



Parenting stress and salivary cortisol in parents of children with autism spectrum disorder: Longitudinal variations in the context of a service dog's presence in the family



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ABSTRACT

A significant portion of parents of children with autism spectrum disorder report high levels of stress related to parenting responsibilities, which have been linked to abnormal cortisol patterns. This study seeks to better understand the parents' adaptation to caregiving demands and use of a service dog, by taking into account longitudinal variations in salivary cortisol and perception of parental stress. Salivary cortisol was collected one day per week for 15 weeks by 98 primary caregivers of children with ASD. Overall, parents perceived high levels of stress at baseline. Mean morning cortisol increase was below expected levels for healthy adults, and perception of stress predicted morning cortisol activity. Hypocortisolism related to chronic stress may be present in parents of children with ASD. Longitudinal analysis revealed that the presence of a service dog in the family had an effect on parenting stress, waking and morning cortisol levels.

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1. Introduction

Many parents of children diagnosed with autism spectrum disorder (ASD) report a considerable number of stressors related to their parental responsibilities. Obtaining a diagnosis, managing behavioral difficulties, the unpredictability and heterogeneity of these difficulties, meeting challenges associated with chronological and developmental ages, as well as obtaining services and treatment are some of the many challenges faced by parents on

a daily basis to meet their child's needs (Dykens & Lambert, 2013; Hecimovic & Gregory, 2005; Higgins, Bailey, & Pearce, 2005). These challenges can lead to a significant impact on the daily functioning of the family unit and to parents experiencing significant stress (Barker, Greenberg, Seltzer, & Almeida, 2012; Foody, James, & Leader, 2014; Seltzer et al., 2009). Parents of children with ASD report higher levels of fatigue and negative affect in comparison to mothers of typically developing children (Smith et al., 2010). Prior to entering an early intervention inclusion program, nearly 60% of mothers of young children with ASD reported significantly high levels of parenting stress related to the child's characteristics compared to a control group of mothers of typically developing children, of which only 17% expressed high levels of stress (Baker-Ericzén, Brookman-Frazee, & Stahmer, 2005). The experience of stress can possibly increase the risk of feeling a lack of parenting effectiveness, thus leading to poor mental health (Kuhn & Carter, 2006; Noh, Dumas, Wolf, & Fisman, 1989) and fatigue (Seymour, Wood, Giallo, & Jellett, 2013).

The issue of stress experienced by parents of children diagnosed with ASD is well documented. However, it has mainly been addressed on the basis of studies using a methodology probing the

Abbreviations: ASD, Autism Spectrum Disorder (including autism or autistic disorder, Asperger's Syndrome, Pervasive Developmental Disorder Not Otherwise Specified); CAR, Cortisol awakening response; CARS, Childhood Autism Rating Scale; EXP, experimental; HPA, Hypothalamic-pituitary-adrenal; PSI-SF, Parental stress index, short-form; PCDI, Parent-Child Dysfunctional Interaction; PD, Parental Distress; DC, Difficult Child; PDD-NOS, pervasive developmental disorder not otherwise specified; WLC, waitlist control.

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perception of stress from a psychological point of view. It is novel for studies to refer to physiological biomarkers such as cortisol, in conjunction with the subjective assessment of stress in parents of children with ASD (see Foody et al., 2014; Lovell, Moss, & Wetherell, 2012; Riuiz-Robledillo et al., 2014; Seltzer et al., 2009). The study of cortisol offers the potential to investigate the physiological mechanisms involved when the individual perceives a stressor in its environment. This biomarker can also provide an overview of the mechanisms by which caregiving stress affects health and well-being (Barker et al., 2012; Seltzer et al., 2009). Among the hormones released as part of this mechanism, cortisol has received considerable attention, mainly because it offers the possibility to measure the temporal and individual variations in a more meaningful and natural context (Kirschbaum & Hellhammer, 1989). In addition to being an index of physiological reactivity to cope with stress, cortisol also provides an overview of the individual's sleep-wake cycle. In healthy adults, cortisol secretion follows a circadian rhythm in which its rate gradually increases a few hours before waking and reaches its maximum 30 to 45 minutes after waking, a phenomenon named the cortisol awakening response (CAR). Cortisol secretion decreases during the course of the morning and further declines in the afternoon, reaching its lowest rate in the evening (Kirschbaum & Hellhammer, 1989). The CAR may play a crucial role in mobilizing energy during the transition from sleep to wakefulness and readiness of the organism to meet future demands later in the day (Clow, Thorn, Evans, & Hucklebridge, 2004; Fries, Dettenborn, & Kirschbaum, 2009). Thus, increasing cortisol reactivity associated with stress protects the body and promotes homeostasis by adaptive physiological responses. This hypothalamic-pituitary-adrenal (HPA) axis activation following exposure to stress is adaptive in the short term, but may become ineffective if the systems are stressed repeatedly or chronically or if they fail to stop when the threat no longer exists in the environment (McEwen, 1998). In the short term, these changes allow the body to meet the immediate challenge, but chronic stress and persistent activation of the HPA axis may have adverse effects on health and welfare, such as the dysregulation of certain immune responses and poor cognitive performance (Lupien, McEwen, Gunnar, & Heim, 2009). Chronic stress is the result of harmful or threatening, but stable, living conditions and may arise from stressful responsibilities related to work and family, amongst others factors (Lazarus, 1999).

In support of the early hypothesis suggesting that the presence of a pet is likely to help children overcome difficult times (Beck & Katcher, 1984), a recent study showed that cortisol levels in children were significantly lower in the presence of a dog as a form of support during a stressful task as opposed to a toy dog or a friendly adult (Beetz, Julius, Turner, & Kotrschal, 2012). These results are consistent with those presented in previous work (Viau et al., 2010) in which children with ASD had a significantly diminished CAR once a service dog was permanently living in the child's environment. Cortisol levels returned to their high initial values once the dogs were removed, four weeks after their arrival (Viau et al., 2010). It is possible that the service dog, by being a calm and soothing presence, made daily stressful situations less threatening to the child. It was suggested that a family facing difficulties, such as the experience of a chronic disease by one of its members, might seek the affection and distraction that a pet provides as an adaptation strategy (Cox, 1993). It is also assumed that the pet acts as a "social facilitator" as it promotes positive interactions between individuals (Berry et al., 2012; Guéguen & Ciccotti, 2008; McNicholas & Collis, 2000; Messent, 1985; Triebenbacher, 2000). It was thus conceivable that the use of a well-trained service dog would likely have a positive impact on children with ASD by contributing to the stimulation of positive social interactions between the child and members of his or her social environment (Burrows, Adams, & Spiers, 2008; Martin & Farnum, 2002; Redeker & Goodman, 1989), and by dimin-

ishing the perceived threat in otherwise stressful situations (Barker, Knisely, McCain, Schubert, & Pandurangi, 2010; Beetz et al., 2012).

In a qualitative study, several parents of children with ASD reported that the daily stress related to parenting decreased once a service dog was present (Burrow et al., 2008). It is possible that the presence of the dog encouraged the family to follow a daily routine more typical of an average family in addition to providing support to the parents. For example, during outings in public places, some parents no longer felt the pressure and stress exerted by the perceived expectations and concerns of others. There were, however, some disadvantages related to the presence of a service dog in the family; namely, maintaining the dog's training added to an ever-growing list of parenting tasks. In addition, parents who had unrealistic expectations of the service dog's effect did not perceive positive benefits from this method of intervention (Burrow et al., 2008). In sum, this qualitative study provides relevant lines of inquiry by highlighting the importance of focusing on the family context in the study of the effectiveness of an intervention based on the use of a service dog by the parents.

Based on the positive impact that a service dog may have on the child and his/her parents, the concomitant examination of biomarkers and psychosocial stress during this intervention offers a comprehensive model of stress regulation. The use of a homogeneous group of service dogs such as those offered by the Mira Foundation, provided a consistent intervention for each child and their family, paired with the opportunity to better identify their impact on parental stress. Prior to the analysis of the impact of the service dog on parents of children with ASD, it was essential to document the parents' daily profile of salivary cortisol and perceived stress. The present study aimed to describe diurnal cortisol activity and perceived stress by the parents before and during the service dog's presence in the family. Given the chronicity of the parental task of raising a child with ASD (Barker et al., 2012; Dykens & Lambert, 2013; Foody et al., 2014; Seltzer et al., 2010), the following hypotheses were made. First, we anticipated finding a blunted morning cortisol response, characteristic of persistent, chronic stress, which would result in a flat diurnal profile at baseline. Second, we expected that perception of stress would predict cortisol values (Lovell, Moss, & Wetherell, 2013). Finally, we sought to determine the temporal evolution of cortisol activity during 15 consecutive weeks. This offered an opportunity to identify two components: the temporal stability of individual variations and the effect associated with the service dog's presence based on the trend of cortisol regulation. We expected to find differences in cortisol responses and perception of parental stress between the experimental and control groups once the dog was present in the family.

2. Methods

2.1. Participants

The families recruited for this study had a child aged between five and ten years old, diagnosed with ASD by independent teams of physicians and professionals based on DSM-IV criteria. Exclusion criteria for participation included families struggling with dog allergies, the presence of a pet dog, or a situation in which participants took steroid-based medication that alters glucocorticoids regulation (e.g., pharmaceutical treatment of asthma). In addition, families had to confirm that as per the requirements of the Mira Foundation, the service dog would not be left alone for more than four hours per day.

A total of 114 children diagnosed with ASD and their families participated in the study between 2006 and 2009. Upon reception of the participation request and validation of inclusion criteria, families were randomly distributed between the eight experimental

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