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Leiden
The Netherlands

Quality in home-based childcare : Impact and improvement

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Citation

Groeneveld, M. G. (2010, November 4). *Quality in home-based childcare : Impact and improvement*. Retrieved from <https://hdl.handle.net/1887/16109>

Version: Not Applicable (or Unknown)

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Downloaded from: <https://hdl.handle.net/1887/16109>

Note: To cite this publication please use the final published version (if applicable).

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

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Manuscript submitted for publication

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 Kruijf 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

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Caregivers	1. Cortisol at 11 AM (nmol/L)	3.69	2.16									
	2. Cortisol at 3 PM (nmol/L)	3.34	1.93	.22								
	3. <i>RDC</i>	.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**					
Children	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. <i>RDC</i>	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*

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			
	<i>B</i>	<i>SEB</i>	β	R^2	<i>B</i>	<i>SEB</i>	β	R^2	<i>B</i>	<i>SEB</i>	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.

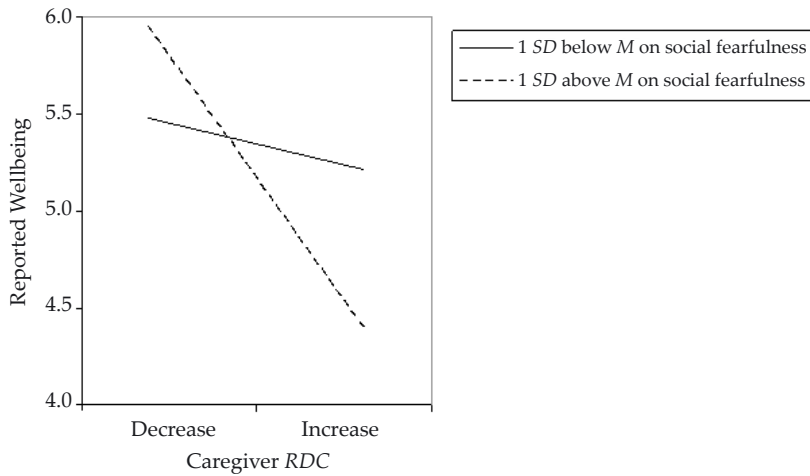


Figure 4.1 Interaction between children's fearfulness and caregiver cortisol (RDC) on reported wellbeing

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.

