

'Emotional' does not even start to cover it: Generalization of overeating in emotional eaters

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1 'EMOTIONAL' DOES NOT EVEN START TO COVER IT: GENERALIZATION OF OVEREATING IN EMOTIONAL
2 EATERS

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33 Based on recent studies indicating that emotional eating is not the clearly defined problem it is often
34 thought to be, the present study investigated whether emotional eaters overeat merely in response to
35 negative emotional cues, or to other cues as well. It was hypothesized that emotional eaters would
36 overeat after a variety of food cues, not limited to negative emotions. Participants took part in four
37 conditions (negative mood manipulation, positive mood manipulation, food exposure and a control
38 condition) divided over two sessions. Each condition was followed by a bogus taste test, after which
39 food intake was measured. Results showed strong correlations between food intake after all four
40 conditions, indicating that increased intake after one type of cue is related to increased intake after
41 other cues. Participants were identified as emotional or non-emotional eaters based on food intake in
42 the negative mood condition, and based on self-reported emotional eating scores. Both measures of
43 emotional eating were significantly related to food intake after all cues. Based on the current findings,
44 we conclude that individuals who show increased food intake when in a negative emotional state also
45 overeat when experiencing other food-signalling cues. This indicates that 'emotional eating' may not
46 fully capture the eating behaviour of individuals currently identified as 'emotional eaters'.

47

48

49 Keywords: emotional eating, external eating, food cue exposure, cue-reactive eaters, cue reactivity, food
50 intake, types of eaters

51 In eating research, it is common practice to use labels to define certain types of eaters. In the 1970s,
52 Herman and Mack (1975) introduced the 'restrained eater', a term that is used to describe individuals
53 who deliberately try to restrict their food intake to maintain or achieve their desired weight. Restrained
54 eaters were later contrasted with disinhibited eaters (Stunkard & Messick, 1985), to discriminate
55 between those who are constantly able to restrict food intake, and those who tend to overeat or break
56 their diets on a regular basis (Herman & Polivy, 1975). Such disinhibiting factors leading to overeating
57 could be internal cues (e.g., emotions), or external cues (e.g., the sight or smell of food), and two types
58 of eaters have been presented accordingly: emotional eaters (assumed to be specifically responsive to
59 negative emotions) and external eaters (assumed to be specifically responsive to external food cues)
60 (Van Strien, Frijters, Bergers, & Defares, 1986). These eater types are distinguished from restrained
61 eaters, who are supposed to succeed in restraining their food intake (Van Strien, et al., 1986). Currently,
62 the distinction between emotional, external and restrained eaters is generally accepted, and the past 20
63 years have seen a wealth of studies devoted to these specific subtypes. Some clear empirical predictions
64 follow from the division into these three eating types: individuals scoring high on measures of emotional
65 eating should increase their food intake in response to the experience of (negative) emotions, high
66 scorers on external eating scales should consume more in response to external cues, and those scoring
67 high on restraint - but low on emotional and external eating- should not overeat.

68 However, recently there have been indications that emotional and external eating are not the clearly
69 demarcated issues of overeating in response to negative emotions or external cues they have long been
70 thought to be, but rather small aspects of a more general issue revolving around problematic food
71 intake. Van Strien and Ouwens (2003) found that emotional eating, but not external eating or dietary
72 restraint, moderated the relationship between a preload and food intake. Jansen, et al. (2011) assessed
73 degree of emotional eating, external eating and restrained eating in a female student sample.
74 Unexpectedly, external eating scores did not predict food intake after exposure to food, and very similar
75 eating patterns among high scorers on all three types of eating were found. Based on their data, Jansen,
76 et al. (2011) argued that there may be no need to distinguish between different types of eaters, but that
77 high scorers on such scales are 'generally eating-concerned', whereas low scorers are unconcerned.
78 According to the researchers, the eating-concerned individuals are characterized by an ever-present
79 concern about their food intake as well as problems with restricting their food intake when confronted
80 with intake-inducing cues such as emotions and palatable food. Along similar lines, studies taking a
81 diary-approach were unable to relate emotional eating scores to food intake after the experience of
82 daily hassles (Adriaanse, de Ridder, & Evers, 2011; Conner, Fitter, & Fletcher, 1999). However, they did

83 identify snacking out of habit, restraint, and external eating as predictors of overeating after
84 experiencing negative emotions. In an additional study, Adriaanse, et al. (2011; study 3) found that high
85 scores on emotional eating were predictive of eating concerns, specifically high worrying about and high
86 monitoring of their own eating behaviour, low perceived control over the own eating behaviour, and
87 stronger extrinsic motivation with regard to healthy eating. They proposed that people who score high
88 on emotional eating are preoccupied with food and eating in general, and focus specifically on the
89 negative aspects of eating.

90 Considering the aforementioned studies, it is conceivable that there is a bigger issue of general food
91 responsiveness at hand and that in certain individuals many different cues will lead to overeating. This
92 idea is further supported by studies showing strong associations between self-reported emotional
93 eating, external eating, and dietary restraint (Jansen, et al., 2011; Turner, Luszczynska, Warner, &
94 Schwarzer, 2010; Van Strien, et al., 1986). In addition, there is some evidence that positive emotions can
95 also induce overeating (i.e., higher intake in an experimental compared to a control procedure) in
96 people who score high on an emotional eating questionnaire (Bongers, Jansen, Havermans, Roefs, &
97 Nederkoorn, 2013a). Insight into the cues that lead to overeating and whether individuals who report or
98 display excessive food intake do so in response to only one specific cue or several cues is important for
99 more effective prevention, assessment, and treatment of overeating.

100 The aim of the current study was to investigate food intake of emotional eaters in response to a
101 variety of potentially food-signalling cues. Because substantially more studies have focused on
102 emotional compared to external eating and some previous studies have questioned the validity of
103 emotional eating questionnaires and classifications (see for example Adriaanse, et al., 2011; Bongers, et
104 al., 2013a; Evers, de Ridder, & Adriaanse, 2009), we use emotional eating as the reference point in this
105 study. In addition, because recent studies have shown that high scores on questionnaires assessing
106 eating after negative emotions do not necessarily correspond with actual eating behaviour after
107 negative emotions (Adriaanse, et al., 2011; Bongers, et al., 2013a; Bongers, Jansen, Houben, & Roefs,
108 2013b; Brogan & Hevey, 2013; Conner, et al., 1999; Evers, et al., 2009), we sought to add to self-report
109 questionnaires by including actual food intake after experiencing negative emotions to identify
110 emotional and non-emotional eaters.

111 It is hypothesized that participants identified as emotional eaters will consume more food in a
112 negative emotional state, in a positive emotional state and after food cue exposure compared to a
113 control condition. No intake differences between conditions in the non-emotional eaters are expected.

114 In addition, it is hypothesized that emotional eaters will consume more food than non-emotional eaters
115 after all experimental conditions, but not the control condition.

116

117

118 **Methods**

119

120 Participants

121 Participants were 42 female undergraduate students of Maastricht University, ranging in age from 19 to
122 27 years old ($M = 20.26$, $SD = 1.82$). They were recruited through advertisements distributed throughout
123 the university and online. The advertisements called for female undergraduate students in the ages 18
124 to 30 to participate in a study allegedly on taste perception under different circumstances. Students
125 suffering from food allergies were excluded from participating. The study was approved by the local
126 ethics committee.

127

128 Conditions and manipulations

129 The study employed a within-subject design, with participants partaking in all five conditions. The
130 conditions were divided over two sessions one week apart, with each session containing one control
131 condition and one emotional condition. The emotional conditions were divided over the two sessions to
132 avoid difficulties in switching from positive to negative moods or vice versa in a short time-frame. One
133 control condition was implemented in each session to check for increased food intake during the second
134 session, in light of the possibility that participants felt more comfortable to eat upon returning to the
135 lab. The exposure condition always took place in the first session. Order of the emotion conditions and
136 of the conditions within sessions was counterbalanced. The conditions and sessions are depicted in
137 Table 1.

138 *Negative mood.* While listening to personal sad music (see procedure), participants wrote down a sad
139 memory. If they were to finish writing before the music ended, they were instructed to keep thinking
140 about the sad memory. The manipulation lasted for 5 minutes, and was proven to be effective in earlier
141 studies (Bongers, Van den Akker, Havermans, & Jansen, submitted; Vuoskoski & Eerola, 2012).

142 *Positive mood.* This procedure was similar to the negative mood induction, except that participants
143 listened to a personal happy piece of music, while thinking of and writing down a happy memory.

144 *Food exposure.* Participants were presented with two bowls containing two varieties of one of their
145 top 3 chosen foods (e.g., for chocolate, they would receive M&M's and Maltesers). For 3 minutes, they

146 were instructed by the experimenter to smell the food and think about eating it, but not to actually eat
147 it.

148 *Control.* In the control condition, participants solved connect-the-dots puzzles for 5 minutes. The
149 puzzles ranged from 118 to 270 dots.

150

151

152 Table 1. Overview of conditions per session.

| Conditions in Session 1 (week 1) ¹ | Conditions in Session 2 (week 2) ¹ |
|---|---|
| Negative or Positive Exposure | Negative or Positive ² |
| Control | Control |

153 ¹ Order of conditions was counterbalanced within sessions

154 ² The emotional condition in session 2 was opposite from the emotional condition in session 1

155

156

157 Measurements

158 *Manipulation check.* To evaluate successfulness of the manipulations, participants filled out four
159 100mm VAS scales before and after every manipulation. The VAS scales asked how sad, happy and
160 hungry the participant felt, as well as how strong their desire to eat was. The scales ranged from 'not at
161 all' to 'very much' for the measures of sadness, happiness and hunger, and from 'not strong at all' to
162 'very strong' for the desire-measure.

163 *Food intake.* Participants were presented with three types of food which they had selected as their
164 favourites from five types of food before the start of the experiment. This selection was included to
165 ensure food liking. For each type of food, two varieties were presented, as studies have shown that food
166 variety counters sensory specific satiety (Brondel, et al., 2009; Hetherington, Foster, Newman,
167 Anderson, & Norton, 2006). The types of food and their varieties (kcal per 100 grams reported in
168 brackets) were: Chocolate – M&M's (479 kcal) and Maltesers (498 kcal); Crisps – salty (555 kcal) and
169 paprika (560 kcal); Peanuts – salted peanuts (615 kcal) and cocktail nuts (535 kcal); Cookies – mini
170 chocolate chip cookies (505 kcal) and typical Dutch mini syrup waffles (445 kcal); Sweets – gummy bears
171 (328 kcal) and gummy cola bottles (343 kcal). Food was presented in large bowls, containing between
172 553.97 grams ($SD = 15.92$; for crisps) and 1007.16 grams ($SD = 96.10$; for M&Ms) of each food. For each
173 participant, the top three foods were counterbalanced over conditions. The two control conditions and
174 the two emotional conditions were paired with the same type of food (i.e., if a participant received
175 chocolate during the first control condition, she received chocolate during the second control condition

176 taste test as well). Participants filled out questions regarding the chosen foods during the bogus taste
177 tests, which took place after every manipulation. Questions were asked about the palatability of the
178 food, the flavour, and how the two food varieties compared to each other. Participants were instructed
179 to taste of each food variety in order to answer the questions, and they were told that they were free to
180 eat as much as they liked. Each taste test lasted for 5 minutes. Actual food intake was measured by
181 weighing the bowls with food in a separate room before and after each taste test.

182 *Dutch Eating Behaviour Questionnaire (DEBQ)*. The DEBQ (Van Strien, 2005) is a 33-item self-report
183 questionnaire measuring dietary restraint (DR; 10 items), external eating behaviour (EX; 10 items) and
184 emotional eating behaviour (EE; 13 items). Questions are answered on a 5-point Likert Scale, ranging
185 from 'never' to 'very often'. A mean score per subscale is calculated. Although the DEBQ has high
186 internal consistency and factorial validity (Van Strien, et al., 1986), the predictive and discriminant
187 validity of the external (Jansen, et al., 2011) and emotional subscales (Bongers, et al., 2013a; Evers, et
188 al., 2009) is debatable.

189 *Awareness check*. A questionnaire was used to check whether participants were aware of the
190 hypothesis of the study and whether they complied with the instruction to not eat in the 2 hours prior
191 to the experiment.

192 *BMI*. BMI was obtained by measuring and weighing participants in the lab, while wearing street
193 clothes and no shoes.

194

195 Procedure

196 Participants signed up for participation in a study on the palatability of food. They were instructed by
197 email not to eat two hours prior to the experiment, and asked to rank five types of food (chocolate,
198 crisps, peanuts, cookies, sweets) from most to least palatable. In addition, they were requested to fill
199 out the DEBQ and to email back the completed questionnaire. Finally, they were asked to bring two
200 songs that made them sad and two songs that made them happy with them to the lab on both testing
201 days. Then dates for the first and second session were agreed upon. Upon entering the lab for the first
202 session, the participant filled out an informed consent form and was informed about the procedure,
203 using a cover story of taste perception under different circumstances. Then, the first mood VAS was
204 filled out, followed by one of the manipulations (either negative or positive emotion, exposure, or
205 control). The experimenter left the room during all manipulations, except for the exposure. After the
206 manipulation, the participant was provided with another mood VAS. Subsequently, she was presented
207 with two chosen bowls of food and filled out the taste questionnaire. The experimenter left the room

208 during the 5 minutes of the taste test. Upon return, the experimenter took away the bowls of food and
209 the participant relaxed for five minutes to make sure the effects of the manipulation and taste test
210 would subside. Several magazines on gardening and home decoration were provided, carefully checked
211 for the presence of eating-related advertisements or other food cues; whenever food was found in the
212 magazines, the particular page was taken out. After relaxation, the exact same procedure was repeated
213 for the other two manipulations. At the end, participants filled out a question regarding adherence to
214 food intake restrictions, and the date for the second session was confirmed. The second session took
215 place one week later, at the same time of day. The procedure was exactly the same as in the first
216 session. The participant underwent the manipulation for the emotional condition opposite to the one in
217 the previous session and a control condition. This order was counterbalanced across participants. At the
218 end of the second session, the participant filled out the awareness check and height and weight were
219 determined. Upon completion of the experiment, the participant was rewarded with course credits or a
220 €15 voucher.

221

222 Statistical analyses

223 All intake data was converted from grams to kcal, and all analyses on intake use kcal consumed as the
224 dependent variable. Intake in the two control conditions did not differ significantly (Control 1, $M =$
225 169.02 , $SD = 105.81$; Control 2, $M = 181.31$, $SD = 119.31$, $t(41) = .76$, $p = .46$), therefore one averaged
226 variable of intake for the control condition was calculated and used in all analyses. Repeated Measures
227 (M)ANOVAs with an adjusted alpha of .01 to correct for multiple testing were used to assess the
228 effectiveness of the four manipulations (negative mood, positive mood, exposure and control). Pearson
229 correlation coefficients were computed to assess associations between intake in different conditions. To
230 analyze data with regard to the specific hypotheses, a Repeated Measures ANOVA with intake per
231 condition (positive, exposure and control) as WS-factor and Z-transformed intake after negative
232 emotions as covariate was conducted. A similar analysis was performed concerning Z-transformed self-
233 reported emotional eating scores as covariate, with the addition of intake after negative emotions to
234 the WS-factor. Greenhouse-Geisser corrections are reported whenever Mauchly's test indicated a
235 violation of sphericity. Significant interactions were further investigated through spotlight analyses, in
236 which intake was assessed at 1 SD below and 1 SD above the mean of emotional eating.

237

238

239 **Results**

240

241 **General**

242

243 *Participant characteristics*

244 Participants' BMI ranged from 17.48 to 25.51 ($M = 21.83$, $SD = 2.14$). DEBQ-EE scores ranged from 1.15
245 to 4.23 ($M = 2.46$, $SD = .68$). Compared to DEBQ-EE norm scores for female students (2.61-2.66; Van
246 Strien, 2005), the mean score is slightly below average. The awareness check revealed that none of the
247 participants was aware of the hypotheses of the study.

248

249 *Manipulations*

250 Four separate Repeated Measures (M)ANOVAs (WS-factor Condition: negative mood, positive mood,
251 exposure and control) were conducted to assess changes in sadness, happiness, hunger and desire to
252 eat in all five conditions. To correct for multiple testing across the five conditions, an alpha of .01 was
253 applied to these analyses. The results are reported in Table 2. From the analyses it is clear that all
254 manipulations were successful in reaching the intended effects (marked in grey). However, there was
255 also a significant decrease in hunger and desire in the negative mood, and a small but significant
256 increase in desire to eat during the second control condition. The effect of the negative mood
257 manipulation on hunger and desire is not surprising as this is a normal response to aversive states,
258 resulting from decreased gut activity (Wardle, 1990).

259

260 Table 2. Mean and SD of VAS ratings before and after manipulation for each condition

| Condition | | Before manipulation | | After manipulation | | <i>F</i> | <i>p</i> ¹ | η^2 |
|---------------|------------------|---------------------|-----------|--------------------|-----------|----------|-----------------------|----------|
| | | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | | | |
| Negative mood | Sad ² | 13.74 | 16.31 | 52.55 | 21.25 | 120.21 | .000 | .75 |
| | Happy | 64.48 | 13.29 | 37.60 | 16.44 | 145.12 | .000 | .78 |
| | Hungry | 55.62 | 19.01 | 44.50 | 19.11 | 26.76 | .000 | .39 |
| | Desire | 60.45 | 17.76 | 44.60 | 22.12 | 29.38 | .000 | .42 |
| Positive mood | Sad | 14.71 | 14.54 | 9.88 | 12.09 | 12.76 | .001 | .24 |
| | Happy | 66.62 | 10.01 | 77.86 | 11.70 | 94.08 | .000 | .70 |
| | Hungry | 52.14 | 20.47 | 53.07 | 20.59 | .50 | .48 | - |
| | Desire | 56.83 | 17.35 | 57.24 | 18.54 | .05 | .83 | - |
| Food exposure | Sad | 17.38 | 18.49 | 15.50 | 16.04 | 4.34 | .04 | - |
| | Happy | 63.93 | 13.63 | 66.95 | 12.46 | 3.43 | .07 | - |
| | Hungry | 49.10 | 23.66 | 54.21 | 22.52 | 11.17 | .002 | .21 |
| | Desire | 52.69 | 20.75 | 64.48 | 19.92 | 25.62 | .000 | .38 |
| Control 1 | Sad | 16.86 | 16.74 | 15.21 | 15.92 | 2.77 | .10 | - |
| | Happy | 65.74 | 11.36 | 68.95 | 10.98 | 5.84 | .02 | - |
| | Hungry | 51.71 | 21.30 | 52.86 | 23.58 | .70 | .41 | - |
| | Desire | 52.90 | 17.05 | 52.79 | 19.65 | .006 | .94 | - |
| Control 2 | Sad | 19.07 | 20.06 | 17.38 | 16.91 | 1.55 | .22 | - |
| | Happy | 63.50 | 15.52 | 64.38 | 14.15 | .28 | .60 | - |
| | Hungry | 55.98 | 18.31 | 55.74 | 19.78 | .04 | .84 | - |
| | Desire | 56.93 | 20.50 | 60.14 | 20.43 | 7.59 | .009 | .15 |

261 ¹ An α of .01 was used to correct for multiple testing

262 ² The highlighted data (grey) reflect the intended effects of the various manipulations

263

264 *Intake within sessions*

265 Participating in multiple taste tests within one session did not appear to affect food intake. Repeated
 266 Measures ANOVA showed that both within session 1 (test 1, *M* = 136.46, *SD* = 89.70 ; test 2, *M* = 151.62,
 267 *SD* = 80.41, test 3, *M* = 163.82, *SD* = 97.12, *F* (2, 82) = 1.96, *p* = .15) and within session 2 (test 1, *M* =
 268 165.91, *SD* = 104.63, test 2, *M* = 180.77, *SD* = 110.04, *F* (1, 41) = .76, *p* = .39) the average amount of kcal
 269 consumed per taste test was equal.

270

271 Emotional eating - Actual consumption

272

273 *Correlations*

274 Food intake in a negative mood correlated significantly with food intake in a positive mood ($r = .87, p < .$
275 $.001$), food intake after food exposure ($r = .53, p < .001$) and food intake after a control procedure ($r =$
276 $.48, p = .001$). Thus, in line with our hypothesis, increased food intake after negative mood is strongly
277 related to increases in food intake after a positive mood and intake after exposure. Unexpectedly, there
278 was also a strong correlation between the negative mood and the control condition.

279

280 *Food intake*

281 The Repeated Measures ANOVA revealed a significant Condition X Emotional Eating interaction, $F(1.74,$
282 $67.66) = 3.88, p = .031, \eta^2 = .08$, as well as a significant effect of Emotional Eating, $F(1, 39) = 54.63, p <$
283 $.001, \eta^2 = .58$. Pairwise comparisons with Bonferroni correction at 1 SD below (i.e., non-emotional
284 eaters) and 1 SD above (i.e., emotional eaters) the mean of emotional eating showed no condition
285 differences in non-emotional eaters (Positive Mood: $M = 82.87, SE = 9.64$; Exposure: $M = 100.13, SE =$
286 14.46 ; Control: $M = 128.33, SE = 20.12$; all p 's $> .14$). In the emotional eaters, intake in both the positive
287 mood ($M = 234.58, SE = 9.44; p = 1.0$) and exposure ($M = 179.66, SE = 14.16; p = .096$) conditions did not
288 differ from intake in the control condition ($M = 222.81, SE = 19.71$). There was however a significant
289 intake difference between the positive mood and exposure conditions, $p = .003$. Results are displayed in
290 Figure 1. These findings indicate that emotional eaters (based on actual consumption) show overall
291 increased food intake compared to non-emotional eaters, with intake differing across conditions only in
292 the emotional eaters.

293

294 << Insert Figure 1 about here >>

295

296 Figure 1. Caloric intake of emotional (1 SD above the mean) and non-emotional eaters (1 SD below the
297 mean), based on actual consumption, in the positive mood, exposure and control conditions.

298

299 Emotional eating - Self-report

300

301 *Correlations*

302 There were small but non-significant correlations between the DEBQ-EE and the other DEBQ subscales
303 (EE – EX, $r = .21$, $p = .18$; EE – RS, $r = .26$, $p = .10$). Self-reported emotional eating scores correlated
304 significantly with intake in all conditions (negative mood, $r = .32$, $p < .042$; positive mood, $r = .32$, $p <$
305 $.041$; exposure, $r = .31$, $p < .047$; control, $r = .31$, $p < .047$).

306

307 *Food intake*

308 The Repeated Measures ANOVA showed no significant Condition X Emotional Eating interaction, $F(2.14,$
309 $83.62) = .08$, $p = .93$, nor a main effect of Condition, $F(2.14, 83.62) = 2.31$, $p = .10$. There was however a
310 significant effect of Emotional Eating, $F(1, 39) = 6.30$, $p = .016$, $\eta^2 = .16$. Results are plotted in Figure 2.
311 These data show that self-reported emotional eating scores are significantly related to increased food
312 intake in all conditions, i.e. after a variety of cues.

313

314 << Insert Figure 2 about here >>

315

316 Figure 2. Caloric intake of self-reported emotional (1 SD above the mean) and non-emotional eaters (1
317 SD below the mean) in the negative mood, positive mood, exposure and control conditions

318

319

320 **Discussion**

321

322 In the current study we aimed to investigate whether people who overeat after experiencing negative
323 emotions (based on both self-report and actual intake) are not merely emotional eaters, but instead
324 overeat after a variety of food cues. The high correlations among intake during negative emotions,
325 positive emotions, and after food exposure support this idea: increased intake after negative emotions
326 is associated with increased intake in response to other cues, both in self-reported emotional eaters and
327 emotional eaters identified by actual food intake. In addition to this, we also made predictions with
328 regard to emotional versus non-emotional eaters. More specifically, we expected emotional eaters to
329 show increased food intake in every experimental condition compared to the control condition, while
330 we expected no differences in food intake in any of the conditions in the non-emotional eaters.
331 Furthermore, we hypothesized that in all experimental conditions, but not the control condition,
332 emotional eaters would consume more food than non-emotional eaters. The latter prediction was partly
333 confirmed: emotional eaters tended to consume more food in all conditions, including the control

334 condition. With regard to the first hypothesis, as predicted, the non-emotional eaters consumed equal
335 amounts of food under all circumstances. However, the emotional eaters - at least when identified on
336 basis of their intake - consumed more food in the positive mood than in the exposure condition, but
337 neither condition differed from control. The data are in line with studies that show a strong correlation
338 between questionnaire scores on emotional and external eating (Jansen, et al., 2011; Turner, et al.,
339 2010; Van Strien, et al., 1986) and studies that have shown increased food intake in response to positive
340 emotions in emotional eaters (Bongers, et al., 2013a). Furthermore, a recently published study (Vainik,
341 Neseliler, Konstabel, Fellows, & Dagher, 2015) showed that various eating related traits, including
342 emotional eating, (i.e., emotional eating, attention paid to food, control over eating, eating impulsivity
343 and binge eating) all share a similar underlying construct, which the researchers labelled 'uncontrolled
344 eating'. With regard to intake in emotional eaters, the data show that self-reported emotional eaters
345 consumed more food than non-emotional eaters in response to all cues. Emotional eaters classified on
346 their actual intake also overeat in response to all cues, albeit to a lesser degree after exposure
347 compared to when in a positive mood. It might be that food exposure is a different construct from
348 emotions and does not lead to the same intake patterns. If so, however, it could be argued that the non-
349 emotional control condition should also have led to different intake levels, and this was not observed.
350 Together, the findings suggest that high levels of emotional eating are indicative of increased food
351 consumption in general, and not specifically in response to negative emotions.

352 Interestingly, we also found high correlations between the experimental and control conditions and
353 the control procedure seemed to elicit the exact same behaviour in participants as our experimental
354 procedures did. One possibility is that certain individuals (i.e., those identified as emotional eaters)
355 always eat more than other individuals (i.e., non-emotional eaters), no matter what the circumstances
356 are. The mere presence of food during the taste test after the control condition was already enough to
357 trigger increased intake. However, similar control conditions (i.e., taste test without a preceding
358 manipulation) have been used numerous times without leading to an increase in food intake. On the
359 other hand, it is also conceivable that the control condition might have unintentionally served as a
360 fourth experimental condition: the knowledge that eating of high-caloric food would be necessary as a
361 participant in the experiment, or having already consumed food in a condition preceding the control
362 condition, could have served as triggers for eating. Similarly, it is possible that the puzzles we used
363 caused boredom, ego depletion, stress, or feelings of disappointment or inadequacy, which could also
364 all act to induce overeating (Greeno & Wing, 1994; Groesz, et al., 2012; Havermans, Vancleef,
365 Kalamatianos, & Nederkoorn, 2015; Kahan, Polivy, & Herman, 2003; Sellahewa & Mullan, 2015; Vohs &

366 Heatherton, 2000). Even though we instructed our participants that they could make the puzzles at their
367 own leisure, and it did not matter how many they would finish, we cannot exclude the possibility that
368 participants set self-imposed goals on how many of the puzzles they wanted to complete, and perhaps
369 felt ego-depleted by the effort they put in, or disappointed when they did not reach this goal. It would
370 be interesting to replicate the current study with a control condition that is unlikely to elicit feelings of
371 boredom or a need to achieve. Future studies incorporating an improved control condition could
372 elucidate whether the observed overeating in emotional eaters is conditional on the presence of food-
373 related cues, or whether the mere availability of food is a cue in itself and sufficient to induce
374 overeating.

375 It has repeatedly been shown that emotional eating does not predict food intake in response to
376 negative emotions in both student (Adriaanse, et al., 2011; Bongers, et al., 2013a; Bongers, et al., 2013b;
377 Conner, et al., 1999; Evers, et al., 2009) and obese samples (Brogan & Hevey, 2013). In contrast with
378 these findings, but in line with some other studies (Raspopow, Abizaid, Matheson, & Anisman, 2014;
379 Van Strien, et al., 2013; van Strien, Herman, Anschutz, Engels, & de Weerth, 2012), the current results
380 indicate that self-reported emotional scales may have at least some predictive validity, in the sense that
381 individuals scoring high on this measure increased their food intake when in a negative mood. However,
382 'emotional eating' appears to be a misleading name that does not fully capture the eating behaviour of
383 individuals currently named 'emotional eaters'. Indeed, emotional eaters overeat after a variety of cues,
384 not restricted to negative emotions. If future studies replicate the current findings, 'cue-reactive eaters'
385 might be a more appropriate name for these individuals.

386 The current study has some limitations that should be noted. First, the sample consisted of healthy
387 young women, and therefore the results cannot be generalized to other populations, such as individuals
388 who seek treatment, or those who are obese or otherwise eating-disordered. The second limitation
389 concerns the lab-setting the experiment was conducted in. It is possible that some individuals are more
390 comfortable with eating in the lab than others, and therefore a lab-design might not accurately capture
391 those specific individuals who overeat in response to negative emotions in real life. Third, although
392 advertised as a study on taste perception under different circumstances, we cannot rule out the
393 possibility that some participants were aware that we measured food intake and that this altered their
394 behaviour. Fourth, questionnaires and behaviour can mutually influence each other. Although we aimed
395 to minimize this effect by having participants fill out the DEBQ at the moment of study sign-up and not
396 during one of the study sessions, we cannot exclude the possibility that filling out the questionnaire
397 exerted some influence on eating behaviour. A final concern is the repeated taste tests in the study,

398 both within and between sessions. It is possible that participating in taste tests in session 1 influenced
399 participants' intake during the taste tests in session 2. In the current study this seems unlikely, given the
400 finding that in the two control conditions in session 1 and session 2 intake was not significantly different.
401 With regard to taste test influences within sessions, even little intake of food during one taste test might
402 lessen hunger or could cause lesser intake in subsequent taste tests. However, because the order of
403 manipulations was fully counterbalanced, if this effect was indeed present, it should have been the
404 same for all conditions.

405 Taken together, the results of this study provide the first experimental evidence for the idea that so-
406 called emotional eaters increase their food intake in response to a variety of cues. This raises the
407 question whether 'emotional eating' fully captures the eating behaviour of individuals classified as
408 'emotional eaters'.

409

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411

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