



## Research report

Dietary restraint and body mass change. A 3-year follow up study in a representative Dutch sample <sup>☆</sup>Tatjana van Strien <sup>a,b,\*</sup>, C. Peter Herman <sup>c</sup>, Marieke W. Verheijden <sup>d</sup><sup>a</sup> Department of Clinical Psychology, Institute for Gender Studies and Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands<sup>b</sup> Faculty of Earth and Life Sciences, Institute of Health Sciences, VU University, Amsterdam, The Netherlands<sup>c</sup> The Department of Psychology, University of Toronto, Ont. M5S3G3, Canada<sup>d</sup> TNO, Leiden, The Netherlands

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## ABSTRACT

**Objective:** To determine in a representative Dutch sample the association of dietary restraint, Concern for Dieting, and Weight Fluctuation with subsequent change in body mass index (BMI; in kg/m<sup>2</sup>) in addition to possible moderator effects of sex, level of education, age category, ethnicity, overweight level and physical activity. **Design:** In a longitudinal study in a representative Dutch sample consisting of 675 participants (331 females, 344 males), dietary restraint (including Concern for Dieting and Weight Fluctuation) was assessed with the Restraint Scale at baseline, and also self-reported weight and height. Three years later, weight and height were also assessed. **Results:** Dietary restraint was significantly associated with an increase in BMI after three years ( $B = .272, p = 001$ ). Inspection of the significant moderator effect of sex ( $B = -.387, p = .012$ ) indicated that dietary restraint was significantly associated with increases in BMI only in females. There was no main effect for Concern for Dieting ( $p = .091$ ). There was a moderator effect of sex on the association between Concern for Dieting and BMI change ( $B = -.424, p = .002$ ): initial concern for dieting was positively associated with subsequent body mass gain only in women. Weight Fluctuation was significantly associated with an increase in BMI after three years ( $B = .162, p = 008$ ) and sex did not moderate this association. There were no moderator effects for level of education, age category, ethnicity, overweight level and physical activity. **Conclusion:** Dietary restraint and Concern for Dieting are associated with increases in BMI only in females. Weight Fluctuation is associated with increases in BMI in both males and females.

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## Introduction

Does dietary restraint, the attempted restriction of food intake to control body weight, suppress or promote future weight gain? The few longitudinal studies in the general population show contradictory results. In the 2-year follow-up study by [de Lauzon-Guillain et al. \(2006\)](#), initial dietary restraint did not predict subsequent weight change. In contrast, in the 6-year follow-up study by [Chaput et al. \(2009\)](#), those with high initial dietary restraint scores were significantly more likely to subsequently gain weight and become obese.

The association between dietary restraint and subsequent weight change may be moderated by sex. In the 6-year follow up study by [Drapeau et al. \(2003\)](#), initial dietary restraint was positively associated with subsequent weight gain in women but in men the association was negative. Similarly, in the 1-year follow-up study by [Klesges, Isbell, and Klesges \(1992\)](#), dietary restraint was associated with weight gain in women but not in men.

Possible moderator effects of level of education, age category, ethnicity, degree of overweight and physical activity on the relationship between baseline dietary restraint and change in BMI have not yet been examined, and none of the studies have been conducted in a representative sample. Accordingly, in a 3-year follow-up study in a representative Dutch sample we examined the moderator effects of these factors and sex in addition to the main effect of dietary restraint on BMI change. As the measure of dietary restraint, we used the Restraint Scale (RS) [Herman, Polivy, Pliner, Threlkeld, & Muncie, 1978](#), because this scale permits analyses of the independent contribution of Concern for Dieting and Weight Fluctuation, two sub-scales of the Restraint Scale. One may also

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examine the contribution of dietary restraint or Concern for Dieting with and without the Tendency toward Disinhibition (the RS item: *I eat sensibly in front of others but splurge alone*) (Van Strien, Breteler, & Ouwens, 2002). Finally, the RS permits assessment of possible effects of frequency of dieting (The RS item: *I diet*).

## Methods

### Participants

Data were collected in a cohort of Dutch adults (representative for age, sex, level of education, ethnic origin, and region in the Netherlands) as part of a larger longitudinal study on knowledge and use of a Dutch mass media campaign. Participants were recruited through a panel service agency. At baseline, a sample of 1200 participants was recruited. The study design is described more extensively elsewhere (Verheijden et al., 2012).

### Measurements

Data were collected either online or using paper and pencil in a so-called “food and health” study. The baseline measurement took place in November 2007 and the follow-up for the present study was three years later, at the same time of year (November 2011). Constructs that were measured include: sociodemographics, height and weight, and behaviors related to energy-balance, including physical activity and dietary restraint. All of these measures were self-reported.

### Measures

#### Body mass index

(BMI) was calculated as weight (kg) divided by height (m) squared (self-reported). Self-reported height and weight are considered reliable and valid for epidemiological studies (Imrhan, Imrhan, & Hart, 1996; Spencer, Appleby, Davey, & Key, 2002; Stunkard & Albaum, 1981). Participants were assigned to degree-of-overweight groups as follows: no overweight (overweight level = 0): BMI between 17.5 and 25.0; Overweight (overweight level = 1): BMI  $\geq 25$  kg/m<sup>2</sup>. Underweight participants (BMI  $\leq 17.5$ ) were excluded from the current analyses.

**Table 1**

Subscale structure in the Restraint Scale (RS).

CD	1. I 'diet' [ ik 'lijn'] Never; rarely; sometimes; often; always
WF	2. What is the maximum amount of weight (in kilos) you have ever lost within 1 month? 0–2.5; 2.5–5; 5–7.5; 7.5–10; 10+
WF	3. What is the maximum amount of weight gain (in kilos) within a week? 0–0.5; 0.5–1; 1–1.5; 1.5–2.5; 2.5+
WF	4. In a typical week, how much does your weight fluctuate? 0–0.5; 0.5–1; 1–1.5; 1.5–2.5; 2.5+
CD	5. Would a weight fluctuation of 2.5 kilos affect the way you live your life? Not at all; slightly, moderately; very much
CD	6. I eat sensibly in front of others but splurge alone Never; rarely, often, always
CD	7. I give too much time and thought to food Never, rarely, often; always
CD	8. I have feelings of guilt after overeating Never, rarely, often, always
CD	9. How conscious are you what you are eating? Not at all; slightly, moderately, extremely
WF	10. How many kilos over your desired weight were you at your maximum weight? 0–0.5; 0.5–3; 3–5; 5–10; 10+

Note. CD = concern for dieting; WF = weight fluctuation.

Dietary restraint was measured with the 9-item version of the Restraint Scale (RS (Herman et al., 1978) (Table 1). One item (item 10) had been dropped because of little consensus in earlier studies as to its proper factor assignment (Van Strien et al., 2002). The RS has two subscales, a 6-item CD (Concern for Dieting) scale (all CD items listed in Table 1) and a 3-item WF (Weight Fluctuation) scale (all WF items listed in Table 1 except for item 10) (Van Strien et al., 2002). The Cronbach's alpha in the present study was 0.74, 0.72 and 0.65 for the 9-item RS, the 6-item CD scale and 3-item WF scale, respectively.

One item of the RS, item 6, refers to disinhibited eating (*I eat sensibly in front of others but splurge alone*). In order to assess the contribution of Dietary restraint or Concern for Dieting without the possibly contaminating influence of Tendency towards Disinhibition, we also conducted analyses of the restraint (sub)scales without item 6, yielding an 8-item RS (RS8) and a 5-item CD (CD5). Cronbach's alpha for RS8 and CD5 was in the present study, respectively, 0.72 and 0.69. The RS has good validity for the cognitive resolution to eat less than desired and adequate construct validity (Van Strien, Engels, Van Staveren, & Herman, 2006; Van Strien, Herman, Engels, Larsen, & Van Leeuwe, 2007).

In one additional analysis we also assessed the effects of dieting frequency. This was done with the single RS item (item 1): *I diet* (see also Keel, Baxter, Heatherton, & Joiner, 2007).

### Physical activity

Time spent doing physical activity, in summer and winter, was translated to the Dutch norm for Healthy Physical activity (Haskell et al., 2007; Pollock et al., 1998). To comply with the norm, a person must be active at least five days per week for more than 30 min per day, in summer and winter, doing cycling, walking, doing sports, or comparable moderately or intensive physical activities. The resulting physical activity levels were coded as “not norm active” (less than five days per week sufficiently active in summer and winter) and “norm active” (at least five days per week sufficiently active per week in summer and winter).

### Analytic strategy

The outcome measure, change in BMI, was calculated by regressing BMI at T2 (November 2011, after 3 years, the dependent variable) on BMI at base line (Time 1). With Student *t*-tests we first assessed sex- and overweight-level differences of the RS scales at T1. Subsequently, with hierarchical regression analyses we assessed in the first step the possible main effect of dietary restraint on BMI change, corrected for the effects of sex, level of education, age category, ethnic group (Dutch versus non-Dutch), overweight level (normal weight: BMI < 25; overweight: BMI  $\geq 25$ ) and physical activity (not norm active versus norm active). In a series of second steps we assessed the possible individual moderator effects of sex, level of education, age category, ethnic group, overweight level, and physical activity on the relationship between baseline dietary restraint and change in BMI. This procedure was repeated for the RS subscales CD and WF, and also for the RS8 and CD5 with the item on disinhibition, item 6, deleted from the scale.

To avoid multicollinearity in the regression analyses, all variables were centered before computing interaction terms. *P* values < .05 (two-sided) were considered statistically significant. All analyses were conducted with SPSS (19.0) for Windows.

## Results

Height and weight measures were available for 1030 participants (86%) at the first measurement. Compared to the first measurement, 34.5% at the follow-up measurement had missing

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