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## Cause or consequence? Investigating attention bias and self-regulation skills in children at risk for obesity



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### ABSTRACT

Impaired self-regulation, especially in food-specific situations, has been linked to childhood obesity. These deficits may be acquired during the development of obesity rather than being a prerequisite thereof. The current study, hence, focused on an at-risk population versus controls. Normal-weight children of obese and normal-weight parents were tested regarding attentional flexibility, emotion regulation, and inhibitory control. A sample of 50 preschoolers of obese parents ( $n = 25$ ) or normal-weight parents ( $n = 25$ ) participated in this study. Through eye-tracking, attentional bias for food cues was measured during a visual probe task using food and toy images. Emotion regulation was assessed during a distress-evoking task, and inhibitory control was examined through a delay-of-gratification task. Both tasks are standardized and were conducted in non-food contexts. Results showed no significant group differences in overall attentional bias to food images over toy images. However, children of normal-weight parents showed a preference for toy images. Regarding emotion regulation, children in the risk group expressed significantly less overall emotional distress. In addition, less gaze aversion and bodily sadness could be observed in this group. No differences were found for

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inhibitory control. Findings suggest that general deficits in self-regulation are not yet present in normal-weight children at risk for obesity. Instead, they might develop as a by-product of unhealthy weight gain. Results indicate, however, that children of obese parents are less emotionally expressive compared with children of normal-weight parents. Furthermore, children of normal-weight parents appeared to be more interested in toy images than in food images.

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## Introduction

Obesity has been named an epidemic, affecting children and adults alike. Especially in children and adolescents, prevalence has increased substantially over the last decades. In 2013, approximately 23% of children in developed countries were estimated to be overweight or obese (Ng et al., 2014). Furthermore, 43% of children with obesity persist to be obese as adults, and 29% become overweight (Lee, 2009; Maffeis et al., 2002). Thus, childhood obesity not only presents an immediate burden on health and well-being but also needs to be considered for its long-term consequences. This in combination with the lack of established successful obesity therapies highlights the need for prevention at an early age (Peirson et al., 2015).

To prevent unhealthy weight gain, it is of great importance to gain a better understanding of factors contributing to it. In general, a lot of research has focused on hereditary factors, finding a strong link between parental and childhood obesity (Francis, Ventura, Marini, & Birch, 2007; Parsons, Power, Logan, & Summerbell, 1999). Twin and adoption studies further support the notion of body fat mass being a heritable trait (Bell, Walley, & Froguel, 2005; Farooqi & O'Rahilly, 2006; Hebebrand, Friedel, Schauble, Geller, & Hinney, 2003; Stunkard et al., 1986), indicating that parental obesity is one of the main predictors for childhood obesity. However, other important risk factors for the development of overweight have been identified, including environmental, societal, and individual characteristics (Graziano, Calkins, & Keane, 2010; Parsons et al., 1999; Wardle, Guthrie, Sanderson, Birch, & Plomin, 2001).

In terms of individual characteristics, evidence has been found that children with lower self-regulation are at a higher risk for becoming overweight and obese (Anderson & Keim, 2016; Francis & Susman, 2009; Graziano et al., 2010). As our environment shifted in a way that promotes overeating and unhealthier lifestyles (Hill, Wyatt, Reed, & Peters, 2003), differences in individual self-regulation could serve as decisive factors in the development of healthy eating behavior. Self-regulation in obesity, however, is still an emerging research area, and the role of individual characteristics in weight development needs to be investigated more strongly. In this study, therefore, we investigated self-regulation skills that have been found to influence eating behavior and have been linked to the development of obesity—attentional flexibility, emotion regulation, and inhibitory control (Bennett, Greene, & Schwartz-Barcott, 2013; Castellanos et al., 2009; Graziano et al., 2010).

Attentional flexibility constitutes an important aspect of self-regulation in the context of obesity in both children and adults. Visual food cues interact with the brain's reward system, direct attention, and trigger motivated behavior (Castellanos et al., 2009). Using various measures, attention bias for food cues has been found in obese adults, reflecting an increased incentive and motivational salience (Castellanos et al., 2009; Kemps, Tiggemann, & Hollitt, 2014; Nijs, Franken, & Muris, 2010; Werthmann et al., 2011), indicating preferential processing. Considering the constant presence of food cues in our environment, this might increase the risk of eating beyond satiety or in the absence of hunger. Research to date, however, has produced inconsistent findings. Some studies found evidence for altered visual food processing in overweight/obese children (Braet & Crombez, 2003; Graziano et al., 2010), whereas other studies reported no differences between lean and overweight or obese children regarding attention bias to food (Soetens & Braet, 2007; Werthmann et al., 2015). In adults,

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