

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

Citation for published version (APA):

Bongers, P., de Graaff, A., & Jansen, A. (2016). 'Emotional' does not even start to cover it: Generalization of overeating in emotional eaters. *Appetite*, 96, 611-616. <https://doi.org/10.1016/j.appet.2015.11.004>

## Document status and date:

Published: 01/01/2016

## DOI:

[10.1016/j.appet.2015.11.004](https://doi.org/10.1016/j.appet.2015.11.004)

## Document Version:

Accepted author manuscript (Peer reviewed / editorial board version)

## Document license:

CC BY-NC-ND

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

## General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

[www.umlib.nl/taverne-license](http://www.umlib.nl/taverne-license)

## Take down policy

If you believe that this document breaches copyright please contact us at:

[repository@maastrichtuniversity.nl](mailto:repository@maastrichtuniversity.nl)

providing details and we will investigate your claim.

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

3  
4  
5  
6 Peggy Bongers<sup>1</sup>

7 Anastacia de Graaff<sup>2</sup>

8 Anita Jansen<sup>1</sup>

9

10

11

12 <sup>1</sup> Faculty of Psychology and Neuroscience, Maastricht University

13 CPS, Department of Eating Disorders and Obesity

14 P.O. Box 616

15 6200 MD Maastricht

16 The Netherlands

17

18 <sup>2</sup> Health & Social Psychology Master, Maastricht University

19

20

21 Corresponding author: [peggy.bongers@maastrichtuniversity.nl](mailto:peggy.bongers@maastrichtuniversity.nl) (Peggy Bongers)

22 Not for publication: telephone: 0031-43-3881582 fax: 0031-43-3884196

23

24 Email addresses co-author:

25 [Acp.degraaff@student.maastrichtuniversity.nl](mailto:Acp.degraaff@student.maastrichtuniversity.nl) (Anastacia de Graaff)

26 [a.jansen@maastrichtuniversity.nl](mailto:a.jansen@maastrichtuniversity.nl) (Anita Jansen)

27

28

29

30

31

32

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) <sup>1</sup>	Conditions in Session 2 (week 2) <sup>1</sup>
Negative or Positive Exposure	Negative or Positive <sup>2</sup>
Control	Control

153 <sup>1</sup> Order of conditions was counterbalanced within sessions

154 <sup>2</sup> 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> <sup>1</sup>	$\eta^2$
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Negative mood	Sad <sup>2</sup>	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 <sup>1</sup> An  $\alpha$  of .01 was used to correct for multiple testing

262 <sup>2</sup> 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



410 **Acknowledgements**

411

412 This study is part of an ongoing project that is financed by the Netherlands Organisation for Scientific  
413 Research (NWO): Vici Grant 453.10.006, awarded to Anita Jansen. We thank Angeliki-Maria Miliaraki for  
414 her help with data collection.

415

416

417

418

- 419 Adriaanse, M. A., de Ridder, D. T. D., & Evers, C. (2011). Emotional eating: Eating when emotional or  
420 emotional about eating? *Psychology & Health, 26*(1), 23-39.
- 421 Bongers, P., Jansen, A., Havermans, R., Roefs, A., & Nederkoorn, C. (2013a). Happy eating: The  
422 underestimated role of overeating in a positive mood. *Appetite, 67*, 74-80.
- 423 Bongers, P., Jansen, A., Houben, K., & Roefs, A. (2013b). Happy Eating: The Single Target Implicit  
424 Association Test predicts overeating after positive emotions. *Eating Behaviors, 14*, 348-355.
- 425 Bongers, P., Van den Akker, K., Havermans, R., & Jansen, A. (submitted). Emotional eating as a case of  
426 Pavlovian learning: does negative mood facilitate appetitive conditioning?
- 427 Brogan, A., & Hevey, D. (2013). Eating styles in the morbidly obese: restraint eating, but not emotional  
428 and external eating, predicts dietary behaviour. *Psychology & health, 28*(6), 714-725.
- 429 Brondel, L., Romer, M., Van Wymelbeke, V., Pineau, N., Jiang, T., Hanus, C., et al. (2009). Variety  
430 enhances food intake in humans: role of sensory-specific satiety. *Physiology & behavior, 97*(1),  
431 44-51.
- 432 Conner, M., Fitter, M., & Fletcher, W. (1999). Stress and snacking: A diary study of daily hassles and  
433 between-meal snacking. *Psychology & Health, 14*(1), 51-63.
- 434 Evers, C., de Ridder, D. T. D., & Adriaanse, M. A. (2009). Assessing yourself as an emotional eater:  
435 Mission impossible? *Health Psychology, 28*(6), 717-725.
- 436 Greeno, C. G., & Wing, R. R. (1994). Stress-induced eating. *Psychological bulletin, 115*(3), 444.
- 437 Groesz, L. M., McCoy, S., Carl, J., Saslow, L., Stewart, J., Adler, N., et al. (2012). What is eating you? Stress  
438 and the drive to eat. *Appetite, 58*(2), 717-721.
- 439 Havermans, R. C., Vancleef, L., Kalamatianos, A., & Nederkoorn, C. (2015). Eating and inflicting pain out  
440 of boredom. *Appetite, 85*, 52-57.
- 441 Herman, C. P., & Mack, D. (1975). Restrained and unrestrained eating. *Journal of Personality, 43*(4), 647-  
442 660.
- 443 Herman, C. P., & Polivy, J. (1975). Anxiety, restraint, and eating behavior. *Journal of abnormal*  
444 *psychology, 84*(6), 666.
- 445 Hetherington, M. M., Foster, R., Newman, T., Anderson, A. S., & Norton, G. (2006). Understanding  
446 variety: tasting different foods delays satiation. *Physiology & behavior, 87*(2), 263-271.
- 447 Jansen, A., Nederkoorn, C., Roefs, A., Bongers, P., Teugels, T., & Havermans, R. (2011). The proof of the  
448 pudding is in the eating: Is the DEBQ - External Eating Scale a valid measure of external eating?  
449 *International Journal of Eating Disorders, 44*(2), 164-168.
- 450 Kahan, D., Polivy, J., & Herman, C. P. (2003). Conformity and dietary disinhibition: A test of the  
451 ego-strength model of self-regulation. *International Journal of Eating Disorders, 33*(2), 165-171.
- 452 Raspopow, K., Abizaid, A., Matheson, K., & Anisman, H. (2014). Anticipation of a psychosocial stressor  
453 differentially influences ghrelin, cortisol and food intake among emotional and non-emotional  
454 eaters. *Appetite, 74*, 35-43.
- 455 Schyns, G, Roefs, A., Mulkens, S., & Jansen, A. (2015). *Expectancy violation, reduction of food cue*  
456 *reactivity and less eating in the absence of hunger after one food cue exposure session for*  
457 *overweight and obese women*. Manuscript submitted for publication.
- 458 Sellahewa, D. A., & Mullan, B. (2015). Health behaviours and their facilitation under depletion  
459 conditions: The case of snacking. *Appetite, 90*(0), 194-199.
- 460 Stunkard, A. J., & Messick, S. (1985). The three-factor eating questionnaire to measure dietary restraint,  
461 disinhibition and hunger. *Journal of psychosomatic research, 29*(1), 71-83.

462 Turner, S. A., Luszczynska, A., Warner, L., & Schwarzer, R. (2010). Emotional and uncontrolled eating  
463 styles and chocolate chip cookie consumption. A controlled trial of the effects of positive mood  
464 enhancement. *Appetite*, *54*(1), 143-149.

465 Vainik, U., Neseliler, S., Konstabel, K., Fellows, L. K., & Dagher, A. (2015). Eating traits questionnaires as a  
466 continuum of a single concept. Uncontrolled eating. *Appetite*, *90*(0), 229-239.

467 Van Strien, T. (2005). Nederlandse Vragenlijst voor Eetgedrag 2005. Handleiding en Verantwoording  
468 [Manual of the Dutch Eating Behavior Questionnaire 2005]: Amsterdam: Boom test uitgevers.

469 Van Strien, T., Cebolla, A., Etchemendy, E., Gutiérrez-Maldonado, J., Ferrer-García, M., Botella, C., et al.  
470 (2013). Emotional eating and food intake after sadness and joy. *Appetite*, *66*, 20-25.

471 Van Strien, T., Frijters, J. E., Bergers, G. P., & Defares, P. B. (1986). The Dutch Eating Behavior  
472 Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior.  
473 *International Journal of Eating Disorders*, *5*(2), 295-315.

474 van Strien, T., Herman, C. P., Anschutz, D. J., Engels, R. C. M. E., & de Weerth, C. (2012). Moderation of  
475 distress-induced eating by emotional eating scores. *Appetite*, *58*(1), 277-284.

476 Van Strien, T., & Ouwens, M. A. (2003). Counterregulation in female obese emotional eaters: Schachter,  
477 Goldman, and Gordon's (1968) test of psychosomatic theory revisited. *Eating Behaviors*, *3*(4),  
478 329-340.

479 Vohs, K. D., & Heatherton, T. F. (2000). Self-regulatory failure: A resource-depletion approach.  
480 *Psychological science*, *11*(3), 249-254.

481 Vuoskoski, J. K., & Eerola, T. (2012). Can sad music really make you sad? Indirect measures of affective  
482 states induced by music and autobiographical memories. *Psychology of Aesthetics, Creativity,*  
483 *and the Arts*, *6*(3), 204.

484 Wardle, J. (1990). Conditioning processes and cue exposure in the modification of excessive eating.  
485 *Addictive Behaviors*, *15*(4), 387-393.

486

487

488

489