

## Why obese children cannot resist food: The role of impulsivity

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### Abstract

Facing the undesirable health consequences of being obese, an important question is why some people are not able to resist eating to excess. It is theorized that increased impulsivity at least partly underlies the inability to control eating behaviour; being more impulsive is supposed to make it more difficult to resist food intake. Thirty-three obese children in a residential setting and 31 lean control children are tested. Impulsivity is measured with two behavioural measures (inhibitory control and sensitivity to reward) and questionnaires. Results show that the obese children in treatment were more sensitive to reward and showed less inhibitory control than normal weight children. In addition, the obese children with eating binges were more impulsive than the obese children without eating binges. Most interesting finding was that the children that were the least effective in inhibiting responses, lost less weight in the residential treatment program. To conclude: impulsivity is a personality characteristic that potentially has crucial consequences for the development and maintenance, as well as treatment of obesity.

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### 1. Introduction

Most parts of the world are nowadays characterised by food abundance, and the increased energy supply is closely associated with increasing BMIs. While our body is equipped for times of scarcity, we are constantly surrounded by plenty of fat, high caloric and tasty snacks. That is why, for many people, energy intake exceeds energy expenditure and the consequences are well known: the mean BMI of people in the Western European countries, Australia, USA and China increases rapidly (Silvertoinen et al., 2004). Although mean BMI of the populations increases, the dispersion is large: an increasing part of the population is overweight, obese or even morbid obese, while others stay lean. Yet within these societies, everyone is exposed to the same profusion of food, so an important question is why are there so many individual differences? Besides the influence of metabolism and build, behaviour has a large influence on the variation in body weight. Physical activity, watching television and a sedentary lifestyle are related to weight (Davison & Birch, 2004; Janssen, Katzmarzyk, Boyce, King, & Pickett, 2004). Furthermore, obese people are found to show a preference for energy dense, high-fat food (Schrauwen & Westerterp, 2000; Seidell, 1998; Skinner,

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Bounds, Carruth, Morris, & Ziegler, 2004) and eat more of these fattening foods compared to lean people (Cutting, Fisher, Grimm-Thomas, & Birch, 1999; Ebbeling et al., 2004; Fischer & Birch, 1995; Halford, Gillespie, Brown, Pontin, & Dovey, 2004; Johnson & Birch, 1994; Stubbs & Lee, 2004). Besides eating more, obese children seem more vulnerable for food triggers, like the smell and taste of food, than lean children and they respond with increased food intake to these triggers (Jansen et al., 2003). So for obese people it is more difficult to resist the temptation of tasty food than for lean people, despite the negative consequences of overeating for health and quality of life. An important question is why.

Research suggests that obese people have more deficits in impulse control than lean people. Obese people in weight reduction programs score higher on trait impulsivity questionnaires and engage more often in impulsive behaviours, like substance abuse, than lean people do (Chalmers, Bowyer, & Olenick, 1990; Rydén et al., 2003, 2004; Williamson, Kelley, Davis, Ruggiero, & Blouin, 1985). Within a sample of obese people, obese binge eaters appeared more impulsive than obese women without eating binges (De Zwaan et al., 1994; Nasser, Gluck, & Geliebter, 2004).

It is not only in self-reports that obese people are found to be more impulsive than lean people. Behavioural tasks like the delay of gratification paradigm in which people have to choose between a smaller, direct reward and a larger delayed reward, showed that it was more difficult for obese than normal weight children to wait for a larger delayed reward (Bonato & Boland, 1983; Johnson, Parry, & Drapman, 1978; Lewittes & Israel, 1978; Sigal & Adler, 1976, but see Bourget & White, 1981; Geller, Keane, & Scheirer, 1981). In line with this, it was found that BMI in adult women (ranging from lean to obese) predicted a preference for immediate reward (Davis, Levitan, Muglia, Bewell, & Kennedy, 2004). In this study, participants play a gamble task on the computer. Participants with higher BMI more often choose for high immediate gain and larger future losses in a gamble task, instead of lower immediate gain and smaller future loss, indicating poor and impulsive decision making.

A third line of evidence for a link between obesity and impulsivity is the comorbidity between obesity and attention deficit/hyperactivity disorder (ADHD) in children. Obese children in treatment are found to have a much higher incidence of ADHD (58%) than in the general population (10%) (Agranat-Meged et al., 2005). Moreover, Holtkamp et al (2004) found that, contrary to their hypotheses, children with ADHD had higher BMIs compared to reference values, and their ADHD sample included twice as much participants with obesity as expected.

Interestingly, increased impulsivity has been found to predict weight loss failure during therapy (Jönsson, Björvell, Levander, & Rössner, 1986) and it also predicts the dropouts in a weight-loss program (Hjördis & Gunnar, 1989).

Other eating disorders in which overeating is an important aspect, like bulimia nervosa, are also associated with increased impulsiveness (Claes, Vandereyken, & Vertommen, 2002; Loxton & Dawe, 2001; Steiger et al., 2001). Although experimental research on impulsivity in bulimic participants is scarce, a few studies were done. Ferraro, Wonderlich, and Jolic (1997) found that bulimics showed more impulsivity deficits on neuropsychological tests than controls. In another study, Ferraro, Wonderlich, and Johnson (1997) used a negative priming task to measure inhibitory control and found that subjects at risk for an eating disorder failed to show an inhibitory effect of negative primes, thereby demonstrating less inhibitory control. Kane, Loxton, Staiger, and Dawe (2004) used a behavioural measure of reward responsiveness (speed of card sorting with and without financial reward) as an index of impulsivity and found that bulimic women were more responsive to reward. Nederkoorn, Van Eijs, and Jansen (2004) found that subjects with bulimic symptoms were less effective in response inhibition during the stop signal task. These findings suggest a general impulsivity problem in disorders concerning overeating, including bulimia nervosa, binge eating disorder and obesity.

In obesity research, the measures used for impulsivity are diverse and mostly based on self reports, which are susceptible for demand characteristics and limited self-knowledge. A second problem is that impulsivity is a broad concept and includes many definitions and operationalizations. Correlations between different measures of impulsivity are low (Barkley, 1991). The research on impulsivity shows two major foci: a motivational focus and an inhibition focus (Dougherty et al., 2003; Solanto et al., 2001). In the motivational approach, a sensitivity to reward and an intolerance for delay of reward are key factors. The motivational focus originates from the study of operant behaviour of animals. People are considered impulsive if they prefer immediate smaller reward over larger delayed rewards even if this is smaller. In his neuropsychological model, Gray (1982, 1987) demonstrated that sensitivity to reward is an important determinant of impulsivity. According to his theory, motivated behaviour is mediated by two systems, the behavioural activation system (BAS) and the behavioural inhibition system (BIS). The BAS regulates appetitive and reward-seeking behaviour and increases motor output. The counterpart of this system, the BIS, is active

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