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Research report

Eating style, overeating and weight gain. A prospective 2-year follow-up study in a representative Dutch sample ☆

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ABSTRACT

This study examined which individuals are particularly at risk for developing overweight and whether there are behavioral lifestyle factors that may attenuate this susceptibility. A prospective study with a 2-year follow-up was conducted in a sample representative of the general population of The Netherlands (n = 590). Body mass change (self-reported) was assessed in relation to overeating and change in physical activity (both self-reported), dietary restraint, emotional eating, and external eating, as assessed by the Dutch Eating Behavior Questionnaire. There was a consistent main (suppressive) effect of increased physical activity on BMI change. Only emotional eating and external eating moderated the relation between overeating and body mass change. However, the interaction effect of external eating became borderline significant with Yes or No meaningful weight gain (weight gain >3%) as dependent variable. It was concluded that whilst increasing physical activity may attenuate weight gain, particularly high emotional eaters seem at risk for developing overweight, because overconsumption seems to be more strongly related to weight gain in people with high degrees of emotional eating.

Introduction

The current environment has been described as obesogenic (Swinburn, Egger, & Raza, 1999), meaning that abundant availability of food, coupled with declines in physical activity in interaction with genetic susceptibility, encourage positive energy balance, weight gain, and ultimately overweight. Despite the potency of this obesogenic environment, not all people become overweight; some remain lean. Susceptibility to increased body weight may be understood at many levels, ranging from genetic, physiological or metabolic, to behavioral and psychological (Blundell et al., 2005). The present study focuses on behavioral and psychological factors, and examines which individuals are particularly at risk for developing overweight and whether there are behavioral lifestyle factors that may exacerbate or attenuate this susceptibility.

Increasing physical activity and reducing food intake (dieting) are considered cornerstones in the prevention and treatment of obesity (Holmes, Ekkekakis, & Eisenmann, 2010; Keith et al., 2006). Yet dietary restraint[1] has been found to be associated with excessive food intake and weight gain (Chaput et al., 2009; Polivy & Herman, 1985; Stice, Cameron, Killen, Hayward, & Taylor, 1999). Also reviews of calorie-restricted diets have not provided grounds for optimism regarding the effectiveness of such diets in the long term (Aphramor, 2010; Mann et al., 2007). In the Mann et al. (2007) meta-analysis, between one-third and two-thirds of the dieters had at follow-up regained more weight than they lost on their diets. A problem with dietary restraint is that the body cannot distinguish true food shortage from self-imposed food restriction and acts as if it is in the starvation mode: feelings of hunger increase and metabolic rate slows down (anabolism and adaptive thermogenesis) (Goldsmith et al., 2010; Major, Doucet, Trayhurn, Astrup, & Tremblay, 2007). Moreover, dietary restraint (a form of inhibition) is often associated with overeating tendencies (disinhibition), as in emotional eating or external eating. Emotional eating refers to the tendency to overeat in response to negative emotions as result from poor interoceptive awareness, a notion derived from Bruch's (1964), psychosomatic theory of obesity. External eating refers to the overeating tendency resulting from susceptibility to tempting

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[1] Dietary restraint is defined as the attempted restriction of food intake in order to maintain or loose body weight. Although dietary restraint or 'dieting' is not the same as 'being on a diet', a dichotomous category that can be answered with a Yes or a No, the question 'Do you diet' was found to load on the same factor as dietary restraint (see further, Van Strien, Herman, Engels, Larsen, & Van Leeuwe, 2007).

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food cues, a notion derived from Schachter's (1968) externality theory of obesity (Herman & Polivy, 2008). Emotional and/or external eating can therefore complicate the association between dietary restraint, food intake, and change in body weight. What ought to produce weight loss may end up producing weight gain (Herman, van Strien, & Polivy, 2008). The precise direction of the relationship between dietary restraint and these overeating tendencies is as yet unclear and may even differ for various subgroups (Spoor et al., 2006; Stice, 1998; Stice, Presnell, & Sprangler, 2002; van Strien, Engels, van Leeuwe, & Snoek, 2005).

The risk of anabolism and weight (re)gain after a diet may be counteracted by increasing physical activity. What is more, physical activity may have benefits that go beyond increased caloric expenditure and increasing metabolic rate, because it has been found to be associated with lower depressive symptomatology, decreased feelings of tension, and greater emotional well-being (Amenesi & Whitaker, 2008; Dunn, Trevedi, Kampert, Clark, & Chambliss, 2005). Physical activity was found to be negatively associated with emotional and external eating (van Strien & Koenders, 2010), and physical activity self-efficacy (i.e., confidence in one's ability to be regularly physically active) was also negatively associated with emotional eating (Konttinen, Silventoinen, Sarlio-Lähteenkorva, Männistö, & Haukkala, 2010).

For the present study we were interested in extending prospectively earlier cross-sectional results regarding the moderator effects of restrained, emotional, and external eating on the relation between overconsumption and overweight. In this earlier study in a representative Dutch sample (van Strien, Herman, & Verheijden, 2009), both dietary restraint and emotional overeating significantly moderated the relationship between overconsumption and level of overweight. Overconsumption was more strongly related to overweight in people with lower levels of dietary restraint and in people with higher levels of emotional eating. External eating, however, did not moderate the relationship between overconsumption and level of overweight, and there also was no positive *main* effect of external eating on level of overweight. It was concluded that one's body weight is possibly determined more by one's tendency toward emotional eating than by one's sensitivity to environmental food cues. A further conclusion was that dietary restraint may prevent people who overeat from developing overweight.

The finding that overweight people did not differ from normal-weight people in their degree of external eating is somewhat surprising in view of the recent interest in the possible role of environmental (external) food cues in the development of overweight (the obesogenic environment!) (Herman & Polivy, 2008). The absence of a difference between overweight and normal weight people in external eating is, however, consistent with similar results in various other studies (Lluch, Herbeth, Mëjean & Siest, 2000; Pothos, Tapper, & Calitri, 2009; Snoek, van Strien, Janssen & Engels, 2007; van Strien, Herman, et al., 2007; Wardle, 1987; Wardle et al., 1992). Also in a prospective 4-year follow-up study on 1576 adult Korean twins and their families, there was no support for external eating as risk factor for development of overweight; external eating was not associated with either overweight or weight gain (Sung, Lee, & Song, 2009). The same result was obtained in a prospective 2-year follow-up study on 1562 employees in a Dutch banking environment (Koenders & van Strien, 2011). So the question now arises: Is the absence of support for external eating as a risk factor for overweight and weight gain robust and can this finding be replicated in a prospective study in a different representative Dutch sample?

The finding by van Strien et al. (2009) that dietary restraint attenuated the relation between overconsumption and overweight is also in need of replication in a prospective study, because it conflicts with outcomes of earlier studies in which dietary restraint was shown to be an important risk-factor for overeating and weight gain (Mann et al., 2007; Polivy & Herman, 1985). Also of interest would be the assessment of the possible attenuating role of physical activity in the development of overweight. Results of a recent meta-analysis of diet interventions suggested that the risk of regaining body weight was lower in a diet-plus-exercise intervention than in a diet-alone intervention (Wu, Gao, Chen, & van Dam, 2009). Further, in the prospective 2-year follow-up study in Dutch banking employees, a high level of athletics was found to be predictive of weight loss. A further finding in that study was that the positive association of emotional eating with weight gain was weaker in employees with high engagement in sports than in those with low engagement in sports (Koenders & van Strien, 2011). Accordingly, it would be of interest to ascertain whether physical activity has an attenuating effect on the association between over-consumption and weight gain.

In the present prospective study on a representative Dutch sample, overconsumption, dietary restraint, emotional eating, external eating, and physical activity were assessed in spring 2009 (T1) and tested against BMI in spring 2011 (T2), controlling for spring 2009 (T1) BMI. The following hypotheses were formulated. Dietary restraint and physical activity were both expected to attenuate the positive relationship between overeating and body mass change after 2 years, whereas emotional eating was expected to strengthen this relationship. No moderator effect was expected for external eating. We further expected these findings to remain robust in the models that included the other eating styles as possible confounders.

Methods

Participants

Data were collected in a cohort of Dutch adults (representative for age, sex, SES, ethnic origin, and region in The Netherlands) as part of a larger longitudinal study on knowledge and use of the Dutch mass media campaign: Monitoring Healthy body weight. Participants were recruited through a panel service agency. At baseline, a sample of 1200 participants was recruited.

At the first measurement (T1) of the present study, height and weight measures were available for 744 participants (64% of the people who had been initially approached to participate). Forty-eight percent of the participants were female. Educational levels broke down into 32.9% lower-level education, 42.2% medium-level education, and 24.9% higher-level education. Further, 17.6% of the participants were non-Dutch and the mean age was 48.2 years (SD = 14.5; range: 19–75 years). A total 14.7% lived in the three big cities and their agglomeration, 27.5% lived in the West, 10.6% in the North, 21.6% in the East and 25.4% in the South part of the Netherlands. These distributions are in close correspondence to the actual distribution in the Dutch population according to CBS (Central Bureau voor de Statistiek [Central Office for Statistics]) (2009). The only exception is educational levels, where the actual distributions for people with ages between 45 and 65 years in the age-lower-level, medium-level and higher-level education are, respectively, 34%, 38% and 27%.

Compared to the first measurement, 154 participants (21.6%) at the second measurement (T2) had missing weight and height measures. There were no differences between the drop-outs and non-dropouts in regard to their BMI, ethnicity (Dutch versus non-Dutch), education and sex. However, the mean age was lower for the drop-outs compared to the non-dropouts, $t_{(742)} = -4.477$, $p<.001$.

So, in the present study, complete information was obtained from 590 participants, 308 males and 282 females (see Table 3 for the mean (SD) of the participants' age and BMI). When categorizing participants according to weight loss of >3%, weight maintenance (±3%), or weight gain of >3% of baseline weight (see for this