

# Daycare Attendance, Stress, and Mental Health

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**Objective:** Daycare stress can be indexed by cortisol, and elevated levels of cortisol have been implicated in the onset and development of mental health disorders. Our objective was to quantify the associations between daycare and cortisol and to identify individual and environmental conditions under which daycare attendance is associated with cortisol concentrations.

**Methods:** We used Cohen effect size statistics to quantify these associations and to compare them across 11 published studies that were identified with MEDLINE and PsycINFO.

**Results:** Cortisol levels increased during the daycare day, whereas they decreased when children stayed at home. The mean effect size was  $d = 0.72$ . The magnitude of the daycare–stress relation seemed to vary under 3 specific conditions. First, the effect size was larger for children in low-quality daycare ( $d = 1.15$ ), whereas there was essentially little or no effect for children in high-quality daycare ( $d = 0.10$ ). Second, the effect size was larger for preschoolers (aged 39 to 59 months) ( $d = 1.17$ ) than for infants (aged 3 to 16 months) ( $d = 0.11$ ) or school-aged children (aged 84 to 106 months) ( $d = 0.09$ ). Third, children with difficult temperaments in daycare were more likely to exhibit a rising pattern of cortisol, compared with children who were not difficult.

**Conclusions:** Our review suggests that daycare attendance in relatively low-quality daycare conditions and for children with difficult temperaments may result in atypical cortisol elevation. Although the link between atypical cortisol elevation and mental health requires further study, programs aimed at improving the quality of daycare services during the preschool years are expected to lead to better physiological adaptation to daycare and to reduce the risks of mental health problems.

(Can J Psychiatry 2006;51:607–615)

Information on funding and support and author affiliations appears at the end of the article.

## Clinical Implications

- Improving the quality of daycare settings may help to prevent mental health problems in daycare.
- Interventions targeting vulnerable children must be promoted.

## Limitations

- Studies of low-quality daycare are lacking.
- Longitudinal studies are lacking.
- The studies we reviewed did not control for social selection factors.

**Key Words:** daycare, childcare, stress, cortisol, mental health, developmental psychopathology, children

As in most Western industrialized countries, the majority (53%) of Canadian preschool children attend daycare (1). Nonetheless, a long-standing debate about its impact on children’s mental health continues. One side suggests that daycare attendance may carry risks. For instance, studies have shown that daycare could interfere with secure attachment and constitute a serious risk for social maladjustment (2,3). The other side of the debate suggests that daycare is an essential part of children’s socialization and that it may promote healthy social and cognitive development. For example, studies have shown that daycare experience could reduce the risk of behavioural problems (4) and improve cognitive development (5).

The influence of daycare on stress levels, specifically the influence of daycare on the HPA system, is one possible physiological mechanism that may mediate the relation between daycare and mental health problems. The glucocorticoid hormone, cortisol, is the principal effector of the HPA system and is involved in stress regulation (6). Cortisol follows a circadian rhythm in that its concentrations fluctuate throughout the day. The level of cortisol peaks after one wakes in the morning and is lowest in the evening before one falls asleep (7). This rhythm is established in early childhood (8). Although the short-term glucocorticoid response to stress serves an adaptive function (9), chronic exposure to elevated glucocorticoid concentrations could predispose an individual to mental health problems such as depression and anxiety (10). Studies to date have shown a general association between atypical cortisol levels and children’s internalizing and externalizing behavioural problems (11–13).

Several studies have examined the effects of daycare stress by examining children’s diurnal cortisol variation. However, results across studies are inconsistent. This appears to be related to the fact that several features of the daycare context and experience (such as the quality of the daycare and the age of the child) are associated with variations in stress response (14–16). To sharpen the focus of future research and practice, we summarize the literature on daycare experiences and cortisol levels across relevant studies.

## Method

### Selection of Studies

Using MEDLINE and PsycINFO, we searched for all studies that examined the relation between daycare attendance and diurnal cortisol variation. We used the following key words:

childcare or daycare or nonmaternal care and cortisol or hydrocortisone or hypothalamic–pituitary–adrenocortical. The search included all studies published between 1985 and February 2006. Additionally, we examined the reference lists of all relevant articles for supplementary studies not identified by MEDLINE and PsycINFO. We tracked citations of these articles with the ISI Web of Science. We determined whether to include articles in the literature review, using 3 criteria:

1. Studies must include children between the ages of 0 and 12 years who attended daycare on a regular basis.
2. Cortisol must have been collected at daycare and preferably also at home to allow comparison between daycare and home levels.
3. Studies must have been published in a peer-reviewed journal.

These criteria generated 11 relevant empirical articles. These empirical articles are marked with an asterisk in the reference list.

### Effect Sizes Calculation

To facilitate comparisons across studies and to pool the results of similar studies together, where relevant, we quantified the association between key variables with children’s cortisol levels using Cohen effect sizes ( $d$ ) (17). Values of 0.20, 0.50, and 0.80 indicated small, medium, and large effect sizes, respectively (17). We used 3 sources to obtain effect size  $d$  statistics:

1. We converted Pearson correlations (that is,  $r$ ) into the effect size  $d$  statistic with the following equation (18):

Formula 1

$$d = \frac{2r}{\sqrt{1-r^2}}$$

2. We converted  $t$  tests into the effect size  $d$  statistic with the following equation (19):

Formula 2

$$d = \frac{2t}{\sqrt{df}}$$

3. When both mean and SDs of cortisol in daycare and at home were available, we calculated effect sizes using the equation suggested by Cohen (17):

Formula 3

$$d = \frac{(X \text{ daycare} - X \text{ home})}{\sigma \text{ pooled}}$$

$$\sigma \text{ pooled} = \sqrt{\frac{(n \text{ daycare} - 1)SD \text{ daycare}^2 + (n \text{ home} - 1)SD \text{ home}^2}{n \text{ daycare} + n \text{ home} - 2}}$$

( $n$  represents the number of children in each group)

### Abbreviations used in this article

HPA	hypothalamic–pituitary–adrenocortical
SD	standard deviation

Relative to home care, positive  $d$  values indicate higher levels of cortisol in the daycare group, whereas negative  $d$  values indicate lower levels of cortisol in the daycare group.

## Results

The following section proceeds historically from the simple to the more complex. Results are presented in Table 1.

### Setting

Early studies compared the same children's cortisol samples taken at daycare and at home at the same time of day (20–22). In those studies, a single cortisol sample was collected. The time of sampling ranged between 9 AM and 4 PM. A small negative effect size was calculated for these studies ( $d = -0.05$ ,  $n = 4$ ; where  $n$  corresponds to the number of  $d$  statistics included in the average effect size), suggesting that the levels of cortisol in daycare were similar to or lower than those collected at home.

### Time of Day

Tout and colleagues took more samples during the day and noticed increased diurnal cortisol at daycare when cortisol normally decreases following the circadian rhythm (23). We adapted the effect size calculation for this study ( $d = 0.83$  or large) from Formula 3:

Formula 4

$$d = \frac{X_{\text{daycare (afternoon)}} - X_{\text{daycare (morning)}}}{\sigma_{\text{pooled}}}$$

Because cortisol was not also collected at home, this unexpected increase in cortisol during daycare prompted further research into time of day effects across settings.

### Setting and Time of Day Interactions

Subsequent studies comparing the diurnal cortisol patterns at home with daycare showed that setting had a moderating effect. Cortisol increased at daycare, whereas it decreased when children stayed at home (14–16,24–26). The change in cortisol ( $\Delta$ ) was obtained by subtracting the level of cortisol measured in the afternoon (about 4 PM) from that measured in the morning (about 10 AM), with the exception of one study that had only 3 morning measurements (26). We adapted Formula 3 for these studies:

Formula 5

$$d = \frac{(X\Delta_{\text{daycare}} - X\Delta_{\text{home}})}{\sigma\Delta_{\text{pooled}}}$$

When reported data were insufficient to calculate an exact effect size, we requested additional information from the investigators. We obtained data for 2 studies (14,15).

The mean effect size was 0.72 or a medium effect ( $n = 9$ ). However, the effect sizes were not homogenous ( $d = 0.09$  to

1.91). These results suggest that, although the overall relation between cortisol rise and daycare attendance was moderate, other factors must be considered to explain this heterogeneity. Such factors may have to do with daycare quality, children's developmental age, and children's temperaments.

### Daycare Quality

Children's increased stress levels may be related to features reflecting the quality of the daycare setting, such as neglectful or coercive caregivers, absence of positive peer interaction, and the constraints associated with group activities. Contrarily, high-quality daycare environments minimize such sources of stress, providing personalized care and smooth transitions between activities (27).

Daycare quality has been defined by 2 highly correlated components: process quality and structural quality (28). Process quality reflects the child's immediate daycare experience, including interactions with caregivers, educational play, and health and safety (29). Structural quality is conceptualized as a more distal quality indicator, such as caregiver-to-child ratio, group size, and caregiver training (29). Process and structural quality indices are associated with developmental outcomes (30,31).

Four studies show a negative relation between daycare quality and diurnal cortisol levels. One study found that 96% of children attending lower-quality daycare exhibited increased cortisol levels during the day, compared with 73% of children attending high-quality daycare (23). However, cortisol was not collected at home, and the evaluated daycare settings were all in the high-quality range (15). A second study showed that, for children in lower-quality home-based childcare, cortisol increased over the day ( $d = 1.15$ ), whereas daily cortisol levels dropped in children in high-quality home-based childcare ( $d = 0.10$ ) (15). In the latter study, quality of home-based childcare settings included 3 dimensions (verbal interaction, quantity of stimulation, and quality of stimulation) that were not distinguished from each other. A third study examined the relation between stress and the structural features of daycare, such as group size, mean age differences among children, number of adults in the group, and the space available for each child (26). The results showed that increases in cortisol during the morning varied according to group size (when  $\geq 15$  children,  $d = 0.60$ ), age difference among children (when  $\geq 6$  months,  $d = 0.41$ ), area in the playrooms available for each child (when  $\leq 5$  m<sup>2</sup>,  $d = 0.45$ ), and number of adults in the group (when  $\geq 4$  adults,  $d = 0.60$ ) (26). This author suggested that a stable relationship between child and caregivers is more difficult to establish when the number of caregivers in a team exceeds 4 adults. Additionally, the author suggested that playrooms providing each child with 5 m<sup>2</sup> of space reduce competition and conflicts and keep an optimal distance between

**Table 1 Characteristics and effect sizes of reviewed studies**

Author	Age of participants (months)	Setting	Participants (n)	Participants' sex (n)		Time of day of cortisol measurement (approximate)	Effect sizes	95%CI	
				Boys	Girls				
Gunnar and others (32)	8.6 to 10.7	Daycare	38	16	22	8:30 AM to 9:30 AM	—		
Lundberg and others (20)	36 to 47	Daycare and home	60	30	30	9:00 AM to 2:30 PM	—		
Gunnar and others (21)	38 to 62	Daycare and home	46	14	32	10:30 AM (morning classes), 2:30 PM (afternoon classes)	-0.51 <sup>a</sup>		
de Hann and others (22)	27 to 33	Daycare and home	24	14	10	10:00 AM to 10:30 AM			
							Week 1	-0.17 <sup>a</sup>	-0.76 to 0.43
							Week 6 to 9	0.00 <sup>a</sup>	-0.63 to 0.63
							Return week 1	0.48 <sup>a</sup>	-0.17 to 1.10
Tout and others (23)	32 to 70	Daycare	75	38	37	10:30 AM and 3:00 PM	0.83	0.50 to 1.16	
Dettling and others (14)	39 to 106	Daycare and home	70	37	33	10:00 AM and 4:00 PM			
							39 to 59	1.17 <sup>b</sup>	0.51 to 1.78
							60 to 81	0.62 <sup>b</sup>	-0.14 to 1.35
							84 to 106	0.09 <sup>b</sup>	-0.51 to 0.68
Dettling and others (15)	35 to 69	Daycare and home	61	26	35	10:00 AM and 4:00 PM			
							Low quality	1.15 <sup>b</sup>	0.45 to 1.80
							High quality	0.10 <sup>b</sup>	-0.53 to 0.73
Watamura and others (24)	32 to 69	Daycare and home	35	17	18	10:00 AM and 4:00 PM	1.91 <sup>b</sup>	1.33 to 2.45	
Watamura and others (16)	3 to 38	Daycare and home	55	23	32	10:00 AM and 4:00 PM			
							3 to 16	0.11 <sup>b</sup>	-0.60 to 0.80
							16 to 38	0.71 <sup>b</sup>	0.14 to 1.26
Ahnert and others (25)	11 to 20	Daycare and home	70	34	36	Upon the infant's arrived at daycare, 30 and 60 minutes later	—		
Legendre (26)	18 to 40	Daycare and home	113	62	51	7:30 AM, 9:30 AM, and 10:30 AM			
							Group size (≥ 15 children)	0.60 <sup>c</sup>	
							Age difference (≥ 6 months)	0.41 <sup>c</sup>	
							Area available (< 5 m <sup>2</sup> )	0.45 <sup>c</sup>	
							Number of adults (> 4)	0.60 <sup>c</sup>	

<sup>a</sup>Values used to compute the average effect size for setting  
<sup>b</sup>Values used to compute the average effect size for setting and time of day interactions  
<sup>c</sup>t tests were converted into the effect size d statistic according to formula 2  
— = unable to obtain information to calculate effect sizes

**Table 2 Cortisol rise at daycare in relation to temperament (effect sizes)<sup>a</sup>**

Author	Temperament	Effect sizes ( <i>d</i> )			
		Boys	Girls	Total	
Tout and others (23)	Anxious or withdrawn <sup>b</sup>	0.80	-0.12		
	Solitary behaviour <sup>c</sup>	0.32	0.16		
	Onlooker or unoccupied <sup>c</sup>	-0.24	-0.56		
Dettling and others (14)	Negative affectivity <sup>d</sup>	0.08	0.16	0.08	
	Surgency <sup>d</sup>	0.98	-0.02	0.18	
	Effortful control <sup>d</sup>	0.08	-1.25	-0.24	
	Negative affectivity <sup>e</sup>	0.56	-0.04	0.12	
	Surgency <sup>e</sup>	-0.16	0.16	0.04	
	Effortful control <sup>e</sup>	-0.39	0.02	0.00	
	Total aggression <sup>e</sup>	0.43	0.72	0.56	
	Subscales				
		Impulsivity (surgency)	1.04	0.04	0.26
		Inhibitory control (effortful control)	-0.35	-1.5	-0.61
	Sadness (negative affectivity)	0.54	-0.04	0.12	
	Shyness (negative affectivity)	0.77	-0.06	0.18	
	Anger (negative affectivity)	0.47	0.14	0.20	
	Relational aggression (total aggression)	0.43	0.98	0.72	
Dettling and others (15)	Negative affectivity <sup>d,e</sup>			1.39	
	Surgency <sup>d,e</sup>			-0.45	
	Effortful control <sup>d,e</sup>			-0.95	
	Aggression <sup>d,e</sup>			0.35	
Watamura and others (16)	Peer play amount <sup>h</sup>			0.02	
	Peer play complexity <sup>h</sup>			0.16	
	Distress <sup>h</sup>			0.04	
	Positive affect <sup>f,g</sup>			-0.26	
	Attend <sup>f,g</sup>			-0.10	
	Social fear <sup>f,g</sup>			0.90	
	Anger <sup>f,g</sup>			0.04	

<sup>a</sup>Pearson correlations (*r*) were converted into the effect size *d* statistic according to Formula 1. When variables were significantly correlated with age, we used partial correlations controlling for age to calculate effect sizes.

<sup>b</sup>Assessed with the Play Observation Scale

<sup>c</sup>Assessed with the Social Competence and Behavioural Evaluation Questionnaire

<sup>d</sup>Assessed with the Child Behavior Questionnaire

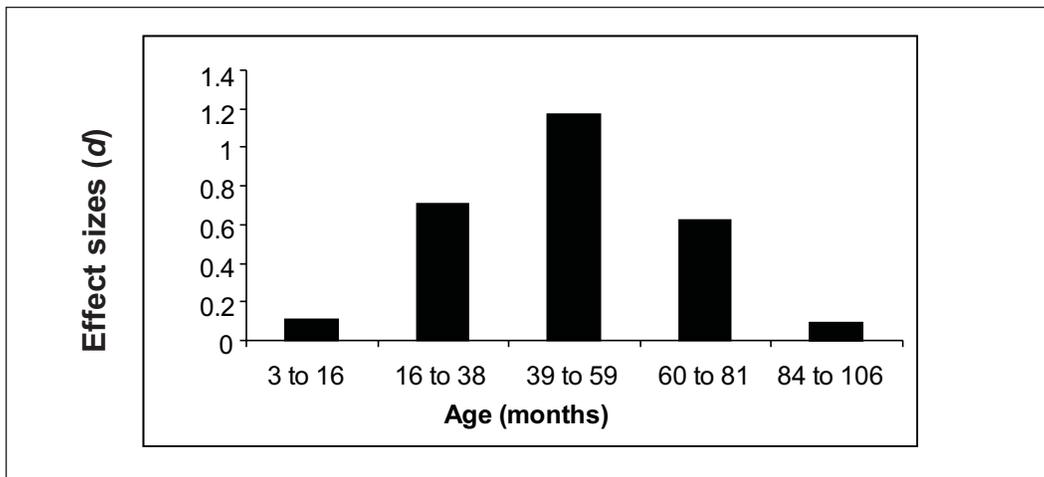
<sup>e</sup>Assessed with the Teacher Behavior Questionnaire

<sup>f</sup>Assessed with the Infant Behavior Questionnaire

<sup>g</sup>Assessed with the Toddler Behavior Assessment Questionnaire

<sup>h</sup>Observations

Figure 1 Cortisol rise at daycare in relation to the child's age (effect sizes)



Watanura and others (16); Dettling and others (14)

peers. A fourth experimental study demonstrated that cortisol levels varied with process quality, which is reflected by the quality of interaction between children and caregivers (32). Following a separation phase from their mothers, children were randomly assigned to 1 of 2 quality conditions: high or low. In the low-quality condition, the caregiver was instructed to be busy while the child played with toys. In the high-quality condition, the caregiver settled the child with toys and continued interacting and playing. Significant increases in cortisol were observed in children with low-quality conditions, but not in those with high-quality conditions.

### Children's Age

Results from 2 cross-sectional studies with children ranging in age from 3 to 106 months suggest that the link between children's age and their cortisol levels during daycare may be curvilinear (14,16). The lowest levels were observed in infants (aged 3 to 16 months,  $d = 0.11$ ) and school age children (aged 84 to 106 months,  $d = 0.09$ ), as illustrated by Figure 1, whereas a peak was noted for preschoolers (aged 39 to 59 months,  $d = 1.17$ ). This finding is consistent with results from 3 studies of preschoolers showing high cortisol levels at daycare (15,23,24). However, in terms of cortisol rise at home on nondaycare days, 2 studies reported no age difference (14,16). Thus children's age may be one of the factors contributing to the heterogeneity of the effect sizes that relate change in cortisol to daycare attendance.

### Individual Characteristics

Several studies highlight the importance of peer relationships, showing that less socially competent children exhibit larger

increases in cortisol in peer group situations (33,34). The studies conducted in daycare settings also revealed a small association between difficult temperament and rise in cortisol at daycare ( $d = 0.29$ ,  $n = 24$ ) (Table 2). However, larger effect sizes were observed among specific individual characteristics that affect peer acceptance or are related to negative social interactions (35,36). For instance, highly aggressive ( $d = 0.72$ ) (14), socially fearful ( $d = 0.90$ ) (16), or emotionally negative ( $d = 1.39$ ) (15) children were more likely to have elevated cortisol levels at daycare. Children's individual characteristics also differ according to sex. For boys, anxiety, ( $d = 0.80$ ) (23), surgency (impulsivity) ( $d = 0.98$ ), and negative affectivity (that is, shyness, sadness, or anger) ( $d = 0.56$ ) (14) were associated with high cortisol levels in daycare, whereas, for girls only, decreasing effortful control (inhibitory control) ( $d = -0.53$ ) (14) was associated with a rising pattern of cortisol. Individual characteristics were not related to cortisol concentration at home (15,16). These studies highlight individual factors that may put some children at risk for higher cortisol levels during daycare.

### Discussion

The aim of this review is to examine the effect of daycare experiences as a source of children's stress and to identify the conditions under which daycare may be stressful or beneficial. To do so, we reviewed studies that compared children's cortisol levels at daycare with those at home, cortisol levels of children attending daycares of varying quality, cortisol levels among children of different ages, and cortisol levels among children with different temperaments. From this review, one may draw 4 broad conclusions:

1. The results clearly demonstrate that children exhibit a different pattern of diurnal cortisol secretion at daycare, compared with when they are at home. Cortisol levels increased during the daycare day, whereas they decreased when children stayed at home. However, substantial variability among effect sizes suggested that other factors, such as daycare quality, may explain this association.
2. The most important finding of this review is that daycare quality was negatively related to change in cortisol. This suggests that diurnal cortisol increase is attenuated by high-quality daycare and exacerbated by lower-quality daycare. In turn, high-quality daycare settings promote social adaptation (37) and better cognitive performance among children (5). Lower-quality daycare, however, may put children's psychosocial and cognitive development at risk (38, 39). The literature is limited by the fact that studies are largely focused on daycare that is of objectively adequate to excellent quality. Therefore, we do not know how children respond physiologically to low-quality daycare (16).
3. The developmental pattern of diurnal cortisol increases appeared to be quadratic, that is, it was most marked among preschoolers, compared with infants or school-aged children. However, we note that the studies to date that examined the associations between age and cortisol in daycare were cross-sectional and assessed cortisol at one time among children of different ages. Thus it is unclear whether the cross-sectional age changes are a reflection of age or of social experience in daycare (16). Longitudinal follow-ups with cortisol assessments repeated over several years are needed to understand the associations between age and diurnal cortisol patterns.

Nonetheless, the cross-sectional results indicate that infants were not physiologically affected by daycare experience. Indeed, infants and preschool children differed in their ability to relate to peers in groups (36). Watanabe and colleagues observed very little peer play in the infant daycare classrooms and a higher amount of peer play among the older children (16). Because infants are less socially solicited in daycare, it is not surprising that their cortisol levels remained stable. Conversely, results showed that school-aged children were less likely to exhibit a rising pattern of cortisol at daycare. Compared with preschoolers, school-aged children may have more mature social skills, greater capacity for self-control, and better understanding of social rules, which allow them to follow social rules and minimize conflicts with peers. Therefore, we

predict that the age-to-cortisol relation should be mediated by social competencies.

4. Perhaps most importantly for mental health, the results indicate that temperament may also moderate children's stress levels at daycare. Difficult children were more likely to exhibit cortisol increases at daycare than children who were not difficult. Several studies demonstrate the importance of child temperament, regardless of adaptation to daycare, which indicates that some children may find it hard to be separated from their mothers and to cope adequately in daycare because of their difficult temperaments (40). Daycare experiences may also be particularly physiologically challenging for children who tend to be rejected by their peers, who are less socially competent, and who are more likely to be implicated in negative interactions with peers. Consistent with this view, Gunnar and others showed that a small group of children who maintained high cortisol levels over the years tended to be rejected by their peers (21). Further, results showed that difficult boys may be more vulnerable to psychosocial stress in daycare than difficult girls. Indeed, some studies suggest that boys could be more adversely affected by daycare attendance than girls (2).

#### ***Prevention of Mental Health Problems***

The individual characteristics related to cortisol increases at daycare that are reviewed above are also related to mental health (36). Our review thus suggests that daycare attendance may exacerbate risks to mental health through chronic atypical cortisol elevation for children in low-quality daycare conditions and for children with certain individual characteristics (for example, difficult temperament). Programs aimed at improving the quality of daycare services during the preschool years are expected to lead to better physiological adaptation to daycare and to reduce the risks of mental health problems.

#### ***Limitations***

Effect sizes from daycare and stress studies may be biased because children were not randomly assigned to various daycare conditions. There is evidence that the extent to which families make use of daycare is influenced by family characteristics. Prenatal risk factors such as low income and low education are the most important selection factors. Children from families with low socioeconomic status are less likely than those from families with middle or high socioeconomic status to be in high-quality daycare (41). Further, at-risk children may exhibit higher cortisol levels than those who are not at risk. (42,43). If selection factors are not controlled, it may not be possible to separate the effects of daycare from those of family factors. In most of the daycare and stress studies to

date, social selection factors were not carefully controlled (14–16,24–26) and most of the children were from families with high socioeconomic status (14,15). Future studies should control for the social selection factors that will likely operate in their samples (for example, by using experimental design) and should select participants from a broader socioeconomic range.

## Conclusion

Further studies examining the conditions under which daycare attendance influences children's levels of stress are needed. This is especially important in the context of governmental investments in universal daycare services. Such studies could help design services adapted to children's needs and, eventually, help design prevention services better suited to vulnerable children. Future studies should use a longitudinal design to examine the long-term effects of daycare stress on adaptation. They should also control for key confounds and cover the entire range of daycare quality as well as the entire socioeconomic gradient. In the interim, practices could be more broadly updated to address children's personal vulnerabilities as a function of their developmental stage, their family risk factors, and the daycare environment.

## Funding and Support

This research was supported by a doctoral award from the Social Sciences and Humanities Research Council of Canada (SSHRC) to Marie-Claude Geoffroy, by SSHRC grant number 410-2004-2206 to Sylvana M Côté, and by a Research Scientist award from the Fonds de recherche en santé du Québec to Jean Richard Séguin.

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Manuscript received October 2005, revised, and accepted April 2006.

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### **Résumé : La fréquentation de la garderie, le stress et la santé mentale**

**Objectifs :** Le stress des garderies peut être indiqué par le cortisol, et des taux élevés de cortisol sont impliqués dans l'apparition et le développement de troubles de santé mentale. Nos objectifs étaient de quantifier les associations entre la garderie et le cortisol, et d'identifier les conditions individuelles et environnementales dans lesquelles la fréquentation de la garderie est associée avec les concentrations de cortisol.

**Méthodes :** Nous avons utilisé des statistiques de la taille de l'effet Cohen pour quantifier ces associations et les comparer avec 11 études publiées qui ont été repérées dans MEDLINE et PsycINFO.

**Résultats :** Les niveaux de cortisol augmentaient durant la journée à la garderie, tandis qu'ils diminuaient quand les enfants restaient à la maison. La taille de l'effet moyenne était  $d = 0,72$ . L'ampleur de la relation garderie-stress semblait varier dans 3 conditions spécifiques. Premièrement, la taille de l'effet était plus importante pour les enfants en garderie de faible qualité ( $d = 1,15$ ), alors qu'il y avait essentiellement peu ou pas d'effet pour les enfants en garderie de grande qualité ( $d = 0,10$ ). Deuxièmement, la taille de l'effet était plus importante pour les enfants d'âge préscolaire (âgés de 39 à 59 mois) ( $d = 1,17$ ) que pour les bébés (âgés de 3 à 16 mois) ( $d = 0,11$ ) ou les enfants d'âge scolaire (âgés de 84 à 106 mois) ( $d = 0,09$ ). Troisièmement, les enfants ayant des tempéraments difficiles à la garderie étaient plus susceptibles de présenter un modèle de cortisol à la hausse, comparés aux enfants qui n'étaient pas difficiles.

**Conclusions :** Notre étude suggère que la fréquentation de la garderie dans des conditions de qualité relativement faible et pour les enfants de tempérament difficile peut entraîner une hausse du cortisol atypique. Bien que le lien entre une hausse atypique du cortisol et la santé mentale exige davantage de recherche, les programmes destinés à améliorer la qualité des services de garde d'enfants durant les années préscolaires sont censés amener une meilleure adaptation psychologique à la garderie et réduire les risques de problèmes de santé mentale.