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## Psychology & Health

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/gpsh20>

### Double trouble: restrained eaters do not eat less and feel worse

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Published online: 17 Dec 2012.

To cite this article: Jessie C. de Witt Huberts, Catharine Evers & Denise T.D. de Ridder (2013): Double trouble: restrained eaters do not eat less and feel worse, *Psychology & Health*, 28:6, 686-700

To link to this article: <http://dx.doi.org/10.1080/08870446.2012.751106>

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## Double trouble: restrained eaters do not eat less and feel worse

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*(Received 19 December 2011; final version received 15 November 2012)*

**Objective:** While high levels of dietary restraint do not appear to reflect actual caloric restraint, it has been found to be a risk factor for a wide array of maladaptive eating patterns. These findings raise the question what, if not caloric restriction, dietary restraint entails. We propose that the very finding that restrained eaters do not eat less than they intend to do can provide an answer. Based on this disparity between the intention to restrain oneself and actual behaviour, we therefore hypothesised that high levels of restraint are associated with eating-related guilt.

**Method:** Three studies ( $N=148$ ) using unobtrusive measures of food intake; different restraint scales; and different measures of guilt tested whether restraint is related to eating-related guilt.

**Results:** Results indicated that restraint was not associated with food intake, but instead was associated with increased levels of guilt after eating. Guilt was explicitly related to food intake. Moreover, the observed guilt could not be attributed to a general increase in negative affect.

**Conclusion:** The results of these studies suggest that restraint is not an indicator of actual restricted food intake, but rather a reflection concerns about food and eating manifested in eating-related guilt.

**Keywords:** restraint eating; maladaptive eating patterns; guilt; food intake; dietary restraint

Many people guard themselves against the risks of the obesogenic environment by attempting to restrict their caloric intake. Paradoxically, however, such dietary restraint seems to have counterproductive results: instead of weight loss, restrained eating often seems to promote maladaptive eating patterns such as binge eating and emotional eating (e.g. Stice, Presnell, & Spangler, 2002). To explain this unexpected outcome, the current paper investigates how the intention to restrict food intake could lead to a troubled relationship with eating.

Dietary restraint, defined as ‘the intentional and sustained restriction of caloric intake for the purpose of weight loss or weight maintenance’ (Herman & Mack, 1975; Wadden, Brownell, & Foster, 2002) remains a controversial construct in the scientific study of eating behaviour (e.g. Heatherton, Herman, Polivy, King, & McGree, 1988; Lowe, 1993). Whereas dietary restraint in monitored weight-loss interventions effectively resulted in weight loss (e.g. Wadden, Foster, & Letizia, 1994), high levels of dietary restraint as assessed by the major measures of restraint, including the Restraint Scale (RS) (Herman & Polivy, 1980), the restraint scales of the three-factor eating ques-

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tionnaire (TFEQ-R; Stunkard & Messick, 1985) and the Dutch eating behaviour questionnaire (DEBQ-R; Van Strien, Frijters, van Staveren, Defares, & Deurenberg, 1986) do not consistently seem to translate into actual behaviour. That is, in the long-term self-identified restrained eaters did not seem to reach their goal of weight maintenance or weight loss. Rather, several cross-sectional and prospective studies indicated that elevated scores on restraint scales often predict weight *gain* (French et al., 1994; Mann et al., 2007). Even more surprisingly, various studies found restraint status to be a risk factor for the future onset of obesity (Field et al., 2003; Stice et al., 2005b). These findings led several authors to question whether restrained eaters actually restrict their food intake (e.g. Stice, Fisher, & Lowe, 2004).

Whilst previously the predictive validity of restraint scales had been established based on self-reports of caloric intake, a new line of studies used unobtrusive behavioural and physiological measures across both laboratory and naturalistic settings to determine if people high on restraint in fact restrict their food intake (Martin et al., 2005; Stice, Cooper, Schoeller, Tappe, & Lowe, 2007; Stice et al., 2004; Stice, Roberto, & Allison, 2010; Tomiyama, Mann, & Comer, 2009). These studies demonstrated that individuals with elevated scores on restraint scales did not restrict their caloric intake compared to individuals with low scores on these scales, thereby suggesting that restraint is not necessarily indicative of actual caloric restriction.

While high levels of restraint do not appear to reflect actual behavioural dietary restraint as is implied by the original definition, elevated restraint scores have been found to be a risk factor for a wide array of maladaptive eating patterns. Elevated scores on dietary restraint scales are found to predict the future onset of binge eating (Stice et al., 2002), bulimic pathology (Stice, 2001), as well as general eating disorders (Killen, Taylor, Hayward, Wilson, Haydel, Hammer et al., 1994; Killen, Taylor, Hayward, Haydel, Wilson, Hammer et al., 1996), and have been identified as a risk factor for maladaptive eating styles such as emotional eating (Polivy, Herman, & McFarlane, 1994).

Yet, while restrained eating consistently predicts maladaptive eating behaviour and is found to be a risk factor for more severe eating pathology – leading several authors even to argue for a moratorium on dieting (Polivy & Herman, 1992) – it is not clear how restrained eating stimulates maladaptive eating behaviour. After all, the explanation that restricted caloric intake leads to maladaptive eating habits, such as bingeing and loss of control over eating, no longer suffices in light of mounting evidence that restrained eaters do not actually restrict their food intake. This potential explanation is further undermined by recent findings demonstrating that weight-loss interventions promoting caloric restriction actually decreased maladaptive eating episodes, such as bulimic symptoms (e.g. Burton & Stice, 2006; Stice et al., 2005a) and bingeing (e.g. Goodrick, Poston, Kimball, Reeves, & Foreyt, 1998; Reeves et al., 2001). It thus seems that the risk restrained eating entails for developing maladaptive eating patterns should not be sought in caloric restriction, leaving open the question what, if not caloric restriction, high restraint scores entail that makes them a risk factor for disturbed eating behaviour. Considering that a majority of the population aims to restrict his or her food intake, it is of great importance to uncover what makes restraint eating so maladaptive. We propose that the very finding that restrained eaters do not consume fewer calories than they intend may provide an answer to this question. Consistent with prior findings, we suggest that rather than capturing actual behaviour, scales assessing eating behaviour reflect concerns about one's eating behaviour (Adriaanse et al., 2011). More specifically,

by taking into account that restrained eaters may intend to restrain their intake, but are not always successful in doing, so we expect that high levels of restraint are related to eating-related guilt.

This assumption is supported by the observation that in societies with a strong emphasis on weight management, attitudes toward food and eating are more negative than in societies that do not assign high value to effects on weight, body shape and appearance of food intake. These worries about body weight, calories and the proper diet to maintain the desired weight seem to result in more stress and less experienced pleasure in eating (Rozin, 1999). A large study by Rozin and colleagues revealed that a substantial proportion of females, who constitute the majority of restrained eaters (Jeffery, Adlis, & Forster, 1991), associates food with worry rather than pleasure and relates chocolate cake with guilt instead of celebration (Rozin, Fischler, Imada, Sarubin, & Wrzesniewski, 1999). Likewise, more controlled lab studies indicated that eating high-energy food produces feelings of guilt in females (Macht & Dettmer, 2006; Macht, Gerer & Ellgring, 2003) and have demonstrated an association between feelings of guilt and the amount of food eaten (Rozin, Kabnick, Pete, Fischler, & Shields, 2003). Thus, guilt is already a familiar phenomenon in the context of eating behaviour, and based on the ensuing account, we expect this to be even more pronounced in restrained eaters.

People high on restraint assign high importance to the goal of losing or maintaining weight. After all, actively restraining one's food intake does not take place in an intentional vacuum: one must want to lose weight before one undertakes actions to restrict one's food intake (Ajzen, 1991; Hagger, Chatzisarantis, & Harris, 2006). However, highly restraint eaters might *want* to restrict their food intake, yet they may not always be successful in doing so. The recent evidence that restrained eaters do not actually seem to eat less, affirms that their intention may not always effectively translate into action. To the restrained eater, eating may thus imply a failure to keep to one's dieting standards. Given that the violation of one's personal standards is a key component of guilt (Tangney & Dearing, 2002), the realisation that one's behaviour is not in line with one's intentions can produce feelings of guilt. Based on these observations we propose that rather than caloric restriction, restraint is associated with eating-related guilt: that is, people scoring high on restraint scales will experience more guilt after subjectively failing to restrict their food intake than people scoring low on restraint.

### Research overview

The three studies conducted to test whether high levels of restraint are related to guilt after eating, all followed the same basic procedure: firstly, participants were given the opportunity to unobtrusively sample food in a taste test after which levels of guilt and restraint were assessed. Restraint status was determined after the taste test as the questions about restraint could influence subsequent eating behaviour. Since restraint is considered to be a relatively stable attitude rather than a state (Lowe, 1993), the order of assessment should have no consequences concerning its predictive power. To assess level of restraint, we used the most widely used RS, the RS by Herman and Polivy (1980).<sup>1</sup>

We selected a female student population to investigate the assumed relationship as restraint eating is highly prevalent among female students and as they are at high risk

for developing maladaptive eating patterns (Ackard Croll, & Kearney-Cooke, 2002). This allows for investigating the relation between high restraint scores and maladaptive eating patterns in the population for which this association is highly relevant.

Study 1 examined whether restraint levels were linked with guilt after unobtrusively having been exposed to food. In order to determine whether restraint is related to guilt in particular or negative affect in general, Study 2 also accounted for other types of negative affect. Furthermore, Study 2 included baseline guilt measures to assess whether an increase in guilt could specifically be attributed to food consumption. Finally, Study 3 aimed to explicitly establish whether an observed increase in guilt was related to eating by asking participants directly how guilty they felt about their snack consumption in the taste test. In sum, we predict that higher restraint scores do not predict food intake but are associated with eating-related guilt.

## Study 1

### *Method*

#### *Participants*

Fifty-eight female undergraduates participated in exchange for course credit or five Euros. One participant who was an outlier ( $>3$  standard deviation (*SD*)) on guilt was excluded from further analysis, resulting in a final sample of 57 participants with a mean age of 20.91 years ( $SD=2.0$ ) and a mean BMI of 21.81 ( $SD=2.95$ ).

#### *Procedure*

Participants were told they were participating in a consumer taste test for a large supermarket chain. To create standardised satiety rates, participants were informed beforehand that they could only participate if they had not eaten for at least two hours. Food intake was determined by means of a bogus consumer taste test in which participants had to taste and evaluate different food products on a number of dimensions such as taste and structure. To give participants the opportunity to exert control over their total caloric intake, the taste test included both high- and low-caloric foods. Unbeknownst to the participant, each bowl was weighed before and after to calculate participants' food intake. During the taste test, participants were left alone in the room for 10 min to give them the opportunity to inconspicuously sample the food. After the taste test, affect, including guilt, was measured and level of dietary restraint was assessed. Finally, after providing demographic information, participants were debriefed and reimbursed for participation.

#### *Measures*

*Dietary restraint.* To assess participants' restraint level, the RS (Herman & Polivy, 1980) was used. The RS was developed to identify chronic dieters and assesses dieting behaviours, preoccupation with eating and past weight fluctuations. The translated version of the RS consists of 10 items (e.g. 'How often do you diet?'; 'Do you give too much time and thought about food?'; 'How conscious are you of what you are eating?') scored on five-point scale (1–5), with higher scores reflecting higher levels of restrained

eating (the total scores for the translated RS ranged from a minimum score of 10 to a maximum score of 49). The scale had a good reliability (Cronbach's  $\alpha = .82$ ).

*Guilt.* Participants had to indicate how much guilt they experienced at that moment ranging on a five-point scale ranging from 1 (*not at all*) to 5 (*a lot*). The guilt item was embedded in a list of 25 filler items measuring various emotional and visceral states such as 'tense' and 'tired'.

*Food intake.* In an alleged consumer taste test, participants had to evaluate different food types on several dimensions, such as look, taste and structure. In total, participants had to taste four different snack types: two high-calorie snacks (chips and chocolate-covered peanuts) and two low-calorie snacks (crackers and apple pieces). The amount of kcal consumed was calculated by multiplying the total of grams consumed of each snack by the average amount of kcal it contains. In addition to total caloric intake, separate calculations were made for caloric intake of high- and low-caloric products.

## Results

Table 1 shows the means, *SDs* and intercorrelations of the variables under study. Caloric intake from total and high caloric snack consumption was log transformed to obtain a normal distribution. However, for ease of interpretation Table 1 presents means and *SDs* for the non-transformed variables. The mean scores for restraint eating showed a wide variety of scores ranging from 'very low' to 'very high'.

Two multiple hierarchical regression analyses were performed to determine whether restraint predicted food intake and guilt. As can be seen in Table 1, BMI correlated significantly with restraint. Therefore, BMI was entered in the first step of the analyses as control variable. In none of the analyses this first step was found to be significant ( $p$ 's > .05).

Table 2 shows the results of the regression analysis with the RS as predictor variable for total caloric intake. As can be seen in Table 2, restraint did not predict total caloric intake. Additional analyses to investigate whether both restraint measures predicted either high- or low-caloric intake yielded no significant results ( $p$ 's > .05).

A second regression analysis investigated the predictive validity of restraint on guilt. As can be seen in Table 2, RS score was a significant predictor of guilt, explaining 11% of the variance (unadjusted) in guilt. The hypothesis that restraint status does not predict food intake, but guilt was therefore confirmed.<sup>2</sup>

Table 1. Study 1: Means, *SD* and correlations.

|                            | 1     | 2     | 3      | 4     | 5      | 6    |
|----------------------------|-------|-------|--------|-------|--------|------|
| BMI (1)                    | –     |       |        |       |        |      |
| RS (2)                     | .49** | –     |        |       |        |      |
| Total caloric intake (3)   | –.09  | .00   | –      |       |        |      |
| Healthy caloric intake (4) | –.09  | .00   | .99**  | –     |        |      |
| Unhealthy caloric (5)      | –.20  | –.02  | .47**  | .33*  | –      |      |
| Guilt (6)                  | –.07  | .25   | .08    | –.14  | .11    | –    |
| <i>M</i>                   | 21.81 | 23.91 | 224.74 | 56.29 | 168.45 | 1.32 |
| <i>SD</i>                  | 2.95  | 5.99  | 135.83 | 21.87 | 126.99 | .76  |

Notes: \* $p < .05$ ; \*\* $p < .01$ .

Table 2. Study 1: Hierarchical multiple regression analysis for total caloric intake and guilt.

|        | Total caloric intake |            |              | Guilt   |            |              |
|--------|----------------------|------------|--------------|---------|------------|--------------|
|        | $\beta$              | $\Delta F$ | $\Delta R^2$ | $\beta$ | $\Delta F$ | $\Delta R^2$ |
| Step 1 |                      | 3.42       | .06          |         | .30        | .00          |
| BMI    | -.24                 |            |              | -.07    |            |              |
| Step 2 |                      | .21        | .00          |         | 6.35*      | .11          |
| RS     | .07                  |            |              | .37     |            |              |

Note: \* $p < .05$ .

Finally, explorative regression analyses with (high and low) caloric consumption as predictor and guilt as dependent variable were carried out to determine whether food consumption itself would predict guilt. Total caloric consumption ( $p > .05$ ), as well as high- or low-calorie food consumption did not predict guilt ( $p$ 's  $> .05$ ), thereby suggesting that the observed guilt is a function of restraint rather than food intake itself.

### Discussion

The results of Study 1 did not reveal a relation between restraint and caloric intake, but did demonstrate a significant relation between restraint status and guilt. These results are strengthened by the fact that participants were offered both high- and low-calorie snacks, providing them with the opportunity to take control over their caloric intake, for example, by eating more of the low-calorie snacks and limiting the intake of the high-caloric snacks. Yet, the current results did not reveal an effect of restraint status on caloric intake in general and low-caloric intake in particular.

Moreover, the results indicated that food intake itself was not related to guilt. This finding implies that guilt is specifically related to restraint status, rather than food intake in itself. In addition, neither high- nor low-calorie food intake was associated with guilt; this indicates that the guilt felt by restraint eaters is not limited to eating 'forbidden' (i.e. high calorie) foods.

A limitation of Study 1 is that no baseline guilt measures were included, thereby not allowing for the conclusion that the guilt observed in restrained eaters can be attributed to eating. Furthermore, while our hypothesis assumes that high restraint scores are related to guilt specifically, it cannot be ruled out that an observed increase in guilt is a by-product of a general increase in negative affect. To rule out these alternative hypotheses, Study 2 included baseline guilt measures and included other types of negative affect to test the specificity of the relation between restraint and guilt.

## Study 2

### Method

#### Participants

Forty-six female students participated for course credit or five Euros. Three participants were excluded from analysis because they were outliers ( $SD > 3$ ) on one of the dependent variables (snack food consumption:  $n = 1$ ; guilt:  $n = 2$ ). The final sample consisted of 43 participants with a mean age of 22.67 years ( $SD = 2.84$ ) and an average BMI of 22.58 ( $SD = 3.11$ ).

### Procedure

The procedure was largely similar to Study 1 with the additional inclusion that baseline measures of affect, guilt and other types of negative affect were taken upon arrival at the lab (T0). Again food intake was determined by means of a bogus consumer taste test. However, this time only palatable (i.e. high calorie) snacks were included, because no differing effects of caloric content were observed in Study 1. After the taste test, affect was assessed again (T1). Finally, restraint was measured.

### Measures

*Dietary restraint.* The RS was applied to obtain a restraint measure (Cronbach's  $\alpha = .82$ ).

*Guilt and negative affect.* Guilt was measured similar to Study 1. By subtracting baseline guilt scores (T0) from post-food intake guilt scores (T1), a change score of *guilt* was obtained. Similarly, change scores were calculated for three other types of negative affect that previous studies associated with eating: 'sadness', 'frustration' and 'anxiousness' (Macht and Dettmer, 2006; Macht et al., 2003).

*Food intake.* Assessment of food intake was identical to Study 1, except that this time participants had to compare different brands of palatable snacks. In a bogus consumer taste test, participants had to taste and evaluate different brands of three different types of snack food: Chips, chocolate-covered peanuts and chocolate chip cookies. For each different type of snack two different brands were provided (labelled A and B) which had to be compared on taste and perception. Thus, participants were provided with six different bowls of snacks.

### Results

Mean scores, *SDs* and intercorrelations of the variables under study are presented in Table 3. The scores on the RS showed a wide variety ranging from 'very low' to 'very high'.

Two hierarchical regression analyses were performed to examine the effect of restrained eating on caloric intake and guilt. As BMI correlated with the RS, BMI was controlled for in the first step of both analyses. Table 4 shows the results demonstrating that BMI was not a significant contributor in either analysis ( $p$ 's > .05). The results for caloric intake revealed that restraint eating was not a significant predictor,  $p > .05$ . Results for the second regression analysis indicated that dietary restraint was associated

Table 3. Study 2: Means, *SD* and correlations.

|                          | 1     | 2     | 3      | 4    |
|--------------------------|-------|-------|--------|------|
| BMI (1)                  | —     |       |        |      |
| RS (2)                   | .36*  | —     |        |      |
| Total caloric intake (3) | .04   | -.16  | —      |      |
| Guilt change score (4)   | .26   | .39** | -.02   | —    |
| <i>M</i>                 | 22.58 | 24.58 | 213.78 | -.19 |
| <i>SD</i>                | 3.11  | 6.15  | 91.12  | .88  |

Notes: \* $p < .05$ ; \*\* $p < .01$ .

Table 4. Study 2: Hierarchical multiple regression analysis for total caloric intake and guilt change score.

|        | Total caloric intake |            |              | Guilt   |            |              |
|--------|----------------------|------------|--------------|---------|------------|--------------|
|        | $\beta$              | $\Delta F$ | $\Delta R^2$ | $\beta$ | $\Delta F$ | $\Delta R^2$ |
| Step 1 |                      | .07        | .00          |         | 3.05       | .07          |
| BMI    | .04                  |            |              | .26     |            |              |
| Step 2 |                      | 1.38       | .03          |         | 4.82*      | .17          |
| RS     | -.20                 |            |              | .34*    |            |              |

Note: \* $p < .05$ .

positively with change in guilt. Restraint explained 16.9% of the variance in guilt (unadjusted). Finally, analyses were carried out to assert whether restraint specifically predicted guilt, or whether it also predicted other types of negative affect (sadness, anxiousness and frustration). Regression analyses examining the effect of restraint on these three types of affect did not show any significant effects ( $p$ 's  $> .05$ ), indicating that restraint status typically predicts guilt.

### Discussion

The findings of Study 2 replicated the results of Study 1 while controlling for baseline guilt. Again it was found that restraint scores are not an indicator of caloric intake but of guilt. Moreover, restraint status was not associated with other types of negative affect, thereby strengthening our assumption that restraint is significantly associated with guilt specifically and that this result cannot be attributed to a general increase in negative affect.

While the inclusion of a baseline measure of guilt indicates that the observed guilt could be attributed to the food consumption, Studies 1 and 2 measured guilt unobtrusively by embedding guilt with other filler items. The pattern of results would be strengthened if the measured guilt was also *explicitly* attributed the food intake. In Study 3, this is investigated by directly asking participants how guilty they felt about eating the snacks.

### Study 3

#### Method

##### Participants

Forty-four female participants participated in this study for course credit or five Euros. Two participants who were outliers ( $SD > 3$ ) on *eating-related guilt* or total caloric consumption were excluded from further analysis. The final sample consisted of 42 participants with a mean age of 20.57 ( $SD = 2.70$ ) and a mean BMI of 20.98 ( $SD = 1.98$ ).

##### Procedure

The basic procedure was identical to both previous studies. Baseline guilt measures were followed by the same taste test as Study 2. Afterwards, to more rigorously test

whether the observed guilt was related to eating, explicit questions addressing eating-related guilt were posed.

### Measures

*Baseline guilt.* Similar to the previous studies, baseline guilt was determined by embedding guilt in an affect scale.

*Food intake.* Food intake was assessed using the same taste test as in Study 2.

*Restraint.* The RS ( $\alpha = .86$ ) was used to assess restraint.

*Eating-related guilt.* To assess whether guilt was specifically related to eating, three questions addressed how guilty participants felt about having eaten the snacks in the taste test: 'How guilty do you feel about eating the snacks?'; 'How guilty do you feel about the amount of snacks you have eaten?'; 'How guilty do you feel about eating?'. Answers were rated on five-point scale ranging from 1 (*not at all*) to 5 (*very much*). The three items were combined into a scale indicating *eating-related guilt* ( $\alpha = .74$ ).

### Results

Table 5 shows the means, *SDs* and intercorrelations of the variables under study. Total caloric intake was log transformed to obtain a normal distribution. However, for ease of interpretation, the means and *SDs* for the non-transformed variables are presented. Mean restraint scores on the RS showed a wide variety of scores ranging from 'very low' to 'very high'.

Two hierarchical regression analyses were performed to examine whether restraint predicted caloric intake and *eating-related guilt*. As baseline guilt differed from the measurement of *eating-related guilt*, change scores could not be calculated. Instead, baseline measures of guilt were entered in the first step of the analysis as control variable. In both sets of analyses, baseline guilt did not significantly contribute to the model (all  $p$ 's > .05).

In the first regression analysis, restraint score was entered as predictor of caloric intake. As can be seen in Table 6, restraint did not significantly predict caloric intake ( $p > .05$ ). The second regression analysis investigated the predictive value of restraint on

Table 5. Study 3: Means, *SD* and correlations.

|                          | 1     | 2     | 3      | 4    | 5    |
|--------------------------|-------|-------|--------|------|------|
| BMI (1)                  | –     |       |        |      |      |
| RS (2)                   | .02   | –     |        |      |      |
| Total caloric intake (3) | –.11  | –.09  | –      |      |      |
| Baseline guilt (4)       | –.14  | .13   | –.15   | –    |      |
| Eating-related guilt (5) | .09   | .43** | .02    | .19  | –    |
| <i>M</i>                 | 20.98 | 22.33 | 326.18 | 2.20 | 2.74 |
| <i>SD</i>                | 1.98  | 6.61  | 173.32 | .67  | .71  |

Note: \*\* $p < .01$ .

Table 6. Study 3: Hierarchical multiple regression analysis for total caloric intake and eating related guilt.

|                | Total caloric intake |            |              | Eating related guilt |            |              |
|----------------|----------------------|------------|--------------|----------------------|------------|--------------|
|                | $\beta$              | $\Delta F$ | $\Delta R^2$ | $\beta$              | $\Delta F$ | $\Delta R^2$ |
| Step 1         |                      | .86        | .02          |                      | 1.56       | .04          |
| Baseline guilt | -.15                 |            |              | .19                  |            |              |
| Step 2         |                      | .23        | .01          |                      | 8.20**     | .21          |
| RS             | -.07                 |            |              | .41**                |            |              |

Note: \*\* $p < .01$ .

*eating-related guilt*. As can be seen in Table 6, restraint contributed significantly to the prediction of *eating-related guilt*, with the RS explaining 20.5% of the variance in *eating-related guilt*.<sup>3</sup>

### Discussion

Study 3 replicated and extended the findings of the previous two studies. Again it was demonstrated that restraint scores are not a valid indicator of actual caloric intake, but rather an indicator of guilt. Moreover, Study 3 demonstrated explicitly that this guilt is related to eating.

### General discussion

The current studies demonstrated that high restraint scores are not an indicator of actual restricted food intake, but rather reflects concerns about food and eating manifested in guilt. As with all non-experimental studies, however, caution is warranted in drawing causal inferences from the current results as the cross-sectional nature of the study renders it impossible to rule out factors that were not incorporated in the current design. Nevertheless, based on the factors that were included in the current study, the findings suggest that dietary restraint comes at a double cost. Firstly, restrained eaters do not eat less compared to people who do not aim to restrict their food intake, which suggest that restrained eating may well be attempting the impossible considering that it involves counteracting strong visceral drives (Polivy & Herman, 2006), the difficulty of which is underlined by studies indicating that many diets are ineffective in the long term (e.g. Mann et al., 2007). Secondly, besides not achieving caloric restriction, restrained eaters also seem to experience a negative reaction in response to eating: guilt. Given that guilt is indicative of a transgression of one's personal standards, the finding that restraint predicts guilt and is not related to other types of negative affect such as sadness, supports the assumption that the negative outcomes of restraint are indeed associated with the disparity between one's intentions to restrain food intake and one's actual consumption. Furthermore, this guilt was explicitly linked to eating. While not explicitly tested in the present paradigm, literature indicates that the specific increase in guilt is most likely to be accompanied by a decrease in pleasure derived from eating (Lindeman & Stark, 2000; Macht & Dettmer, 2006; Macht et al., 2003; Rozin et al.,

1999), suggesting that restrained eating not only leads to an increase in guilt but also makes eating a less pleasurable as a whole.

Nevertheless, to draw causal inferences about the relation between restraint scores, eating and guilt, future studies should manipulate restraint, as other factors that interfere with reaching one's goal of losing or maintaining weight could also form an explanatory link between restraint and guilt, such as a tendency to overeat (e.g. Presnell, Stice, & Tristan, 2008) or excessive sedentary behaviour. Manipulation of restraint, however, may be complicated as restraint, in contrast to following a weight-loss diet, is a relatively stable attitude (Lowe, 1993) rendering it difficult to manipulate (cf. Presnell et al., 2008 for an exception).

The current findings also suggest an alternative interpretation of the previously found association between restraint and poor general psychological well-being. Studies comparing restrained eaters with non-restrained eaters have found restrained eaters to display greater emotional responsivity, greater anxiety, greater depression and lower self-esteem (e.g. McFarlane, Polivy, & McCabe, 1999). The relationship between restrained eating and poor psychological health was moderated by pleasure normally associated with eating (Appleton & McGowan, 2006; Remick, Pliner, & McLean, 2009): greater pleasure derived from eating combined with higher levels of restraint was associated with a higher level of general anxiety, suggesting that high levels of restrained eating lead to increased anxiety in restrained eaters for whom eating in fact is a source of pleasure. This association between high restraint and high pleasure and poor psychological health was interpreted in terms of frequency: restrained eaters deny themselves from pleasure by eating *less*. However, this interpretation could be reconsidered in light of the current findings. That is, the reduced pleasure may not be the consequence of restricted consumption of a source of pleasure in terms of frequency, but rather a consequence of reduced pleasure from eating per se irrespective of the quantity or frequency of eating. Indeed, the current findings support the suggestion made by Stice and colleagues (2010) that it may not be the attempt to limit dietary intake itself that makes restraint eaters vulnerable to maladaptive eating patterns, but rather the inability to *successfully* limit their dietary intake. The current studies thus allow for new insights in the role of restraint as a risk factor for maladaptive eating and psychological patterns, by suggesting that the explanatory link should be sought in psychological outcomes of restraint rather than actual reduced food consumption.

Another intriguing finding is that restraint eaters explicitly attribute their guilt to the eating. This observation could have interesting implications. If people are aware of the negative emotional consequences of eating despite intentions to restrict their food intake, this raises the question whether the experienced guilt influences subsequent actions. As guilt motivates people to make reparations (Tangney & Dearing, 2002), it is plausible that the guilt restrained eaters feel after eating could reinforce their intention to restrict their food intake. Future research should investigate whether the experienced guilt leads to reduced consumption afterwards. If again they would not be successful in translating their intentions to actions, it could possibly instigate a maladaptive cycle of intentions to restrain one's caloric intake, leading to guilt after eating, which in turn could lead to stronger restraint, again leading to guilt after consumption and possibly other detrimental consequences for psychological well-being, such as reduced self-efficacy (cf., McFarlane et al., 1999).

Besides the interesting new directions that are raised by the current findings, there are also some limitations that should be addressed in future research. For instance, although the finding that restraint is associated with guilt, but not with other types of affect, supports the presumption that restrained eaters perceive themselves as violating their self-imposed restrictions by eating, there is also evidence suggesting that restrained eaters tend to underestimate their caloric intake (Jansen, 1996). Therefore, future studies incorporating restraint, subjective perceptions of overeating, and guilt, are called for to ascertain whether restrained eaters in fact perceive themselves as overeating and if this explains the relation between restraint and guilt to support the hypothesised process. Another possibility is that restrained eaters may not only subjectively feel that they are overeating, but may also objectively be classified as overeaters. This notion is supported by recent findings that suggest that restraint scales might identify persons who struggle with an overeating tendency and attempt to curb their overeating behaviour, albeit unsuccessfully (Presnell et al., 2008).

Another limitation of the present studies is that our findings are based on a single eating episode; future studies should employ food diaries to investigate whether guilt occurs after every eating episode, and whether this influences subsequent eating patterns or intentions to restrain one's food intake. Relatedly, as the present studies tested the hypothesis in a sample of young non-obese women, other populations should be included in future studies to explore the generalisability of the present findings. Finally, the levels of guilt observed in the current studies were rather low. However, as the participants were required to eat as part of the study, their personal control, and potentially their responsibility, for their behaviour was reduced. This lack of accountability for their behaviour could have prevented feelings of guilt rising. In addition, the study context might have served as a justification for (over)eating, thereby reducing guilt that would normally be associated with eating (Kivetz & Zheng, 2006).

Despite these limitations, the present studies convincingly demonstrate that restraint is associated with eating-related guilt rather than restricted food intake. By using unobtrusive measures of food intake rather than self-report, employing different measures of restraint, and both implicit and explicit measures of guilt, many of the pitfalls of studying eating behaviour could be avoided (Evers, De Ridder, & Adriaanse, 2009). As restraint explained up to a quarter of the observed variance in (eating-related) guilt, the present studies illustrate that restraint and guilt are inevitably connected, with restraint being a better predictor of guilt than of restricted eating. This could have important implications for both the theoretical definition of restraint as well as the clinical consequences of restraint for eating symptomatology. That is, negative consequences of restraint should not be sought in restricted food intake, but rather in a negative relationship with eating. Considering that 45% of young girls currently report dieting (Neumark-Sztainer, 2005), asserts the urgency of exploring the negative consequences of restraint further, as it seems that despite their good intentions, restraint eaters seem to gain nothing and lose twice.

## Notes

1. As there is a debate in the restraint literature about what the restraint scales precisely reflect (e.g. Westenhoefer, 1991), we also included another measure of restraint, the restraint subscale of the Dutch eating behavior questionnaire (DEBQ-R; Van Strien et al., 1986). The DEBQ-R consists of ten items aimed to assess dietary behaviours for weight loss and maintenance. The items (e.g. 'Do you intentionally eat less to avoid gaining weight?') are measured

- on five-point scale ranging from 1 (*never*) to 5 (*very often*). The pattern of results that emerged using the DEBQ-R as measure of restraint was similar to that using the RS (Herman & Polivy, 1980) as predictor, suggesting that the results obtained are not an artefact of the particular scale used but related to restraint in general.
2. Similar analyses using the DEBQ-R ( $\alpha = .92$ ) as measure of restraint showed a similar pattern with restraint not being predictive of caloric intake yet being a significant predictor of guilt, explaining 12.1% of the variance (unadjusted).
  3. Similar analyses using a different scale to assess restraint produced similar results: the DEBQ-R ( $\alpha = .93$ ) did not predict food intake, but was a significant predictor of eating-related guilt, explaining 28.5% (unadjusted) of the variance.

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