lower than 0.1 nmol/L and higher than 100 nmol/L were coded as missing because of their impossible values. In total, 12% of the saliva samples were not mailed by parents to the laboratory, and 18% of the tubes did not contain enough saliva for the immunoassay. Missing samples were only imputed for children who had a maximum of one missing sample per day. A total of 79 children with complete sample sets of a childcare day (of all four time points) were used in the analyses. Of these children, a total of 66 children also had a complete cortisol sample set for the day at home. We also examined diurnal change scores using children's cortisol levels sampled at 11 AM and 3 PM at childcare only (see Data analysis). These data were available from 98 children. No significant differences were present in wellbeing or quality of care (global quality, sensitivity, and noise) between the group of children with and without missing cortisol samples.

Wellbeing. Children's wellbeing was measured with the Wellbeing Scale, developed and validated by the Dutch Consortium for Child Care Research (NCKO; De Kruif et al., 2007). This scale contains several indicators of the child's wellbeing, such as pleasure, self-confidence, and relaxation. Scores were based on three video-fragments of 10 min each of the child at childcare. Every 2 min a score was registered, resulting in three periods of five scores. Wellbeing scores are presented on a seven-point scale, ranging from (1) a very low wellbeing (signals of discomfort are clearly present, e.g., crying, screaming) to (7) a very high wellbeing (signals of comfort are clearly present, e.g., enjoyment, smiling). Scores were aggregated across the time periods.

Eight observers were trained to reliably assess the children's wellbeing. All observers met the criterion of reliability: mean intra-class correlation (two-way mixed, absolute agreement) was .79 (range from .74 to .81). Internal consistency of the fifteen intervals was .80.

Quality of childcare. Three aspects of the quality of childcare were measured: global quality, caregiver sensitivity, and noise levels.

Global quality. In childcare centers, the ECERS-R (Harms et al., 1998) was used to examine the process quality of the centers. This instrument is a revision of the ECERS, which is a reliable and valid scale that has been used extensively

worldwide. The predictive validity with respect to children's development has been demonstrated repeatedly (e.g., Peisner-Feinberg & Burchinal, 1997). The scale comprises seven subscales: (a) Space and Furnishings, (b) Personal Care Routines, (c) Language-Reasoning, (d) Activities, (e) Interaction, (f) Program Structure, and (g) Parents and Staff. The 43 items of the ECERS-R are presented on a seven-point scale with detailed descriptions for 1 (*inadequate*), 3 (*minimal*), 5 (*good*), and 7 (*excellent*). For each item a score is given from 1 to 7, resulting in an average score for global quality across all items. Scoring is based on observation as well as caregiver responses to questions about aspects of the program that are not directly observable. *Inadequate* encompasses childcare that does not even meet custodial care needs, *minimal* describes childcare that meets custodial and to some small degree basic developmental needs, *good* describes the basic dimensions of developmental care, and *excellent* describes high-quality personalized care.

A Dutch translated version of the ECERS(-R) has been validated and included in several studies in the Netherlands in the past 15 years (see Vermeer et al., 2008). For the present study, three observers had received an in-depth training prior to the study by expert trainers in the ECERS-R. After a general introduction, each observer completed at least four field observations supervised by an expert trainer. Interrater reliability was established to a criterion of 80% agreement within one rating point for three consecutive observations. The mean percent of agreement for the three consecutive observations above the 80% agreement level was 86% (range 83%–87%); the mean weighted Kappa was .88 (range .86–.90). Internal consistency (Cronbach's alpha) of the ECERS-R was .85. The mean ECERS-R score for the 26 centers was 3.4 ($SD = .47$), indicating mediocre quality of care in the centers of this study (see Table 2.1). This mean score is comparable with that of previous studies of center-based childcare quality in the Netherlands (Vermeer et al., 2008).

In home-based childcare, the IT-CC-HOME (Caldwell & Bradley, 2003) was used to measure global quality of care. The HOME attempts direct, relatively standardized measurement of environmental and interaction factors. The IT-CC-HOME is designed to measure the quality and quantity of stimulation and support available to a child in the childcare home environment and consists of six subscales: responsiveness, acceptance, organization, learning materials, involvement, and variation. A positive (1) or a negative (0) score is achieved for each of the 43 items. Internal consistency (Cronbach's alpha) of this scale was .66. The total IT-CC-HOME score is a summation across the 43 item scores (1 or 0).

For the IT-CC-HOME six observers were trained prior to the study. After a general introduction, observers visited at least four caregivers in pairs, to complete the IT-CC-HOME. Each observation was followed by an item-by-item debriefing with the trainer. Interrater reliability was established to a criterion of 80% agreement. The mean IT-CC-HOME score was 36.98 ($SD = 3.35$), which means that on average a total of 86% of the items of the IT-CC-HOME scale was scored positively. This is comparable with the mean total score of 36.3 ($SD = 5.1$) as reported by Bradley, Caldwell, and Corwyn (2003) from data collected as part of the NICHD Early Child Care Research Network.

The ECERS-R and the IT-CC-HOME measure aspects of the physical environment and the socio-emotional environment of the childcare setting. However, because of the use of different instruments, a direct comparison of the two types of childcare in terms of global quality is not possible here.

Caregiver sensitivity. Caregiver sensitivity in the group setting was examined by means of a scale developed and validated by the Dutch Consortium for Child Care Research (NCKO; De Kruif et al., 2007). This rating scale is based on scales developed to measure sensitivity in a parent-child context (Ainsworth, Bell, & Stayton, 1974; Erickson, Sroufe, & Egeland, 1985). Scoring was based on three video-fragments of 10 min, each taped during the observation day at the childcare setting. Sensitivity ratings are presented on a seven-point scale, ranging from (1) very low sensitivity to (7) very high sensitivity. A caregiver scoring high on this scale provides emotional support to all children who need this support, both during stressful and non-stressful situations. A caregiver scoring low on this scale does not succeed in providing emotional support to the children when they need it. In a Dutch study, the Caregiver Interaction Scale (Arnett, 1989) was positively correlated ($r = .48, p < .01$) with this sensitivity scale (De Kruif et al., 2007).

Seven observers were trained to reliably assess caregivers' sensitivity. All observers were trained and became reliable on the same dataset. Mean intra-class correlations (two-way mixed, absolute agreement) were .75 (range .72–.80). Internal consistency of this scale was .76.

Noise levels. A BG-5 Data Logger Sound Level Meter was used to measure noise levels in decibels at the childcare setting. This sound level meter was designed to register noise in much the same way as the human ear. The sound level meter was put in the room where the caregiver and children stayed during the observation. Three episodes of 30 minutes were recorded, which run parallel to the video-fragments.

Data analysis

Cortisol measures were inspected for outliers defined as values with *SD* greater than 3.29 above the mean (Tabachnick & Fidell, 1996). By means of winsorizing, outliers were made no more extreme than the most extreme value that was accurately measured (Tabachnick & Fidell, 1996). Because the distributions of the cortisol measurements were positively skewed, \log_{10} transformations were used for analysis. Cortisol diurnal patterns were analyzed both utilizing the area under the curve with respect to the ground (AUC_G) and mean ratios of cortisol diurnal change (*RDC*). According to the formula specified by Pruessner, Kirschbaum, Meinlschmid, and Hellhammer (2003), the AUC_G was computed with the original (not log transformed) values to avoid negative values. Because the distribution of the AUC_G was positively skewed, a \log_{10} transformation was used prior to analysis. Correlations of the AUC_G with the measurement points were all significant ($p < .01$), except for one (childcare day: 7 AM $r = .67$, 11 AM $r = .73$, 3 PM $r = .65$, and 6 PM $r = .17, p = .14$, day at home: .67, .72, .66, and .33, respectively). The mean *RDC* consisted of the diurnal change at childcare between 11 AM and 3 PM, controlled for the measurement at 11 AM (Δ cortisol/11 AM). A constant of 1 was added to

the computed *RDC* in order to make \log_{10} transformation possible and to avoid negative values.

To test whether differences in cortisol levels were present across the 2 days and the two types of care, a multivariate analysis of variance with repeated measures (the children's cortisol levels at four time points) was performed. Next, multiple regression analyses were performed to test whether noise, caregiver sensitivity, and global quality predicted children's wellbeing and cortisol levels in the two types of care. Because of the hierarchical structure of this dataset, with units grouped at different levels, multilevel regression analyses were performed as well, using MLwiN (Rasbash et al., 2000). In these analyses, the children were considered as Level-1 units, and the childcare settings as Level-2 units. It is important to take this multilevel structure into account, because children that are cared for in the same group might be more alike in their wellbeing and/or cortisol levels than children from different groups

RESULTS

Differences between center-based childcare and home-based childcare

Cortisol. In Table 2.2, children's (untransformed) cortisol levels during the childcare day and during the day at home are shown. Analyses of children's cortisol levels at home and on a childcare day were performed using a 2 (Context: home versus childcare) by 4 (Time of day) by 2 (Type of care: childcare home versus center) multivariate analysis of variance with repeated measures. There was a significant main effect of time of day, demonstrating declining cortisol levels throughout the day (*Pillais F* (3, 62) = 130.7, $p < .01$, $\eta^2 = .87$) and a significant main effect of context (*Pillais F* (1, 64) = 8.0, $p < .01$, $\eta^2 = .11$), demonstrating higher cortisol levels during a childcare day than during a day at home. No main effects of type of care or interaction effects emerged. To test for influences of child characteristics, all analyses were repeated with age and gender included as between-subjects variable besides context. These analyses yielded no differences in cortisol levels while the effects of context remained significant.

Wellbeing. Children in home-based childcare were rated significantly higher in wellbeing than children in center-based childcare (t (114) = 5.53, $p < .01$; $d = 1.98$): Children in home-based childcare showed a mean score of 4.59 ($SD = .37$), whereas children in center-based childcare showed a mean score of 4.27 ($SD = .24$).

Table 2.2
Cortisol levels (in nmol/L) of children during a day at home and at childcare

	Home ($n = 66$)		Childcare centers ($n = 24$)		Childcare homes ($n = 55$)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
7 AM	10.04	5.82	9.79	4.32	10.73	5.16
11 AM	3.74	3.56	3.30	2.85	3.45	2.25
3 PM	3.18	3.42	3.12	1.63	3.75	2.16
6 PM	1.72	1.75	1.78	.97	2.45	2.71

Quality of care. Caregiver sensitivity was higher in home-based childcare ($M = 4.89$, $SD = .86$) than in center-based childcare ($M = 3.97$, $SD = .83$; $t(79) = 4.55$, $p < .01$; $d = 1.10$). In terms of the physical environment, children in home-based childcare experienced less noise ($M = 56.49$, $SD = 2.93$) compared to children in center-based childcare ($M = 62.65$, $SD = 3.58$; $t(79) = -8.21$, $p < .01$; $d = 1.98$).

In Table 2.3, the outcomes of a binary logistic regression for type of care are presented. Controlled for gender and age, the type of care a child is attending was almost perfectly predicted from sensitivity, noise, and caregiver-child ratio (Nagelkerke $R^2 = .83$). For this reason, both types of care were analyzed separately in the following section.

Table 2.3

Binary logistic regression analyses: Predicting type of care (home-based childcare or center-based childcare)

	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>Exp(B)</i>
Constant	-37.15**	13.95	7.10	.00
Block 1				
Gender	1.25	.90	1.94	3.49
Age	.03	.07	.23	1.03
Block 2				
Sensitivity	-1.93**	.66	8.48	.15
Wellbeing	-1.32	1.45	.84	.26
Noise	.75**	.20	13.35	2.11
Caregiver-child ratio	.95**	.31	9.43	2.58

** $p < .01$ (2-tailed)

Associations between cortisol, wellbeing, and quality of care

In Table 2.4, the associations between children's wellbeing, their cortisol levels, and the quality measurements are presented, separately for type of care. A significant positive association was found between sensitivity and wellbeing, but only for home-based childcare ($r = .27$, $p < .05$). In both types of care, there was a positive association between caregiver sensitivity and global quality (home-based childcare: $r = .34$, $p < .01$; center-based childcare: $r = .44$, $p < .01$).

As shown in Table 2.4, there was no significant association between wellbeing and the RDC or the AUC_G in either type of care. In center-based childcare, there was a significant negative association between RDC and global quality ($r = -.39$, $p < .01$). To further examine this association, we dichotomized the ECERS-R scores by using a median-split procedure (median at 3.37). A significantly different pattern of cortisol levels was present in the group of children experiencing below-median global quality compared to children experiencing above-median global quality (Figure 2.1). Cortisol levels during the day in childcare centers decreased in the above-median group, whereas cortisol levels increased in the below-median group. Additional analyses revealed that associations between global quality and cortisol levels at 11 AM and 3 PM were (nearly) significant (11 AM $r = .41$, $p < .05$; 3 PM $r = -.39$, $p = .06$).

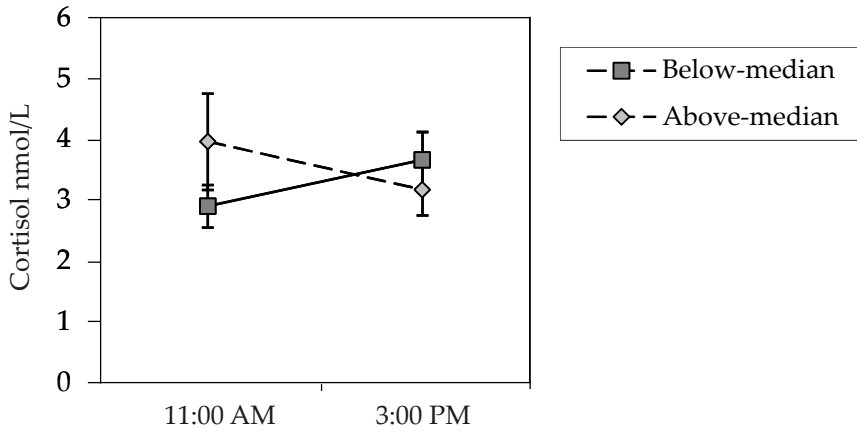


Figure 2.1. Cortisol levels of children in childcare centers with below-median ($n = 19$) and above-median ($n = 17$) global quality

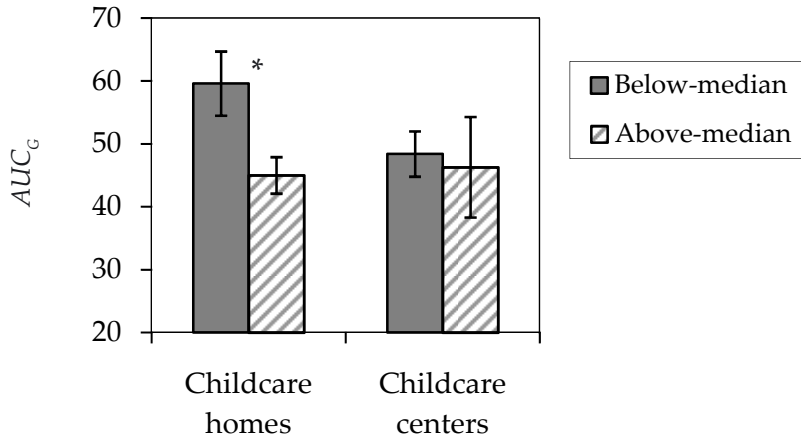


Figure 2.2. AUC_G of Children experiencing below-median (home-based childcare $n = 29$, center-based childcare ($n = 14$) and above-median (respectively $n = 26$ and $n = 10$) caregiver sensitivity

* $p < .05$

Table 2.4
Correlations between cortisol levels, wellbeing and quality of care split for type of care

		1.	2.	3.	4.	5.	6.
1.	Wellbeing		.05	-.16	.09	.27*	-.06
2.	RDC	.29		.02	-.06	.10	-.13
3.	AUC_G	.04	.08		-.14	-.26	.01
4.	Global quality	-.24	-.39**	-.05		.34**	.21
5.	Sensitivity	.00	-.15	-.14	.44**		.04
6.	Noise	.04	.03	.00	-.13	-.06	

Note: Correlations within the center-based childcare sample are displayed below the diagonal and correlations within the home-based childcare sample are displayed above the diagonal.

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

Next, we dichotomized caregiver sensitivity scores by using a median-split procedure (median in home-based childcare at 5.0; median in center-based childcare at 4.0). A significantly different AUC_G was present in home-based childcare ($t(53) = 2.20, p < .05, d = .60$), indicating an overall lower level of cortisol in children experiencing above-median caregiver sensitivity in childcare homes (Figure 2.2). Additional analyses revealed a significant association between sensitivity and cortisol levels at 11 AM ($r = -.33, p < .05$), but not at 3 PM ($r = -.14, p = .32$). For childcare centers, no significant differences in AUC_G were present between children cared for by above-median or below-median sensitive caregivers ($t(22) = .74, p = .47, d = .36$).

Predictors of wellbeing and cortisol levels

Multivariate regression analyses were performed to test whether the quality indices predicted wellbeing, RDC, or AUC_G of children in each type of childcare (separately). In the hierarchical regression analyses, first age and gender were added, followed by global quality and sensitivity in the second step. Noise was not added as a predictor, because no significant correlations were found between noise and wellbeing, and between noise and children's cortisol levels in both types of care. Results of these analyses are displayed in Table 2.5 (home-based childcare) and Table 2.6 (center-based childcare). Multilevel analyses of these six models were performed as well, and results were comparable.¹

¹ Results of the multilevel analyses of the models can be requested from the authors

Table 2.5
Hierarchical regressions in home-based childcare

Outcome	Wellbeing				RDC				AUC_G			
	B	SEB	β	R ²	B	SEB	β	R ²	B	SEB	β	R ²
Step 1				.04				.10				.06
Age	.00	.01	-.02		-.01	.01	-.19		-.01	.00	-.25	
Gender	.14	.09	.19		-.11	.07	-.20		.05	.05	.14	
Step 2				.10				.12				.15
Global quality	-.01	.61	.01		-.32	.47	-.09		.02	.30	.01	
Sensitivity	.11	.06	.25		.06	.05	.17		-.07	.03	-.32*	

* $p < .05$

Table 2.6
Hierarchical regressions in center-based childcare

Outcome	Wellbeing				RDC				AUC_G			
	B	SEB	β	R ²	B	SEB	β	R ²	B	SEB	β	R ²
Step 1				.08				.00				.23
Age	.02	.01	.28		.00	.01	.01		.00	.01	-.11	
Gender	-.01	.07	.02		.01	.11	.02		-.16	.07	-.47*	
Step 2				.15				.16				.25
Global quality	-.17	.10	-.29		-.29	.12	-.43*		.03	.08	.09	
Sensitivity	.04	.05	.13		.03	.08	-.07		-.04	.06	-.16	

* $p < .05$

Controlled for age and gender, sensitivity was a significant predictor of children's wellbeing in home-based childcare ($\beta = .25, p < .05$). By adding global quality, sensitivity showed a trend ($\beta = .25, p = .06$). None of the quality indices in home-based childcare was a significant predictor of RDC. As expected, a significant effect of sensitivity was present on the AUC_G of children in home-based childcare: Children who experienced less sensitive care showed higher levels of cortisol during the day, controlled for age and gender ($\beta = -.32, p < .05$).

To test whether the quality indices predicted children's wellbeing, RDC, and AUC_G in childcare centers, the three models were tested again (Table 2.6). In childcare centers, controlled for age and gender, global quality showed a trend in predicting the wellbeing of children ($\beta = -.29, p = .09$). As expected, global quality significantly predicted the RDC: Children who were cared for in higher-quality centers showed a decrease in cortisol levels during childcare, whereas children attending lower-quality centers showed an increase in cortisol levels ($\beta = -.43, p < .05$). Gender and age, and in a second step, caregiver sensitivity, did not significantly add to this model. Gender had a significant effect in the prediction of the AUC_G : Boys secreted a higher amount of cortisol during the day ($M = 1.72, SD = .15$), compared to girls ($M = 1.57, SD = .16; \beta = -.47, p < .05$). None of the other variables had a significant effect on AUC_G .

DISCUSSION

We found that children displayed higher cortisol levels during a childcare day than during a day at home. Children's cortisol levels in home-based childcare and center-based childcare were similar. However, the following differences were found in favour of home-based childcare: (1) Children in home-based childcare appeared to feel more at ease than children in center-based childcare, (2) Caregiver sensitivity was higher in home-based childcare than in center-based childcare, and (3) Noise levels were lower in home-based childcare than in center-based childcare. Furthermore, children who experienced more sensitive care in home-based childcare showed higher observed wellbeing during childcare.

Sensitivity and wellbeing

The finding that caregiver sensitivity in home-based childcare – but not in center care – was positively associated with the child's wellbeing, raises the question why caregiver sensitivity in home-based childcare is a better predictor of the child's social-emotional wellbeing than caregiver sensitivity in the context of center-based childcare. In home-based childcare, the children are cared for by the same caregiver each day they attend childcare, whereas in center-based childcare children experience the care of more than one caregiver each day and multiple caregivers during the week. In other words, caregiver stability is higher in home-based childcare than in center-based childcare. It should be noted that caregiver sensitivity in center-based childcare in this study was defined as the mean caregiver sensitivity across the caregivers present during the observation day. This was decided because children in the group receive (an equal amount of) caregiving from both caregivers. Thus, individual differences in the sensitivity of caregivers within one group were not taken into account.

Quality of care and cortisol

In line with our expectations, quality of care was significantly associated with children's cortisol levels. However, these associations were different in home-based childcare compared to center-based childcare. Lower caregiver sensitivity was associated with a higher total production of salivary cortisol during the day (AUC_C), but in home-based childcare only. To examine this association across the two settings, we combined the groups using the original criteria for 'below-median caregiver sensitivity' and 'above-median caregiver sensitivity' for each setting separately. When doing so, children in the above-median and the below-median groups significantly differed in the AUC_C ($d = .51$), indicating an overall lower level of cortisol in children experiencing above-median caregiver sensitivity. However, median caregiver sensitivity in home-based childcare is not equivalent to median caregiver sensitivity in center-based childcare. In home-based care, children experiencing caregiver sensitivity of, for example, a score of 4.3 would be classified in 'below-median sensitivity', but in center-based care children receiving the same amount of caregiving would be classified in 'above-median sensitivity'. In addition, it would not be justifiable to dichotomize caregiver sensitivity scores across the two settings. In this way, 67% of the home-

based caregivers would be classified in the 'above-median sensitivity' group, but only 19% of the center-based caregivers would be classified in this category. In other words, the range in sensitivity scores would be too restricted in both types of settings.

The same reasoning can be followed for reported associations between global quality and *RDC*. After analyzing the two types of care separately, quality of care was associated with *RDC*, but for center care only. When combining the children receiving above-median quality and children receiving below-median quality from both types of settings, a significant difference was present in *RDC* ($d = .43$) for the total group of children. Children's cortisol levels during the day at childcare decreased in the above-median group, and increased in the below-median group. Again, we could not combine the two types of care, due to the two different measures of global quality.

This however leaves the question unanswered why caregiver sensitivity predicted the total output of salivary cortisol during the day, whereas the mean ratios of diurnal change were predicted by global quality. A recent study of Watamura, Kryzer, and Robertson (2009) showed a negative association between quality of childcare centers (ORCE ratings of emotional climate, community building, expressed community, [reversed] chaos, and [reversed] over-control) and rise in cortisol from mid-morning to mid-afternoon: A better climate during the morning was associated with a decrease in cortisol. Consistent with our results, Watamura et al. (2009) did not find an association between sensitivity and changes in cortisol. They suggest that this failure to find an association may have been due to their presence; caregivers might have an idea which child is being observed, and may try to not interfere with the observation. Although we did not observe the sensitivity of the caregivers to a specific child, we did not find an association between sensitivity and ratio of diurnal change either.

Child characteristics

Overall, children's cortisol levels were not associated with gender and age. It should be noted that in this study, the age range was restricted to 20-40-months-old children, because previous studies found that children's elevated cortisol levels were especially notable in 2-3-year-old children. As for gender, one difference was present in childcare centers: Boys produced a higher amount of cortisol during the day at childcare centers compared to girls. Although focusing on another age group, this finding is in line with a recent publication of the NICHD Early Child Care Research Network (Roisman et al., 2009) reporting that 15-year-old males showed higher awakening cortisol levels than females. Again, this main effect of gender did not affect the association between quality indices and AUC_G .

Noise

In our study, no association was present between noise and wellbeing or cortisol patterns of the children. Although we expected higher noise levels to result in lower wellbeing and higher cortisol levels in children, this could not be confirmed in the current study. This might be due to the source and intensity of noise levels.

In the study of Evans et al. (1998) the noise source was an airport resulting in higher noise levels than in childcare settings. Another explanation is a lack of variance in noise: The present study did not allow a comparison of children in very quiet childcare settings with children in very noisy childcare settings. For future studies, it would be worthwhile to take into account sources of noise and to include childcare settings with substantial variances in noise.

Limitations

A limitation of this study is the sampling of cortisol on only one day at home and one childcare day. As cortisol levels may vary from day to day, caution is required when drawing conclusions relating individual differences in quality of care to variations in cortisol levels. It should be noted however that the one-day sampling will not have affected the comparisons across different types of childcare. Our data do support findings from studies, showing associations between quality of care and children's cortisol levels (Sims et al., 2006; Vermeer & Van IJzendoorn, 2006), suggesting validity of our findings. However, in future studies it would be better to collect saliva across different days at home as well as at childcare to get a more stable pattern. Also, the use of an electronic monitoring device would enhance the reliability of the (home) measurements of cortisol (Kudielka, Broderick, & Kirschbaum, 2003). Another limitation is the relatively small sample size, although the size of our sample is not deviating from those in other recent studies in this area (e.g., Watamura et al., 2009). As for childcare quality, the moderate internal consistency of the CC-IT-HOME should be taken into account. Except for the NICHD (Vandell, 1996) study in which an internal consistency of .81 was reported, we are not aware of other studies that used the CC-IT-HOME in home-based childcare. The authors of the CC-HOME inventories stated: "We no longer report internal consistencies estimates for the HOME Inventories. The CC-HOMEs are composed of cause rather than effect indicators and reliability estimates such as the alpha coefficient assume effect indicators." (Bradley et al., 2003, p. 308).

Implications for policy and practice

This study confirms the importance of childcare quality in both types of childcare as basic hormonal indices of stress and wellbeing seem to be affected by quality of care. Children appear to feel more at ease and less stressed when they are cared for by caregivers who provide more emotional support during both stressful and non-stressful situations. Although we do not know the impact of elevated cortisol levels and lower wellbeing on children's development in the long run, parents want childcare to be a place where their children feel secure and happy here and now (Fukkink, Tavecchio, De Kruijf, Vermeer, & Van, Zeijl, 2005). In childcare settings of lower quality, children's stress-regulation and behavior demonstrate that this parental wish is not fully fulfilled. Therefore, investments in the improvement of childcare quality, enhancing both the socio-emotional and physical environment of the children, are needed.

Conclusion

In conclusion, results from the present study show that children's cortisol levels on a childcare day are elevated compared to their cortisol levels at home, irrespective of type of childcare. Even home-based childcare – with fewer children and lower noise levels – can be a stressful situation for children. Our data suggest that quality of care is an important determinant of individual differences in children's cortisol levels. Dependent on the type of care, lower levels of global quality (center-based childcare) or caregiver sensitivity (home-based childcare) may result in elevated cortisol levels. Therefore, we conclude that high-quality sensitive caregiving in both types of childcare is important for children's wellbeing and stress-regulation.

Caregivers' cortisol levels and perceived stress in home-based and center-based childcare

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ABSTRACT

The current study examined professional caregivers' perceived and physiological stress, and associations with the quality of care they provide. Participants were 55 female caregivers from childcare homes and 46 female caregivers from childcare centers. In both types of settings equivalent measures and procedures were used. On non-work days, caregivers' salivary cortisol levels decreased between 11 AM and 3 PM, whereas on work days caregivers' cortisol levels remained at the same level during this period. Caregivers' cortisol levels and perceived stress did not differ across the two types of settings. In home-based childcare, caregivers offered higher-quality caregiving, compared to caregivers in center-based childcare. Caregivers' negative appraisal in home-based childcare –but not in center care– was associated with less positive caregiver behavior. These findings suggest that work at childcare influences cortisol secretion in professional caregivers, and that perceived stress but not cortisol is associated with quality of care.

Keywords: caregiver behavior, childcare, cortisol, perceived stress, professional caregivers

INTRODUCTION

Work-related stress has been shown to negatively affect employees' physical and psychological wellbeing. Employees who experienced more stress during work reported more health complaints, fatigue, and negative moods (Åkerstedt et al., 2004; Repetti, 1993). Stress can also affect behavioral responses. At days when reported workload was higher, mothers showed more behavioral and emotional withdrawal during reunion with their children (Repetti & Wood, 1997). For professional caregivers in childcare (hereafter: caregivers), potential stress in the work situation is inextricably connected to interacting with a group of children. Our aim is to examine caregivers' stress and associations with the quality of care they provide.

Perceived stress is generally measured as a global feeling of stress, for example over the last month, or as a context-specific feeling of stress related to a specific

moment. Physiological stress can be measured by collecting salivary cortisol. Hypothalamic-pituitary-adrenal (HPA)-axis activation, which is triggered by physiological stress, results in elevations of cortisol. During acute stress, cortisol is essential to cognitive performance and the immune response (increase of natural-killer cell activity and the numbers of some types of leukocytes), but chronic exposure to stress can have a negative effect on brain function and immune response (decrease of the number and activity of natural-killer cells) (Eigenbaum, Otto, & Cohen, 1992; Glaser & Kiecolt-Glaser, 2005; Segerstrom & Miller, 2004).

Normally, cortisol levels peak about half an hour after waking up and gradually reach their lowest point around midnight (Kirschbaum & Hellhammer, 1994). Cortisol levels may vary not only within days (diurnal patterns), but also across days. Schlotz, Hellhammer, Schultz, and Stone (2004), for instance, found that participants who reported higher levels of chronic work overload and worrying showed a stronger increase and higher cortisol levels after awakening on weekdays but not on weekend days. Therefore, we collected caregivers' salivary cortisol during a work day and a non-work day.

Furthermore, we tested whether (perceived and physiological) stress was associated with the quality of care caregivers provide. The core feature of quality of care is sensitive caregiving behavior. Children cared for by highly sensitive caregivers are more often securely attached to their caregiver than children cared for by less sensitive caregivers. Securely attached children use caregivers as a secure base and seek comfort from them (Goossens & Van IJzendoorn, 1990). Sensitive caregiving is not only beneficial for children's social-emotional development, but also for their cognitive development. Peisner-Feinberg et al. (2001) for instance showed that closeness of caregiver-child relationships in childcare was related to children's cognitive and social skills.

Stress may negatively affect caregiving behavior. Studies on associations between stress and caregiver behavior have mainly focused on parenting and care-giving of adults with a chronic disease. As for parents, Belsky, Crnic, and Woodworth (1995) found that daily hassles mediated the effect of mother's neuroticism on her sensitivity and expression of negative effect to her toddler. Also, reported maternal stress has been associated with less positive and more conflictive mother-child interaction (Crnic, Gaze, & Hoffman, 2005), more maternal depression, and a higher frequency of spanking (Coyle, Roggman, Newland, 2002). In a meta-analysis, it was found that caregivers of a parent or spouse with dementia had a 23% higher level of stress hormones than non-caregivers (matched on age and sex) (Vitaliano, Zhang, & Scanlan, 2005). Besides higher cortisol levels, it has been reported that these caregivers experience adverse psychological and physiological consequences (Baumgarten et al. 1992; Son Erno, Shea, Femia, Zarit, & Stephens, 2007; Wright, Hickey, Buckwalter, Hendrix, & Kelechi, 1999).

Three studies examined caregiver stress in the context of childcare. Atkinson (1992) reported that mothers working in home-based childcare reported higher stress levels than either mothers employed outside the home or non-employed mothers. Kontos and Riesen (1993) found that caregivers who experienced more

job stress perceived less social support than caregivers who experienced less job stress. In this home-based study, no association was present between job stress and reported childrearing values. Only one study examined associations between caregiver cortisol and quality of care. De Schipper, Riksen-Walraven, Geurts, and De Weerth (2009) reported that lower-quality caregiver behavior in childcare centers was predicted by caregivers' higher cortisol levels and reports of higher physical workload. In this pioneering study the authors measured cortisol only during the morning at childcare, which makes it impossible to examine changes in cortisol throughout the day.

In the study reported here, we measured caregivers' cortisol at four times during a work day and a non-work day. We included caregivers from home-based and center-based childcare in order to extend the variety in caregiver behavior and perceived stress. Howes (1983) reported that caregivers in home-based childcare spent more time with the children than caregivers in center-based childcare. Furthermore, home-based childcare was characterized by more stable child-caregiver relationships. In the Netherlands, fewer children are present and caregiver-child ratios are more favourable in home-based childcare than in center-based childcare. These variations in structural features across home-based childcare and center-based childcare may contribute to individual differences in caregiver stress levels. Due to the larger groups, caregivers in center-based childcare might be more stressed than caregivers in home-based childcare.

It is expected that caregivers who are more stressed offer lower-quality caregiver behavior. Caregivers' working hours may moderate this association. In a study of Eller, Netterstrøm, and Hansen (2006), a rise in cortisol levels during the working day was shown in women who worked more than 37 hours per week, whereas a decrease in cortisol levels was found in women who worked less than 37 hours per week.

In the current study, four questions are central: (1) Do caregivers' cortisol levels differ between a work day and a non-work day? (2) Do caregiver (physiological and perceived) stress and caregiver behavior differ across home-based childcare and center-based childcare? (3) Do associations exist between (physiological and perceived) stress indices and caregiver behavior? and (4) Does the number of working hours moderate associations between (physiological and perceived) stress and caregiver behavior?

We hypothesize that cortisol levels are higher on a work day compared to a non-work day. Because of more favorable aspects of home-based childcare (less children, more home-like environment) we expect higher-quality caregiver behavior and lower (physiological and perceived) stress in caregivers in home-based childcare, compared to caregivers in center-based childcare. Higher perceived stress and higher cortisol levels will be associated with lower-quality caregiver behavior. Finally, we hypothesize that caregivers who work more hours per week show higher-quality caregiver behavior when they are less stressed (compared to caregivers with less working hours), but that caregivers who work more hours per week show lower-quality caregiver behavior when they are more stressed (for so many hours per week).

METHOD

Participants

Hundred-and-one female caregivers participated in this study: 46 caregivers from childcare centers and 55 caregivers from home-based childcare. Similar recruitment strategies were used in both childcare settings. From national samples 250 childcare centers and 147 home-based childcare organizations were randomly selected. Directors of 26 centers and 21 home-based childcare organizations agreed to participate in the study. In center-based childcare, one group per center was randomly selected which resulted in a total of 46 caregivers. In home-based childcare, 110 caregivers agreed to participate, from which 55 caregivers received permission of the parents of all children for the videotaped episodes

The low participation rate can be attributed to the following reasons: (1) childcare providers felt uncomfortable with video recordings, (2) childcare providers disliked the idea of saliva sampling, and (3) disappointing results indicating low-quality of center care in the Netherlands had just been published (Vermeer et al. 2008).

Demographic information is summarized in Table 3.1. Caregiver-child ratios differed significantly between the two types of settings, and were in favor of childcare homes ($t(99) = -9.77, p < .01, d = -1.70$). In home-based care, one caregiver was on average responsible for almost three children, whereas in center-based care one caregiver was responsible for more than five children. In centers, the number of caregivers per group varied from one to three ($M = 2.02, SD = 0.46$). In home-based childcare, eleven of the caregivers (20%) took care of their own child beyond the guest children. Mean ages of caregivers differed significantly between the two settings: Caregivers in home-based childcare were significantly older than caregivers in center-based childcare ($t(76) = 7.73, p < .01, d = 1.83$). Caregiver education, which was coded as the number of years of education after primary school entry (from age six), was comparable across settings. The nationality of almost all caregivers was Dutch (in home-based childcare 90.9%; in center-based childcare 97.8%).

Table 3.1
Information on childcare settings and subject demographics

Characteristics	Centers		Home-based	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Childcare settings	<i>(n = 26)</i>		<i>(n = 55)</i>	
Group size	10.88	2.70	2.88**	1.45
Caregiver-child ratio	1 : 5.35	1.52	1 : 2.88**	1.45
Caregivers	<i>(n = 46)</i>		<i>(n = 55)</i>	
Age	28.97	7.31	44.30**	9.30
Education (years)	12.87	1.41	12.34	2.08
Experience (years)	7.19	5.56	8.49	7.26
Working hours per week	31.09	12.99	28.05	7.25

* $p < .01$, ** $p < .01$

Procedure

Data collection took place in 2006-2007. All procedures were carried out with adequate understanding and written consent of caregivers and parents. Ethical approval for this study was provided by the Leiden Institute of Education and Child Studies. Each setting was visited once by an observer who videotaped three different 10-minute episodes at predetermined time points for each caregiver. Caregivers collected their saliva four times during a work day (including two measures at home) and four times during a non-work day. In addition, they were asked to complete a questionnaire about daily schedules, the use of medicine, illnesses, and food on the collection days.

A few weeks after the observation, caregivers were sent questionnaires concerning their perceived stress during the last month. Video-taped episodes were rated afterwards by coders who met the criteria to reliably assess these scales. To obtain independency in ratings, observers who visited a childcare setting did not rate caregiver sensitivity or talking and explaining for that particular setting, and none of the coders rated both scales.

Measures

Cortisol levels. Caregivers' stress levels were assessed by measuring their salivary cortisol levels, using cellulose-cotton tip sorbettes (Strazdins et al., 2005), at four time points during one work day and one non-work day: immediately after awakening, at 11 AM, at 3 PM and just before dinner (around 6 PM). Caregivers were mailed sampling kits including the material needed for collection and detailed written instruction how to obtain the samples. During the work day, 11 AM and 3 PM sampling took place at childcare. Mean cortisol sampling times on the non-work day were 07:49 AM ($SD = 00:57$), 11:11 AM ($SD = 00:27$), 03:19 PM ($SD = 00:36$), and 06:20 PM ($SD = 00:38$). Mean cortisol sampling times on the work day were 06:56 AM ($SD = 00:33$), 11 AM ($SD = 00:04$), 03:06 PM ($SD = 00:17$), and 06:31 PM ($SD = 00:44$). Correlational analyses revealed one significant association between mean cortisol sampling time and cortisol values within these time points (6 PM non-work day; $r = 0.31$, $p < .01$); the other cortisol values were not significantly associated with sampling times. Cortisol sampling time since awakening and hours of sleep on the collection day were not significantly associated with cortisol levels. Ten percent of the caregivers reported that they were feeling unwell (e.g., having a cold) on the non-work day, compared to 12.9% of the caregivers on the work day. Mean cortisol levels did not differ between the group of healthy caregivers and the group of caregivers feeling unwell, neither on the work day nor on the non-work day. In total, 21.7% of the caregivers reported the use of medicine on the non-work day, compared to 19.8% of the caregivers on the work day. Mean cortisol levels differed between the two groups for the collection at 6 PM on the non-work day only: Cortisol levels of caregivers who reported the use of medicine were lower than cortisol levels of caregivers who did not report the use of medicine ($t(70) = -2.16$, $p < .05$, $d = 0.57$). For this reason, we controlled for the use of medicine when comparing diurnal cortisol patterns (including the 6 PM measure) during a non-work and a work day.

Caregivers mouthed the sorbette under the tongue for at least 1 minute. Once the sorbette was saturated, it was placed in a 2-ml plastic cryovial and sealed. Samples were stored at -18°C until being assayed by the Research Center for Psychobiology at the University of Trier. Caregivers returned cortisol samples by mail, which should not affect cortisol levels (Kirschbaum & Hellhammer, 1994).

As for the saliva sampling protocol, all caregivers were mailed detailed written instruction how to obtain the samples. Caregivers were explained how important it is to have “clean” saliva before sampling, e.g. they were not allowed to eat or drink or brush their teeth at least 30 minutes before sampling. During the work day, the observer (who videotaped caregiver behavior, see below) was present to assist with the procedure, if necessary. To increase compliance in collecting cortisol samples, research staff telephoned caregivers the day before the observation day to remind them of the collection. Cryovials were labelled beforehand, so caregivers only had to note the exact time they collected their saliva in a pre-printed table.

Cortisol was assayed using a time-resolved fluorescence immunoassay. The intra-assay coefficient of variation of this immunoassay was between 4.0% and 6.7%, and the corresponding inter-assay coefficients of variation were between 7.1% and 9.0%. Samples were run in duplicate and mean values were calculated for each sample. The detection limit for cortisol ranged from 0.1 to 100 nmol/L. More than 99% of salivary cortisol measures were within this assay detection limit. Samples lower than 0.1 nmol/L and higher than 100 nmol/L were coded as missing because of their impossible values. In total 19% of the saliva samples were not mailed by caregivers to the laboratory. Missing samples were imputed (using maximum likelihood estimation) for caregivers who had only one missing sample per day. In the analyses of within-subjects differences between cortisol levels on a work day and a non-work day 71 complete sample sets were used. On a work day, saliva samples were available from 77 caregivers. No significant differences were present in perceived stress or caregiver behavior between caregivers with and without missing cortisol samples.

Perceived stress. Caregiver perceived stress was assessed with two self-report questionnaires measuring work related stress (workload) and stress related to the caregiver’s life in general (negative appraisal). Workload was measured by a subscale of the Trier Inventory for the Assessment of Chronic Stress (TICS; Schulz & Schlotz, 1999; Dutch translation by De Vries, 1999) consisting of 13 items on a 5-point rating scale, ranging from 1 (never) to 5 (very often). Negative appraisal was measured by the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Dutch translation by De Vries, 1998). Responses on the 14 items are given on a 4-point scale ranging from 1 (never) to 4 (always). Internal consistencies (Cronbach’s alpha’s) of workload and negative appraisal were 0.88 and 0.83, respectively.

Caregiver behavior. Caregiver behavior in the group setting was examined by means of two rating scales developed and validated by the Dutch Consortium for Child Care Research (NCKO; De Kruijf et al., 2007): caregiver sensitivity and talking and explaining. The caregiver sensitivity rating scale is based on scales developed to measure sensitivity in a parent-child context (Ainsworth,

Bell, & Stayton, 1974; Erickson, Sroufe, & Egeland, 1985), and was adjusted for group settings by the NCKO. Scoring was based on three video-fragments of ten minutes, each taped during the observation day at childcare. Sensitivity ratings are presented on a seven-point scale, ranging from (1) very low to (7) very high. Caregivers scoring high on this scale provide emotional support to all children who need this support, both during stressful and non-stressful situations. Caregivers scoring low on this scale do not succeed in providing emotional support to children when they need it. In a Dutch study, the Caregiver Interaction Scale (Arnett, 1989) was positively correlated ($r = 0.48$, $p < .01$) with this sensitivity scale (De Kruif et al., 2007).

The caregiver talking and explaining scale covers the verbal interactions between caregiver and children in a group setting, in which frequency, style and content play an important role (based on Harms, Cryer, & Clifford, 2003; McWilliam, Zulli, & De Kruif, 1998). Scoring of talking and explaining was based on the same three video-fragments of ten minutes. Ratings are on a seven-point scale, ranging from very low (1) to very high (7).

Seven observers were trained on the same dataset to reliably assess caregiver behavior. Mean intra-class correlations (two-way mixed, absolute agreement) were 0.75 (range 0.72 to 0.80) for caregiver sensitivity and 0.83 (range 0.76 to 0.88) for talking and explaining. Internal consistencies (Cronbach's alpha's) were 0.81 and 0.77, respectively. To create an overall caregiver behavior composite score, ratings of both scales were combined by standardizing the mean scores and calculating the sum of these scores. Internal consistency of the combined scale of caregiver behavior was 0.86.

Data analysis

Distributions of cortisol measurements were positively skewed, therefore \log_{10} transformations were used for analysis. Cortisol diurnal patterns were analyzed in two ways: (1) cortisol levels on the four time points and (2) mean ratios of cortisol diurnal change (*RDC*). To examine differences in caregivers' cortisol levels across the two days and the two types of care, a MANOVA with repeated measures (caregivers' cortisol levels at four time points) was performed.

To answer the second research question (differences in stress and caregiver behavior during work between the two types of care), we calculated the *RDC*. This mean ratio of cortisol change on a work day (RDC_w) and on a non-work day (RDC_{nw}) was defined as the diurnal change between 11 AM and 3 PM, controlled for the measurement at 11 AM ($\Delta\text{cortisol} / 11 \text{ AM}$). A constant of 1 was added to the computed *RDC* in order to make \log_{10} transformation possible and to avoid negative values. In childcare research, measurements during the mid-morning (11 AM) and the mid-afternoon (3 PM) are frequently used to represent changes in cortisol patterns (for a review see Vermeer & Van IJzendoorn, 2008). In our study, we used the *RDC* as an index of an increase (positive number) or a decrease (negative number) of caregivers' cortisol levels during work. In this analysis, the morning (7 AM) and evening (6 PM) measurements were excluded, since these were not administered during work.

Cortisol measures and *RDC* were inspected for outliers, which were defined as values with *SD* greater than 3.29 above the mean. By means of winsorizing, outliers were made equal to the most extreme value that was accurately measured (Tabachnick & Fidell, 1996). Because caregivers in home-based childcare were significantly older than caregivers in center-based childcare, we controlled for age before analyzing differences between the two types of care.

Due to substantial differences between the two types of care, correlations for stress indices and caregiver behavior were calculated for each type of care separately, to avoid artificial associations. Next, multiple regression analyses were performed to test whether stress indices predicted caregiver behavior (research question 3). In these hierarchical regression analyses, type of care was added in the first step to control for differences between the two types of care. Finally, we tested whether the number of hours working in childcare served as a moderator between stress indices and caregiver behavior (research question 4).

RESULTS

Diurnal cortisol on a work day and a non-work day

In Figure 3.1 caregivers' (untransformed) cortisol values are shown of caregivers during a work day and a non-work day. After log-transforming, analyses of cortisol levels were performed using a 2 (Context: work day versus non-work day) by 4 (Time of day) by 2 (Type of care) MANCOVA with repeated measures, controlled for the use of medicine during at least one of the collection days. There was a significant main effect of time of day, demonstrating declining cortisol levels throughout the day (*Pillais F* (3, 66) = 66.37, $p < .001$, $\eta^2 = 0.75$), confirming the daily cortisol curve. Although no main effect of context emerged (*Pillais F* (1, 68) = 1.23, $p = .27$, $\eta^2 = 0.02$), a significant interaction effect of context by time was present (*Pillais F* (3, 66) = 3.63, $p < .05$, $\eta^2 = 0.14$). There was a significant difference in caregivers' cortisol levels at 11 AM: cortisol levels at 11 AM were higher during a non-work day ($M = 4.91$, $SD = 3.20$), compared to a work day ($M = 3.80$, $SD = 2.68$, t (70) = -2.93, $p < .01$, $d = 0.42$). Figure 3.1 shows that cortisol levels remained at the same level between 11 AM and 3 PM on a work day and decreased during a non-work day. Analyses using ratios of diurnal change indeed showed that (transformed) *RDC* differed across the two contexts (non-work day $M = -0.11$, $SD = 0.91$; work day $M = 0.24$, $SD = 1.54$), t (70) = -2.46, $p < .05$, $d = 0.39$). There was no main effect of type of care (*Pillais F* (1, 68) = 0.15, $p = .70$, $\eta^2 = 0.00$). No interaction with type of care was present either (*Pillais F* (3, 65) = 0.21, $p = .89$, $\eta^2 = 0.00$).

Differences between caregivers across type of care

Physiological stress. Caregiver RDC_w did not differ significantly across both types of care (t (75) = 1.53, $p = .13$, $d = 0.42$). This was also true when we controlled for age (F (1, 66) = 1.01, $p = .32$).

Perceived stress. Caregivers in center-based childcare reported higher workload ($M = 2.19$, $SD = 0.47$) and higher negative appraisal ($M = 2.36$, $SD = 0.37$) compared to caregivers in home-based childcare (workload $M = 1.80$, $SD = 0.61$, t (99) = -3.60, $p < .01$, $d = 0.73$; appraisal $M = 2.11$, $SD = 0.47$, t (99) = -2.90, $p < .01$, $d =$

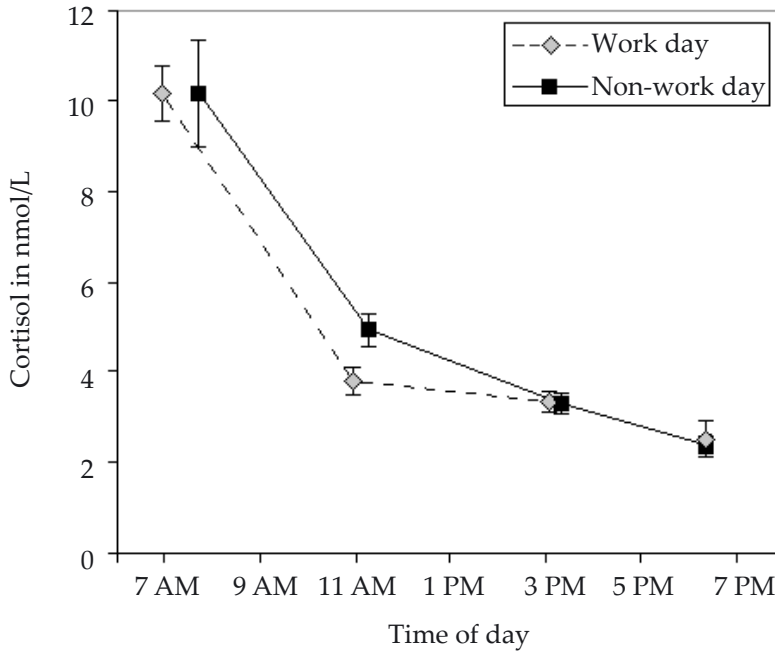


Figure 3.1. Caregivers' cortisol levels (in nmol/L) during a non-work day and a work day ($n = 71$)

0.58). However, after controlling for age, both types of perceived stress were no longer significantly different across type of care (workload $F(1, 78) = 1.50, p = .23$; appraisal $F(1, 78) = 1.65, p = .20$).

Caregiver behavior. The composite score of caregiver behavior was higher in home-based childcare ($M = 0.84, SD = 1.61$) than in center-based childcare ($M = -1.01, SD = 1.67; t(99) = 5.66, p < .01, d = 1.14$), indicating that caregivers in home-based childcare showed higher-quality caregiving behavior than caregivers in center-based care. This effect remained significant after controlling for age ($F(1, 78) = 5.82, p < .05$).

A binary logistic regression for type of care was performed, controlling for caregiver age. Type of care was significantly predicted from caregiver age ($B = -0.26, S.E. = 0.06, Wald = 17.51, Exp(B) = 0.77, p < .01, R^2 = 0.76$). Stress indices and caregiver behavior did not significantly add to this prediction. Due to the differences across the two types of care, data from caregivers in home-based childcare and caregivers in center-based childcare were analyzed separately in the next section.

Correlations between stress, caregiver behavior, and background variables

In Table 3.2 Pearson correlations are shown between background variables, stress indices, and caregiver behavior. In center-based childcare, one significant association was present, namely between negative appraisal and working hours ($r = -0.37, p < .05$): Caregivers who perceived more stress in their lives, worked less

hours per week in childcare centers. This negative association was also present in home-based childcare ($r = -0.29, p < .05$).

For home-based childcare, a significant positive association was present between RDC_w and both types of perceived stress (workload; $r = 0.30, p < .05$; negative appraisal; $r = 0.30, p < .05$). To further examine this association, we dichotomized the perceived stress scales using a median-split procedure (median workload at 1.77, median negative appraisal at 2.07). In Figures 3.2a and 3.2b, cortisol patterns are shown of caregivers reporting lower perceived stress versus higher perceived stress. Caregivers' cortisol levels during the work day decreased when reporting lower workload or lower negative appraisal, whereas caregivers' cortisol levels slightly increased when reporting higher workload or higher negative appraisal. For caregivers in center-based childcare, no significant associations were present between perceived stress and physiological stress levels.

For home-based childcare, a negative association was present between negative appraisal and caregiver behavior ($r = -0.30, p < .05$): Caregivers who perceived more stress in their lives showed lower-quality caregiver behavior. There was no significant association between RDC_w and caregiver behavior in either type of care.

Table 3.2

Pearson correlations between working hours, stress indices, and caregiver behavior

	1.	2.	3.	4.	5.
1. Working hours		-0.18	-0.20	-0.37*	-0.01
2. RDC_w	-0.16		0.18	0.03	0.10
3. Workload	-0.20	0.30*		0.16	0.03
4. Negative appraisal	-0.29*	0.30*	0.57**		-0.13
5. Caregiver behavior	-0.15	-0.04	-0.25	-0.30*	

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

Note. Correlations within the home-based childcare sample are displayed below the diagonal and correlations within the center childcare sample are displayed above the diagonal.

Predictors of caregiver behavior

A multivariate regression analysis was performed to test whether stress predicted caregiver behavior, after working hours had been accounted for. Type of care was added in the first step to control for differences between the two types of care. In the second step, working hours were added, followed by the stress indices in the third step. Results are displayed in Table 3.3.

As expected, type of care significantly added to the prediction of caregiver behavior ($\beta = -0.46, p < .01$). Controlled for working hours, only negative appraisal had a significant additional negative association with caregiver behavior ($\beta = -0.33, p < .05$).

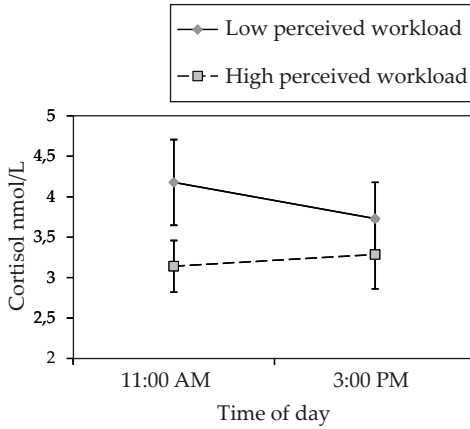


Figure 3.2a
Caregivers' cortisol levels (in nmol/L) in childcare homes with low perceived workload ($n = 23$) and high perceived workload ($n = 22$)

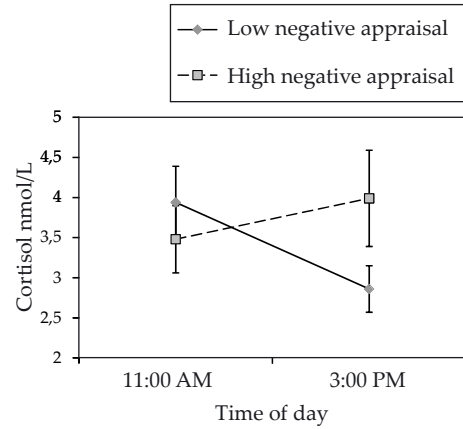


Figure 3.2b
Caregivers' cortisol levels (in nmol/L) in childcare homes with low negative appraisal ($n = 19$) and high negative appraisal ($n = 26$)

Table 3.3
Hierarchical regression in predicting caregiver behavior

	<i>B</i>	<i>SEB</i>	β	R^2
Step 1				0.21**
Type of care	-1.87	0.45	-0.46**	
Step 2				0.21**
Working hours	0.01	0.02	0.03	
Step 3				0.29**
<i>RDC_w</i>	0.45	0.69	0.07	
Workload	0.15	0.54	0.04	
Negative appraisal	-1.76	0.81	-0.33*	

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

Moderator models

In order to test the moderator models of caregiver behavior, we performed linear regression analyses predicting caregiver behavior including the interaction between stress indices (workload, appraisal, RDC_w) and working hours after controlling for caregiver age and the main effects of the predictors in each type of care. Before testing the moderator effects, all variables were centered. None of the regression analyses showed a significant interaction effect in addition to main effects; the effects of stress on caregiver behavior were not moderated by caregivers' working hours.

DISCUSSION

Caregivers' cortisol levels differed between a non-work day and a work day, but only during the morning: Cortisol levels at 11 AM were higher during a non-work day, compared to a work day. Also, cortisol levels decreased between 11 AM and 3 PM during a non-work day, and remained at the same level on a work day. These results suggest that work at childcare influences cortisol levels in caregivers.

Cortisol on a non-work day and a work day

How can differences in morning cortisol across a non-work day and a work day be explained? Although time since awakening, hours of sleep, and mean time points of collecting cortisol slightly differed across a non-work day and a work day, no significant associations were present with cortisol levels. Also, the number of children present and caregiver-child ratio were not associated with caregivers' cortisol levels, and caregivers did not report more stressful events during the non-work day than during the work day. Rather than differences in caregivers' daily activities between a work day and a non-work day, it seems more likely that the relative lower cortisol levels during the morning at childcare reflect specific demands of the childcare context.

A possible explanation of the lower cortisol levels during a work day, compared to a non-work day, is suppression. Suppression might be particularly noticeable during the morning when cortisol levels are normally high. Caplan, Cobb, and French (1979) found that white collar workers who reported low workload showed the expected decrease in cortisol from morning to afternoon, while workers who reported high workload showed lower morning cortisol levels and an increase in cortisol during the mid-afternoon. These authors hypothesized that chronic stress was examined, rather than acute stress. During chronic stress, down-regulation in cortisol would be adaptive. A recent meta-analysis has shown that acute stressors elicited greater cortisol changes than chronic stressors in natural settings (Michaud, Matheson, Kelly, & Anisman, 2008). Caregivers' work might cause chronic stress as well, with hyporegulated cortisol during the morning anticipating a strenuous day at work. However, we can only speculate on this because no data are available on caregivers' chronic stress. To examine the stability of the lower cortisol levels at 11 AM during a work day, compared to a non-work day, cortisol samples should be collected on more than one day.

Home-based childcare and center-based childcare

Cortisol levels were comparable across the two types of care. Although caregivers in center-based childcare reported higher workload and more negative appraisal than caregivers in home-based childcare, this difference could be accounted for by caregiver age. Because caregiver age and type of care are interrelated, it is unclear whether caregiver age or type of care is responsible for these differences. As was expected, the quality of caregiver behavior was higher in home-based childcare than in center-based childcare, even after controlling for caregiver age.

Stress and quality of care

In home-based childcare, caregivers who reported more negative appraisal in their lives showed lower-quality caregiver behavior. This is consistent with findings in parents, where perceived stress has been found to negatively affect parenting (Belsky et al., 1995; Coyl et al., 2002; Crnic et al., 2005). No significant associations were found between quality of care and cortisol or perceived stress. Other variables might be involved in this association. For instance, Van IJzendoorn, Bakermans-Kranenburg, and Mesman (2008) reported that daily hassles led to less sensitive parenting, but only in mothers who have a particular genetic makeup (with a *DRD4-7R* and a *COMT* val allele).

Working hours

We found an association between negative appraisal and working hours in both types of care: Caregivers who perceived more stress in their lives, worked less hours per week. A possible explanation is that caregivers who perceive more stress might not be able to manage as many working hours per week as caregivers who perceive less stress. Working hours was not related to quality of caregiver behavior and did not moderate the association between caregiver stress and caregiver behavior.

Limitations

As we already briefly discussed, a limitation of this study is the sampling of cortisol on only one non-work and one work day. As cortisol levels may vary from day to day, caution is required when drawing conclusions relating individual differences in quality of care to variations in cortisol levels. It should be noted however that the one-day sampling does not affect comparisons across types of childcare. Also, the use of an electronic monitoring device would enhance the reliability of cortisol measurements (Kudielka, Broderick, & Kirschbaum, 2003).

Conclusion

Results show that caregivers' cortisol levels differed between a work and a non-work day, irrespective of type of childcare. Caregivers showed lower cortisol levels during the mid-morning on a work day in childcare, compared to a non-work day. Cortisol levels decreased from morning to afternoon on a non-work day at home, but remained stable at childcare. Even caregivers in home-based childcare—who reported less stress and took care of fewer children—showed this cortisol patterning. Our data suggest that caregivers' perceived stress in home-based childcare is an important determinant of quality of care. This study confirms the impact of work on basic hormonal indices of stress in caregivers. Reduction of caregivers' stress is an important focus for the improvement of childcare quality, and, eventually, may positively contribute to children's development.

Stress, cortisol, and wellbeing of caregivers and children in home-based childcare: A case for differential susceptibility

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ABSTRACT

Perceived stress and cortisol levels of professional caregivers ($n = 44$), and associations with children's ($n = 44$) wellbeing and cortisol levels in home-based childcare were examined. Caregiver perceived stress and cortisol levels were related to children's wellbeing but not to children's cortisol levels. Children's social fearfulness acted as a moderator between caregivers' ratio of diurnal change in cortisol and children's wellbeing. When caregiver cortisol levels decreased, fearful children were reported higher on wellbeing than less fearful peers. In contrast, when caregiver cortisol levels increased, fearful children were reported lower on wellbeing. The findings point to differential susceptibility.

Keywords: differential susceptibility, home-based childcare, perceived stress, salivary cortisol, social fearfulness, wellbeing

INTRODUCTION

Parental stress may have a negative effect on mental health and behavior of children (Essex, Klein, Cho, & Kalin, 2002; Van Zeijl et al., 2006; Crnic, Gaze, & Hoffman, 2005; Hart & Kelley, 2006). Professional caregiver stress may affect a whole group of children. Here we examine whether children cared for by stressed caregivers show lower socio-emotional wellbeing and more stress, compared to children cared for by less stressed caregivers.

Caregiver stress

Caregivers in home-based childcare take care of a group of children, each younger than four years of age. Feelings of responsibility and of continuously having to divide their attention among more children are part of caregivers' daily work, which might cause stress. Perceived stress refers to the degree to which situations in one's life or at work are appraised as stressful, and is generally measured through self-reports. To assess stress in a more objective manner, we additionally used a physiological marker of stress: salivary cortisol. Activation of the hypothalamic-pituitary-adrenal (HPA)-axis, which is triggered by physiological stress, results

in elevations of cortisol. Normally, cortisol levels peak about half an hour after waking up and gradually reach their lowest point around midnight (Kirschbaum & Hellhammer, 1994). During acute stress, cortisol is essential to cognitive performance and the immune response, but chronic exposure to stress can have a negative effect on, among other things, brain function and immune response (Eigenbaum, Otto, & Cohen, 1992; Glaser & Kiecolt-Glaser, 2005; Segerstrom & Miller, 2004).

Caregiver stress and children's cortisol

Meta-analytic results have shown that children display higher cortisol levels during a day in childcare than during a day at home (Geoffroy, Côté, Parent, & Séguin, 2006; Vermeer & Van IJzendoorn, 2006). Stress responses during childcare may be triggered for various reasons: the long hours, the separation from the parents, and the need to reorganize security seeking behavior around multiple adults (Dettling, Gunnar, & Donzella, 1999). Furthermore, it has been shown that caregiving plays an important role in regulating activity of the HPA system. Results from childcare studies point in the direction of an association between lower-quality care and higher cortisol levels in children (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Groeneveld, Vermeer, Van IJzendoorn, & Linting, 2010; Tout, De Haan, Kipp Campbell, & Gunnar, 1998). Associations between caregiver stress and children's cortisol levels have not been studied yet.

In few studies, associations between parental stress and children's cortisol have been investigated. Essex et al. (2002) found that perceived maternal stress during the child's first year of life was associated with cortisol reactivity at age 4.5. Children with a history of maternal stress experiencing concurrent stress showed higher cortisol levels at age 4.5 compared to their peers who had no history of maternal stress (or a history of maternal stress but no concurrent stress). In addition, Spangler (1991) and Stenius et al. (2008) reported that cortisol levels of mothers were associated with cortisol levels of their infants. Correlations between cortisol of father and child were weaker (Stenius et al., 2008). This suggests that not only genetic similarities affect basic hormonal indices of stress in young children, but also the environment.

Caregiver stress and children's wellbeing

Caregiver stress has been suggested to be related to children's socio-emotional development. Maternal stress has been associated with more mental health problems (Essex et al., 2002) and more behavior problems in children (Crnic et al., 2005; Hart & Kelley, 2006; Van Zeijl et al., 2006). In this study, we focus on one aspect of children's socio-emotional development, that is their wellbeing. In our view, wellbeing is one of the most fundamental aspects of all types of childcare, covering physical, cognitive, psychological or environmental domains (Pollard & Lee, 2002). Wellbeing is defined as the extent to which children feel safe, self-confident, relaxed and are enjoying the activities in which they are involved (Riksen-Walraven, 2004). The current study is the first to examine associations between professional caregiver stress and children's wellbeing.

Child temperament

In addition, child characteristics, in particular temperament, may affect children's wellbeing and cortisol levels, or may act as a moderator of caregiver effects. Childcare is a social context, in which children engage in interaction with other children and caregivers. Especially children who are shy and fearful may experience social threat in this context. Temperamental characteristics have often been linked to individual differences in children's stress reactivity and wellbeing. It has been found that social fearfulness (Watamura, Donzella, Alwin, & Gunnar, 2003) and poor self-control (Dettling, Gunnar, & Donzella, 1999) were positively associated with higher cortisol levels. Talge, Donzella, and Gunnar (2008) found that highly fearful children (enrolled in home-based childcare) showed more often increases in cortisol levels during a stressful task in the laboratory than low fearful children. For wellbeing, De Schipper, Tavecchio, Van IJzendoorn, and Van Zeijl (2004) found an association between a more easy-going temperament and higher wellbeing in children during childcare.

Although both caregiver stress and child temperament may each uniquely relate to children's cortisol and wellbeing, the interaction between caregiver stress and child temperament may also contribute to individual differences in children's cortisol and wellbeing. According to the differential susceptibility theory (Belsky, 1997; Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2007), effects of caregiver stress may be moderated by temperament, for better *and* for worse. Congruent with the differential susceptibility hypothesis, we expect more socially fearful children to be more susceptible to high caregiver stress (i.e., showing lower wellbeing, higher cortisol levels) as well as more susceptible to low caregiver stress (i.e., showing higher wellbeing, lower cortisol levels) compared to less fearful children.

Aims of this study

Our research questions are:

- 1) Is caregiver stress associated with children's wellbeing and cortisol levels?
- 2) Does child temperament moderate associations between caregiver stress and children's wellbeing and cortisol levels?

We hypothesize that children who are cared for by more stressed caregivers (increase in cortisol during childcare, more perceived stress), show lower wellbeing and higher increases in cortisol levels, compared to children cared for by less stressed caregivers. We further expect that more socially fearful children are more susceptible to caregiver stress compared to less fearful children.

METHOD

Participants

Forty-four children (25 boys) and their caregivers participated in this study. Of the 110 caregivers who agreed to participate, 55 caregivers received permission of the parents to collect their child's saliva and to have their child videotaped during childcare. One child per caregiver was randomly selected to participate.

In total, 11% of the caregivers' saliva samples (8% for children's samples) were not returned, and an additional 5% of the tubes (8% for children's samples) did not contain enough saliva for the immunoassay. This resulted in a total sample of complete data from 44 caregiver - child dyads. The 11 caregivers and children with no cortisol data did not differ on any of the other variables

All children were raised in two-parent families. In total, 82.5% of the children had one or more siblings. Mothers completed on average 13.98 years ($SD = 2.07$) of education after primary school entrance (from age six), fathers completed on average 13.58 years of education ($SD = 2.22$). The nationality of almost all parents was Dutch (mothers 97.5%, fathers 100%).

Group sizes ranged from 1 to 7 ($M = 2.95$, $SD = 1.52$). All caregivers were female with a mean age of 44.78 ($SD = 7.78$). On average they completed 12.39 ($SD = 2.11$) years of education. Thirty percent of the caregivers completed an education in the field of childcare. Children's age ranged from 20 to 40 months ($M = 29.37$, $SD = 6.31$).

Procedure

All procedures were carried out with the adequate understanding and written consent of the caregivers and the parents. Ethical approval for this study was provided by the Leiden Institute of Education and Child Studies. Each setting was visited by an observer who spent a morning in the childcare homes to videotape three different 10-minute episodes at predetermined time points for the target child. Children's and caregivers' saliva was collected two times during childcare (11 AM and 3 PM) to measure their cortisol levels.

Parents and caregivers were asked to complete a questionnaire about the child's medicine use, mood, naps, and food on the collection day. Caregivers completed a similar questionnaire about themselves as well. A few weeks after the observation, questionnaires concerning perceived stress during the last month were sent to the caregivers, and temperament questionnaires were sent to the parents. Videotaped episodes were rated afterwards on child wellbeing by coders who met the criteria to reliably assess this scale. To obtain independency in ratings, observers who visited a childcare setting did not rate the videotaped episodes for that particular setting.

Measures

Cortisol. Caregivers' and children's stress levels were assessed by measuring their salivary cortisol levels. Based on the study of Strazdins et al. (2005), in which three saliva collection methods for measuring cortisol were compared, cellulose-cotton tip sorbettes were used. Caregivers were mailed sampling kits including detailed written instruction how to obtain the samples. Caregivers were asked to collect both their own saliva and the child's saliva at 11 AM and at 3 PM. Caregivers and children were not allowed to eat or drink at least 30 minutes before sampling. The sorbette was mouthed under the tongue for at least 1 minute. Once the sorbette was saturated, it was placed in a 2-ml plastic cryovial and sealed. Samples were stored at -18°C until being assayed by the Research Center for Psychobiology at the University of Trier. Caregivers returned the cortisol samples by mail, which

should not affect the cortisol levels (Kirschbaum & Hellhammer, 1994). Cortisol was assayed using a time-resolved fluorescence immunoassay. The intra-assay coefficient of variation of this immunoassay was between 4.0% and 6.7%, and the corresponding inter-assay coefficients of variation were between 7.1% and 9.0%. Samples were run in duplicate and mean values were calculated for each sample. The detection limit for cortisol ranged from 0.1 to 100 nmol/L. All salivary cortisol measures were within this assay detection limit.

Mean cortisol sampling times for caregivers were 10:59 AM ($SD = 0:05$) and 3:06 PM ($SD = 0:13$), and for children 11:05 AM ($SD = 0:23$) and 3:24 PM ($SD = 0:30$). Correlational analyses revealed no significant associations between mean cortisol sampling time and cortisol values within these time points. Several studies have shown that parental background (e.g., socio-economic status) can impact cortisol production of young children (Lupien, King, Meaney, & McEwen, 2000, Lupien, King, Meaney, & McEwen, 2001). In our study, children's cortisol levels were not associated with parents' educational level or age.

Wellbeing. Children's wellbeing was measured in two ways: observed wellbeing (by independent observers) and reported wellbeing (by the caregiver). Observed wellbeing was measured by the Wellbeing Scale, developed and validated by the Dutch Consortium for Child Care Research (NCKO; De Kruijff et al., 2007). Scores were based on three 10-minute videotaped episodes of the child at predetermined time points at childcare. Every two minutes a score was registered on a seven-point scale, ranging from (1) very low wellbeing (signals of discomfort are clearly present, e.g. crying, screaming) to (7) very high wellbeing (signals of comfort are clearly present, e.g. enjoyment, smiling). Scores were aggregated across time periods. Three observers were trained to reliably assess the children's wellbeing: mean intra-class correlation (two-way mixed, absolute agreement) was .80 (range .74-.89). Internal consistency of the fifteen intervals was .80.

Children's reported wellbeing was assessed with the Leiden Inventory for the Child's Well-being in Day Care (LICW-D, Van IJzendoorn, Tavecchio, Stams, Verhoven, & Reiling, 1998), consisting of 24 6-point Likert-type items. Caregivers completed this questionnaire. One overall wellbeing scale was extracted, consisting of 15 items, Cronbach's alpha was .84. The mean score was computed, with higher scores reflecting a higher wellbeing at childcare.

Perceived stress. Caregiver perceived stress was assessed with two self-report questionnaires on two aspects of stress: work related stress (workload) and stress related to the caregiver's life in general (negative appraisal). Workload was measured with a subscale of the Trier Inventory for the Assessment of Chronic Stress (TICS; Schulz & Schlotz, 1999; Dutch translation by De Vries, 1999) consisting of 13 items on a 5-point rating scale, ranging from 1 (never) to 5 (very often). Negative appraisal was measured with the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Dutch translation by De Vries, 1998). Responses on the 14 items are given on a 4-point scale ranging from 1 (never) to 4 (always). Internal consistencies (Cronbach's alpha's) of workload and negative appraisal were .88 and .83, respectively.

Social fearfulness. Parents were asked to complete the Toddler Behavioral Assessment Questionnaire (TBAQ; Goldsmith, 1996). Parents rated how often

Table 4.1
Descriptives and correlations between caregiver stress, children's cortisol, wellbeing, and fearfulness

	M	SD	Caregivers							Children									
			1.	2.	3.	4.	5.	6.	7.	8.	9.	10.							
1. Cortisol at 11 AM (nmol/L)	3.69	2.16																	
2. Cortisol at 3 PM (nmol/L)	3.34	1.93	.22																
3. RDC	.09	0.66	-.62**	.59**															
4. Workload	1.85	0.63	-.26	.14	.30*														
5. Negative appraisal	2.10	0.41	-.20	.12	.27	.75**													
6. Cortisol at 11 AM (nmol/L)	3.31	2.32	.11	-.01	-.11	.26	.06												
7. Cortisol at 3 PM (nmol/L)	3.77	2.20	.06	.10	.01	.08	.08	.50**											
8. RDC	0.32	.93	-.03	.12	.11	-.13	.04	-.31*	.67**										
9. Observed wellbeing	4.60	.38	.20	.01	-.19	-.17	-.37*	-.05	-.10	-.06									
10. Reported wellbeing	5.26	.51	.24	-.10	-.33*	-.32*	-.41**	-.03	.08	.11	.28								
11. Fearfulness	3.43	.69	.23	.23	.00	.07	.07	.06	-.08	-.14	-.35*	-.14							

Note. * $p < .05$, ** $p < .01$; Cortisol values are untransformed

they observed specific behaviors described in 108 items during the previous month on a seven-point scale, ranging from never (1) to always (7). In our study the subscale 'social fearfulness' (Cronbach's $\alpha = .71$; hereafter: fearfulness) was used to test the differential susceptibility theory.

Analysis plan

Cortisol. Distributions of the cortisol measurements were positively skewed, therefore \log_{10} transformations were used for analysis. Cortisol diurnal change was analyzed by calculating mean ratios of cortisol diurnal change at childcare (*RDC*). *RDC* was defined as the diurnal change between 11 AM and 3 PM, controlled for the measurement at 11 AM ($\Delta\text{cortisol}/11\text{ AM}$). A positive *RDC* reflects an increase in cortisol between 11 AM and 3 PM, and a negative *RDC* reflects a decrease in cortisol.

Data analyses. First, correlations were calculated to test whether associations were present between caregiver stress and children's wellbeing and cortisol levels (research question 1). Next, a multivariate regression analysis was performed to test whether caregiver stress predicted children's wellbeing and cortisol levels, controlled for child characteristics (age, gender, fearfulness). Second, temperament as a moderator of the associations between caregiver stress and children's wellbeing and cortisol levels was tested (research question 2). Multiple regression analyses were performed to test whether the interaction between caregiver stress and children's fearfulness added significantly to the prediction, after controlling for the main effects of the predictors.

RESULTS

Caregiver stress and children's cortisol and wellbeing

In Table 4.1, means and correlations are shown of caregivers' and children's cortisol levels (in nmol/L), caregiver perceived stress and children's wellbeing. Mean *RDC* of caregivers was .09 ($SD = .66$), indicating that caregivers' cortisol levels remained stable over the day, whereas the mean *RDC* of children was .32 ($SD = .93$), indicating an overall increase in cortisol levels over the day.

Children's observed wellbeing was associated with negative appraisal ($r = -.37, p < .05$). Reported wellbeing was associated with all caregiver stress indices: Children who were perceived lower in wellbeing were taken care of by caregivers with higher *RDC* ($r = -.33, p < .05$), higher workload ($r = -.32, p < .05$), and more negative appraisal ($r = -.41, p < .01$).

Children's age and gender were not significantly associated with stress indices or child outcomes. Fearfulness was negatively associated with observed wellbeing: More fearful children were observed as lower in wellbeing ($r = -.35, p < .05$). Children's cortisol levels were not associated with caregiver stress.

A multivariate regression analysis was performed to test whether caregiver stress predicted children's cortisol (*RDC*) and wellbeing (observed and reported). In three hierarchical regression analyses, child characteristics were entered in the first step, followed by caregiver stress in the second step. Results are displayed in Table 4.2.

Table 4.2
Hierarchical regression in predicting children's cortisol RDC and wellbeing

	Children's RDC				Observed wellbeing				Reported wellbeing			
	B	SEB	β	R ²	B	SEB	β	R ²	B	SEB	β	R ²
Step 1				.09				.16				.03
Age	-0.01	0.01	-.23		0.00	0.01	.01		0.00	0.01	.06	
Gender	-0.04	0.09	-.08		0.13	0.12	.18		0.04	0.17	.04	
Fearfulness	-0.07	0.06	-.19		-0.19	0.08	-.35*		-0.09	0.12	-.13	
Step 2				.14				.33				.23
Caregiver RDC	0.11	0.16	.11		-0.21	0.20	-.15		-0.45	0.28	-.25	
Workload	-0.14	0.10	-.33		0.16	0.13	.27		0.02	0.18	.03	
Negative appraisal	0.17	0.15	.26		-0.49	0.19	-.53*		-0.45	0.28	-.36	

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

None of the predictors had a significant effect on children's RDC or reported wellbeing. For observed wellbeing, fearfulness was a significant predictor in the first step ($\beta = -.35$, $p < .05$, step 1 $R^2 = .16$). In the second step, negative appraisal added significantly to the prediction of observed wellbeing ($\beta = -.53$, $p < .05$, step 2 $R^2 = .33$).

Child temperament: Moderator model

Does child temperament moderate the associations between caregiver stress and children's wellbeing and cortisol levels? Because of the significant associations between caregiver stress and children's wellbeing, we tested whether children's observed wellbeing and reported wellbeing were predicted from interactions between caregiver stress and children's fearfulness after controlling for the main effects of child characteristics (age, gender, fearfulness) and predictors (caregiver stress). One moderator model showed a significant interaction term: interaction of caregiver RDC and fearfulness predicted reported wellbeing.

In the final model (with interaction terms, $R^2 = .41$) of predicting children's reported wellbeing, all three child characteristics remained non-significant: age ($B = 0.01$, $S.E. = 0.01$, $\beta = .07$, $p = .67$), gender ($B = 0.19$, $S.E. = 0.14$, $\beta = .19$, $p = .19$), and fearfulness ($B = -0.04$, $S.E. = 0.06$, $\beta = -.10$, $p = .49$). Adding the interaction term we found that caregiver RDC significantly predicted children's reported wellbeing ($B = -0.72$, $S.E. = 0.26$, $\beta = -.40$, $p < .05$). The interaction between fearfulness and caregiver RDC was significant as well ($B = -0.85$, $S.E. = 0.29$, $\beta = -.45$, $p < .01$). Perceived stress did not add significantly to the prediction of reported wellbeing: workload ($B = -0.13$, $S.E. = 0.16$, $\beta = -.17$, $p = .44$), negative appraisal ($B = -0.30$, $S.E. = 0.25$, $\beta = -.26$, $p = .23$).

The interaction effect is shown in Figure 4.1 for two subgroups: 1 SD above and 1 SD below the mean on fearfulness. Figure 4.1 shows that more fearful children were more susceptible to caregiver RDC than less fearful children, for better and for worse. When caregiver cortisol levels decreased, more fearful children scored higher on reported wellbeing. When caregiver cortisol levels increased, more fearful children scored lower on reported wellbeing compared to less fearful peers. Belsky et al. (2007) formulated a formal test of differential

susceptibility which consists of five steps. As Table 4.3 shows, the reported model meets all steps.

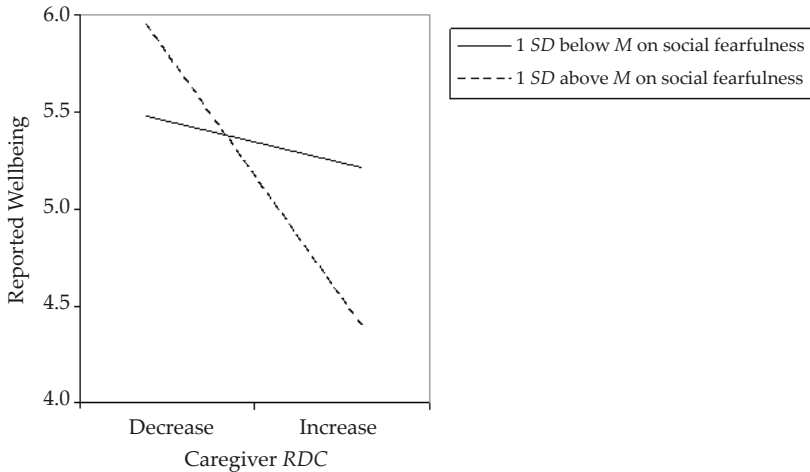


Figure 4.1 Interaction between children’s fearfulness and caregiver cortisol (RDC) on reported wellbeing

Table 4.3
Five steps of Belsky et al. (2007) to test differential susceptibility

Step	Outcome
1 Significant interaction of fearfulness and RDC predicting reported wellbeing	$B = -0.85, S.E. = 0.29, \beta = -.45, p < .01$
2 No significant association between fearfulness and caregiver RDC	$r = -.004, p = .98$
3 No significant association between fearfulness and reported wellbeing	$r = -.14, p = .36$
4 Plot with positive and negative outcomes for the high susceptible group in contrast to the low susceptible group	See Figure 4.1
5 Specificity is tested by replacing other possible moderators and outcomes (replacing fearfulness with child gender)	Interaction gender * caregiver RDC: $B = -0.13, S.E. = 0.57, \beta = -.04, p = .82$

DISCUSSION

Caregivers who perceived their life as more stressed (more negative appraisal) took care of children with lower observed wellbeing. Children’s reported wellbeing was also associated with caregiver stress: Children who were perceived by their caregivers as lower in wellbeing were taken care of by caregivers who showed

more increase in cortisol during childcare, and who reported higher workload and more negative appraisal. More fearful children were more susceptible to caregiver stress than less fearful children, for better and for worse.

Differential susceptibility to caregiver stress

In predicting reported wellbeing, an interaction effect of caregiver RDC and fearfulness was present. Higher increases in cortisol levels over the day in caregivers resulted in lower reported wellbeing in children. Also, more fearful children tended to be more susceptible to caregiver RDC than less fearful children. The five steps Belsky et al. (2007) formulated to formally test differential susceptibility were all met, indicating that the differential susceptibility model is applicable rather than the dual risk model. This differential susceptibility effect emerges even with rather low variability in RDC. With more variability the interaction effect might have been stronger.

Pluess and Belsky (2009) give an explanation why especially children with a difficult temperament are more susceptible to rearing influences. They state that “the characteristics of difficult temperament – low adaptability, high activity, low emotional regulation – may be indicators of a general heightened sensitivity of the nervous system to environmental stimuli” (p 402). In most studies, environmental stimuli are indicated as quality of care. Children with a difficult temperament are more susceptible to *quality of parenting*: When experiencing supportive parenting, these children show less behavior problems (Bradley & Corwyn, 2008, Van Zeijl et al., 2006), more moral self (Kochanska, Aksan, & Joy, 2007), less stress reactivity (Gilissen, Bakermans-Kranenburg, Van IJzendoorn, & Van der Veer, 2008), higher academic competence and social skills (Dopkins Stright, Cranley Gallagher, & Kelley, 2008), and are more often securely attached (Klein Velderman, Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 2006). At the same time, these children are also more vulnerable for unsupportive parenting (more behavior problems, less moral self, lower stress reactivity, lower academic competence and social skills, less often securely attached) compared to their peers with a relatively easy temperament. Another ‘environmental stimulus’ is *childcare quality*: Children with a difficult temperament benefit more from high quality childcare (showing less externalizing behavior and higher social competence) but also suffer more from low quality childcare (showing more externalizing behavior and less social competence) than their peers (Pluess & Belsky, 2009). In the study reported here, caregiver stress is the environmental stimulus to which children are less or more susceptible. This is the first study to report differential susceptibility to a physiological measure of caregiver stress: cortisol. Children with a difficult temperament were more susceptible to caregiver stress as indexed by cortisol than children with a relatively easy temperament.

Caregiver stress and children’s wellbeing and cortisol

Children’s observed wellbeing was significantly predicted by caregivers’ negative appraisal. Children were observed to feel more at ease with a caregiver who reported less stress related to her life. Surprisingly, stress related to workload was not associated with children’s observed wellbeing. Possibly, in home-based

childcare, it is difficult for caregivers to distinguish between stress related to their work and stress related to their life in general because work and private life are intertwined. Indeed, a significant association was present between workload and negative appraisal. Negative appraisal seems a more comprehensive measurement of perceived stress, because this measure also includes work-related stress.

Children's reported wellbeing was associated with all three caregiver stress indices, but none of them remained significant after adding all stress indices in one regression analysis. This might be due to the significant correlations between the three stress indices. The number of predictors in combination with the small sample size might have resulted in a modest power, although the size of our sample is not different from those in other recent studies in this area (e.g., Watamura, Kryzer, & Robertson, 2009).

Limitations

A limitation of this study is the sampling of cortisol on only one home day and one childcare day. As cortisol levels may vary from day to day, caution is required when drawing conclusions relating individual differences in caregiver stress to variations in child outcomes. Also, the use of an electronic monitoring device would enhance the reliability of cortisol measurements (Kudielka, Broderick, & Kirschbaum, 2003). Although the sample size is relatively small, the associations between caregiver stress and wellbeing are significant, as is the moderation by temperament.

Conclusion

This is the first study in which caregiver stress and children's cortisol levels and wellbeing are jointly examined. Results suggest that children tend to feel less at ease in the presence of a more stressed caregiver. This seems especially obvious for more fearful children: these children suffer the adverse consequences of caregivers who show an increase in cortisol levels during childcare, but also benefit more from caregivers who show decreases in cortisol, compared to their less fearful peers.

Enhancing home-based childcare quality through video-feedback intervention: A randomized controlled trial

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Manuscript submitted for publication

ABSTRACT

In the current randomized controlled trial, the effectiveness of Video-feedback Intervention to promote Positive Parenting – Child Care (VIPP-CC) was tested in home-based childcare. Forty-eight caregivers were randomly assigned to the intervention group or control group. Caregivers scoring high on sensitivity ($n = 37$) served as an additional comparison group. Global childcare quality improved in the intervention group, but not in the control group. Although the program did not change observed caregiver sensitivity, caregivers in the intervention group showed a more positive attitude towards sensitive caregiving than caregivers in the control group. The study shows that the family-based intervention can be applied with some minor modifications in a professional group setting as well. The brief VIPP-CC program is an important tool for enhancing quality of home-based child care.

Keywords: home-based childcare, quality of care, randomized controlled trial, sensitivity, video-based intervention

INTRODUCTION

Home-based childcare has become a commonly used type of care. The NICHD Early Child Care Research Network reported that 24% of the children in their sample visited home-based childcare at entry in childcare (NICHD ECCRN, 1997). In the Netherlands, the number of children visiting home-based childcare has been increasing rapidly. Whereas in 2006, 70.000 children visited home-based childcare, this number had increased to 140.000 children one year later (Statistics Netherlands, 2008a). Home-based childcare is provided from a caregiver's personal home and is, in the Netherlands, restricted to a maximum of six children under the age of four, which makes the daily environment more similar to a child's home than center-based childcare. The quality of care these caregivers provide is crucial for the children's feeling of security and their development (NICHD ECCRN, 2005; Vandell, Belsky, Burchinal, Steinberg, Vandergrift, & NICHD ECCRN, 2010). In this study, a video-intervention is implemented in

home-based childcare using a randomized controlled design with the aim to enhance childcare quality. Two indicators of childcare quality are central: global quality and caregiver sensitivity.

Global quality

Global quality refers to the stimulation and support available to children in the childcare home environment, for example organization of the environment, (learning) materials available to the children, and variety in events and environments. In general, children who visit higher quality childcare homes or centers have better cognitive and social skills than children experiencing lower quality childcare (Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000). In the physiological domain, results from cortisol studies point in the direction of an association between lower-quality care and higher cortisol levels in children in childcare homes (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000) and childcare centers (Dettling et al., 2000; Groeneveld, Vermeer, Van IJzendoorn, & Linting, 2010; Sims, Guilfoyle, & Perry, 2006).

Sensitive caregiving

Sensitive caregiving facilitates children to build a secure relationship with their caregiver. According to attachment theory, children use their caregivers as a haven of safety, from which they can explore the environment (Bowlby, 1969). Parental sensitivity is a determinant of children's attachment security (De Wolff & Van IJzendoorn, 1997) and can be defined as the ability to accurately perceive the child's signals and to respond promptly and adequately to these signals (Ainsworth, Blehar, Waters, & Wall, 1978). Several studies have shown that children do not only form attachment relationships with their parents, but also with professional caregivers in childcare, and that attachment security was predicted by caregiver sensitivity (Elicker, Fortner-Wood, & Noppe, 1999; Goossens & Van IJzendoorn, 1990).

Role of caregiver education and training

Several studies have shown that caregiver education is a predictor of caregiver sensitivity and quality of care in childcare homes (Clarke-Stewart, Lowe Vandell, Burchinal, O'Brien, & McCatney, 2002; Doherty, Forer, Lero, Goelman, & LaGrange, 2006). In the Netherlands, most caregivers in home-based childcare have limited or no education in childcare. In a recent Dutch study, only 30% of the caregivers in home-based childcare reported to have completed an education in childcare, whereas all caregivers in center-based childcare completed a vocational education directed at various domains of care (Groeneveld et al., 2010). For center-based childcare, Burchinal, Cryer, Clifford, and Howes (2002) showed that not only caregivers with formal education in early childhood, but also caregivers who attended to informal workshops scored higher on caregiver sensitivity and quality of care. The importance of caregiver training, beyond caregiver education, has also been demonstrated in home-based childcare (Burchinal, Howes, & Kontos, 2002; Clarke-Stewart et al., 2002). In the present study, we implemented a caregiver training to enhance childcare quality in

home-based childcare. Before selecting an effective intervention for childcare homes, several existing interventions were reviewed, focusing on families and childcare homes.

Interventions in families

Programs aimed at enhancing parental sensitivity have been studied more often than programs directed at professional caregivers' sensitivity. Bakermans-Kranenburg, Van IJzendoorn, and Juffer (2003) conducted a meta-analysis of 80 studies to test the effectiveness of various types of interventions for enhancing maternal sensitivity. This 'Less is more' meta-analysis showed that interventions that (1) only focused on sensitivity, (2) made use of video-feedback, and (3) consisted of less than 16 intervention sessions were more effective than interventions with a broader focus, without video-feedback, and with more intervention sessions. Based on this meta-analysis, a short-term, behaviorally focused intervention program was developed: Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD; Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2008). Based on both attachment theory (Ainsworth et al., 1978; Bowlby, 1969) and coercion theory (Patterson, 1982), the goal of VIPP-SD is to enhance parental sensitivity as well as sensitive discipline. Mother and child are videotaped during daily situations at home. Videotaped episodes are discussed with the mother, focusing on various parts of sensitivity as defined by Ainsworth (Ainsworth et al., 1978). First, during the videotaped episodes the intervener focuses on observing the child's signals in an accurate way. Second, through positive reinforcement of the mother's sensitive behavior shown on the videotape, the mother is reinforced to respond to the child's signals in an adequate and prompt way.

Studies using the VIPP approach showed positive effects on parental sensitivity in intervention groups compared to control groups in various samples: insecure mothers (Klein Velderman, Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 2006), insensitive mothers (Kalinauskiene, Cekuoliene, Van IJzendoorn, Bakermans-Kranenburg, Juffer, & Kusakovskaja, 2009), mothers with eating disorders (Stein et al., 2006), adoptive mothers (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005b), and mothers of children with externalizing problems (Van Zeijl et al., 2006, for an overview see Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2009).

Interventions in home-based childcare

The effectiveness of the project Rural Early Childhood Educational Institute (REACH) was tested in a group of caregivers from childcare homes ($n = 62$) and childcare centers ($n = 39$) (Espinosa, Mathews, Thornburg, & Ispa, 1999). This training program was individualized, since caregivers decided themselves how often they attended the training, and whether they preferred group workshops and/ or received home-visits. Immediately after the project, improvements were present in global quality, sensitivity, and caregiver attitudes. However, during follow up ten months later a decline in global quality was present although global quality was still higher than prior to the intervention. No control group was present.

The effectiveness of only three other programs in home-based childcare has been tested. Aguirre and Marshall (1998) tested the effectiveness of a self-instructional training program for home-based caregivers ($n = 437$) directed at health and safety, business management, child development, and nutrition, which combined written material and videotaped material. They found that the program was successful in increasing caregiver knowledge and in changing caregiver-reported behavior. These authors did not measure (changes in) caregiver behavior through observations. As in the REACH project (Espinosa et al., 2009), no control group was present.

Kontos, Howes, and Galinsky (1996) observed global quality of care and sensitivity of caregivers ($n = 95$) in home-based childcare after a broad training. This Family-to-Family training involved 15 to 25 hours of classes (duration and number of sessions varied per site) and home visits. No randomization took place, because caregivers enrolled themselves in the training. The comparison group ($n = 112$) consisted of caregivers who did not enroll themselves in the training program. Although the training had a positive effect on business practices (e.g. providing a parent-caregiver contract, emergency authorization forms), planned activities, and global quality, the training did not affect caregiver sensitivity.

Recently, a randomized controlled trial was published evaluating the Carescapes program: a video-based training program for home-based caregivers to promote positive social development in young children (Rusby, Smolkowski, Marquez, & Taylor, 2008). The intervention consisted of three meetings in which, with the use of a video model, was demonstrated (1) how to support the social development of children, (2) how to manage their behavior, and (3) how to understand and deal with problem behavior. Although the use of effective behavior management practices increased in the intervention group ($n = 33$) compared to those in the waiting list control group ($n = 30$), the use of strategies did not maintain over time: 18 weeks afterwards this increase had disappeared.

Current study

From previous intervention studies performed in families and home-based childcare it can be concluded that interventions tend to be more effective when they have a narrow focus, a fixed-curriculum, make use of video-feedback, and are short term (Bakermans-Kranenburg et al., 2003). The VIPP-SD satisfies these criteria, and has already shown positive effects on parental attitudes and sensitivity in various settings (see Juffer et al., 2008). In the current study, the intervention program VIPP-SD, is minimally adapted for home-based childcare, and tested with home-based caregivers. This study is unique in its kind, because (1) we make use of individualized video-feedback (instead of a video model), (2) we observe childcare quality and caregiver sensitivity (besides reported caregiver attitudes), and (3) conduct a randomized controlled trial. We expect the intervention program to be effective in (1) enhancing global childcare quality and caregiver sensitivity, and (2) positively changing caregiver attitude towards sensitive caregiving and limit setting. In addition, we evaluate caregiver satisfaction with the program.

METHOD

Participants and randomization

Participants in this randomized, controlled, parallel-group study were recruited from 23 home-based child care organizations in the western region of the Netherlands. Inclusion criteria were: (1) caregivers took care of at least two children under the age of four, (2) caregivers were not biologically related to these children, and (3) caregiving took place in their own home. Caregivers were approached for participation, and registration for the study was closed after agreement to participate from 120 caregivers. The flow chart (see Figure 5.1) shows participant progress through the phases of the randomized trial, which lasted for six months including selection (baseline), pretest assessment, intervention (or control condition), and posttest assessment. All measurements and the intervention took place at caregivers' homes during childcare.

In September 2008, all caregivers were invited for the baseline visit. Seventeen caregivers were not eligible for the study, because inclusion criteria were not met. All other 103 caregivers were visited between November 2008 and January 2009 by an observer who measured caregiver sensitivity using the Caregiver Interaction Scale (CIS, Arnett, 1989). Based on our pilot study we anticipated that some caregivers would not be willing to participate in the study after all (e.g., because of changes in the childcare arrangement, such as children leaving). In anticipation of this expected refusal rate, we included an extra group of caregivers. After the baseline visit, 66 caregivers, scoring the lowest on sensitivity (CIS subscale 'sensitivity' mean score ≤ 3), were randomly assigned to either the intervention group ($n = 25$), the control group ($n = 25$), or the extra group ($n = 16$). Because of availability of interveners, the number of participants in the intervention group and the control group was restricted to 25. Mean CIS scores between these three groups did not differ ($F(2, 63) = 0.43, p = .65$). Following simple randomization procedures (random numbers), participants were randomly assigned to one of these three groups by the first author. Caregivers scoring high on sensitivity ($n = 37$; 'high sensitivity group') served as non-experimental comparison group only (see demographic information in Table 5.1).

Table 5.1

Demographics of intervention group, control group, and high sensitivity group

	Intervention group ($n = 24$)		Control group ($n = 24$)		High sensitivity group ($n = 37$)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Age	43.30	9.23	40.36	8.80	44.07	6.58
Education	12.57	1.80	11.86	2.10	12.45	1.97
Hours/ week working	34.74	9.36	37.55	9.69	38.20	12.01
<i>N</i> children in childcare	6.82	3.92	6.91	3.85	6.52	3.32

The fifty caregivers in the intervention group and the control group received a letter revealing whether they were assigned to the 'training' (intervention) or

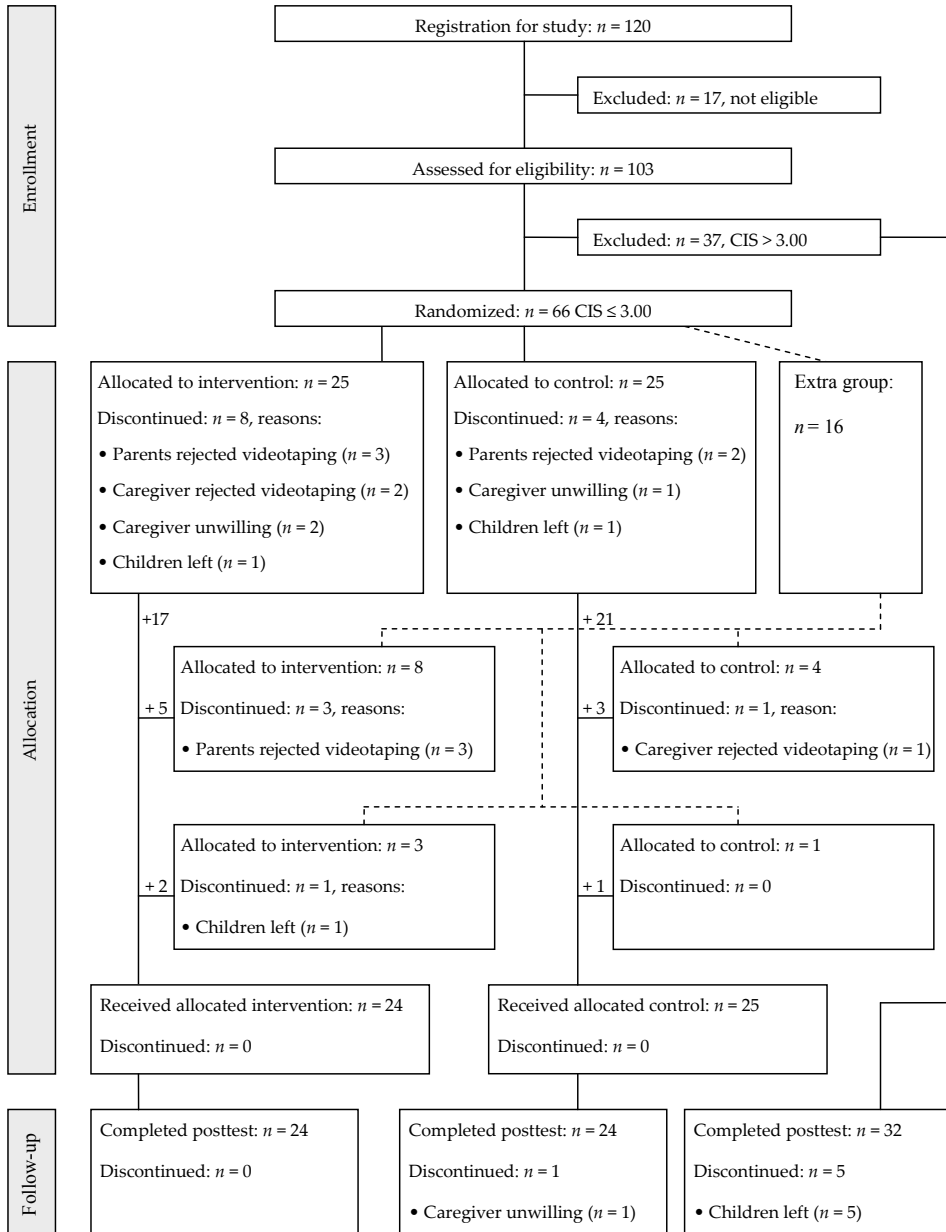


Figure 5.1 Flow chart

the 'telephone' (control) group. Eight caregivers in the intervention group and four caregivers in the control group refused to participate. Caregivers from the extra group –scoring as low on caregiver sensitivity as the intervention and the control group– were randomly assigned to the intervention ($n = 8$) or the control group ($n = 4$). Of these caregivers, again four caregivers relinquished from the study, and caregivers from the extra group were again randomly assigned to the intervention ($n = 3$) or the control group ($n = 1$). Of this group, only one caregiver (in the intervention group) discontinued because all the children she was taking care of had left. The total number of caregivers who relinquished from the study ($n = 17$) did not differ on caregiver sensitivity from caregivers who remained in the study ($t(63) = -1.66, p = .11$). In addition, caregivers who relinquished from the intervention group ($n = 12$) did not differ on caregiver sensitivity from caregivers who relinquished from the control group ($n = 5$) ($t(15) = -0.34, p = .74$). The allocation phase resulted in two groups of caregivers: 24 caregivers in the intervention group and 25 caregivers in the control group.

All 49 caregivers received a pretest home visit. The posttest took place in May – July 2009, after which the trial was ended. One of the caregivers in the control group did not complete the posttest because she cancelled all appointments. This caregiver's scores on all measures, both during baseline and pretest, did not differ from the other caregivers' mean scores in the control group. To control for the effect of removing this caregiver from the study, we ran duplicates of all analyses: We found no differences in outcomes after imputing missing scores in the posttest (with the mean of the control group) or after (multiple) random deletion of one caregiver from the intervention group. The final sample included 48 participants: 24 caregivers in the intervention group and 24 caregivers in the control group.

The non-experimental comparison group ('high sensitivity group'; $n = 37$) received a posttest only. Five caregivers in this group did not complete the posttest, because they no longer took care of children under the age of four. Demographic information of the intervention group, control group, and 'high sensitivity' group is summarized in Table 5.1. Caregivers' age, education, number of working hours per week, and the number of children they were taking care of in childcare did not differ significantly.

Procedure

The procedure within this study meets with the CONSORT criteria. All procedures were carried out with the adequate understanding and written consent of caregivers and parents. Ethical approval for this study was provided by the Leiden Institute of Education and Child Studies. During baseline, each setting was visited by an observer who spent a morning in the childcare homes to administer the CIS and the Infant Toddler Child Care Home Observation for Measurement of the Environment inventory (IT-CC-HOME; Caldwell & Bradley, 2003). After the baseline visit, caregivers scoring low on sensitivity (CIS ≤ 3) were randomly assigned to either the control or the intervention group. All 48 caregivers received a pretest visit, in which the observer videotaped three 10-minute episodes of regular childcare activities at predetermined time points and two structured play episodes of each five minutes.

Caregivers in the intervention group received six home visits and, parallel in timing, caregivers in the control group received six telephone calls. Post-test visits took place approximately six months after baseline ($M = 5.92$, $SD = 1.14$). Again, the IT-CC-HOME was administered and the three 10-minute episodes and two structured play situations were videotaped. For the high sensitivity group, only the IT-CC-HOME was administered. All videotaped episodes were rated afterwards on caregiver sensitivity by coders who were unaware of the experimental condition and who met the criteria to reliably assess these scales. To obtain independency in ratings, observers who visited the childcare setting did not rate caregiver sensitivity in this specific setting, and coders who rated the pretest caregiver fragments did not rate the fragments from the posttest, and vice versa. For the same reason, observers visited a specific childcare setting only once.

Intervention program

VIPP-SD. The Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPPSD, Juffer et al., 2008) was adapted for implementation in home-based childcare: the Video-feedback Intervention to promote Positive Parenting: ChildCare (VIPPS-CC). The intervention trajectory is divided into three phases, which all consist of two sessions. In the first phase, interveners try to build a relationship with the caregiver with an emphasis in their video-feedback on child behavior. The themes of the first two sessions are (1) exploration versus contact seeking, (2) 'speaking for the child'. The second phase focuses at improving caregiver behavior by showing at what moments strategies work. The themes of the two sessions in this phase focus on (3) sensitivity, how and when to use a sensitive time-out, and (4) empathy. The third phase consists of two booster sessions in which all feedback and information is reviewed. At the end of the intervention program, caregivers receive a brochure with information on key issues discussed during the home visits.

VIPP-CC. To implement the original VIPPS-SD to childcare, we adapted the program for caregivers taking care of a group of children by slightly modifying the procedure and materials of the home visits, as the situation in home-based childcare differs from the home situation (e.g. more than one child present, professional childcare). In the VIPPS-SD, interveners first videotaped a structured play session (for about half an hour) and then subsequently discussed the videotaped episodes from the last visit (for about an hour). In the VIPPS-CC, interveners first videotaped the structured play session and then left the home, allowing caregivers and children to have a quiet lunch. After the caregivers put (some of) the children into bed, interveners returned and discussed the videotaped episodes from the last visit. Furthermore, the 'speaking for the child' was not only directed to one child at a time, but also to the entire group of children ('speaking for the children'), emphasizing caregivers' attention for the signals of all children present. In addition, the toys that were used during structured play situations were adapted for a group setting, for example by using a big box of Duplo bricks and large story books. A pilot study with eight caregivers (from whom five received the intervention program and three the control condition) showed the feasibility of the VIPPS-CC approach in the context of group care.

Interveners were graduate students ($n = 7$), who were first trained on the VIPP-SD during a full-time week workshop by one of the VIPP-SD experts from the Centre of Child and Family Studies, including home assignments which were provided with feedback from the VIPP-SD expert. After this training, interveners received further training on the adapted VIPP-CC. During the intervention period, four feedback sessions were held, in which structured play situations and scripts were discussed, as well as how to build and obtain a professional relationship with the caregiver.

Control group

In order to keep in contact with all caregivers and to prevent attrition, caregivers in the control group received a dummy intervention (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2005a). Parallel to the intervention sessions, caregivers in the control group received six telephone calls. During these semi-structured interviews, caregivers were invited to talk about general developmental topics (e.g. eating, talking, playing). This control group received no advice or information about sensitivity or child development.

Measures

Selection. For selection purposes, caregiver sensitivity in the group setting was examined by direct observation using the Caregiver Interaction Scale (CIS, Arnett, 1989). The CIS consists of 26 items; for each item a score is given from 1 (not applicable) to 4 (very applicable). In a Dutch study (Van IJzendoorn, Tavecchio, Verhoeven, Reiling, & Stams, 1996), two dimensions were found: sensitivity (14 items) and authoritarian caregiving (12 items). In the study reported here, the subscale 'sensitivity' was used, because of its close link with the aim of the intervention. Internal consistency (Cronbach's alpha) of this scale was .84. Mean intra-class correlations of the observers (two-way mixed, absolute agreement) was .80 (range .78 to .84).

Caregiving attitude. Two weeks after the posttest, caregivers were sent a questionnaire regarding their attitude towards sensitive caregiving and limit setting (Bakermans-Kranenburg & Van IJzendoorn, 2003). They were asked to indicate their attitudes on 17 items, ranging from (1) totally disagree to (5) totally agree. Examples of items are 'In my opinion, I should praise my children in childcare at least once a day' and 'My children in childcare must learn that I will get angry when they do not listen to me' (reversed). Cronbach's alpha was .64.

Global quality of childcare. The IT-CC-HOME (Caldwell & Bradley, 2003) is designed to measure the quality and quantity of stimulation and support available to a child in the childcare home environment, and covers various domains of childcare: responsivity, acceptance, organization, learning materials, involvement, and variation. A positive (1) or a negative (0) score is achieved for each of the 43 items. Two items were deleted from the scale: item 21 'Child gets out of house at least four times a week' and item 42 'Caregiver and child visit or receive visits from neighbor or friends once a month or so'. These items were not applicable to the Dutch situation, because in the Netherlands children visit home-based childcare on average two or three days a week, in contrast to

other countries (Statistics Netherlands, 2008b). The total IT-CC-HOME score is a summation across the 41 item scores (0 or 1). Internal consistency (Cronbach's alpha) of this scale was .60. Here, we do not report on data at the sub-scale level, because of low internal consistencies (range Cronbach's alpha's from .12 to .48). Ten observers were trained prior to the study. After a general introduction, observers visited at least four caregivers in pairs to complete the IT-CC-HOME. Each observation was followed by an item-by-item debriefing with the trainer. Interrater reliability was established to a criterion of 80% agreement.

Caregiver sensitivity. During pretest and posttest, three unstructured episodes of each ten minutes and two structured play episodes of each five minutes were videotaped to code caregiver sensitivity. Both structured situations consisted of ten minutes play with Duplo bricks or a car rollercoaster. Coding of videotaped episodes took place by means of a scale developed and validated by the Dutch Consortium for Child Care Research (NCKO; De Kruif et al., 2007). This group rating scale is based on scales developed to measure sensitivity in a parent-child context (Ainsworth, Bell, & Stayton, 1974; Erickson, Sroufe, & Egeland, 1985). Sensitivity ratings are presented on a seven-point scale, ranging from (1) very low sensitivity to (7) very high sensitivity. Five observers were trained and became reliable on the same dataset to assess caregivers' sensitivity. Mean intra-class correlations (two-way mixed, absolute agreement) was .73 (range .69 to .75). Internal consistency of this scale was .74 (pretest) and .83 (posttest). During data collection, sensitivity of ten caregivers was doubly coded, resulting in an intra-class correlation of .95.

Caregiver feedback. Two weeks after the posttest, we sent caregivers a questionnaire to evaluate the intervention regarding several topics, e.g. usefulness, number of sessions, the video-feedback, and the contact with the intervener.

Data analysis

To test whether changes in global quality of childcare and observed caregiver sensitivity occurred, repeated measures ANOVA's were conducted controlling for the baseline (global quality) or the pretest (observed sensitivity) measures. An independent *t*-test was used to compare caregiver attitude between the control group and the intervention group.

RESULTS

Descriptives

During the posttest, a significant association was present between global quality and observed sensitivity ($r = .35, p < .05$). No associations were found between caregiving attitudes and global quality ($r = .20, p = .17$) or observed sensitivity ($r = -.18, p = .22$). For the intervention group, a significant association was present between global quality during baseline and observed sensitivity during the posttest ($r = .55, p < .01$), and between observed sensitivity during the pretest and global quality during posttest ($r = .50, p < .01$). In the control group, global quality during baseline and posttest were significantly associated ($r = .56, p < .01$). Also, observed sensitivity during pretest and posttest were associated ($r = .43,$

$p < .05$). For the high sensitivity group, there was a significant association between the two measurements during baseline and posttest: $r = .40$, $p < .05$. Descriptive statistics of the pretest, baseline, and posttest measures are shown in Table 5.2.

Table 5.2

Descriptive statistics for intervention group, control group, and high sensitivity group during baseline/ pretest and posttest

	Intervention			Control			High sensitivity			Difference ¹	
	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	<i>t-/F-value</i>	<i>p</i>
Baseline/ pretest											
Global quality	34.46 ^a	2.52	0.51	35.21 ^a	2.43	0.50	37.32 ^b	2.01	0.33	13.07	.00
Observed sensitivity	4.60	0.83	0.17	4.98	0.66	0.13				-1.75	.09
Posttest											
Global quality	35.92	3.05	0.62	34.75	3.44	0.70	35.91	1.78	0.32	1.49	<.01
Observed sensitivity	4.53	0.81	0.17	4.75	0.86	0.18				-0.91	.37
Caregiving attitudes	3.97	0.41	0.08	3.69	0.42	0.08				2.29	.03

^a and ^b differ significantly.

*Note*¹. Statistics for global quality are *F*-values. Statistics for observed sensitivity and caregiving attitudes are *t*-values.

Caregiving attitude

After the intervention, caregivers who received the intervention reported a more positive attitude towards caregiving and limit setting ($M = 3.97$, $SD = 0.41$, $SE = 0.09$) than caregivers in the control group ($M = 3.69$, $SD = 0.42$, $SE = 0.08$); $t(46) = 2.29$, $p < .05$, $CFI = 0.03-0.52$ $d = 0.69$).

Global quality

To test whether the intervention resulted in changes in global quality, repeated measures ANOVA's were conducted on the IT-CC-HOME. No main effects were present for time (*Pillais F* (1, 46) = 1.30, $p = .26$, *partial* $\eta^2 = .03$) or group (*Pillais F* (1, 46) = 0.09, $p = .77$, *partial* $\eta^2 < .00$), but a significant interaction effect was found (*Pillais F* (1, 46) = 4.76, $p < .05$, *partial* $\eta^2 = .09$). This interaction is shown in Figure 5.2: Global quality significantly increased in the intervention group, but not in the control group.

After including the scores of the high sensitivity group into the repeated measures analysis, there was still no main effect for time (*Pillais F* (1, 77) = 0.58, $p = .45$, *partial* $\eta^2 = .01$), but a significant main effect for group emerged (*Pillais F* (1, 77) = 5.94, $p < .01$, *partial* $\eta^2 = .13$), as well as a significant interaction effect (*Pillais F* (1, 77) = 9.54, $p < .01$, *partial* $\eta^2 = .20$). At baseline, global quality was higher in the high sensitivity group compared to the intervention group and control group. Furthermore, global quality declined in the high sensitivity group and in the control group, whereas it increased in the intervention group.

Observed caregiver sensitivity

No significant main effects of time (*Pillais F* (1, 46) = 1.54, $p = .22$, *partial* $\eta^2 = .03$) or group (*Pillais F* (1, 46) = 2.42, $p = .13$, *partial* $\eta^2 = .05$) were present for observed caregiver sensitivity. Also, no interaction effect (*Pillais F* (1, 46) = 0.39, $p = .54$, *partial* $\eta^2 = .01$) emerged.

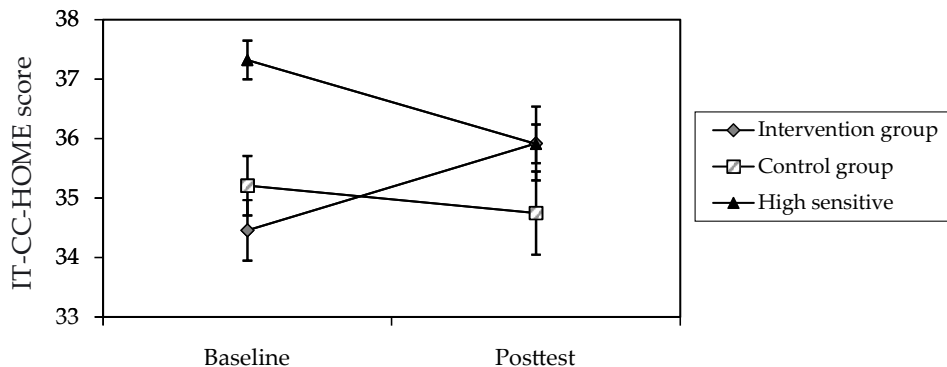


Figure 5.2 Global quality in the intervention group (n = 24), the control group (n = 24), and the high sensitivity group (n = 32) during baseline and posttest

Caregiver feedback

Almost all caregivers reported that the VIPP-CC was useful (18/24) or very useful (4/24). The majority (19/24) of caregivers thought that the number of sessions was adequate. One of the caregivers thought that six sessions were too few (1/24), whereas four caregivers thought these were many (3/24) or too many (1/24). Almost all caregivers experienced the contact with the intervener as pleasant (14/24) or very pleasant (9/24). Only one of them was neutral about the contact with the intervener (1/24). None of the caregivers experienced the visits as interfering. Some caregivers responded they felt tense (9/24) or very tense (1/24) when looking at themselves on video. Nine felt neutral (9/24), and five of them responded they did not feel tense (3/24) or not tense at all (2/24). Finally, most caregivers indicated that they found the intervention not very (12/24) beneficial to their own children (adjusted standardized residual 4.3), but beneficial to the children in childcare (18/24), the caregivers themselves (20/24), and the childcare setting as a whole (21/24) (Table 5.3).

Table 5.3
Caregiver feedback on whether the intervention was beneficial

Beneficial for:	Not very beneficial	Beneficial	Very beneficial	Total
Children in childcare	6 (-0.4)	13 (0.7)	5 (-0.4)	24
Caregiver	4 (-1.5)	13 (0.7)	7 (0.8)	24
Own children ^a	12 (4.3)	3 (-2.8)	2 (-1.3)	17
Childcare setting	3 (-2.0)	14 (1.1)	7 (0.8)	24

^a For seven caregivers this was not applicable, since they did not have (young) children themselves.

Note. Total number (adjusted standardized residuals)

DISCUSSION

Based on the findings of previous intervention studies in families and childcare, the VIPP-SD was selected as an intervention to enhance global quality and caregiver sensitivity in home-based childcare. A randomized controlled design showed that global childcare quality had improved in the intervention group in comparison to the control group. In addition, caregivers in the intervention group showed a more positive attitude towards sensitive caregiving and limit setting than caregivers in the control group. The expected increase in observed sensitivity was not found.

Global quality

Global childcare quality improved significantly through the intervention. The effect size (*partial* η^2) of the interaction was 0.09, which is a medium to large effect size (Kirk, 1996). The children who were visiting caregivers in the intervention group, were in a more stimulating and safe environment after the intervention. This finding is important, because global childcare quality has been found to affect children's cognitive and social development (Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000).

Bradley, Caldwell, and Corwyn (2003) assessed the quality of childcare homes using data from the NICHD ECCRN (1996). They reported a mean total score of 34.76 ($SD = 5.04$) on the IT-CC-HOME, based on 43 items. This means that in total 81% of the items was scored positively. In our study, 84% of the items were scored positively by caregivers in the intervention group, prior to the intervention. This is comparable to the IT-CC-HOME scores in the NICHD ECCRN study. After the intervention, 88% of the items were scored positively. Our study confirms that the IT-CC-HOME is sensitive to intervention effects, not only in families (for an overview, see Bradley, 1993), but also in home-based childcare.

Caregiver sensitivity

Although after the intervention caregiving attitude towards sensitivity was significantly higher for caregivers in the intervention group than in the control group, there was no significant difference in observed sensitivity. This may be explained by a ceiling effect, due to the relatively high sensitive caregivers in our sample. We selected caregivers who scored a 3 or lower on the CIS (Arnett, 1989). A score of 3 on a 4-point scale however represents a relatively sensitive caregiver. In addition, the absence of an increase in observed sensitivity might be due to the ample child-rearing experience of caregivers in our sample. In the study of Stolk et al. (2008), the use of positive discipline strategies had increased after the VIPP-SD, but only for first-time mothers, and not for multiparas. Because all caregivers in our intervention group already had experience as parents, we were not able to test whether caregivers taking care of a child for the first time benefited more from the intervention than caregivers with child-rearing experience.

Fukkink and Lont (2007) reported in their meta-analysis that experimental results were smaller in the domain of caregiver skills compared to the domain of caregiver attitudes and knowledge. Attitudes seem to be easier to change

than caregiver behavior itself, and attitudinal changes may precede behavioral changes, which may require a longer period of training. However, in the domain of attachment-based family interventions it has been shown that rather brief interventions (less than 16 intervention sessions) were more effective in improving caregiving behavior than long term interventions (Bakermans-Kranenburg, et al., 2003). Taking care of several same-aged children at the same time may be more difficult than interacting with one or two children in the same age-range as is the case in most families. To sensitively divide attention to several different children may therefore require a somewhat longer series of sessions.

In addition, the timing of the posttest may be problematic. Effects of interventions may lie dormant directly after the intervention (sleeper effect), but may become noticeable later on. In our study, the posttest took place two weeks after the last intervention session. Possibly an effect on observed caregiver sensitivity could have been detected if the posttest had taken place later on. The more positive caregiving attitudes might be the first (necessary) step in changing caregiver behavior.

Limitations

The sample size of this study is relatively small, which may have resulted in a lack of statistical power to detect a moderate intervention effect. Also, our small sample size prevented us from comparing subgroups of caregivers. Some caregivers might benefit more from the intervention than others. For example, Klein Velderman et al. (2006) found a larger effect of the VIPP on maternal sensitivity for mothers of highly reactive infants. As already mentioned, another limitation is the relatively high level of sensitivity prior to the intervention which may have caused the ceiling effect. Also, the low variance in observed sensitivity scores may have contributed to not having found significant intervention effects.

In total, 17 caregivers (26%) dropped out after the selection phase, which might have resulted in a selection bias. However, attrition seems unavoidable in intervention studies in childcare even during the intervention phase. For example in the Family-to-Family study, 27% of the caregivers dropped out during the intervention phase (Kontos et al., 1996). In the individualized REACH program, in total 43% of the caregivers dropped out (Espinosa et al., 2009). Although we lost caregivers at the start of the intervention, we were able to retain all caregivers during the complete intervention phase of the study.

Generalizability

As the intervention was implemented in caregivers of different ages with various levels of experience and education in childcare, the results indicate that the entire range of caregivers would benefit from the intervention program. Our experience with implementing the VIPP intervention as well as testing its effectiveness demonstrates that the intervention can be cost-effectively delivered in this childcare setting.

Implications

This study is a first step in adapting and testing the VIPP-SD, originally developed for interventions in families, in childcare. The intervention was effective in enhancing the global quality of childcare homes, a setting that is relatively similar to the home setting. Future studies might focus on adapting the intervention program even further for childcare centers with larger groups of children. A next step will be to study the effects of the VIPP-CC on both caregivers *and* children, in order to study the causal link from intervention through caregiver attitudes and skills to child behavior and development.

Conclusion

The current study revealed that the short term, behaviorally oriented VIPP-CC was effective in enhancing global quality in home-based childcare. Although observed caregiver sensitivity did not increase after the intervention, caregiver attitudes towards sensitive caregiving were higher in the intervention group compared to the control group. This study shows that investing in the improvement of childcare quality through video-feedback interventions is highly valuable for an increasing number of children attending this type of childcare.

6 | General discussion

This thesis reported on two studies in childcare in the Netherlands, focusing on children, caregivers, and quality of care. The first part of the thesis presented an empirical study in which we examined children's cortisol levels and wellbeing in home-based childcare and center-based childcare, and the role of caregiver stress and childcare quality. In the second part of the thesis we described a randomized controlled trial to test the effectiveness of the Video-feedback Intervention to promote Positive Parenting – Child Care (VIPP-CC) to enhance childcare quality in home-based childcare. In this chapter, the results of both studies are integrated and discussed. In addition, recommendations for practice and future research are presented.

Differences between childcare homes and childcare centers

We found significant differences between childcare homes and childcare centers, all in favor of childcare homes. In home-based childcare: (1) children scored higher on observed wellbeing, (2) caregivers scored higher on observed sensitivity, and (3) noise levels were lower compared to center-based childcare. These results show that home-based childcare is a valuable type of childcare for children and caregivers.

As was hypothesized, children attending home-based childcare showed a higher wellbeing than their peers in childcare centers. In addition, children's wellbeing was positively associated with caregiver sensitivity, but in home-based childcare only: Children who experienced more sensitive care in childcare homes showed a higher wellbeing.

At the start of our study, caregivers in home-based childcare were not obliged to have a professional education in childcare, and in fact most of the caregivers did not have any specialized education. Despite this lack of professional education, we found that caregivers in home-based childcare showed more sensitive caregiving behavior compared to caregivers in center-based childcare, who all had a formal training in childcare. Since January 1st 2010, Dutch caregivers in home-based childcare are legally bound to formal training and/or experience in childcare. Our first study took place prior to the introduction of this act. A cautious conclusion is that caregiver sensitivity may not be dependent on educational level, but that experience with child-rearing may be a more important indicator.

An additional consideration is the high caregiver stability in home-based childcare. In home-based childcare, where the same caregiver cares for a group of children each day they attend childcare. Several studies showed that caregiver stability is positively related to caregiver behavior and the quality of the relationship between caregivers and children (Barnes & Cummings, 1994; De Schipper, Tavecchio, Van IJzendoorn, & Linting, 2003; Elicker, Fortner-Wood,

& Noppe, 1999). Due to higher caregiver stability, caregivers get to know the children better, which makes it easier to recognize the child's signals and to respond more appropriately.

Another possible explanation lies in caregiver-child ratios. In home-based care, one caregiver was on average responsible for almost three children, whereas in center-based care one caregiver was responsible for more than five children. In an experimental study in center-based childcare De Schipper, Riksen-Walraven, and Geurts (2006) demonstrated that a caregiver-child ratio of 1:3 produced significantly higher quality of caregiver-child interaction than a ratio of 1:5. However, we found that, after controlling for caregiver-child ratio, sensitivity and noise still significantly differed between the two types of care. This implies that caregiver-child ratios may be important but not sufficient in explaining differences in caregiver sensitivity between the two types of care.

Noise levels were higher in center-based childcare than in home-based childcare, even after controlling for caregiver-child ratios. Of course, larger group sizes in childcare centers may have caused higher noise levels. An additional explanation is that the physical environment in center-based childcare is less noise-absorbing than in home-based care. In Dutch childcare centers, 'clean' materials are used, like linoleum, whereas in home-based childcare, more carpeting and soft materials are present which absorb noise. Although we expected higher noise levels to be associated with higher cortisol levels in children, this hypothesis was not confirmed in the current study. Probably, the source and intensity of noise levels are responsible for not finding any associations with cortisol. In studies in which associations between noise and cortisol were found, the noise source was an airport or rail traffic, which produce higher noise levels than childcare settings (Evans, Bullinger, & Hygge, 1998; Evans, Lercher, Meis, Ising, & Kofler, 2001). Another explanation is a lack of variance in noise: The present study did not allow for a comparison of children's cortisol levels in very quiet childcare settings with children's cortisol levels in very noisy childcare settings. For future studies, it would be worthwhile to take into account sources of noise, and to include childcare settings with substantial variation in noise.

Cortisol levels of children

Meta-analytic results have shown that children in childcare centers display higher cortisol levels during a day in childcare than during a day at home (Geoffroy, Côté, Parent, & Séguin, 2006; Vermeer & Van IJzendoorn, 2006). We confirmed these results for Dutch childcare, not only for childcare centers, but also for childcare homes. During childcare, children's cortisol levels remained the same from 11 AM to 3 PM, while their cortisol levels decreased during a day at home. In a recent study, Gunnar, Kryzer, Van Ryzin, and Phillips (2010) also reported this cortisol rise in children in home-based childcare. It is unclear which mechanisms evoke the relatively higher cortisol secretion at childcare compared to a day at home. Two important differences between children's experiences at childcare versus home are the children's separation from their parents and the number of children present.

Ahnert, Gunnar, Lamb, and Barthel (2004) demonstrated that first entry into childcare was stressful for children, even when their mothers were present. Their findings suggest that cortisol increases are evoked by factors beyond the separation from the parents, for example interactions with the peer group (Gunnar, Talge, & Herrera, 2009). In childcare, children spend the entire day with peers, but may not yet have developed sufficient linguistic, social, and self-regulatory skills to handle this complex situation. We showed that, even in home-based childcare with only a few children present, cortisol levels were higher than at home. Consistent with the findings of Gunnar et al. (2010), no significant associations were present between caregiver-child ratios and children's cortisol levels at childcare. Nevertheless, the number of children present during home-based childcare is on average larger than the number of children at home.

The peer group probably only partly explains elevated cortisol levels. In our view, the most plausible explanation lies in an interaction between the peer group, characteristics of the child itself, and the quality of childcare. Although children are separated from their parents and are in a setting with peers, the caregiver may prevent elevations of children's cortisol levels, by interacting sensitively and stimulating positive peer interactions. Thus, sensitive caregivers may buffer increases in cortisol levels (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Gunnar, Larson, Hertsgaard, Harris, & Broderson, 1992).

Individual differences in children's stress reactivity have often been linked to temperamental characteristics. In a recent study, a rise in cortisol levels during home-based childcare was associated with anxious, vigilant behavior for girls, but with angry, aggressive behavior for boys (Gunnar et al., 2010). Particularly children who are shy and fearful may experience social threat in the context of childcare, in which they must engage in interaction with other children and caregivers.

According to the differential susceptibility theory (Belsky, 1997; Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2007), the effects of childcare quality may be moderated by child temperament. Consistent with this theory, Pluess and Belsky (2009) found that children with a difficult temperament as infants showed more behavior problems when they experienced low childcare quality at 54 months, but showed fewer behavior problems when they experienced high childcare quality, compared to children with an easy temperament. However, our data did not point to differential susceptibility when explaining individual variations in children's cortisol. To obtain associations with cortisol, it is conceivable that instruments are needed that measure both reactive and regulatory components of temperament, and preferably would be based on observations of children in various settings to enhance the validity of assessments (Kagan, 2008).

Consequences of children's elevated cortisol

It is unclear to what extent children's higher cortisol levels at childcare affect their development. As long as results from longitudinal studies are not available, we can only speculate about the possible risks of the observed higher cortisol levels at childcare. The finding that cortisol levels were not elevated consistently

across the settings (at home and at childcare) but seem to be related to the specific context of childcare, contradicts the expectation that stress experiences at childcare would spill over into the home setting, and that in this respect a long term effect on children's development should be expected. Apparently, (some) children display an adaptive cortisol response to the challenges at childcare, and are, at the same time, capable of a physiological recovery when at home. If the stress that children experience in childcare does not have a carry-over effect to the home situation, their baseline cortisol levels at home should be comparable with those of children who are exclusively being raised at home. We found one study that supports this hypothesis. Watamura, Donzella, Kertes, and Gunnar (2004) distinguished between children (aged 12-36 months) who were raised exclusively by their parents (or received less than 10 hours a week of childcare), and children who received at least 10 hours a week of childcare. When comparing the cortisol levels at home, no significant differences were found between the two groups.

It should be noted that cortisol is not only known as a stress hormone, but that it has a wide range of physiological functions, including the mobilization of resources (Sapolsky, Romero, & Muck, 2000). Not only stressful situations but also positive arousal, for instance the preparation for and reaction to physical activities, may alter cortisol levels (Corral, Mahon, Duncan, Howe, & Craig, 1994; Tremblay, Copeland, Van Helder, 2005; Karkoulias et al., 2008). Indeed, mobilizing energy can be appropriate in childcare in which physical activities are common. However, our finding that quality of care is associated with children's cortisol does not support the hypothesis that only the mobilization of energy would cause higher cortisol levels. It is not very plausible that children in childcare of lower quality engage in more (intense) physical activities compared to children in childcare of higher quality. Nevertheless, to test this alternative hypothesis it would be important to control for physical activities, by using an actigraph to measure children's physical activity during a day at childcare and during a day at home.

Cortisol levels of caregivers

Caregivers' cortisol levels remained at the same level from 11 AM to 3 PM at a work day, whereas their cortisol levels decreased during a non-work day. Unexpectedly, caregivers' cortisol levels at 11 AM were higher during a non-work day than during a work day. We offer two possible explanations; both are shown in Figure 6.1. In this figure, the cortisol levels of the four measurement points during the work day and the non-work day are shown, in combination with two hypothesized lines: suppression (small dots) and depletion (stripes).

The first explanation, cortisol suppression, might be particularly noticeable during the morning when cortisol levels are normally high. Caplan, Cobb, and French (1979) found that white collar workers who reported low workload showed the expected decrease in cortisol from morning to afternoon, while workers who reported high workload showed lower morning cortisol levels and an increase in cortisol during the mid-afternoon. These authors hypothesized that chronic stress was examined, rather than acute stress. During chronic stress, down-regulation in cortisol would be adaptive. A recent meta-analysis showed

that acute stressors elicited greater cortisol changes than chronic stressors in natural settings (Michaud, Matheson, Kelly, & Anisman, 2008). Caregivers' work might cause chronic stress, with hypo-regulated cortisol during the morning anticipating a strenuous day at work. However, we can only provide tentative speculations because no data are available on caregivers' chronic stress. To examine the stability of the lower cortisol levels at 11 AM during work days, compared to non-work days, cortisol samples should be collected on more than one day.

Second, cortisol depletion might be an explanation. We do not know what the cortisol secretion was between awakening and 11 AM. Cortisol levels might have increased during the morning when children arrived at childcare (9 AM), at a hectic time when caregivers have to divide their attention between both parents and children. As a reaction to these heightened cortisol levels, negative feedback inhibition may have taken place: Cortisol binds to its receptors on cells, among others in the hypothalamus, inhibits secretion of corticotropin releasing hormone (CRH) and adrenocorticotrophic hormone (ACTH), leading to a decrease in cortisol levels. Thus, cortisol levels may have dramatically decreased at 11 AM, which resulted in the difference between 11 AM measurements at childcare and at home. This is in line with results of Steptoe, Cropley, Griffith, and Kirschbaum (2000) who suggested an anticipatory psychobiological response, in which cortisol levels at the beginning of the day are elevated because of an individual's anticipation of a stressful day. In the Steptoe et al. study (2000), teachers' cortisol samples were taken between 8 AM and 8:30 AM after arriving at school. Increased cortisol levels were present in teachers who reported high job strain but not in teachers who reported low job strain. In order to test this hypothesis in future studies, cortisol should be measured at more time points in the morning.

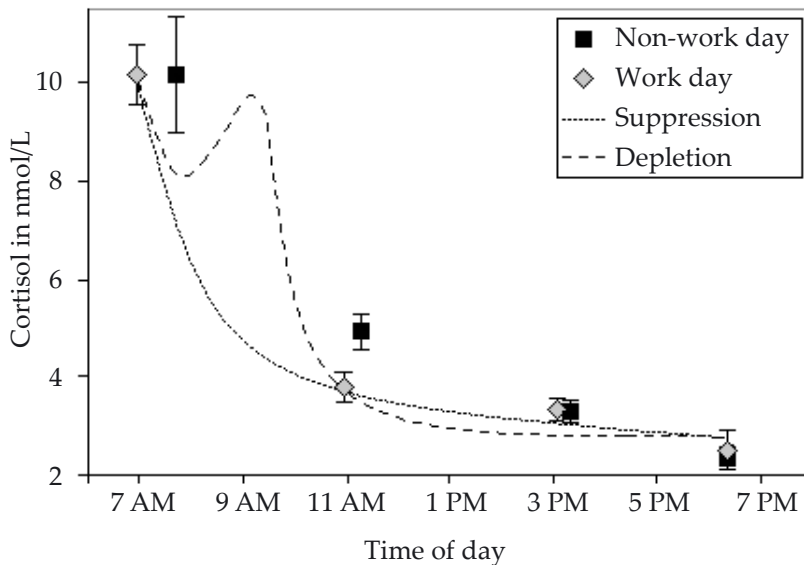


Figure 6.1. Caregivers' cortisol levels at a non-work day, a work day, and hypothesized suppression and depletion

Quality of care

Although caregivers' cortisol levels were not associated with the quality of care they provided, their perceived stress was. Consistent with findings in parents (Belsky, Crnic, & Woodworth, 1995; Coyl, Roggman, & Newland, 2002; Crnic, Gaze, & Hoffman 2005), caregivers in home-based childcare (higher) reports of negative appraisal in their lives were associated with (lower) quality of observed caregiver behavior. This was not found for caregivers in childcare centers.

For both types of care, quality of care was significantly associated with children's cortisol levels. In home-based childcare, lower caregiver sensitivity was associated with a higher total production of salivary cortisol during the day. In center-based childcare, (lower) global childcare quality was associated with (an increase in) cortisol levels during childcare. Accordingly, in the two settings two different aspects of childcare quality seem relevant for cortisol regulation. These different findings for the two types of care can possibly be explained by caregiver stability, as discussed above. In home-based childcare, the caregiver (a single caregiver during the child's stay at childcare) has the main influence on the child. In childcare centers, global quality might be a more relevant indicator of children's stress levels than caregiver sensitivity, because children in childcare centers are taken care of by more than one caregiver per day and different caregivers throughout the week.

In addition, caregivers in childcare homes who were more stressed themselves (both perceiving more stress and showing an increase in cortisol during childcare), also perceived the wellbeing of children in their care as lower. This finding was confirmed when an independent measure of child wellbeing was used: Children's *observed* wellbeing was lower when they were in the care of a caregiver who perceived her life as more stressed. Although the differential susceptibility theory (Belsky, 1997; Belsky et al., 2007) could not be confirmed for the effects of childcare quality, the differential susceptibility theory was confirmed for the effects of caregiver stress. Congruent with the differential susceptibility hypothesis, more socially fearful children were more susceptible to caregiver stress, for better *and* for worse. More socially fearful children were reported as lower on wellbeing when their caregivers were more stressed (showed increases in caregivers' cortisol levels during childcare), whereas they were reported higher on wellbeing when their caregivers were less stressed (decreases in caregivers' cortisol levels) compared to their less fearful peers.

This thesis confirms the importance of childcare quality in both types of childcare as children's basic hormonal indices of stress as well as their wellbeing seem to be affected by quality of care. Children appear to feel more at ease and less stressed when they are cared for by caregivers who provide more emotional support, and who perceive less stress. Therefore, investments in the improvement of childcare quality, enhancing both global quality of care and caregiver sensitivity, are important. The second study was designed to address this crucial issue of improving quality of professional child care.

VIPP-CC

The effectiveness of the Video-feedback Intervention to promote Positive Parenting – Child Care (VIPP-CC) was tested in home-based childcare in a randomized controlled trial. Observed global childcare quality improved in the intervention group compared to the control group. The program did not change observed caregiver sensitivity, but caregivers in the intervention group reported a more positive attitude towards sensitive caregiving than caregivers in the control group. Caregiving attitudes seem to be easier to change than caregiver behavior itself, and more positive caregiving attitudes might be the first (necessary) step in changing caregiver behavior.

The absence of increases in observed sensitivity may be explained by a ceiling effect, due to the relatively high sensitive caregivers in home-based childcare. Another explanation is the ample child-rearing experience of caregivers in our sample. Similar to findings that were reported for parents (Stolk et al., 2008), caregivers taking care of a child for the first time may benefit more from the intervention than caregivers with child-rearing experience.

For global childcare quality, a medium to large effect size (*partial* η^2) of 0.09 was established through the intervention. This effect size is somewhat higher than in a parenting study (*partial* $\eta^2 = 0.05$), in which the VIPP-SD program proved to be effective in changing observed parenting behavior (Mesman et al., 2008). Studies using the VIPP approach showed positive effects in intervention groups compared to control groups in various samples. Effect sizes (Cohen's *d*) ranged from medium effect sizes ($d = 0.49$) in insecure mothers (Klein Velderman et al., 2006) to large effect sizes ($d = 0.78$) in insensitive mothers (Kalinauskienė, Cekuoliene, Van IJzendoorn, Bakermans-Kranenburg, Juffer, & Kusakovskaja, 2009). The randomized controlled trial evaluating the Carescapes program, a video-based training program for home-based caregivers, showed a medium to large effect size ($d = .72$) on the use of effective behavior management practices, but this effect disappeared after 18 weeks (Rusby, Smolkowski, Marquez, & Taylor, 2008).

The medium to large effect size in our study showed that children in the intervention group were in a more stimulating and safe environment after the intervention. This finding is important, because global childcare quality has been found to affect children's cognitive and social development (Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000).

Implications for childcare practice

This thesis confirms the importance of childcare quality in both childcare homes and childcare centers. The importance of investments in childcare seems especially evident in center-based childcare, because caregiver sensitivity is lower in this type of care than in home-based childcare. However, home-based childcare was chosen as a first step in the adaptation and implementation of the VIPP-SD to group care, because the daily environment in this type of care is more similar to a child's home than center-based child care. We showed that the family-based intervention VIPP-SD can be applied with some minor modifications in a professional group setting. Because the VIPP-CC concerns a short-term easily

applicable intervention, it can be implemented in childcare homes at relatively low costs by caregivers or directors (by means of consultation and inter-vision) who are trained using the VIPP-CC. Thus, the cost-benefit ratio for childcare practice is favorable.

The regulation and improvement of home-based childcare quality is all the more important, because lately this type of childcare has been under pressure. The introduction of the 2010 childcare act had its roots in preventing misuse of government finances, and in facilitating control and enhancement of quality of care. In the past, all parents received childcare allowance if the caregiver was registered at a home-based childcare organization. This resulted in misuse, for example by grandparents taking care of their grandchild during a few days per week at the expense of the tax payer. To prevent this incorrect use of public money, the government introduced the new act.

However, it is questionable whether this act's requirement of education will enhance childcare quality. Many caregivers have ample experience in raising children, which might be more important than their educational level. The obligatory educational level was already introduced into center-based childcare, but did not result in high levels of childcare quality (see Vermeer et al., 2008). In terms of experience in child-rearing, caregivers in home-based childcare are ahead of caregivers in center-based childcare. Although most home-based caregivers do not have any education in the field of childcare, this does not necessarily make them less sensitive and less capable of making children feel at ease. In fact, our study showed that caregivers in home-based childcare displayed higher-quality care than (the higher educated) caregivers in center-based care. Introducing a minimum level of education may reduce incorrect spending of childcare allowances, but may not necessarily increase childcare quality.

To increase childcare quality, one should not only focus on caregivers' knowledge, but also on their sensitivity when interacting with children. Although an effect on observed caregiver sensitivity could not be established in this study, the intervention may have triggered caregivers to be more aware of the importance of interacting with the children and creating a more stimulating and safe environment for the children. This is confirmed by our finding that global childcare quality improved after the intervention. We do not advise the abolition of an educational standard for childcare providers, but we do recommend an emphasis on caregiver sensitivity in childcare education, for caregivers in center-based childcare *and* for caregivers in home-based childcare.

Limitations and future directions

A limitation of both studies is the relatively small size of the samples. Although our sample sizes are not deviating from those in other recent studies on cortisol in childcare (e.g., Watamura, Kryzer, & Robertson, 2009) and interventions in home-based childcare with a control group (Rusby et al., 2008), the small sample sizes may have resulted in a lack of statistical power to detect moderate associations or intervention effects. Also, our small sample sizes prevented us from comparing subgroups of children or caregivers. For example, some caregivers with specific characteristics might have benefited more from the intervention than others

(differential susceptibility, Klein Velderman, Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 2006; Stolk et al., 2008). In future studies, larger samples are advisable.

Future studies should focus on adapting and implementing the intervention program even further for childcare centers with larger groups of children and more than one caregiver. Interventions in childcare centers are highly relevant, and, considering the lower caregiver sensitivity levels in childcare centers compared to childcare homes, may even result in larger effects on observed sensitivity. A next step in home-based childcare will be to study the effects of the VIPP-CC on both caregivers *and* children, in order to study the causal link from intervention through caregiver attitudes and skills to child behavior and development.

Finally, it should be noted that the focus of this thesis is on the socio-emotional domain of child development only. Although caregivers in home-based childcare showed more sensitive behavior and children displayed a higher wellbeing than caregivers and children in childcare centers, we do not know anything about children's cognitive development.

Conclusion

In conclusion, we found differences between childcare homes and childcare centers in favor of childcare homes: Children showed a higher wellbeing, caregivers displayed higher sensitivity, and noise levels were lower than in center-based childcare. Both children's and caregivers' cortisol levels differed between a childcare (work) day and a home (non-work) day, irrespective of type of childcare. These higher cortisol levels confirm the impact of (work in) childcare on basic hormonal indices of stress in children and caregivers. Our data suggest that caregivers' perceived stress in home-based childcare is an important determinant of quality of care, which in turn influences children's cortisol levels and wellbeing. Lower levels of global quality (center-based childcare) or caregiver sensitivity (home-based childcare) may result in elevated cortisol levels and, in home-based childcare, in lower wellbeing. Furthermore, the results suggest that more socially fearful children suffer the adverse consequences of caregivers who show an increase in cortisol levels during childcare, but also benefit from caregivers who show decreases in cortisol, compared to their less social fearful peers.

The brief, behaviorally oriented VIPP-CC program is an important tool for enhancing global quality of home-based childcare. Although observed caregiver sensitivity did not increase after the intervention, caregiver attitudes towards sensitive caregiving were higher in the intervention group compared to the control group. This study shows that childcare quality can effectively be improved by video-feedback intervention which may routinely be incorporated in the in-service training of professional caregivers.

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Samenvatting (Summary in Dutch)

Waar voelen kinderen zich meer op hun gemak: in kinderdagverblijven of in gastouderopvang? Ervaren kinderen en hun professionele opvoeders in de kinderopvang meer stress (hogere niveaus van het 'stresshormoon' cortisol) dan thuis en zijn er verschillen tussen de twee typen opvang? Welke opvoeders zijn sensitiever: pedagogisch medewerkers in kinderdagverblijven of gastouders? Kan de kwaliteit van de gastouderopvang in Nederland verhoogd worden door middel van een gerichte interventie? In dit proefschrift worden twee studies in de kinderopvang beschreven die antwoord geven op deze en verwante vragen. In het eerste deel van dit proefschrift komt een beschrijvende studie aan bod gericht op het welbevinden en de stress van kinderen in kinderdagverblijven en gastouderopvang. Ook wordt de rol van stress van de opvoeders en de kwaliteit van de opvang nader belicht. In de tweede studie wordt een video-feedback interventie gericht op de verhoging van de kwaliteit van gastouderopvang geëvalueerd in een gerandomiseerde onderzoeksopzet met een voor- en nameting. Hier vatten we de resultaten van beide studies kort samen.

De kwaliteit van kinderopvang kan een cruciale rol spelen in het bevorderen van het welbevinden en reduceren van stress van jonge kinderen. Uit verschillende studies is gebleken dat kinderen zich beter ontwikkelen in kinderopvang van hogere kwaliteit (NICHD ECCRN, 2002; Peisner-Feinberg et al., 2001; Vandell & Wolfe, 2000; Vandell, Belsky, Burchinal, Steinberg, Vandergrift, & NICHD ECCRN, 2010). Sensitiviteit - ofwel de mate waarin een opvoeder tijdig en adequaat ingaat op signalen van een kind - is een belangrijke indicator voor de kwaliteit van de opvang. Dit is de eerste studie in Nederland waarin de kwaliteit van gastouderopvang onderwerp is van wetenschappelijk onderzoek. De opvang in kinderdagverblijven is daarbij als referentie gekozen. Daarnaast is aandacht voor lawaai een nieuw element in het hier gerapporteerde onderzoek, naast de sensitiviteit van de opvoeder en de globale kwaliteit.

De eerste studie is uitgevoerd bij een aselechte landelijke steekproef bestaande uit 55 gastoudergezinnen (71 kinderen) en 26 kinderdagverblijven (45 kinderen), waarbij het welbevinden van kinderen en de cortisolniveaus van kinderen en professionele opvoeders centraal staan. Het welbevinden van de kinderen wordt in dit proefschrift gedefinieerd als de mate waarin kinderen zich veilig en ontspannen voelen en genieten van de activiteiten waarmee zij bezig zijn. De mate van welbevinden van de kinderen en de sensitiviteit van de opvoeders is door onafhankelijke observatoren in kaart gebracht aan de hand van videofragmenten die zijn opgenomen tijdens een dag in de opvang. Om de fysiologische stress te meten van zowel de kinderen als de professionele opvoeders is speeksel verzameld ter bepaling van cortisol. In de onderzoeksliteratuur worden verhoogde cortisolniveaus over het algemeen beschouwd als biologische indicatoren van

emotionele reacties en stress, maar ook van verhoogde activiteit. Omdat de productie van cortisol een 24-uurs ritme volgt (met een piek na het opstaan en een daling gedurende de dag), is speeksel verzameld op vier momenten gedurende de dag. Om een vergelijking mogelijk te maken tussen cortisolniveaus tijdens de opvang en thuis is speeksel verzameld op twee verschillende dagen, waarvan één thuis en één op de opvang.

De gastouderopvang komt uit deze studie gunstiger naar voren dan de opvang in kinderdagverblijven: Kinderen in de gastouderopvang laten gemiddeld een hogere mate van welbevinden zien, de sensitiviteit van de gastouders is hoger beoordeeld en de geluidsniveaus in de gastouderopvang zijn lager dan in de kinderdagverblijven. Ook geldt dat hoe sensitiever gastouders zijn, hoe meer welbevinden kinderen laten zien. In de kinderdagverblijven is geen significante relatie gevonden tussen sensitiviteit en welbevinden.

Er zijn geen verschillen in cortisolniveaus tussen kinderen die kinderdagverblijven versus gastouders bezoeken. Maar kinderen in beide typen opvang hebben hogere cortisolniveaus in vergelijking met een dag thuis. Dit komt overeen met de uitkomsten van meta-analyses (Geoffroy, Côté, Parent, & Séguin, 2006; Vermeer & Van IJzendoorn, 2006). Thuis volgen de cortisolniveaus het 24-uurs ritme en dalen gedurende de dag, terwijl deze niveaus gelijk blijven tijdens een dag in de opvang. Wanneer rekening wordt gehouden met de globale kwaliteit van de opvang laten kinderen verschillende patronen van cortisolniveaus zien: kinderen in de 50% laagst scorende kinderdagverblijven laten gemiddeld een stijging in cortisolniveaus zien gedurende de dag, terwijl kinderen in de 50% hoogst scorende kinderdagverblijven gemiddeld een daling in cortisolniveaus laten zien. Voor kinderen in de gastouderopvang speelt de sensitiviteit van de gastouder een belangrijke rol: voor kinderen die worden opgevangen door de 50% minst sensitieve gastouders is de cortisolproductie tijdens de opvangdag gemiddeld hoger dan bij kinderen die door de 50% meest sensitieve gastouders worden opgevangen. Kinderen reageren dus op slechtere kwaliteit van kinderopvang met verhoogde productie van het stresshormoon cortisol, zowel in kinderdagverblijven als in gastouderopvang. Ook de professionele opvoeders reageren fysiologisch verschillend tijdens een dag op de opvang vergeleken met een dag thuis. Tijdens een werkdag (een ochtend in de kinderopvang) zijn hun cortisolniveaus lager dan tijdens een dag thuis. Zij laten een stijging in cortisol zien gedurende de dag in de opvang, terwijl de niveaus gelijk blijven tijdens een dag thuis. Hoewel bij professionele opvoeders cortisolniveaus niet gerelateerd zijn aan de kwaliteit van de opvang, is hun ervaren stress dit wel. Gastouders die aangeven meer stress in hun leven te ervaren laten minder positief opvoedgedrag zien. Dit is niet het geval voor pedagogisch medewerkers in kinderdagverblijven. Zowel gastouders die aangeven meer stress te ervaren als gastouders die een stijging in cortisolniveaus laten zien beoordelen kinderen lager op welbevinden. Deze samenhang wordt bevestigd door een meer onafhankelijke maat van welbevinden: ook het geobserveerde welbevinden van kinderen is lager als ze worden opgevangen door een gastouder die haar leven als stressvoller ervaart.

De differentiële ontvankelijkheidstheorie (Belsky, 1997; Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2007) stelt dat kinderen met een reactiever of 'moeilijker' temperament meer ontvankelijk zijn voor zowel negatieve als positieve omgevingsinvloeden. Deze theorie is in dit onderzoek niet bevestigd wat betreft de effecten van de kwaliteit van kinderopvang. Echter, fysiologische stress van de professionele opvoeder blijkt een belangrijke invloed te hebben. De meer sociaal angstige kinderen zijn ontvankelijker voor deze vorm van stress, zowel in negatieve als in positieve zin. In vergelijking met minder sociaal angstige kinderen, wordt het welbevinden van deze meer sociaal angstige kinderen lager beoordeeld door opvoeders die een stijging laten zien in cortisolniveaus gedurende de dag, terwijl het welbevinden van deze kinderen hoger wordt beoordeeld wanneer opvoeders een daling in cortisolniveaus laten zien.

Dit proefschrift bevestigt het belang van kwaliteit van kinderopvang, zowel in kinderdagverblijven als in gastouderopvang. Wanneer de twee typen opvang elk apart worden bekeken hangen sensitiviteit van de opvoeders en het welbevinden van de kinderen alleen binnen de gastouderopvang samen. Hoewel globale kwaliteit dus voornamelijk van belang lijkt in kinderdagverblijven, speelt in de gastouderopvang sensitiviteit een centrale rol.

De interventiestudie is voornamelijk gericht op het verbeteren van sensitiviteit bij gastouders. Meta-analytische resultaten laten zien dat interventies met een beperkt aantal sessies en een welomlijnde gedragsgerichte benadering het meest effectief zijn in het verhogen van sensitiviteit van ouders (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003). De Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD; Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2008) is een interventie die aan deze omschrijving voldoet. Het doel van de VIPP-SD is om de sensitiviteit en het sensitief disciplineren van ouders te verhogen. Eerder onderzoek bij moeders en hun kinderen liet positieve effecten van deze VIPP benadering zien bij verschillende doelgroepen, namelijk moeders met een onveilige gehechtheidsrepresentatie, insensitieve moeders, moeders met eetstoornissen, adoptiemoeders en moeders van kinderen met externaliserend probleemgedrag (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2009).

Hier is de VIPP-SD aangepast voor implementatie in de kinderopvang: de Video-feedback Intervention to promote Positive Parenting: ChildCare (VIPP-CC). Evenals bij de VIPP-SD is het interventietraject van de VIPP-CC ingedeeld in drie fasen, die elk bestaan uit twee sessies. Tijdens deze sessies wordt de gastouder bezocht en worden video-opnames gemaakt van dagelijkse situaties in de opvang. Deze video-opnames worden met de gastouder besproken, waarbij tijdens iedere sessie een specifiek thema aan bod komt. In de eerste fase wordt een relatie opgebouwd tussen de gastouder en de trainer en is de aandacht gericht op het gedrag van de kinderen. De thema's van de eerste twee sessies zijn (1) exploratie versus contact zoeken en (2) 'spreken voor het kind'. De tweede fase is gericht op het verbeteren van opvoedgedrag door de gastouder te laten zien op welke momenten welke strategieën werken. De thema's van de twee sessies in deze fase zijn (3) sensitiviteit en sensitieve time-outs en (4) empathie. De derde fase bestaat uit twee zogenaamde 'booster' sessies waarin vooral herhaling plaatsvindt van de onderwerpen die in de voorgaande bezoeken aan bod zijn gekomen. Om de

oorspronkelijke VIPP-SD in de groepssituatie van gastouderopvang te kunnen implementeren zijn minimale aanpassingen gedaan aan de procedure en de materialen. Zo is het 'spreken voor het kind' niet alleen gericht op één kind, maar ook op de hele groep kinderen tegelijk en is het speelgoed dat tijdens de interventie wordt gebruikt aangepast aan de groepssituatie. Een pilot studie met acht gastouders (van wie vijf gastouders de interventie ontvingen) liet zien dat de VIPP-CC geschikt is voor de opvangsituatie.

In dit proefschrift is de effectiviteit van de VIPP-CC geëvalueerd in de gastouderopvang in een gerandomiseerde onderzoeksopzet met een voor- en nameting. Tijdens de voormeting van het onderzoek zijn gastouders bezocht waarbij de globale kwaliteit van de opvang en de sensitiviteit van de gastouders is gemeten. Vervolgens is een groep gastouders geselecteerd die relatief laag scoorden op sensitiviteit. Vierentwintig van deze gastouders werden willekeurig toegewezen aan de kortdurende gedragsgeoriënteerde VIPP-CC. Gastouders in deze interventiegroep ontvingen zes bezoeken waarin zij individuele video-feedback ontvingen. De 24 gastouders in de controlegroep werden, parallel aan de bezoeken van de interventiegroep, zes keer gebeld om over ontwikkelingsgerelateerde onderwerpen te praten. Tijdens de nameting zijn alle gastouders opnieuw bezocht, waarbij de globale kwaliteit van de opvang en de sensitiviteit van de gastouders opnieuw in kaart is gebracht.

Resultaten van deze studie laten zien dat gastouders in de interventiegroep na de interventieperiode hoger scoorden op gerapporteerde sensitiviteit dan de gastouders in de controlegroep. Dit gold echter niet voor de geobserveerde sensitiviteit. De globale kwaliteit van de opvang in de interventiegroep was gestegen na het volgen van de interventie, terwijl dit bij de gastouders in de controlegroep niet het geval was.

Dit proefschrift bevestigt het belang van een goede kwaliteit kinderopvang in zowel gastouderopvang als kinderdagverblijven. Het belang van investeringen in kinderopvang lijkt vooral zichtbaar in kinderdagverblijven, omdat de sensitiviteit van pedagogisch medewerkers in dit type opvang lager is dan in gastouderopvang. Toch is gastouderopvang gekozen als eerste stap in de toetsing van de effectiviteit van de VIPP-SD binnen de groepsopvang, omdat de dagelijkse omgeving in dit type opvang meer overeenkomsten vertoont met de thuissituatie van een kind dan een kinderdagverblijf. We hebben laten zien dat de gezinsgeoriënteerde interventie VIPP-SD met enkele kleine aanpassingen toegepast kan worden in de gastouderopvang en effectief is gebleken.

De centrale regulering en verbetering van gastouderopvang is van groot belang, vooral omdat de gastouderopvang in Nederland recent onder druk is komen te staan. Gerichte interventies kunnen bijdragen aan het verhogen van de kwaliteit van gastouderopvang in Nederland. Om de kwaliteit van deze vorm van kinderopvang te verhogen moet niet voornamelijk, zoals de regelgeving in Nederland nu voorschrijft, geïnvesteerd worden in kennisvermeerdering van de gastouders, maar in het verbeteren van hun sensitiviteit tijdens interacties met de kinderen. We pleiten niet voor het afschaffen van opleidingseisen voor gastouders, maar onze aanbeveling is het beleid meer toe te spitsen op sensitiviteit van professionele opvoeders, zowel in gastouderopvang als in kinderdagverblijven. Naar onze mening kan de korte gedragsgeoriënteerde VIPP-CC in de opleiding

van professionele opvoeders hieraan een belangrijke bijdrage leveren. Hoewel in onze interventiestudie de geobserveerde sensitiviteit op korte termijn niet is gestegen, zijn de opvoedingsattitudes van gastouders in de interventiegroep positiever in vergelijking met gastouders in de controlegroep. Deze studie heeft laten zien dat de globale kwaliteit van kinderopvang effectief verbeterd kan worden door de video-feedback interventie. Gastouderopvang is een waardevolle vorm van kinderopvang waarin verdere investering zinvol is.

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Curriculum Vitae

Marleen Groeneveld werd geboren op 5 september 1984 in Oud-Beijerland. In 2002 behaalde zij haar VWO-diploma aan de scholengemeenschap Willem van Oranje te Oud-Beijerland. In datzelfde jaar begon ze aan de opleiding Pedagogische Wetenschappen aan de Universiteit Leiden, waar ze in 2006 met lof afstudeerde bij de vakgroep Algemene en Gezinspedagogiek (AGP). Van 2006 tot 2010 werkte Marleen als promovenda op de afdeling AGP van de Universiteit Leiden waar zij onderzoek deed naar gastouderopvang en kinderdagverblijven in Nederland. De resultaten van haar onderzoek zijn in dit proefschrift beschreven. Naast haar aanstelling als promovenda was Marleen ook één dag in de week aangesteld als docent bij AGP. Momenteel is zij bij dezelfde afdeling als post-doc onderzoeker betrokken bij het project 'Boys will be boys' waarin de voorspellers en uitkomsten van seksespecifieke opvoedingspatronen in gezinnen met jonge kinderen worden onderzocht. Hiernaast zal Marleen haar onderzoek in de kinderopvang voortzetten.

