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Short Communication
Word count: 2,380

Restraint, disinhibition and food-related attentional bias.

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Abstract

This study examined associations between restraint, disinhibition and food-relational attentional bias (FAB, assessed by the emotional Stroop task) in males and females in the UK, Greece and Iran. Results showed high restraint was associated with higher FAB. Given the role of attentional bias in the maintenance of addictive behaviours these results suggest that attempting to limit ones food intake may actually be counter-productive. However, results also revealed lower FAB among high restrained dieters compared to high restrained non-dieters, thus it is possible that successful dieters have identified strategies that limit FAB and in turn make it easier to lose weight. High disinhibition was also associated with higher FAB but this difference failed to reach statistical significance. Results are discussed in relation to theories of incentive salience and current concerns.

Keywords: food, attentional bias, restraint, disinhibition, incentive salience, stroop, cross-cultural, diet, addiction, current concerns

Restraint, disinhibition and food-related attentional bias.

When a person abuses a substance they display an attentional bias for information in the environment relating to this substance (e.g., Cox, Fadardi & Pothos, 2006). That is, they will direct their attention towards such information and process it more extensively. Attentional bias is important since it may contribute to the maintenance and/or escalation of the addictive behaviour (e.g., Cox, Pothos & Hosier, 2007). Unlike drugs or alcohol, food is not physically addictive. Nevertheless, like addictive substances, food can be a powerful reinforcer. As such, many individuals overeat and have difficulty limiting their food intake.

Previous research on food-related attentional bias (FAB) in non-clinical populations is limited. A well-documented result is that higher levels of restraint (i.e. attempts to limit food intake) are associated with greater FAB. However, the compellingness of this finding is reduced by methodological limitations. Most of the studies we identified (see Table 1) have measured restraint using the Restraint Scale; a scale that confounds restraint with disinhibition (i.e. tendency to overeat, Van Strien, 1997). Of the four studies that employed alternative measures of restraint, only one (Green & Rogers, 1993), found a main effect of restraint on FAB. An additional problem with work in this area is that it has been almost exclusively conducted with females from western societies. Given societal pressures on western females to be slim (e.g., Cogan, Bhalla, SefaDedeh, & Rothblum, 1996), it seems likely that women who are more inclined to overeat may also be more likely to attempt to limit their food intake, resulting in correlations between disinhibition and restraint. These limitations raise the question of whether it is restraint that is associated with increased FAB or tendency to overeat.

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We sought to address these shortcomings, by including in our sample individuals displaying high disinhibition/low restraint and vice versa. This was achieved by recruiting males and females in the UK, Greece, and Iran, since there is evidence to indicate that men and non-western women are less subject to pressures to be slim (e.g., Cogan et al., 1996; Wardle et al., 1992). Additionally, we employed the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers & Defares, 1986) which assesses restraint and disinhibition (i.e. emotional and external eating) separately. In this way we hoped to better understand the predictors of FAB.

Method

Participants were 224 native undergraduates at the Universities of Swansea, UK (36 females, 30 males), Ioannina, Greece (30 females, 30 males) and Mashhad, Iran (60 females, 38 males). Mean age was 21.7 years (SD=3.91; range=17-47) and mean BMI was 22kg/m^2 (SD=3.57; range=16-36).

Participants were tested in their native language between 10.00-12.00 and 14.00-16.00 hours. They first completed a food version of the emotional Stroop Task, consisting of one card containing 20 different neutral travel-related words and one card containing 20 different food words (e.g., chocolate, salad, potato). Travel and food words were matched in terms of average number of characters (Cox et al., 2006). Each word was presented four times (80 words per card) and printed in blue, green, red or orange. Word order was randomly determined.

Participants first went through a classic Stroop task for practice. Subsequently, they received either the food or neutral card (the order was counterbalanced across participants) and the experimenter recorded the time it took to complete each card and the number of errors. Participants then completed the DEBQ and the Grand (1968) hunger scale. The latter was included to control for hunger biases; none were identified (up to two-way interactions).

Results

For each participant we computed: a FAB score, by subtracting the (overall) time it took to read the neutral words from the time it took to read the food words; BMI; DEBQ scores (ranging from 1 to 5) for restraint and disinhibition (Van Strien et al., 1986; the latter was computed by taking the mean of the emotional and external eating subscales).

Thirty-one participants indicated that they were dieting to lose weight (Britain=6 females, 4 males; Greece=7 females, 2 males; Iran=9 females, 3 males). We first consider results from the 193 participants who were not dieting. One participant (British, female) scored greater than 3.5sds from the mean on the Stroop and was also excluded leaving 192 participants. No participant's error rate exceeded 5%. The correlation between BMI and FAB was non-significant ($r = .11$).

As predicted, there was a main effect of country on restraint with lower restraint in Iran than in Britain and Greece ($F(2,186)=4.01$, $p<.05$; Britain: $M=2.35$, $SD=0.86$; Greece: $M= 2.27$, $SD=0.90$; Iran: $M=2.03$, $SD=0.69$). Also as predicted, there was a main effect of gender on restraint, with males showing lower restraint than females, ($F(1,186)=16.83$, $p<.001$; males: $M=1.96$, $SD=0.67$; females: $M=2.38$, $SD=0.87$). There were no significant main or interaction effects of country or gender on disinhibition. Given that a mixed gender and cross-cultural sample was employed primarily to unconfound restraint and disinhibition, gender and country were not included in further analyses (thus also reducing the chances of Type 2 error).

Considering that a) preliminary correlational analyses revealed considerable noise in the DEBQ continuous measures and b) an important analytical objective concerned an examination of interactions, we adopted a dichotomization approach (MacCallum, Zhang, Preacher, & Rucker, 2002). Restraint and disinhibition scales were dichotomized above and below their midpoints. A two-way ANOVA showed no main effect of disinhibition on FAB ($F(1,188)=2.23$, $p=0.14$; the means, however, were in the predicted direction; $M=2.78$, $SD=7.24$, $n=146$ and $M=3.92$, $SD=7.73$, $n=46$, for low and high disinhibition respectively), a main effect of restraint on FAB ($F(1,188)=6.15$, $p<.05$; $M=2.57$, $SD=7.21$, $n=164$ and $M=5.91$, $SD=7.72$, $n=28$ for low and high restraint respectively), but no interaction.

We next extended our analyses to include participants who were dieting. In this instance we excluded those who reported dieting but scored under 3 on the restraint scale (eliminating six participants; these were taken to be spurious responses) and those who exceeded 3.5sds from the mean of FAB (eliminating two participants). The remaining 216 participants were divided into three groups according to dieting and restraint status (high and low restraint were defined as above): low restrained non-dieters ($n=164$), high restrained non-dieters ($n=28$), high restrained dieters ($n=24$). Control and food card error rates were all under 5%.

A one-way ANOVA with the three restraint and dieting groups as the independent variable and FAB as the dependent variable revealed a near significant effect ($F(2,213)=3.02$, $p=.051$; low restrained non-dieters: $M=2.57$, $SD=7.21$, high restrained non-dieters: $M=5.91$, $SD=7.72$, high restrained dieters: $M=1.44$, $SD=7.60$). Follow-up t-tests showed that dieters displayed *lower* FAB compared to high restrained non-dieters, $t=2.10$, $p<.05$, but not compared to low restrained non-dieters, $t=0.71$, NS.

Discussion

Results showed that high restraint was associated with greater FAB. Given the potential role of attentional bias in the maintenance of addictive behaviours (e.g. Cox et al., 2007), this result is intriguing: attempting to limit food intake may actually be counterproductive. However, the results also suggested that dieters may have lower FAB than high restrained non-dieters. Thus it is possible that successful dieters have identified strategies that limit FAB, which in turn should make it easier to lose weight.

Additionally, the results showed a trend towards an effect of disinhibition on FAB, but one that did not reach significance. It is possible that this would have reached significance in a sample where BMI had been manipulated more carefully. In the present study most of the participants were university students with fairly uniform BMIs. Moreover, all three samples comprised persons who would be of higher socioeconomic status, compared to the average in their respective societies.

Finally, it is important to consider the origins of FAB. There are two possibilities. First, FAB may reflect the incentive salience of stimuli, i.e. their relevance for reinforcement (Robinson & Berridge, 1993). According to this viewpoint, we preferentially attend to food information because of a history of dopaminergic reward as a result of consuming food. Individual differences in taste perception (Drayna, 2005), sensitivity to food reinforcement (e.g., Beaver et al., 2006), or the ease with which food cues acquire incentive properties (Robinson & Berridge, 1993), are all factors that could contribute to individual differences in the incentive salience of food cues and thus account for differences in FAB. The second possibility is that FAB is a consequence of preoccupation with food. Klinger and Cox (2004) suggested that our lives are organized around the pursuit of goals. The process of pursuing a goal is called a *current concern* and it induces attentional bias for information relating to this goal. Although the present study did not directly compare these two accounts it is possible that restraint reflects an individual's level of preoccupation with food whilst disinhibition (particularly external eating) reflects individual differences in the incentive salience of food cues. If this is the case, the present results provide greater support for the preoccupation account, However, this conclusion is bound to be dependent on sample characteristics (e.g., high versus average BMI). Future research will hopefully clarify this issue.

Acknowledgements

This research was partly supported by the Welsh Office of Research and Development (grant ReF05/1/010). We thank Elaine Moreland, Natalie Samuel and Jenna Sullivan for help with data collection.

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Table 1.

Characteristics of studies examining restraint and food-related attentional bias (FAB) in non-clinical populations. *Denotes higher FAB in restrained eaters.

Study	Measure of restraint	Population	Measure of FAB
Francis, Stewart & Hounsell, (1997)	Restraint scale	28 females Canada	*Stroop
Israeli & Stewart, (2001)	Restraint scale	67 females Canada	*Word recall
Overduin, Jansen & Louwerse, (1995)	Restraint scale	51 females Netherlands	*Stroop
Stewart & Samoluk (1997)	Restraint scale	27 females, 7 males Canada	*Stroop

Table 1 continued

Boon, Vogelzang & Jansen, (2000)	Restraint scale	59 females Netherlands	*Dot probe Word recognition
Black, Wilson, Labouvie & Heffernan, (1997)	Restraint scale	29 females USA	Stroop
Mahamedi & Heatherton, (1993)	Restraint scale Restraint scale	47 females USA 48 females USA	Stroop Stroop
Sackville, Schotte, Touyz, Griffiths & Beumont, (1998)	Restraint scale	53 females Australia	Stroop
Green & Rogers, (1993)	DEBQ	55 females Britain	*Stroop

Table 1 continued

Braet & Crombez, (2003)	DEBQ	53 boys, 21 girls (9-16 years, 34 obese, 40 control) Belguim	Stroop (*for obese only)
Ogden & Greville, (1993)	DEBQ	56 females Britain	Stroop (*following preload only)
Long, Hinton & Gillespie, (1994)	Eating inventory	82 females (51 obese restrained, 45 controls) Britain	Stroop