



Emotional eating is related with temperament but not with stress biomarkers in preschool children



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ABSTRACT

Emotional eating (EE) corresponds to a change in eating behavior in response to distress and results in an increase of food intake (overeating (EOE)) or in food avoidance (undereating (EUE)). EE has been related to temperament (i.e. negative emotionality) and dysregulated stress biomarkers in school-aged children; parenting has been understood to influence this relationship in older children. The aim of the study was to investigate to which extent stress biomarkers and negative emotionality are related to EE and to understand the role of parenting in this relationship. The sample consisted of 271 children aged 2–6 years of the Swiss cohort study SPLASHY. We assessed the child's EE, negative emotionality and parenting by parent based reports. Salivary samples were collected over two days to analyze cortisol and salivary alpha-amylase levels. From the whole sample of children, 1.1% showed EOE and 32.9% EUE. Negative emotionality was related to EOE and EUE (0.13 (CI 0.06, 0.21), $p < 0.001$; 0.25 (CI 0.14, 0.35), $p < 0.001$). There was no relationship between stress biomarkers and EE and parenting had any moderating role (all $p > 0.05$). Similar to a Danish study, parents reported more often EUE than EOE of their child. Both are related to the temperament. Even though the course of EE has not yet been well documented, we conclude that a certain subgroup of children with difficult temperament could be at-risk for eat and weight regulation problems in later childhood.

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1. Introduction

Emotional eating is defined as dysfunctional coping with stressful events and can result in either increased food intake or in food avoidance. It corresponds to a change in eating behavior in response to negative emotional stimuli and distress (Wardle, Guthrie, Sanderson, & Rapoport, 2001). There is evidence that about 3.2–63% of children or adolescents show signs of emotional overeating (EOE). This broad range of prevalences can be explained by methodological differences within the different studies. For example, an American study interviewed children and adolescents from 5 up to 13 years on emotional eating. They reported that 63%

of the participants affirmed the question ‘Do you ever eat because you feel bad, sad, bored, or any other mood?’ (Shapiro et al., 2007). Another US study found prevalences of 27% for emotional disinhibition (which is corresponding with increases in appetite in different emotional states) in 197 girls aged 4–6 years (Carper, Orlet Fisher, & Birch, 2000). Carper and colleagues used a child-based, age-adapted assessment (i.e. age-adapted version of the Dutch Eating Behavior Questionnaire DEBQ) (Carper et al., 2000) whereas another age-adapted version of the same questionnaire revealed prevalences of 28.8–30.4% in a European school-aged sample of children and adolescents with severe obesity who are seeking treatment (Halberstadt et al., 2016). In contrast to these child based assessments, parent-based assessment revealed clearly lower prevalences. Within the Danish population based study of 1327 children aged 5–7 years (Micali et al., 2011) only 3.2% showed emotional overeating when using a well-validated questionnaire (i.e. Child Eating Behavior Questionnaire CEBQ (Wardle et al., 2001)). To our knowledge, there is no other parent assessed prevalence data and no data of any other European country and further no data on younger children at preschool age.

The fact that data in young children is missing is even more important as EOE is characterized by a loss of control over eating, the tendency to eat in absence of hunger and the risk of continuous weight gain (Goossens, Braet, Van Vlierberghe, & Mels, 2009; Koenders & van Strien, 2011; Moens & Braet, 2007; van Strien, Herman, & Verheijden, 2012). Emotional overeaters at the age of early adulthood are known to increase the amount of food consumption under stress conditions (van Strien et al., 2012) and to eat more high-caloric and sweet food such as chips, cake or ice-cream under emotional distress within adolescence (Nguyen-Michel, Unger, & Spruijt-Metz, 2007; van Strien, Roelofs, & de Weerth, 2013). EOE in adolescence has further been shown to be associated with symptoms of loss of control of eating (LOC) and binge eating disorder (BED) in adolescents (Stice, Presnell, & Spangler, 2002).

In contrast to overeating as a stress response, approximately 30% of adults report a reduction of food intake (Epel, Lapidus, McEwen, & Brownell, 2001). This reduced food intake under emotional conditions is defined as emotional *undereating* (EUE) and is part of the food avoidant behavior that is described together with an elevated sensitivity to internal cues of satiety (Wardle, Guthrie, Sanderson, & Rapoport, 2001). The Danish population based study of Micali et al. (2011) which had been described above further assessed EUE by the well-validated Child Eating Behavior Questionnaire CEBQ (Wardle, Guthrie, Sanderson, & Rapoport, 2001; Carnell & Wardle, 2007). Parents were asked to provide information on EUE and EOE, but the questionnaire CEBQ does not provide any cut-off values and therefore in this Danish study, EUE and EOE were both defined as present if parents scored the child's EOE or EUE as “present at least sometimes”. About 26% of the 1327 parents reported that their child aged 5–7 years shows EUE (Micali et al., 2011). Due to the fact that EUE would rather be expected to be associated with increased weight conditions, astonishingly EUE has been observed in children with very high and very low BMI (Webber, Hill, Saxton, Van Jaarsveld, & Wardle, 2009) and has also been related to feeding problems and low growth during the first year assessed in children aged 5–7 years (Micali, Rask, Olsen, & Skovgaard, 2016). Nevertheless, probably due to the idea that EUE represents a more natural response to stress as animal studies have revealed that stress conditions provoke food avoidance (Sominsky & Spencer, 2014), previous research has so far not focused on EUE. Up to now, data on the course of EUE are lacking and it remains open whether EOE and EUE are triggered by similar conditions.

Eating behavior is influenced by chronic stress conditions through biological pathways. Chronic stress provokes a change in physiological stress biomarkers and can result as altered or reduced

hypothalamic-pituitary-adrenal (HPA) regulation with typically increased or low morning cortisol levels and steeper or flattened diurnal rhythms (also known as cortisol slopes) (Gunnar & Vazquez, 2001). This adjustment of the stress biomarkers is a result of chronic stress exposure and has been understood as an adaptation of the HPA axis under a prolonged and repeated HPA activation also known as hypocortisolism (Heim, Ehlert, & Hellhammer, 2000). The HPA axis and the autonomic nervous system (ANS) are the two main components of the biological stress response, involving the secretion of glucocorticoids (e.g., cortisol), the activation of the sympathetic branch of the ANS and the release of salivary alpha-amylase. Cortisol and alpha-amylase both underlie a strong autonomous circadian diurnal pattern with opposed patterns. Cortisol shows a typical peak in the early morning, around 30 min after waking up, a steadily decrease throughout the day and reaches its nadir in the first hours after the sleep onset. Salivary alpha-amylase shows a decrease over the first 30 min after waking up and a consistent increase throughout the day.

In animal studies, HPA activation has been found to influence eating behavior (Ulrich-Lai, Fulton, Wilson, Petrovich, & Rinaman, 2015) through the release of corticotropin-releasing hormone and urocortin who suppress grehlin secretion (i.e. known to stimulate appetite) and act on different receptors in the hypothalamus which together reduce food intake (Sominsky & Spencer, 2014). In humans, the release of cortisol increases the appetite and shifts nutritional behavior towards the choice of high-fat and sweet food in most cases (Epel et al., 2001; Tomiyama, Dallman, & Epel, 2011), which in return results in a short-term reduction of stress perception via a dampening of the stress biomarkers (Dallman et al., 2003). Chronic stress exposure and dysregulated stress biomarkers might result in EOE unrelated to hunger- or satiety responses but triggered by emotional cues. Previous investigations in children at school age supported this idea. EOE was related to high levels of stress experiences (i.e. daily hassles and negative life events during the last 6 months) in children aged 5–12 years when EOE was assessed by an age-adapted version of the DEBQ (Michels, Sioen, Braet, et al., 2012), and a greater energy intake in absence of hunger has been associated with dysregulated biological stress biomarkers in children aged 5–9 years (Francis, Granger, & Susman, 2013), but EOE was not assessed in this latter study (n = 43). Whether the same patterns can be found in children at preschool age which is a sensitive period for the development of biological stress biomarkers and self-regulation strategies within childhood remains open. Furthermore, research on the relationship of diurnal stress patterns and emotional eating in children at preschool age is scarce and the only study which investigated this association reported significant findings for lower morning cortisol levels with EOE in children at preschool age (Lumeng et al., 2014). However, the existence of a similar relationship with EUE has not been investigated yet, nor has any study focused on the role of both main components of biological stress biomarkers (including cortisol and salivary alpha-amylase levels) which are both known to be related to body weight in children (Gunnar & Quevedo, 2007; Miller et al., 2013). In addition, appropriate self-assessment of emotional eating for children at preschool age might be difficult due to limited introspection and limited self-awareness capacity at that age (Stegge & Terwogt, 2007).

According to psychological theories, the child's ability to adjust to new or stressful conditions is influenced by family factors and the child's temperament. Temperament has been conceptualized as a psychobiological construct, describing the child's approaching and avoidance behavior as well as its reactivity to strains and demands (Boyce, Barr, & Zeltzer, 1992). In detail, high levels of negative emotionality as a correlate of temperament describe high sensitivity to environmental experiences and to stress. Children

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