



Emotion regulation, emotional eating and the energy-rich dietary pattern. A population-based study in Chinese adolescents



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ABSTRACT

Research investigating the influence of emotion regulation (ER) strategies on emotional eating and diet among Chinese adolescents is scarce. The aim of this study was to test associations between two ER strategies (suppression/cognitive reappraisal), emotional eating, and an energy-rich dietary pattern. A total of 4316 adolescents from 10 high schools were surveyed. Dietary patterns were derived using factor analysis. Bivariate correlations were analyzed to examine associations between ER strategies, emotional eating behavior and an energy-rich dietary pattern, by gender. The mediating effect of emotional eating in the relationship between ER and energy-rich food consumption by gender was estimated using structural equation modeling. A higher level of suppression, but no lack of cognitive reappraisal, was associated with emotional eating in boys and girls. A higher level of suppression and lack of cognitive reappraisal were associated with a greater intake of energy-rich foods in girls only. Emotional eating mediated the relationship between a higher level of suppression and a greater intake of energy-rich food in girls. This study revealed significant associations between two ER strategies and an energy-rich dietary pattern in girls, and provided evidence that higher levels of suppression may put girls at risk for emotional eating, potentially affecting the energy-rich dietary pattern.

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1. Introduction

The food environment has changed dramatically, with an influx of hyperpalatable foods engineered in ways that appear to get the better of the rewarding properties of traditional foods (e.g., vegetables, fruits, whole grains) by increasing fat, sugar, salt, flavors, food additives, and energy to high levels (Nielsen & Popkin, 2003). Many developing countries, including China, are faced with the challenge of overconsumption of high-kilojoule, low-nutrient foods, due in part to changes in global food production (Irizarry et al., 2010). This unhealthy dietary pattern is related to unfavorable outcomes, such as obesity in genetically at-risk groups (Lake & Townshend, 2006). Because many children and adolescents maintain a healthy weight in the current “obesogenic” environment, some researchers, especially those investigating children and adolescents, have emphasized the influence of self-regulation skills in obesity (Duckworth, Tsukayama, & Geier, 2010; Evans, Fuller-

Rowell, & Doan, 2012; Francis & Susman, 2009; Seeyave et al., 2009; Tsukayama et al., 2010) and obesity-related dietary intake (Frankel et al., 2012; French et al., 2012) in the Western society. The assumption is that individual differences in self-regulation (e.g., self-control, delay of gratification) may be one factor that contributes to lower kilojoule consumption despite significant environmental pressure to overconsume. However, the concept of self-regulation is closely related to the behavioral aspects of self-regulation. A broad, generalized aspect of self-regulation (i.e., not just behavioral), emotion regulation (ER), appears to be a primary self-regulation skill (Tice, 2000). Studies have extended previous findings by documenting the association between obesity (Graziano, Calkins, & Keane, 2010) and obesity-related dietary pattern (Gerrits et al., 2010; Wills et al., 2007; Isasi, Ostrovsky, & Wills et al., 2013), and deficits in ER.

Broadly speaking, ER refers to the conscious or unconscious attempt of an individual to modify the magnitude and/or type of emotional experience or the event itself, in response to emotion-eliciting events (Campbell-Sills & Barlow, 2007; Thompson, 1991). Adaptive ER may increase general feelings of efficacy, which could lead, in turn, to healthier lifestyle (e.g., healthy dietary pattern or

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increased physical activity) (Wills, Pokhrel, Morehouse, & Fenster, 2011). Maladaptive ER, on the other hand, may be associated with an increased vulnerability to negative emotions (reviewed by Aldao, Nolen-Hoeksema, & Schweizer, 2010) where food is used to cope with negative emotions, a response known as emotional eating (Adam & Epel, 2007; Dallman et al., 2003; Loxton, Dawe, & Cahill, 2011; Michels et al., 2012). An often-mentioned explanation for emotional eating is that it is a consequence of the inability to regulate emotion effectively in response to emotional events where food is used to reduce negative emotions (Heatherton, & Herman, 1991). In particular, it has been suggested that emotional eating increases the consumption of high fat, sweet and energy-rich food in adults (Konttinen et al., 2010; Nguyen-Michel et al., 2007) as well as in youth (Elfhag, Tholin, & Rasmussen, 2008; Michels et al., 2012; Goossens et al., 2009). Theoretically, emotional eating may serve to regulate emotion (Macht, 2008), however none of the above-mentioned studies examining the association between ER and an energy-rich dietary pattern included measures of emotional eating. Prior research has established a strong direct link between ER strategies and emotional eating in adult and child populations (Harrist et al., 2013; Spoor et al., 2007). For example, Spoor et al. (2007) indicated that, in adults, an inability to regulate emotional stress leads to maladaptive coping strategies such as emotional eating. Harris et al. (2013) found that dysregulated emotional expression or suppression in children was related to emotional eating. However, it remains unclear whether ER may contribute to emotional eating in adolescents.

ER can be understood as the process whereby we manage our own emotions (Koole, 2009). Two well examined processes or strategies in current literature are cognitive reappraisal and suppression, which were developed based on Gross's process model of emotion regulation (1998, 2001). Specifically, cognitive reappraisal, a prototypical adaptive ER strategy, entails changing the way in which a situation is construed with the aim of decreasing its emotional effect. It is regarded as an adaptive strategy because it reduces the negative experience that results from the emotion, without additional costs (Gross & John, 2003). A prototypical example of maladaptive ER is the suppression or inhibition of emotions (Gross & John, 2003), because these inhibit the expression of emotions but not the experience of them (Gross, 2002). The question of what consequences cognitive reappraisal and suppression was tested initially in a cross-sectional study (Gross & John, 2003) using undergraduate samples. Gross and John (2003) reported that individuals differ in their use of cognitive reappraisal and suppression, and that these differences relate in predictable ways to psychological functioning. Given that the physical and psychosocial transformations experienced during adolescence are accompanied by strong emotions (Michels et al., 2012) and many of the neural and cognitive systems thought to control emotion mature during this period (Goossens et al., 2009), ER has become an important topic for research into adolescence. Of note, some studies also examined the use of two strategies of ER based on Gross's (1998) process-oriented model in adolescent population, and showed that suppression and cognitive reappraisal would predict adolescents' psychological distress (Boyes, Hasking, & Martin, 2015; Zhao & Zhao, 2015). Moreover, Gullone, Hughes, King, and Tonge (2009) tested Gross's process model of ER in 9- to 15-year-old children and adolescents, and found suppression use was lower for older participants compared to their younger peers, and reappraisal use in older participants was stability over time. In this study, therefore, we focus on these two domains of ER, and investigate the relationship between ER strategy, emotional eating and an energy-rich dietary pattern in Chinese adolescents. Furthermore, the potentially mediating effect of emotional eating that could explain the relationship of emotion dysregulation with

the consumption of unhealthy energy-rich food, will be tested.

2. Methods

2.1. Participants

We utilized the baseline data from an ongoing 2-year longitudinal study in Xuzhou city in China, in order to assess the role of ER strategy in obesity and obesity-related behavior in urban adolescents. The study population comprised students aged 11–17 years at urban junior and high schools. Xuzhou is located in the northwest of Jiangsu Province, with a recorded history spanning 4000 years. With an area of 11 258 km², of which 963 km² constitutes the urban area, Xuzhou has a total population of over 8 million. Cross-sectional survey data were used to obtain a random sample of adolescents in the 7th and 10th grades in five junior high and five senior high schools, respectively, using multistage cluster sampling, in October 2013. Five districts in urban areas in Xuzhou were selected and one junior high and one senior high school in each district were randomly sampled. In each of the selected schools, all students in Grade 7 and Grade 10 were selected, a total of 5003 subjects (2171 boys and 2145 girls). Informed consent was obtained from all participants and their parents, and the research protocol was approved by the Ethics Committee of the Anhui Medical University.

2.2. Instruments

Anthropometric data were obtained concurrently, with weight and height measured by the department for elementary and middle school student health care, a government department that monitors student health in Xuzhou city through annual physical examination. Weight was measured to the nearest 0.1 kg using a standardized digital scale. Height was measured to the nearest 0.1 cm with a manual height board. Body mass index (BMI) was calculated by dividing the participant's weight in Kilograms by height in meters squared (kg/m²). Rather than using absolute BMI, we used a BMI z-score because doing so provided an indirect age- and sex-specific measure of relative adiposity (Must & Anderson, 2006). The self-administered questionnaires requested socio-demographic information, and information on emotional eating, emotion regulation (suppression and cognitive reappraisal), depressive symptoms and food consumption and are described further.

2.2.1. Emotion regulation questionnaire

The Emotion Regulation Questionnaire (Gross, 2002) was used to measure individual differences in the use of expressive suppression and cognitive reappraisal as ER strategies. It contains 10 items (e.g., "I control my emotions by not expressing them" to measure expressive suppression, and "I control my emotions by changing the way I think about the situation I'm in" to measure cognitive reappraisal) presented as statements, and participants indicate to what extent they agree on 7-point Likert scales ranging from 1 "strongly disagree" to 7 "strongly agree". The questionnaire shows good reliability, and both convergent and discriminant validity (Gross & John, 2003). Cronbach's alpha for the study was 0.82 for the suppression subscale and 0.85 for the cognitive reappraisal subscale.

2.2.2. Dietary assessment

Habitual dietary patterns were assessed by a comprehensive self-administered food frequency questionnaire (FFQ), which was designed to measure the dietary habits of adolescents. The number of times each food or food group was consumed per week was

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