RESTRAINED EATERS ARE RAPIDLY HABITUATING SENSATION SEEKERS

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Summary—Several authors have pointed to similarities between eating disorders and addictive behaviors. In earlier studies, addicts were found to score high on the Sensation Seeking Scale (SSS) and to habituate rapidly to neutral stimuli. In this study, we found experimental support for an addiction model of eating disorders: restrained eaters also scored significantly higher on the Sensation Seeking Scale and also habituated significantly quicker to a series of neutral stimuli than unrestrained eaters. No clear evidence was found for the hypothesis that restrained eaters score lower on measurements of anxiety. It is hypothesized that rapid habituation promotes sensation seeking, which may be manifested in excessive consumption of either drugs or food. Restraint may be a strategy to prevent negative consequences of sensation seeking and excessive consumption. The model is related to earlier experimental findings.

INTRODUCTION

Several authors have pointed to similarities between eating disorders and addictive behaviors (Scott, 1983; Simnet, Judd and Olsen, 1983; Dumont and Vamos, 1983; Brisman and Siegel, 1984; Lacey and Evans, 1986; Lacey and Mourel, 1986; Wardle, 1987; Filstead, Parela and Ebbit, 1988). Both eating disorders and addictions are characterized by craving, preoccupation, and a loss of control over intake. Yet, so far the analogy between eating disorders and addictions is just a theoretical one, which has not been put to direct experimental tests.

Zuckerman (1979) found that individuals who are likely to develop habits of substance abuse are high sensation seekers, where sensation seeking is defined as “a need for varied, novel, and complex sensations and experiences, and the willingness to take physical and social risks for the sake of such experience” (Zuckerman, 1979, p.10). High sensation seekers seek stimulation and stimulation change (Gale and Edwards, 1986). Addicts were found to score higher on the Sensation Seeking Scale (SSS; Zuckerman, 1979) and they also habituated more rapidly to neutral stimuli than normal controls (Zuckerman, 1979). Considering the analogy between addictions and restrained eating (Wardle, 1987) it may be hypothesized that restrained eaters (1) score higher on the SSS, and (2) habituate faster to neutral stimuli than unrestrained eaters.

Indirect support for this hypothesis comes from a study of Calloway, Fonagy and Wakeling (1983). These authors found faster habituation rates of skin conductance responses (SCRs) in bulimic Ss than in normal controls and restricting anorexia nervosa (AN) patients. However, the results of this study should be interpreted cautiously; faster habituation rates in patients with bulimia may be induced by a disturbed skin conductance, as a consequence of the electrolyte imbalance resulting from purging activities. Calloway et al. (1983) also found less spontaneous fluctuations in skin conductance of bulimics compared to AN-restricters and normal controls. Their finding of less spontaneous fluctuations and faster habituation rates in bulimics, and the fact that anxiety states are often associated with more spontaneous fluctuations (Orr and Pittman, 1987) and slower habituation rates (Lader, 1980; Lelliott, Noshirvani, Marks, Monteiro, Basoglu and Cohen, 1987) provided a third hypothesis: (3) restrained eaters score lower on anxiety measures than unrestrained eaters.

To sum up, the primary aim of this study was to investigate the tenability of the addiction model to restrained eating: do restrained eaters score higher on the sensation seeking scale and do they

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habituate quicker to neutral stimuli than unrestrained eaters? Furthermore, we wanted to elaborate the Calloway study by finding out if their data can be reproduced in a sub-clinical sample, and if indeed restrained eating is inversely related to measures of anxiety.

METHOD

Subjects

296 Female students of the Limburg University were invited to complete the Restraint Scale (Herman, Polivy, Pliner and Threlkeld, 1978). From the 73 students who completed the questionnaire, 11 high restrained and 11 low restrained scorers were asked to participate in the experiment. S characteristics are shown in Table 1.

Materials, assessment and measurement

The psychological measurements consisted of Dutch translations of:

1) the Restraint Scale (RS) (Herman et al., 1978), consisting of 10 items measuring attitudes toward eating, frequency of dieting, and weight fluctuations;

2) the short Sensation-Seeking Scale (SSS) (Madsen, Das, Bogen and Grosman, 1987). This scale consists of 10 items and has proven to be a reliable and valid measure of sensation seeking. Scores on the short SSS correlate strongly ($r = 0.78$) with those on the total SSS;

3) the Fear Questionnaire (FQ) (Marks and Mathews, 1979); a 15-item self-rating scale which has proven to give reliable and valid indications of avoidance of certain situations;

4) the Spielberger State–Trait Anxiety Inventory (Van der Ploeg, Defares and Spielberger, 1980), a 40-item inventory measuring self-reported state anxiety and trait anxiety. State anxiety measures momentary anxiety: a transitory emotional condition which varies in intensity and fluctuates in time as a reaction on a certain situation. Trait anxiety refers to a stable and enduring individual difference in anxiety proneness.

The physiological measurement consisted of skin conductance responses (SCRs) to a series of auditory stimuli. Skin conductance level (SCL) and SCRs were picked up from Beckman Ag–AgCl electrodes (diameter 8 mm), attached to the medial phalanges of the second and third finger of S’s right hand. Electrodes were connected to a Beckman Skin Conductance Coupler (Type 9844), using the method of constant voltage (0.5 V). Respiration rate was recorded with a Beckman Respiration Belt, connected to a Beckman Pressure/Pulse/Voltage Coupler (Type 9884), SCR and respiration were monitored on a Beckman R711 polygraph.

The auditory stimuli were 14 × 1000Hz, 85 dB tones binaurally presented through Beyer dynamic earphones (type DT109) connected to a Sony cassette recorder (TCK 88). Signals were held on the exact dB level by a Dual Signal Gate (Symetrics, type SG 200). The tones were presented at random intervals. Intertrial intervals varied between 15 and 30 s, with an average of 20 s. Duration of the tone was 6 s. A prefabricated tape was used to generate the tones.

Response definition and analysis

SCLs were measured during the pre-experimental baseline period. SCRs were defined as the maximal deflections occurring between 1 and 5 s after stimulus onset. SCLs and SCRs were measured in microho and square-root transformed.

Two indices of habituation of the SCRs were used. Response decline over trials were analyzed by subjecting the SCRs magnitudes for each trial to a 2 (Group: Restrained vs Unrestrained) × 14

<table>
<thead>
<tr>
<th>Table 1. S characteristics</th>
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<tr>
<td></td>
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<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>BMI</td>
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<tr>
<td>RSS</td>
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*One-tailed.

BMI = Body Mass Index = weight/height².

RSS = Restraint Scale Score (Herman et al., 1978).
(Trials) Analysis of Variance (ANOVA), with the last factor being a repeated measure. Furthermore, a trials-to-criterion measure of habituation was used: habituation was said to have occurred when SSs failed to respond (SCRs smaller than 0.05 microbm) on two successive trials. Group differences in mean-trials-to-criterion were evaluated with a t-test.

Additionally, spontaneous fluctuations (SFs) were counted. SFs were defined as SCRs which exceeded 0.05 microbm, occurring before stimulus onset or at least 5 s after stimulus offset.

Respiration was used as a control variable: trials with respiratory irregularities were excluded from the data analysis. SCR values for these trials were estimated on the basis of the mean SCRs on adjacent trials.

Procedure

After entering the laboratory, the S was asked to complete the short SSS and FQ. The S sat in a comfortable chair which was placed in a dimly lit, sound-attenuated chamber. The tape recorder and recording apparatus were in an adjacent room. After cleaning S’s fingers with distilled water, electrodes were attached. Before baseline measurement started, the S was told that during the experiment she would hear something through the earphones. Baseline measurement started and SCL was registrated. After a 4 min period of baseline measurement the series of tones was presented. Next, the S completed the State–Trait Anxiety Inventory. Then her weight and height were measured, and finally, she was debriefed and paid for participation.

RESULTS

The results are shown in Table 2.

<table>
<thead>
<tr>
<th></th>
<th>Restained Ss</th>
<th>Unrestrained Ss</th>
<th>t</th>
<th>P*</th>
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<tbody>
<tr>
<td>Sensation Seeking</td>
<td>7.09 (1.45)</td>
<td>5.55 (1.5)</td>
<td>2.45</td>
<td>0.01</td>
</tr>
<tr>
<td>Fear Questionnaire</td>
<td>25.0 (6.59)</td>
<td>31.6 (11.9)</td>
<td>6.3</td>
<td>0.06</td>
</tr>
<tr>
<td>State Anxiety</td>
<td>33.18 (9.2)</td>
<td>34.55 (8.7)</td>
<td>0.36</td>
<td>NS</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>41.27 (13.1)</td>
<td>37.82 (6.9)</td>
<td>0.77</td>
<td>NS</td>
</tr>
<tr>
<td>Mean Trials to Criterion</td>
<td>9.09 (2.93)</td>
<td>11.55 (2.98)</td>
<td>1.94</td>
<td>0.03</td>
</tr>
<tr>
<td>Spontaneous Fluctuations</td>
<td>7.9 (6.5)</td>
<td>10.6 (6.8)</td>
<td>0.95</td>
<td>NS</td>
</tr>
</tbody>
</table>

*One-tailed.

As is evident from Table 2, hypothesis 1 was supported: Restained Ss scored significantly higher on the short SSS than Unrestrained Ss. The picture was less clear as the hypothesis of Restained Ss being unanxious was concerned: Restained and Unrestrained Ss did not differ in State and Trait Anxiety. On the Fear Questionnaire Restained Ss tended to score lower; this difference was marginally significant. Closer inspection of the data revealed no differences between Restained and Unrestrained Ss on the three subscales (agoraphobia, social anxiety, and blood-injury) of the FQ.

Restained and unrestrained Ss did not differ in mean SCL at the start of the experiment, the means (microbm) being 7.4 (SD = 3.4) and 7.0 (SD = 2.9) respectively [t(20) = 0.23, NS]. Also, there was no difference in Orientation Response, defined as the SCR to the first stimulus, between Restained and Unrestrained Ss: means were 2.2 (SD = 1.2) and 1.8 (SD = 1.7) respectively [t(20) = 0.63, NS].

In line with the hypothesis, Restained Ss habituated significantly faster to the series of tones than unrestrained Ss. The group differences in habituation were evident in both indices of habituation rate: (a) restained Ss reached the criterion of non-responding much earlier than unrestrained Ss (see Table 2), and (b) SCRs of restained Ss declined more rapidly over trials than did SCRs of unrestrained Ss [Group × Trial interaction: F(1, 20) = 2.1, P = 0.01]. To control for BMI differences, the ANOVA was repeated with BMI as covariate. The ANCOVA showed significant main effects for Trials [F(1, 20) = 28.56, P = 0.00] and for Groups [F(1, 20) = 5.38, P = 0.032], and again a significant Group × Trials interaction [F(1, 20) = 2.1, P = 0.01] emerged.

However, contrary to what was predicted, we observed no between group differences in the number of Spontaneous Fluctuations (see Table 2).
DISCUSSION

The first and second hypothesis, stating that restrained eaters score higher on the short SSS and habituate quicker to a series of neutral stimuli than unrestrained eaters, were confirmed. The third hypothesis, of restrained eaters scoring low on measurements of anxiety, was partly supported: restrained eaters tended to score lower on the FQ than unrestrained eaters, but no difference emerged between both groups in State and Trait Anxiety. Also, the number of Spontaneous Fluctuations, the frequency of which was found to be higher in anxiety states (Lader, 1980; Orr and Pitman, 1987), did not differ between restrained and unrestrained eaters.

The findings of our study fit with the addiction model of restrained eating. Zuckerman (1979) showed that addicts are rapidly habituating sensation seekers, and in line with this we showed that restrained eaters are rapidly habituating sensation seekers. Since especially high scorers on the “disinhibition” subscale of the total SSS showed fast habituation of the SCR (see Gale and Edwards, 1986)—while this “disinhibition” subscale measures the hedonistic pursuit of pleasure through extraverted activities such as social drinking, sex and parties—it may be of interest to test whether restrained eaters are particularly high “disinhibition” scorers.

The fact that we could reproduce Calloway’s findings in a subclinical sample of restrained eaters strongly supports that Calloway’s findings did not result from purging activities of their bulimics, but that they are associated with addiction-like behavior. Calloway’s observation of fewer SFs in bulimics is in sharp contrast with our findings: we found only marginal differences in anxiety measurements between groups. Calloway et al. (1983) relate bulimia to psychopathy because of their faster habituation rates and fewer SFs in Skin Conductance. However, it should be noted that the psychophysiology of psychopathy is different. Psychopaths are characterized by faster habituation rates, but also by tonic lower levels of SC and smaller ORs (Zahn, 1986). In our study and in the study of Calloway et al. (1983) no differences in OR and SC levels were found between restrained eaters and bulimics respectively, and normal controls. A resemblance of the electrodermal activity of bulimics and psychopaths may thus be restricted to rapid habituation, it does not include ORs and SCLs.

Research on overeating after a preload may help elucidate the present findings. Analogous to a binge of bulimics, which may be triggered by eating a small amount of food, restrained eaters in the laboratory were found to lose control over their food intake after a small preload (Herman and Mack, 1975; Hirschler and Herman, 1977; Jansen, Meckelbach, Oosterlaan, Tuiten and van den Hout, 1988a; Jansen, Oosterlaan, Meckelbach and van den Hout, 1988b). This uncontrollability of food intake after a preload is usually thought to be a consequence of the preload breaking the restraint. The common line of reasoning goes as follows. Binges of bulimics, and sub-clinical over-eating in laboratory situations, are typically preceded by periods of dieting (Wardle, 1980; Polivy and Herman, 1985; Ruderman, 1985, 1986). The explanation given for overeating is that dieting suppresses the body weight below a biological set-point for body weight. Breaking the psychological restraint, e.g. by eating a preload, triggers a biological urge to eat (Herman and Mack, 1975). However, the concept of set-point is rather untestable, and analogous to the overeating/bingeing response in Ss preoccupied with eating, is the drinking response of restrained alcoholics after a preload of alcohol. After drinking a small amount of alcohol the alcoholic engages in a “drinking binge” (Scott, 1983). And it is questionable whether this has anything to do with an inborn, naturally predetermined, set-point.

Considering that (1) rapid habituation to a series of neutral stimuli is characteristic of addicts as well as restrained eaters, (2) addicts and restrained eaters are high sensation seekers, and (3) overconsumption after breaking their restraint is characteristic of both addicts and restrained eaters, the following speculation is made. People who are rapidly habituating to stimuli need a lot of stimulation to reach an optimal level of stimulation: they are high sensation seekers. When high sensation seekers give in to their need of much stimulation, they run the risk of being excessive consumers. This excessive consumption may have negative consequences, e.g. being fat or having a hangover. In order to prevent these negative consequences, the rapidly habituating sensation seekers need to restrain themselves. In this view, restraint is considered to be a consequence of the rapid habituation: rapidly habituating individuals seek stimulation and thus are prone to excessive intake. Then restraint is a preventive means for not suffering from aversive results following
excessive consumption. Breaking the restraint leads to overconsumption, and has thus much more to do with the rapid habituation rates and need for stimulation than with a biologically predetermined set-point for body weight. Schematically:

\[
\text{rapid habituation} \rightarrow \text{sensation seeking} \rightarrow \text{excessiveness} \rightarrow \text{negative consequences} \rightarrow \text{restraintness} \rightarrow +
\]

There are various lines of evidence to support this view.

First, there is the often reported cross-over and co-existence in addictive behavior. Eating-disordered patients often report excessive alcohol drinking or drug abuse in the past or present (Brisman and Siegel, 1984; Jonas and Gold, 1988; Beary, Lacey and Merry, 1986; Lacey and Moureli, 1986), and several studies indicate that certain groups of drug abusers may have (had) elevated rates of eating disorders (Jonas and Gold, 1988). Clearly, being excessive in one modality may often simply be replaced by/or be accompanied with excessiveness in another modality in order to be stimulated one way or the other. It would be of interest to test whether the sub-clinically restrained eaters also show restraint in other behaviors, like drinking or drug abuse.

Second, from this theory it can be predicted that slowing down the habituation rate may reduce the need for external stimulation and thus excessive consumption. If someone is exposed to high levels of environmental stimulation, habituation rate will be reduced (Zahn, 1986). Thus, it may be hypothesized that restrained eaters (1) will habituate normally when they are exposed to high levels of environmental stimulation, and (2) will regulate normally for a preload when they are optimally stimulated. Indirect support for this hypothesis is given by a recent study of Herman, Polivy, Lank and Heatherton (1987). As mentioned before, laboratory studies on food intake stress the importance of dieting status and degree of depletion, i.e. being preloaded or not, as main determinants for food intake: restrained eaters do not regulate their food intake after a preload, while unrestrained eaters do (Herman and Mack, 1975; Hibbscher and Herman, 1977; Herman and Polivy, 1980; Ruderman and Christensen, 1983; Jansen et al. 1988a, b). Herman et al. (1987) stressed the importance of a third factor: level of anxiety. In particular, the interaction between dieting status, degree of hunger/depletion and level of anxiety is supposed to determine food intake. In a recent study, Herman and co-workers (1987) found that only preloaded dieters in a low anxiety condition counter-regulated. Dieters in a high anxiety condition regulated: they ate less after a preload than without one.

Highly intriguing in the study of Herman et al. (1987) is that highly anxious restrained eaters regulated their food intake after a preload, just like lowly anxious unrestrained eaters do. Post hoc analysis of our own data on food intake of restrained and unrestrained eaters after a preload or no-preload (Jansen et al., 1988a) revealed the same pattern of regulation in highly anxious dieters after a preload. To explain the disappearance of counterregulation in anxious dieters, Herman et al. (1987) suggest that only a first dis inhibitor (anxiety or a preload) induces overeating in restrained subjects. After a first dis inhibitor the diet is no more intact and, as a consequence, a second dis inhibitor will have no more effect; "Anxiety cannot disinhibit a dieter who is already disinhibited" (p. 266). Thus, when restrained eaters are either preloaded or anxious, they will counterregulate, but when they are preloaded and anxious, only the first dis inhibitor will be an effective dis inhibited. However, if that is true, one should not expect highly anxious restrained eaters to regulate their food intake after a preload. This explanation does not cover the available data. It should be noted that either the preload or the anxiety should have disinhibited the restrained eater and should thus have resulted in excessive food intake. This was not the case. With the explanation given by Herman et al. (1987) the crucial issue remains unsettled: what causes lowly anxious restrained eaters not to regulate their food intake after a preload, while highly anxious restrained eaters do regulate for a preload just like normally unrestrained eaters? From the present model it appears that the introduction of anxiety slowed down the habituation rates of restrained eaters. The slower habituation rate as a consequence of increased anxiety diminishes the need for external stimulation and thus excessive consumption, leading to normal regulatory behavior. This post-hoc explanation of the Herman et al. data has to be subject to experimental tests: do restrained eaters (a) habituate normally when they are exposed to high levels of environmental stimulation, and (b) will they regulate normally for a preload when they are optimally stimulated?
The model given earlier in this discussion was suggested by the present data and it covers some existing findings quite well. Meanwhile, a model is as good as the predictions that flow from it. Some of the most straightforward implications are given below. As mentioned, restrained eaters (1) should especially be high “disinhibition” scorers, (2) should also show restraint in other behaviors, like drinking or drug use, (3) should habituate normally when they are exposed to high levels of environmental stimulation, and (4) should regulate normally for a preload when they are optimally stimulated. Furthermore, (5) it is postulated that the sensation seeking, excessive, and restraint result from rapid habituation. The model predicts that rapidly habituating people (a) score higher on sensation seeking scales, (b) score higher on restraint scales, and (c) show more excessive behaviors than slowly habituating people. Finally, (6) it is theorized that sensation seeking leads to excessive consumption and ends up in restraint: are high sensation seekers more often either excessive consumers or restrained Ss than low sensation seekers? Clarification of these issues may help understand the intriguing relationship between eating disorders and substance abuse; it may prove a rewarding enterprise.

REFERENCES