



## Emotional psychopathology and increased adiposity: Follow-up study in adolescents



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### A B S T R A C T

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Based on data from a three-year longitudinal study, we assess the effect, according to gender, of emotional psychopathology in preadolescence on anthropometric and body composition parameters in adolescence ( $N = 229$ ). Psychopathology was assessed using the *Screen for Childhood Anxiety and Related Emotional Disorders*, the *Children's Depression Inventory* and the *MINI-International Neuropsychiatric Interview for Kids*. Body fat percentage (%BF), waist circumference (WC) and body mass index (BMI) were also determined. Following analysis with adjusted multiple regression models, the results indicated that symptoms of depression and separation anxiety were significantly associated with increased WC and BMI in boys, and that somatic symptoms were associated with increased WC and %BF in girls. Diagnosis of social phobia, panic disorder or dysthymia led to significantly increased WC and/or BMI in boys and dysthymia increased WC in girls. These findings suggest that emotional psychopathology in preadolescence is associated with increased weight gain and abdominal fat in adolescence.

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Overweight and obesity now affect 9–36% of the child and adolescent population in several developed and developing countries (Gupta, Goel, Shah, & Misra, 2012; Lobstein & Frelut, 2003; Ogden, Carroll, Kit, & Flegal, 2012; Valdes Pizarro & Royo-Bordonada, 2012). This pathology is associated with serious complications in childhood and adolescence and increased morbidity and mortality in adulthood. Overweight and obese children are also at risk of obesity in adulthood (Deckelbaum & Williams, 2001). Moreover, obesity is a chronic disease with a complex multifactorial nature. Numerous genetic and environmental factors have been found to contribute to the recent epidemic of obesity. Among these risk factors, psychological factors warrant particular attention.

Emotional psychopathology includes some of the most common psychiatric disorders among children and adolescents, such as depression or anxiety disorders (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Esbjorn, Hoeyer, Dyrborg, Leth, & Kendall, 2010). In adolescence, anxiety disorders are the most prevalent condition (31.4%), followed in third place by mood

*Abbreviations:* %BF, body fat percentage; WC, waist circumference; BMI, body mass index; BIA, bioelectrical impedance; CDI, Children's Depression Inventory; SCARED, Screen for Childhood Anxiety and Related Emotional Disorders; MINI-KID, Mini-International Neuropsychiatric Interview for Kids.

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disorders (14.3%) (Merikangas et al., 2010). In Spain, symptoms of depression and anxiety affect 9% and 47%, respectively, of the school population (Canals, Marti-Henneberg, Fernández-Ballart, & Domenèch, 1995; Romero Acosta et al., 2010). Emotional psychopathology often shows comorbidity with other psychological disorders and is related to other childhood complications such as physical dysfunction, substance abuse, suicide attempts and hospitalization. Furthermore, anxiety and depression in childhood may predict adult depression and anxiety disorders (Bittner et al., 2007; Canals, Domenech-Llaberia, Fernandez-Ballart, & Marti-Henneberg, 2002; Kendall, Flannery-Schroeder, & Webb, 2004).

Therefore, obesity and emotional psychopathology have become critical public health problems.

The relationship between emotional psychopathology and obesity is the subject of considerable debate, both in adults (Ahlberg et al., 2002; Carpenter, Hasin, Allison, & Faith, 2000; Garipey, Nitka, & Schmitz, 2010; Hach, Ruhl, Klotsche, Klose, & Jacobi, 2006; Needham, Epel, Adler, & Kiefe, 2010; Williams et al., 2009; Zhao et al., 2011) and in children and adolescents (Anderson et al., 2010; Duarte et al., 2010; Goodman & Whitaker, 2002; Hillman, Dorn, & Bin, 2010; Midei & Matthews, 2009; Rhew et al., 2008; Rofey et al., 2009; Tanofsky-Kraff et al., 2006). It has been suggested that early depression and/or anxiety may be predictive of obesity in adolescence (Anderson et al., 2010; Goodman & Whitaker, 2002; Hillman et al., 2010; Rofey et al., 2009) and in adulthood (Anderson, Cohen, Naumova, & Must, 2006; Vamosi, Heitman, & Kyvik, 2010). However, other authors have not observed this relationship (Duarte et al., 2010; Midei & Matthews, 2009; Rhew et al., 2008; Tanofsky-Kraff et al., 2006). Anderson et al. (2006) studied a community-based US cohort from childhood to adulthood and reported that anxiety and depression disorders were associated with higher weight status in females, whereas in males, depression was associated with lower BMI and childhood anxiety was not substantively associated with weight status. Similarly, among white adolescent girls studied over a two-year follow-up period, depression was related to a higher likelihood of obesity (Anderson et al., 2010). Goodman and Whitaker (2002) found that North American adolescents with symptoms of depression showed risk of obesity at 1-year follow-up in both genders. By contrast, among adolescents studied over a one-year follow-up period using height and weight measurements, depression was not associated with BMI in either gender (Rhew et al., 2008). According to a recent review, the relationship between psychological factors and obesity in children and adolescents has not been confirmed (Inclendon, Wake, & Hay, 2011).

Although body mass index (BMI) is the most common measurement of overweight, methods measuring excess fat and its abdominal distribution allow us to study more important cardiovascular risk factors. However, few pediatric studies examining the relationship between psychopathology and obesity have applied these methods (Hillman et al., 2010; Midei & Matthews, 2009; Tanofsky-Kraff et al., 2006).

The transition from childhood to adolescence is a critical period involving both psychological and physical maturation, and as such various symptoms and changes in body composition may be presented. Gender and age are key modulators of emotional psychopathology and obesity. On the one hand, girls are found to experience more emotional problems in adolescence than boys (Canals et al., 1995, 2002; Conley, Rudolph, & Bryant, 2012; Moksnes, Espnes, & Lillefjell, 2012); however, there is also evidence that overweight and obesity have become more prevalent in males during puberty (Serra-Majem, Ribas-Barba, et al., 2003).

To date, there have been few longitudinal studies in adolescents that examine the influence of depression and anxiety on adiposity according to gender. Furthermore, none of the studies carried out has used an accurate methodology to assess adiposity in a non-clinical adolescent population.

Given the limitations of current knowledge, we decided to assess the effect, according to gender, of emotional psychopathology in preadolescence on anthropometric and body composition parameters in adolescence. We hypothesized that emotional psychopathology at baseline would contribute significantly to adiposity gain at three-year follow-up in adolescents, and that this relationship would be different between males and females.

## Methods

### *Sample and study design*

A three-year longitudinal study was conducted of 229 schoolchildren of preadolescent to adolescent age. The participants were recruited from a three-phase epidemiological study of anxiety and depression disorders that was begun in 2007 in the town of Reus (Catalonia, Spain).

The baseline sample in the study was a group of 1514 schoolchildren (720 boys and 794 girls) with a mean age of 10.2 years old ( $SD = 1.2$ ) from 13 schools randomly chosen from the town's state schools and state-subsidized private schools. Screening questionnaires for anxiety and depression were used to select a sample at risk of emotional problems and a risk-free control sample. A child was considered to be at risk of emotional psychopathology if he/she had a score equal to or greater than 25 on the Screen for Children's Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997) and/or a score equal to or greater than 17 on Kovacs' (1985) Children's Depression Inventory (CDI). For the control group, one child without risk of emotional psychopathology (SCARED score below 25 and CDI score below 17) was selected for every three children at risk of emotional psychopathology, matching for age, gender and type of school. Therefore, in the second phase, the participants were 562 children (254 boys and 308 girls), of which 405 were at risk of an emotional disorder (235 at risk of anxiety disorder and 170 at risk of depressive disorder) and 157 were controls. The mean age was 11.2 years old ( $SD = 1.0$ ) (Romero Acosta et al., 2010; Vigil-Colet et al., 2009). At the follow-up three years after the baseline, all second-phase subjects were contacted. 245 adolescents (147 girls and 98 boys) agreed to participate, with a mean age of 13.5 years ( $SD = .9$ ). Sixteen subjects

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