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Ironic processes in the eating behaviour of restrained eaters

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Theory. The present study examines the processes underlying the disinhibition of the eating behaviour of restrained eaters following negative emotions. Based on Herman and Polivy's (1984) Boundary Model and Wegner's Ironic Process Theory (1994), the limited capacity hypothesis is formulated, suggesting that overeating in restrained eaters results from cognitive capacity limitations. Predictions were that (1) impairment of cognitive capacity during eating will lead to overeating in restrained but not in unrestrained eaters and that (2) this difference should only emerge with food perceived to be high in calories.

Method. The hypotheses were tested in an experiment with a 2 (restrained/unrestrained)×2 (distraction yes/no)×2 (perceived calories high/low) design, in which subjects consumed ice-cream in a taste test situation. Ice-cream consumption was the dependent variable.

Results. A second-order interaction was found: as predicted, in the high calorie condition restrained eaters ate the same amount as unrestrained eaters when not distracted, but considerably more when distracted. There was also an unexpected main effect of distraction, which indicated that restrained as well as unrestrained eaters ate more if distracted than if not distracted.

Discussion. The restraint×distraction×perceived calories interaction can be explained by both the Ironic Process Theory and the Boundary Model; and the limited capacity hypothesis appears to be confirmed. The overall main effect of distraction remains puzzling. Two speculative views for the latter effect are offered.

There is a great deal of evidence to suggest that overeating is frequently an unintended consequence of dieting (see e.g. Heatherton & Baumeister, 1991; Lowe, 1993; Ruderman, 1986). The notion that dieting, and not body weight, plays a key role in the regulation of food intake stimulated the theoretical development of the construct of

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dietary restraint in the mid-1970s (Herman & Mack, 1975). The construct refers to the cognitively mediated effort to curb the urge to eat, and can be assessed by the Restraint Scale (Polivy, Herman, & Warsh, 1978). An intriguing explanation for overeating in restrained eaters is given by Herman and Polivy's Boundary Model (1984).

According to this model, biological pressures work to maintain consumption within a certain range in all individuals. The consumption above some minimum level is assured by the aversive quality of hunger, and consumption below a maximum level by the aversive quality of satiety. The area between these two boundaries is called the range of 'biological indifference' and it is within this range that psychological factors are thought to be most influential. Herman and Polivy state that there are two differences between restrained and unrestrained eaters. First, the range of biological indifference is assumed to be wider in restrained than in unrestrained eaters. Due to repeated dieting and overeating in the past, restrained eaters are expected to have lower hunger and higher satiety boundaries. Second, it is postulated that restrained eaters have a third, self-imposed boundary, the diet boundary, a cognitive limit that marks their maximum desired consumption. Central to the boundary model is the prediction that transgression of the diet boundary induces overeating. This 'so-called' preload effect has been investigated in numerous studies (see e.g. Boon, 1998; Ruderman, 1986, for reviews).

More important in the light of the present study is a second prediction suggested by Herman and Polivy (1975, 1984) concerning the empirically well demonstrated disinhibitive effect of negative emotions on the eating behaviour of restrained eaters. Laboratory as well as naturalistic research has demonstrated that negative emotional states such as anxiety (e.g. Herman & Polivy, 1975; Polivy, Herman & McFarlane, 1994) and depressed mood (e.g. Baucom & Aiken, 1981; Cooper & Bowskill, 1986; Frost, Goolkasian, Ely & Blanchard, 1982; Ruderman, 1985; Schotte, Cools & McNally, 1990) induce overeating in restrained eaters but not in unrestrained eaters. Herman and Polivy have argued that the effect of negative emotions is 'best interpreted as the imposition of a more urgent concern (i.e. how to cope with the stressor) than even dieting' and they add that in the case of negative emotions 'eating may proceed as if the diet boundary had been transgressed' (Herman & Polivy, 1984, p. 152).

In the present study, it is suggested that coping with negative emotions requires attention and since cognitive capacity is not unlimited, exerting control over their eating behaviour may be affected by this. Restraining food intake may be assumed to require a great deal of the available cognitive resources. Restrained eaters need to be aware, for example, of the caloric value of food and should constantly monitor what and how much they eat and compare this amount to their maximum desired consumption. It is easy to see that having to cope with a negative emotion may interfere with a person's goal of controlling eating behaviour.

An interesting question in the light of this explanation of the disinhibitive effect of negative emotions, is whether this effect is specific for negative emotions or whether it is merely the general effect of a limited cognitive capacity—due to any factor—that compromises restrained eaters' diets. This might partly explain the fact that so many dieters end up gaining, instead of losing, weight (Klesges, Isbell & Klesges, 1992).

The empirical evidence so far, however, does not allow conclusions regarding the limited capacity hypothesis because so far no study has directly tested this hypothesis. However, indirect support can be derived from a study of Cools, Schotte, and McNally (1992), who examined the effect of mood on eating behaviour. The authors induced negative, positive and neutral moods by having subjects watch frightening, comedy and

neutral films, respectively, during which they could eat popcorn. Restrained eaters in both the negative and positive mood conditions ate more than those in the neutral condition; the unrestrained eaters were unaffected by the emotion induction. Until now this effect of positive emotions has remained puzzling. The limited capacity hypothesis may clear up the picture. It may be assumed that positive emotions, like negative emotions, require attention and thus limit the amount of cognitive capacity still available for controlling food intake.

Some further preliminary support for the limited capacity hypothesis can be found in an interesting series of studies by Green and colleagues. They found that current dieters[1] displayed a significantly lower working memory span than non-dieters and this effect was related to participants' self-rated desire to eat (e.g. Green, Elliman & Rogers, 1997). However, this finding does not allow conclusions regarding the effect of a limitation of subjects' cognitive capacity on actual food intake, since consumption was not included as a dependent measure.

Theoretically, the limited capacity hypothesis is supported by Wegner's Ironic Process Theory (Wegner, 1994). This theory considers the relevance of cognitive capacity for maintaining mental control and the danger of losing it in times of capacity limitation. Wegner suggests processes that may explain the occurrence of the opposite of what a person intends to achieve (e.g. overeating in restrained eaters) as a consequence of this limited capacity. He postulates two processes that are responsible for mental control: the intentional operating process and the ironic monitoring process. The intentional operating process searches for items that are consistent with a desired state of mind and creates this state by occupying the mind with thoughts and sensations relevant to it. The operating process thus reflects a controlled process: it is effortful, consciously guided and demands cognitive capacity. The monitor, on the other hand, searches continuously for items that are inconsistent with the desired state and indicates failure of mental control. This way, the monitor regulates whether or not the operating process will be initiated. The monitoring process is unconscious and requires little cognitive effort.

The main hypothesis derived from Ironic Process Theory is that 'under mental load, intentions to control the mind unleash a monitoring system that not only searches for the failure of mental control but tends itself to create that failure' (p. 34). An elegant series of studies by Wegner and his co-workers established that limitations of an individual's cognitive capacity result in a mental state which is the opposite to the desired state, the so-called ironic process (Wegner & Erber, 1993; Wegner, Erber & Zanakos, 1993; Wegner, Schneider, Carter & White, 1987). For example, participants who were instructed not to think about a target word frequently responded with this target word when asked to respond to target-relevant prompts under time pressure. They mentioned the word that they were told not to think about more often than participants who performed the task without being under time pressure.

Wegner suggests that 'behavioural control may follow many of the same ironic pathways traced by mental control' (1994, p. 34). This suggestion is not (yet) empirically supported. Regarding eating restraint, the Ironic Process Theory would

[1] Following Lowe (1993), they divided restrained eaters into those who were currently on a diet and those who were not on a diet. Lowe showed that these two types of restrained eaters display different eating regulation patterns. In the present study, this distinction was not made since we expected that both types of restrained eaters would direct cognitive resources at restraining food intake. It may be hypothesized that current dieters will do so more extremely, but this was not examined in the present study.

suggest that the operating process of restrained eaters aims at restricting food intake, whereas the monitor searches for signs inconsistent with food restriction. The operating process (I should not eat that food), then, should be susceptible to cognitive distraction, i.e. a limitation of the cognitive capacity due to a cognitive load, whereas the monitor (I want to eat that food) should not. The monitor may thus go on searching for failure of the dietary restraint, whereas the operator may not be initiated. In this situation, it will be very difficult for the restrained eaters to refrain from eating. The limited capacity hypothesis can thus be derived from the Ironic Process Theory: cognitive distraction should lead to the ironic effect of overeating in restrained eaters, whereas it should not affect the food intake of unrestrained eaters (see also Boon, 1998).

To test this hypothesis, a study is needed in which cognitive capacity is manipulated directly rather than indirectly via strong emotions. The present article reports an experiment in which restrained, as well as unrestrained, eaters were either cognitively distracted or not distracted while performing a taste test. Furthermore, as suggested in a previous study (Boon, Stroebe, Schut & Jansen, 1997), the strength of the intention of restrained eaters to control their eating was manipulated by varying the perceived caloric value of the ice-cream in this taste test. The degree of 'danger' restrained eaters attach to certain food is likely to influence the strength of their intention to avoid it. In the light of Wegner's (1994) theory, it can be assumed that restrained eaters' monitors are especially alert if high caloric food is concerned; the more calories, the higher the risk of dietary failure.

To investigate these notions, perceived calorie content as well as distraction were manipulated in a 2 (perceived calories high/low) × 2 (distraction yes/no) × 2 (restrained/unrestrained eaters) design. Restrained and unrestrained individuals were asked to taste ice-cream under distraction or no-distraction conditions. For half the participants, the ice-cream was described as particularly low in calories, for the other half as particularly high (the ice-cream was actually the same for both groups). The dependent measure consisted of the amount of ice-cream eaten. A restraint by distraction interaction was predicted for the high, but not the low, calorie condition; thus in the high calorie condition, restrained eaters were expected to eat more than unrestrained eaters when distracted, but to eat the same or even less than unrestrained eaters when not distracted. With low calorie ice-cream, distraction should not affect the eating control of restrained eaters. For the unrestrained eaters, who are assumed not to regulate their eating behaviour cognitively, neither the distraction, nor the calorie manipulations should have any effects on their eating behaviour.

Method

Participants

A group of 126 female students from different departments at Utrecht University volunteered to participate in the experiment. All participants had eaten their usual meal; there were no indications that groups differed in level of deprivation. Three students guessed the purpose of the experiment, and one claimed to dislike ice-cream; these four were excluded from further analyses. Participants' mean score on the Restraint Scale (RS, see below for description) was 11.2 (SD 4.9, range 0-23), with a median score of 11.[2] Participants were classified as restrained or

[2] The median score for RS was lower in our study than is usual in American research; however this pattern is typical for research conducted in the Netherlands (e.g. Jansen, Oosterlaan, Merckelbach & van den Hout, 1988).

unrestrained eaters by means of a median split of the RS scores. Seven participants scored exactly the median, and were not included in either group. A total *N* of 115 resulted. Table 1 shows the mean age, body mass index (BMI) and RS scores for the restrained and unrestrained eaters.

Table 1. Characteristics of the participants

	Restrained ($N = 56$)		Unrestrained ($N = 59$)			
$N = 115$	*M*	(SD)	*M*	(SD)	*t*	*p*
Age	21.1	(2.4)	21.2	(2.3)	0.1	NS
RS score	15.4	(3.0)	7.3	(2.4)	−16.0	.00
BMI	23.3	(2.5)	20.6	(1.8)	−6.6	.00

Independent variables

Perceived calorie content

The perceived calorie content of the ice-cream was manipulated by telling half the participants that 'the ice cream is extra creamy', whereas the other half were told 'The ice cream is from a firm that specializes in light products. They have managed to produce ice cream that tastes as creamy as other ice-cream, but contains 30% fewer calories'. The effect of the calorie manipulation was assessed with the following question: 'How many calories did this ice-cream contain, compared with normal ice-cream?'. The answer was given on an 11-point Likert scale ranging from 50% less to 50% more calories.

Distraction

Distraction was manipulated by introducing a task that had already been pretested and used in a previous experiment (Boon *et al.*, 1997). It consisted of listening to a 15-minute radio conversation. Participants were first instructed on how to perform the taste test (see procedure). Half were then told that in the meantime they would have to listen to the radio conversation. The instruction was to pay full attention to the conversation and to count the number of animal words figuring in the conversation. Participants were told that they had to answer questions about the content of the conversation afterwards. Two subjective measures of distraction were included as a manipulation check. Distraction was assessed with the following two questions: 'Were you able to concentrate sufficiently on performing the taste test?' and 'Did you feel distracted while performing the taste test?', both answered on a 7-point Likert scale (from 'very badly' to 'very well' and from 'not at all' to 'very much', respectively).

Restraint

Subjects were divided into groups of high and low restraint on the basis of a median split of their scores on the Restraint Scale (Polivy *et al.*, 1978). This scale, a 10-item questionnaire that was designed to measure the level of dietary restraint contains questions on dieting, concerns about weight and eating, and weight variation over different time periods. The RS is well validated (Ruderman & Besbeas, 1992) and is widely used to identify restrained and unrestrained eaters, whose eating behaviour was successfully predicted in a series of laboratory studies (for an overview, see e.g. Ruderman, 1986).

Procedure

Participants were asked to have breakfast or lunch 1–3 hours before participation and to refrain from eating thereafter until the experiment. All subjects were tested individually. Upon arrival at the laboratory, the experimenter told the cover story that the test concerned differences in taste perception between people, with particular interest in the influence of external factors, such as watching TV while eating. Participants were presented with three bowls of ice-cream, each containing approximately 600 g of vanilla, strawberry or chocolate ice-cream. Participants were randomly assigned to either the high or low calorie condition. All participants were instructed to taste the three flavours and to rate them on a rating form that would be handed to them after the taste test. They were told that they had to taste all the flavours and to feel free to eat as much as they wanted and as much as they needed for reliable taste ratings.

Participants were randomly assigned to the distraction or no-distraction condition. In the no-distraction condition they performed the taste test in a silent room. In the distraction condition, participants were informed that they had to perform a second task that consisted of listening to a radio conversation (see distraction). All participants were then left alone for 15 minutes in order to taste. After that, the experimenter returned and asked the participants to fill in a set of questionnaires (the distraction manipulation check, a taste rating form that contained the perceived calories manipulation check, questions about the purpose of the experiment, the Restraint Scale and a general questionnaire containing questions about age, study and time of lunch or breakfast). Participants' height and weight were measured and they were debriefed, thanked and paid a small fee for participation. Ice-cream consumption was calculated by weighing the ice-cream bowls before and after the tasting.

Results

Manipulation checks

The manipulation checks indicated that the manipulations of distraction and of perceived calorie content had been successful. Distracted participants reported that they were significantly less able to concentrate than not-distracted participants (M 4.5 (SD 1.2) vs. M 6.2 (SD 0.9); $t(120) = -8.9$, $p < .001$). Distracted participants also indicated that they felt significantly more distracted than did not-distracted participants (M 4.5 (SD 1.5) vs. M 1.9 (SD 1.3); $t(120) = 10.5$, $p < .001$). Similarly, participants in the low calorie condition perceived the ice-cream as significantly less calorific than did participants in the high calorie condition (M 4.4 (SD 1.7) vs. M 7.7 (SD 1.4); $t(120) = 11.8$, $p < .001$).

Consumption

Table 2 shows the mean consumption for participants in the distraction and no-distraction conditions when eating ice-cream perceived as either low or high in calories. BMI was included as a covariate in all analyses, since our restrained eaters had a significantly higher BMI than our unrestrained eaters.

A 2 (restraint) × 2 (distraction) × 2 (perceived calories) ANCOVA was conducted on consumption with BMI as a covariate. The effect of the BMI as covariate was not significant ($F < 1$). There was a main effect for distraction ($F(1, 106) = 17.7$, $p < .001$) with participants eating more ice-cream under distraction rather than no-distraction conditions. There were no main effects for restraint ($F < 1$) and perceived calories ($F < 1$) and none of the two-way interactions reached significance. However, in line with predictions, there was a significant three-way interaction ($F(1, 106) = 4.4$, $p < .05$). This interaction was clarified by the results of two 2-factor (2 (restraint) × 2 (distraction))

Table 2. Mean consumption (g) for restrained and unrestrained eaters

	No distraction			Distraction		
	M	(SD)	*N*	*M*	(SD)	*N*
High calorie						
Restrained	154.6	(98.9)	14	274.6	(96.9)	14
Unrestrained	176.0	(77.5)	14	192.5	(76.5)	14
Low calorie						
Restrained	186.0	(75.3)	15	234.9	(95.2)	13
Unrestrained	175.1	(97.0)	15	261.0	(78.2)	16

ANOVAs conducted separately for the two calorie conditions. Within the high calorie condition, a significant main effect occurred for distraction ($F(1,51) = 8.1$, $p < .01$) with more ice-cream being eaten under distraction conditions. However, this main effect was moderated by a significant restraint × distraction interaction ($F(1,51) = 4.7$, $p < .05$). Thus, as tests of the simple effects confirm, whereas restrained eaters tended to eat slightly—but not significantly—less ice-cream than unrestrained eaters when not distracted ($F(1,52) = 0.2$, NS), they ate considerably more than unrestrained eaters when distracted ($F(1,52) = 5.1$, $p < .05$). In the low calorie condition, only the main effect of distraction reached significance ($F(1,54) = 9.1$, $p < .01$). There was no indication of an interaction between restraint and distraction ($F < 1$) within the low calorie condition.

In order to further clarify the effects of the distraction, *post hoc* tests of all four simple effects were conducted. These revealed that two of the four groups ate more in the distraction condition than their counterparts in the no-distraction condition; the restrained eaters in the high calorie condition ($F(1,106) = 12.9$, $p < .001$) and the unrestrained eaters in the low calorie condition ($F(1,106) = 7.5$, $p < .05$).

Discussion

Most of the findings of the present study are consistent with our predictions, but some are not and these form an interesting puzzle which needs further exploration. The major hypothesis tested in our study was that of an interaction between restraint, distraction, and the perceived calorie content of the food stimuli. We expected that impairment of cognitive capacity would lead to overeating in restrained—but not in unrestrained—eaters and that this difference should only emerge with food which was high in calories. This prediction was supported in separate analyses for the conditions in which the ice-cream was perceived to be high vs. low in calories.

For the low calorie condition, no restraint × distraction interaction was predicted. Consistent with this hypothesis, no such interaction was found. In the condition in which the ice-cream was perceived to be high in calories, we did predict and find a restraint × distraction interaction. Restrained participants ate the same amount as unrestrained participants in the no-distraction condition, but substantially more than unrestrained individuals in the distraction condition. The consumption of the distracted

restrained eaters was also significantly larger than that of the restrained eaters who had not been distracted. Thus, as predicted from Ironic Process Theory, restrained eaters were successful in realizing their intention to eat little of the high-calorie food if they were not distracted. Apparently the ability to bring their full cognitive resources to bear on the task enables restrained eaters to control their eating. However, as in other tests of the Ironic Process Theory (Wegner, 1994), if they were distracted and thus had to deal with cognitive capacity limitations, their attempts to control their eating appeared to have the ironic effect of resulting in higher consumption.

Contrary to expectation, however, there was also a main effect of distraction. Restrained as well as unrestrained eaters consumed more ice-cream in the distraction than in the no-distraction condition. This finding for the unrestrained eaters was neither predicted from Ironic Process Theory (Wegner, 1994), nor can it be derived from the Boundary Model of Herman and Polivy (1984). Both theories would predict that unrestrained eaters would not be affected by distraction, since they are not assumed to regulate their eating behaviour cognitively.

A potential interpretation of the overall main effect of distraction could be derived from Epstein's research on salivary responses to food cues under conditions of distraction (Epstein, Mitchell & Caggiula, 1993; Epstein, Paluch, Smith & Sayette, 1997). Their findings revealed that attending to environmental stimuli in an attentionally demanding task slows down the process of habituation to repeated presentations of food cues, as indicated by a significant deceleration of the decrease in levels of salivation. They concluded that 'an implication of this finding is that tasks that require significant information processing may slow down habituation to sensory properties of food cues, such that an individual might eat more when involved in cognitively demanding tasks than when allocating the majority of cognitive processing resources to food cues' (Epstein *et al.*, 1993, 1997, p. 63). This effect, then, should be found in restrained as well as unrestrained eaters. Unfortunately, Epstein and colleagues did not differentiate between restrained and unrestrained eaters. To validate this hypothesis, a study is needed which examines the salivary responses as well as actual food consumption of restrained and unrestrained eaters under conditions of high or low cognitive load and with repeated presentation of food cues.

A second possible explanation for the finding that unrestrained eaters, as well as restrained eaters, showed a higher consumption in distraction than in no-distraction conditions is that unrestrained eaters too may pay at least some attention to cognitive cues in regulating their eating behaviour. This assumption would be consistent with findings from Boon, Stroebe, Schut, and Jansen (1998), indicating that unrestrained eaters do attend to calorie information. Both restrained eaters and unrestrained eaters, who had been asked to write down their thoughts elicited by food words presented to them, responded with more restraint-relevant thoughts (e.g. 'I should not eat this' or 'This contains many calories') to words describing high rather than low calorie food items. This would suggest that unrestrained eaters are not as unrestrained as they were assumed to be. However, this interpretation would be difficult to reconcile with the many studies that have shown differences in the behaviour of restrained and unrestrained eaters.

On the whole, our application of the Ironic Process Theory to restrained eating resulted in interesting and novel findings concerning the overeating of restrained eaters. Even though we cannot yet offer any conclusive explanation for the disinhibitive overall main effect of distraction, we did find support for the limited capacity hypothesis. Restrained eaters who were distracted ate more of the (forbidden) high calorie ice-

cream than did unrestrained eaters who were distracted. Their consumption was also higher than that of restrained eaters who were not distracted. This may imply that the nature of the distraction is not important and can be either emotional or non-emotional. If restrained eaters do not have full access to their cognitive resources, they may be sensitive to ironic processes that lead them to overeat. Herman and Polivy's suggestion that negative emotions are a more urgent concern than dieting may thus be true for a number of factors in addition to negative emotional states. To avoid premature conclusions, however, it should be remembered that the present experiment did not include a measure of negative affect. The possibility that distraction had its effect on consumption via the induction of negative affect—due to the frustrating or annoying experience of having to perform two tasks simultaneously, for example—cannot be completely ruled out.

An implication of the present findings—if attributed to distraction and not to negative affect—is that the more that restrained eaters try to exert control over their eating behaviour (e.g. when high calorie food is present), the higher will be their vulnerability for the unintended consequence, namely overeating. Since the risk of being cognitively distracted is pervasive, this would induce repeated overeating. Eating in front of the television, conversations while having dinner, may limit the available cognitive resources needed to restrain high calorific food intake. This may explain findings such as those of Klesges *et al.* (1992), indicating that many dieters are unsuccessful and end up gaining weight instead of losing it.

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