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Social norms and their influence on eating behaviours

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Abstract

Social norms are implicit codes of conduct that provide a guide to appropriate action. There is ample evidence that social norms about eating have a powerful effect on both food choice and amounts consumed. This review explores the reasons why people follow social eating norms and the factors that moderate norm following. It is proposed that eating norms are followed because they provide information about safe foods and facilitate food sharing. Norms are a powerful influence on behaviour because following (or not following) norms is associated with social judgements. Norm following is more likely when there is uncertainty about what constitutes correct behaviour and when there is greater shared identity with the norm referent group. Social norms may affect food choice and intake by altering self-perceptions and/or by altering the sensory/hedonic evaluation of foods. The same neural systems that mediate the rewarding effects of food itself are likely to reinforce the following of eating norms.

25 **Highlights:**

- 26 • Social norms about eating have a powerful effect on both food choice and intake
- 27 • Norm following is an adaptive behaviour
- 28 • Norms provide information about safe foods and facilitate food sharing.
- 29 • Social judgements associated with following foods norms give them power

30

31

32

33 Eating often occurs in a social context and the food choices of others and the amounts that those
34 around us eat have a powerful effect on our own consumption decisions. We model the eating choices
35 of our dining partners and consume amounts similar to what they eat (Herman et al. 2003). Sometimes
36 the presence of other diners may augment consumption compared with eating alone (de Castro and
37 Brewer 1992) and other times eating may be inhibited, even in the face of deprivation-induced hunger
38 (Goldman et al. 1991).

39

40 One mechanism that may underlie the effects of social context on eating is the operation of social
41 norms. Social norms are implicit codes of conduct that provide a guide to appropriate action. There is
42 evidence that we use information about the eating behaviour of others as a guide as to what is
43 appropriate behaviour in a given context (Herman et al. 2003). Dietary behaviours have also been
44 reported to be related to perceptions of normative behaviour within peer groups (Ball et al. 2010;
45 Lally et al. 2011; Louis et al. 2012;) and food intake can be predicted by the eating behaviour of
46 socially connected peers (Feunekes et al., 1998; de la Haye, Robins, Mohr, & Wilson, 2010;
47 Pachucki, Jacques, & Christakis, 2011).

48

49 Studies on the effects on food intake/choice of providing normative information about the eating
50 habits of others have been reviewed elsewhere recently (Robinson et al. 2013; 2014). Studies on
51 social facilitation of eating, modelling and impression management are reviewed elsewhere in this
52 special issue. The aim of this paper is to add to this literature by exploring why people follow eating
53 norms and how these norms influence eating. Consideration will also be given to the factors that
54 determine when people follow norms and when other factors override the influence of norms.

55

56 **What are social eating norms and where do they come from?**

57 Social eating norms are perceived standards for what constitutes appropriate consumption, whether
58 that be amounts of foods or specific food choices, for members of a social group. The social group
59 might be defined at the level of nationality, peer group, family or friendship grouping. Social norms

60 may be communicated directly via cultural practices and rules, actual behaviour in a given situation,
61 or indirectly via environmental cues such as portion size norms. For example, a social norm might be
62 avoidance of eating insects, which is communicated by the group cuisine rules and reinforced by
63 observation of disgust responses to (the prospect of) eating insects (Looy et al. 2013). Descriptive
64 norms refer to the perceptions of the prevalence or extent of a behaviour (what other people do) and
65 injunctive norms refer to perceptions about what behaviour is expected (what other people endorse)
66 (Cialdini et al. 1990).

67 **Why do people follow social eating norms?**

68 Two possible reasons why people follow eating norms are that 1) following a norm enhances
69 affiliation with a social group and being liked; and 2) following a norm results in eating that is correct
70 (Deutsch and Gerard, 1955). Many studies have been conducted to investigate the role of these
71 motives in norm following in the context of eating.

72 It has been reported that traits linked to the need for affiliation, such as self-esteem and empathy, are
73 associated with norm following (Robinson et al. 2011). Robinson and colleagues found that
74 participants were more likely to follow the eating norm set by their eating partner when they scored
75 high on a measure of empathy and low on a measure of self-esteem. They concluded that social
76 acceptance concerns play a role in modelling of a food intake norm. Hermans and colleagues found
77 that the quality of a social interaction affects the degree of modelling observed (Hermans et al. 2009).
78 They instructed a confederate to act either in a friendly or unsociable manner and reported that less
79 modelling occurred when the confederate acted in a friendly manner than when the confederate acted
80 in an unsociable manner. One interpretation of the results of this study is that under conditions where
81 there is little need to ingratiate oneself, because a social partner is already accepting, it is less likely
82 that a social norm inferred from his or her behaviour will be followed. This hypothesis was tested
83 explicitly in a study that employed an experimental manipulation to alter feelings of social acceptance
84 before a social eating opportunity. Priming feelings of social acceptance reduced the extent to which
85 the participant modeled the food intake of a confederate (Robinson et al. 2011). The results of these

86 studies are consistent with the idea that norms are followed as a means of affiliating with others and
87 gaining acceptance.

88

89 Several studies have examined how people adjust their eating behaviour to manage their public image
90 and create a certain impression on others. In reviewing this literature, Vartanian, Herman and Polivy
91 concluded that we make use of stereotypes about consumption patterns to convey an image of
92 ourselves in accord with that stereotype (Vartanian et al. 2007). Eating a small portion conveys a
93 feminine and otherwise positive image, which may be used to create a favourable impression on a
94 fellow diner who values those characteristics (Pliner and Chaiken, 1990). These data are in line with
95 evidence from the broader social psychology literature that adopting normative behaviour achieves a
96 goal of affiliating with others that is driven by our strong desire to be liked (Baumeister & Leary,
97 1995).

98

99 Other studies have examined whether people follow norms conveyed by messages about how other
100 people have behaved in a specific situation, rather than norms set by another present person's eating
101 (see Robinson et al. 2014 for a review). These types of norms are usually referred to as informational
102 norms (Deutsch and Gerard, 1955). In the remote confederate design, participants are exposed to
103 fictitious accounts of the amount of food consumed by previous participants in that study (Feeney et
104 al., 2011; Pliner & Mann, 2004; Roth, Herman, Polivy, & Pliner, 2001). If remote confederates eat a
105 lot, this signals a high intake norm, whereas if they eat only a little then this signals a low intake
106 norm. A high norm increases food intake relative to a no norm control condition whereas a low intake
107 norm decreases intake relative to a no norm control condition (Feeney et al., 2011; Pliner & Mann,
108 2004; Robinson et al. 2011; Roth et al., 2001). Amounts consumed by previous participants in a study
109 can also be communicated via cues such as empty food wrappers. There is evidence that participant
110 choices are affected by such cues. People are more likely to choose a "healthy" versus "unhealthy"
111 food item if they see evidence that previous participants have chosen "healthily" (Prinsen et al. 2012).
112 Furthermore, text-based descriptive norm messages conveying information about the eating behaviour

113 of others affect subsequent food choices (Robinson et al. 2014; Stok et al. 2012; 2014). In these
114 instances, following the norm does not serve to promote affiliation or a sense of belonging because
115 there is no other person present. Hence, it might be concluded that the motive to behave correctly
116 explains why people follow eating norms. Taking the example of studies using a remote confederate,
117 the intake of the fictitious participants indicates the “right” way to behave in terms of how much to eat
118 or what foods to choose, and so that norm is adopted (Cialdini and Trost 1998; Deutsch and Gerard,
119 1955).

120

121 Clearly, there is evidence that on occasion people might follow an eating norm to satisfy a desire to be
122 liked but there is also evidence that in the absence of direct social interaction, people still follow
123 eating norms, perhaps because they desire to behave correctly. Traditionally these motives have been
124 conceptualised as being independent (Cialdini and Goldstein, 2004). However, a more detailed
125 consideration of the evidence suggests that affiliation and correctness concerns are not so easy to
126 disentangle as it might at first seem. Although the use of the remote confederate design may minimise
127 the extent to which people alter their behaviour to create a good impression, there remains the
128 possibility that the participants may follow the norm to impress the experimenter, assuming that they
129 are aware that their food intake/choices are being monitored by the experimenter. In addition,
130 adhering to the norm may make the individual feel as if s/he is a more socially-responsive individual
131 and therefore perhaps more likely to be accepted by others. Given that affiliation and correctness
132 motives seem difficult to dissociate, it may be that rather than considering them as separate and
133 independent, we should consider the possibility that they are interdependent.

134

135 **Norm following as an adaptive behaviour**

136 A new model of social eating norms is suggested here that emphasises the interdependence of both
137 affiliation and informational motives in explaining the power of social norms. The suggestion is that
138 norm following is most usefully conceptualised as an adaptive behaviour that makes it more likely
139 that we will consume safe foods and might promote food sharing. According to this explanation,

140 behaving correctly by following the group norm enhances evolutionary fitness. It is further proposed
141 that the force of norms, the reason why they have such a powerful influence on us, lies in the
142 emotional consequences of either following them (social approval) or not following them (social
143 disapproval). More specifically, it is proposed that the adaptive function of social influence is
144 supported by co-opting affiliation motives: I follow your lead on how to behave and this is reinforced
145 by feelings of a sense of group belonging or the avoidance of social disapproval. Conceptualised in
146 this way, affiliation concerns underpin the force of adaptive social eating norms. The model rests on
147 three specific arguments that will be examined in turn.

148 *Norm following is adaptive in ensuring the selection of safe foods*

149 The selection of safe and nutritious foods is critical for survival but presents a challenge to humans
150 who are omnivores born with few innate flavour preferences (Rozin, 1976). We have to acquire
151 knowledge about which foods are edible and non-toxic and one way that we learn about the foods that
152 are good to eat is by associating food flavours with consequences and adjusting our behaviour
153 accordingly: we learn to like foods that provide energy and avoid items that make us sick (see
154 Brunstrom, 2007 for a review). However, we are also able to take advantage of the learning of others
155 by following their lead. Following a social norm shortcuts the need for learning on a trial-and-error
156 individual basis and so reduces the costs associated with this learning, such as the time taken to learn
157 and the likelihood of error (Boyd et al. 2011). This may be especially important when it comes to
158 learning about foodstuffs because of the potentially lethal consequences of consuming the wrong
159 substances. In support of this notion is the fact that young children are more likely to try a novel food
160 if they see a familiar adult eating the same food (Addessi et al. 2005) and will avoid drinks that are
161 paired with an expression of dislike on the face of someone else (Baeyens et al. 1996). Indeed, there
162 are numerous examples of young children using social information to guide their eating (for a review
163 see Shutts et al. 2012). Such social learning accumulates across generations in the forms of cultural
164 practices around food (Rozin, 1996). Hence, following social eating norms increases evolutionary
165 fitness because eating what others eat is a good guide to food safety and nutrition.

166 *Norm following is adaptive in promoting cooperation and food sharing*

167 Another reason why we tend to eat what others eat might be that it is a behaviour that evolved to
168 support cooperation between members of a group. Indeed, it has been argued that the human
169 disposition to cooperate developed in the context of cooperation around foraging for food (Tomasello,
170 2008). Evidence for this tendency to cooperate can be seen in experimental game playing studies in
171 which people demonstrate a sense of fairness in dividing resources relatively equally between
172 anonymous game playing partners, even when there is no chance for punishing unfair distribution
173 (Dawes and Thaler, 1988). In the context of food foraging, hunter-gatherer societies engage in
174 cooperative food gathering and sharing to the extent that some food resources are shared among a
175 group regardless of who actually made the kill (Hill, 2002). Such cooperative behaviour would be
176 supported by a social norm that one should not eat more than other members of a group, as has been
177 reported on in experimental studies of social eating (Herman et al. 2003). Therefore, norm following
178 may have had an additional evolutionary benefit in promoting food sharing and cooperative
179 behaviour.

180 *Social norms have force because they are associated with social judgement*

181 The end point of eating what others do could be achieved by directly copying what they do or by
182 observing the behaviour of others and then changing one's own behaviour on the basis of those
183 observations (observational learning). In fact there is evidence that this kind of copying occurs
184 around food. For example, studies of eating and drinking in humans show that consumption behaviour
185 may be imitated directly by a person taking a sip or reaching for food directly after an observed
186 person performs the same behaviour (Hermans et al., 2012 Larsen et al., 2010; Koordeman et
187 al., 2011). This behaviour may be underpinned by basic neural processes that link perception with
188 action, the so called "mirror neuron system" (Rizzolatti and Craighero, 2004). Similarly, rats and
189 chimpanzees display a tendency to copy the behaviour of conspecifics and this tendency increases
190 with the number of animals demonstrating the behaviour (Chou and Richerson, 1992; Haun et al.,
191 2012). Monkeys will copy of the food choices of another monkey when they migrate into a new
192 environment, even if that choice goes against their own learned preferences (van de Waal et al. 2013).
193 However, conformity via imitation or observational learning is not the same as adopting a group nom.

194 A critical difference is that there are emotional consequences when we follow (or do not follow) a
195 social norm. We derive a sense of belonging by adopting the norms of a group and this may provide
196 us with a sense of self-worth and esteem that might be considered rewarding (Deutsch and Gerard,
197 1955). But we also know that there are social sanctions or punishments that arise from not following a
198 norm (Baumeister & Leary, 1995; Fehr and Fischbacher, 2004). A consequence of not following a
199 social eating norm might be embarrassment or the disapproval of others. Indeed, given that
200 stereotypes associated with overeating are generally negative and overeating and obesity are
201 stigmatized (Vartanian et al. 2007), it may be that following an intake norm is primarily motivated by
202 a desire to avoid social sanctions associated with appearing to eat excessively (Herman et al. 2003).
203 Regardless, while following an eating norm might be underpinned by processes such as imitation,
204 mere imitation does not constitute socially normative behaviour in and of itself. Norms have force
205 because deviations are discouraged by social judgement (approval or disapproval) and the emotions
206 that accompany such judgements (Tomasello, 2008).

207

208 The value of the proposed model lies in providing a single framework for understanding the role of
209 affiliation and informational motives in norm following behaviour and highlighting the evolutionary
210 benefit of norm following and the power of norms. Further evidence in support of the model may be
211 gathered from a consideration of the factors that affect whether a norm will be followed (or not),
212 which will be considered next.

213

214 **What factors affect whether an eating social norm is followed?**

215 Several factors have been identified that moderate norm following in the context of eating. However,
216 relatively few studies have been conducted and so it is possible that important moderators have yet to
217 be identified.

218

219 *Norm uncertainty*

220 An evolutionary approach to understanding the following of social eating norms suggests that norms
221 will be more likely to be followed when there is uncertainty about the consequences of food choice

222 (Laland, 2004). If individuals' personal experience means that they are not sure of how to behave then
223 they should be more likely to follow the lead of others, because that will be the safest choice. In
224 support of this idea, modelling of food intake is less likely in eating situations where there are already
225 clear expectations about how much one should eat, for example at habitual eating occasions such as
226 breakfast, versus snack sessions where intake norms are more uncertain and variable (Hermans et al.
227 2010). It should be more adaptive to follow a norm when there is a clear consensus about that norm
228 (Morgan et al. 2012). In support of this suggestion, it has been reported that when communicated
229 intake norms are ambiguous participants are less likely to follow them (Leone et al. 2007). In general
230 these data are in line with the results from studies of other types of social influence, such as
231 conformity to the perceptual judgements of others (Asch, 1955). In a classic series of experiments,
232 Asch asked participants to make a judgement about the length of a series of lines. In the Asch
233 paradigm participants are shown one line on card which serves as the standard line and then three
234 lines on another piece of card. The task is to match one of the three lines to the standard. The
235 participant is unaware that the other “participants” in the study are actually confederates of the
236 experimenter and have been instructed to give a specific answer that is sometimes correct, but
237 sometimes incorrect. Asch reported that the majority of participants were not swayed in their
238 judgements even when the confederates were unanimous in reporting incorrect responses about the
239 line. 38% of participants could be persuaded to to give the wrong answer to the question when the
240 confederates were all providing the wrong answer but there was even less conformity to the group
241 when the participants had an ally who was consistent in providing the correct answer (Asch, 1955).
242 Hence, social influence on both eating and perceptual judgements is affected by certainty about the
243 norm.

244

245 Asch also found that conformity was less likely when there was a bigger discrepancy between the
246 standard line and the comparator lines, presumably because participants were more confident of the
247 “correct” answer when the discrepancy was large (Asch 1955). There have been few studies of
248 modelling of eating in groups but it would be interesting to examine how food choices are affected by
249 group norms and the extent to which these effects depend upon the certainty with which personal

250 choices are made. We have reported that modelling of food choices in a buffet line was rather limited
251 insofar as the presence of one “unhealthy” or “healthy” eating confederate did not affect total calories
252 selected at the lunch (perhaps because the participants had a clear sense of what constitutes an
253 appropriate lunch), but the presence of the “unhealthy” confederate did liberate the participants to
254 choose few low energy dense buffet items (Robinson and Higgs 2012). These data suggests a modest
255 influence of the presence of a healthy eating dining companion on food choices in a context where
256 there is free choice for a range of palatable food items, but it remains to be investigated whether
257 greater modelling would be observed in the presence of a group of “healthy eaters”.

258

259 *Norm referent group*

260 Some evidence suggests that choice norms are more likely to be followed if the referent group
261 belongs to a socially proximal group or “in-group” with whom an individual perceives shared identity
262 (See review by Cruwys, Bevelander, and Hermans in this issue.). For example, Cruwys and
263 colleagues (2012) reported that a perceived eating norm affected behaviour when it came from a
264 socially proximal group (fellow university students), but not when it came from a less proximal group
265 (students from a rival university). A norm may be rejected if it comes from a social group with which
266 a person does not wish to associate. For example, it has been reported that people are motivated to
267 avoid the behaviour patterns of “out-groups” that are disliked, seen as lower status, or dissimilar, so as
268 to distance themselves from that group (Berger & Rand, 2008; Berger and Heath, 2008). On the other
269 hand, people tend to follow the norms of “out-groups” that are seen as aspirational (Englis and
270 Solomon 1995). The degree to which participants identify with a norm group also moderates the
271 influence of an eating norm: participants who identify more strongly with the norm group are more
272 likely to follow the norm (Stok et al. 2014). Hermans et al. (2008) found that matching of food intake
273 was less likely when a normal weight participant ate with an underweight confederate, possibly
274 because the participants did not regard the underweight confederate as an appropriate model, or did
275 not identify with the model. A similar effect has been reported by McFerran and colleagues whereby
276 participants were less influenced by the choices of a confederate at a buffet when the confederate was
277 overweight and the participant was normal weight than when both the confederate and participant

278 were normal weight (McFerran et al. 2010). These data are consistent with the idea that norms
279 provide a shortcut for learning about appropriate food choices, because in-group members would be
280 expected to provide the most reliable information about the consequences of eating in the group
281 environment.

282

283 People with whom we have an intimate relationship (e.g. friendship or family relationship) might be
284 expected to provide the most reliable norms because we are likely to share the same environment.
285 However, there is evidence of similar modeling of food intake among both friends and strangers
286 (Howland, Hunger, & Mann, 2012; Salvy et al. 2007; Kaisari and Higgs, this issue). Moreover, there
287 are reports that modeling effects on intake are greater when the eating partners do not know each
288 other than when they are siblings (Salvy, Vartanian, Coelho, Jarrin, & Pliner, 2008). It may be that
289 these results are dependent upon the type of “friendship” and factors relating to shared identity and/or
290 the need to affiliate. For example, I may perceive a shared identity with people whom I have never
291 met before because we are similar in some way (e.g. same gender, age, social group). I may follow the
292 lead of these “strangers” because I consider them “in-group” members. I may also follow the lead of
293 strangers because I have a desire for social approval, especially if I perceive them to belong to a
294 desirable “out-group”. This suggests that studies on how intimate relationships affect social influence
295 should focus on manipulating specific underlying processes such as shared identity to tease out some
296 of these potential influences.

297

298 *Individual characteristics*

299 There has been no systematic investigation of the effect of gender on social eating influences. In fact,
300 most studies have recruited only women. Two studies failed to find modeling effects on eating in men
301 (Salvy et al. 2007; Hermans, Herman, Larsen, and Engels 2010), although the reasons why this might
302 be the case are unclear. Men may have a greater drive for distinctiveness than women do, which may
303 lead to nonconformity in eating (Cross & Madson, 1997). On the other hand, it might be that women
304 may possess a greater interest in facilitating positive social bonds than do men, perhaps due to higher

305 empathic tendencies (Eagly & Carli 1981). Evidence from studies of other types of social influence
306 are consistent with the suggestion that women are more likely to follow social norms than are men
307 (Eagly and Carli, 1981; Bond and Smith, 1996), but further investigation of gender differences in
308 responses to eating norms and the underlying mechanisms is required before strong conclusions can
309 be drawn.

310

311 *Food type*

312 Palatability considerations may override normative considerations. Pliner and Mann (2004) found that
313 social norms did not influence participants to choose an unpalatable “healthy” cookie over a palatable
314 “unhealthy” cookie. This may be in part because some people find it difficult to resist tempting foods
315 and will go for the more palatable “unhealthy” cookie even if it is not the choice that other people are
316 seen to make. It may be that social information cannot persuade people to consume foods that they
317 dislike (or perhaps know to be potentially unsafe). However, evidence from Salmon and colleagues
318 (2014) suggests that a social norm message may persuade people to consume more of a “healthy”
319 food but only if the participants are lacking in self-control. In this study the “healthy” items were
320 cereal bars and fruit and nuts rather than unpalatable foods. More data are required on the issue of
321 how food type interacts with norm information to affect food intake and choice, especially for healthy
322 foods such as vegetables that people typically regard as unpalatable.

323

324 **How do social norms affect eating behaviour?**

325 An important question that has yet to be addressed in any detail is how social norms affect eating.
326 Answering this question will have implications for the potential use of social norms in interventions
327 aimed at changing dietary behaviour. A person may decide to choose a “healthy” food option because
328 others do so, but if this behaviour is based purely on public acceptance of the norm (in other words,
329 the choice is made only so that that person wishes to be seen to conform), then this type of conformity
330 is unlikely to form the basis of an effective, long term intervention on behaviour change. On the other

331 hand, if norms are changing underlying perceptions of oneself or of the food then this would suggest a
332 private acceptance of the norm rather than mere public conformity, which might be more like to
333 sustain behaviour change in the long run.

334 *Change in self-perception*

335 It has been suggested that conforming to group norms may occur because it results in a positive
336 change in self-perception and attitudes. If an observed norm is a “healthy” food choice and I identify
337 with the norm referent group then I might see myself as the kind of person who makes “healthy” food
338 choices and behave in a manner consistent with this self-identity (Bem, 1972). I might also feel that if
339 other people like me are performing the behaviour then this means that I am capable of doing it,
340 which could increase my feelings of self-efficacy for performing the behaviour (de Cremer and van
341 Vugt, 1998). In the case of following healthy eating norms, Stok and colleagues (2014) have reported
342 that the effect an eating norm about vegetable consumption increased self-reported vegetable
343 consumption and that this effect was partially but not fully mediated by changes in self-identification
344 and self-efficacy leaving some variance unaccounted for.

345 *Change in sensory/hedonic evaluation of foods*

346 Another possible mechanism underlying how social norms affect eating is that they change the
347 perception and evaluation of the foods. Asch suggested that participants may have conformed with the
348 incorrect answer of the confederate because they experienced a perpetual distortion and perceived the
349 incorrect stimuli as correct (1955). In support of this hypothesis, Berns and colleagues (2005) reported
350 that conformity to the incorrect group in an Asch-like perceptual judgement task was associated with
351 increased activity in areas of the brain associated with early visual processing. Others have reported
352 that changes in brain reward networks are associated with adherence to social norms (for a review see
353 Izuma, 2013). For example, the provision of social information, in the form of reviews about a song,
354 increased activity in brain areas associated with reward when the songs were heard (Campbell-
355 Meiklejohn et al., 2010).

356 In the case of eating, one could hypothesise that the behaviour of others might affect sensory/hedonic
357 responses to food cues and food consumption, thus affecting food-related decisions. This might be
358 achieved by modulation of expectations about the consequences of consuming that food. A food
359 might be expected to have positive rewarding consequences and taste good because other people
360 whom we identify with are eating it and enjoying it. Moreover, it could be that social influence is
361 accompanied by neural changes that align the liking of the food with others' liking of the food, as has
362 been shown for the effect of other external cues such as labels (Grabenhorst et al. 2009). In support of
363 this idea, we have found that providing information about how much an in-group but not an out-group
364 likes orange juice affects participants' expected liking for orange juice (Robinson and Higgs 2013). In
365 addition, it has been shown that being in agreement with the preferences and decisions of others
366 activates brain reward networks whereas being in disagreement has the opposite effect (Klucharev et
367 al.2009; Botvinick et al. 2004). Thus, conformity to eating norms could be driven by increases in
368 reward-related brain activity as behaviour comes in line with the group. Clearly, this hypothesis
369 requires careful testing but it is consistent with the idea more generally that reward is at the core of
370 social conformity (Zaki et al. 2011).

371 **Conclusions**

372 Normative social influence on eating is potent and pervasive. The presence of other people at an
373 eating occasion or when choices are made about food has a powerful effect on behaviour. This may be
374 because humans are have a highly developed capacity to learn from the behaviour of others and find
375 the approval of others rewarding and disapproval aversive. It is proposed that eating norms are
376 followed because they provide information about safe foods and facilitate food sharing. They are a
377 powerful influence on behaviour because following (or not following) norms is associated with social
378 judgements. Norm following is more likely when there is uncertainty about what constitutes correct
379 behaviour and when there is greater shared identify the norm referent group. Social norms may affect
380 food choice and intake by altering self-perceptions and the sensory/hedonic evaluation of foods. The
381 same neural systems that mediate the rewarding effects of food itself are likely to reinforce the
382 following of eating norms.

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386 **References**

387

388 Addressi, E., Galloway, A. T., Visalberghi, E., & Birch, L. L. (2005). Specific social influences on the
389 acceptance of novel foods in 2–5-year-old children. *Appetite*, *45*(3), 264-271.

390 Asch, S. E. (1955). Opinions and social pressure. *Scientific American*, *193*, 33-35.

391 Baeyens, F., Vansteenwegen, D., De Houwer, J & Crombez, G. (1996). Observational conditioning of
392 food valence in humans. *Appetite*, *27*, 235-250.

393 Ball K, Jeffrey W, Abbott G, McNaughton SA, & Crawford DA. Is healthy behaviour contagious:
394 associations of social norms with physical activity and healthy eating. *Int. J. Behav. Nutr.*

395 *Phys. Act.* 2010. <http://www.ijbnpa.org/content/7/1/86>. Accessed October 3, 2013.

396 Baumeister, R. F., & Leary, M. R. (1995). The need to belong: desire for interpersonal attachments as
397 a fundamental human motivation. *Psychological bulletin*, *117*(3), 497.

398 Bem DJ. Self-perception theory. In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology*.
399 1972;6:1-62. Academic Press, New York.

400 Berger J, Heath C. Who Drives Divergence? Identity-Signaling, Outgroup Dissimilarity, and the
401 Abandonment of Cultural Tastes. *J Pers Soc Psychol.* 2008;95(3):593-607.

402 Berger J, Rand L. Shifting signals to help health: Using identity signaling to reduce risky health
403 behaviors. *J. Cons. Res.* 2008;35(1):509-518.

404 Berns GS, Chappelow J, Zink CF, Pagnoni G, Martin-Skurski ME, Richards J: Neurobiological
405 correlates of social conformity and independence during mental rotation. *Biol Psychiat* 2005,
406 58:245-253.

407 Bond, R., & Smith, P. B. (1996). Culture and conformity: A meta-analysis of studies using Asch's
408 (1952b, 1956) line judgment task. *Psychological bulletin*, *119*(1), 111.

409 Booth, D. A.; Mather P.; Fuller, J. Starch content of ordinary foods associatively conditions human
410 appetite and satiation, indexed by intake and eating pleasantness of starch-paired flavors.
411 *Appetite* 1982, 3:163-184

412 Botvinick, M. M., Cohen, J. D., & Carter, C. S. (2004). Conflict monitoring and anterior cingulate
413 cortex: an update. *Trends in cognitive sciences*, 8(12), 539-546.

414 Boyd, R., Richerson, P. J., & Henrich, J. (2011). The cultural niche: Why social learning is essential
415 for human adaptation. *Proceedings of the National Academy of Sciences*, 108(Supplement 2),
416 10918-10925.

417 Brunstrom, J. M. (2007). Associative learning and the control of human dietary
418 behavior. *Appetite*, 49(1), 268-271.

419 Burger JM, Bell H, Harvey K, Johnson J, Stewart C, Dorian K et al. Nutritious or Delicious? The
420 effect of descriptive norm information on food choice. *Journal of Social & Clinical*
421 *Psychology*. 2010;29(2):228-242.

422 Campbell-Meiklejohn, D. K., Bach, D. R., Roepstorff, A., Dolan, R. J., & Frith, C. D. (2010). How
423 the opinion of others affects our valuation of objects. *Current Biology*, 20(13), 1165-1170.

424 Chistakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J*
425 *Med*. 2007;357(4):370-379.

426 Chou, L. S., & Richerson, P. J. (1992). Multiple models in social transmission of food selection by
427 Norway rats, *Rattus norvegicus*. *Animal Behaviour*, 44, 337-343.

428 Louis W, Davies S, Smith J, Terry D. Pizza and pop and the student identity: the role of referent
429 group norms in healthy and unhealthy eating. *The Journal of Social Psychology* 2012; 147:
430 57-74.

431 Cialdini, R.B. & Goldstein, N.J. (2004). Social influence: compliance and conformity. *Annual Review*
432 *of Psychology*, 55, 591-621.

433 Cialdini, R.B., Reno, R.R., & Kallgren, C.A. (1990). A focus theory of normative conduct: Recycling
434 the concept of norms to reduce littering in public places. *Journal of Personality and Social*
435 *Psychology*, 58, 1015-1026.

436 Cross, S. E., & Madson, L. (1997). Models of the self: self-construals and gender. *Psychological*
437 *bulletin*, 122(1), 5.

438 Cruwys T, Platow MJ, Angullia SA, Chang JM, Diler SE, Kirchner JL et al. Modeling of food intake
439 is moderated by salient psychological group membership. *Appetite*. 2012; 58(2):754-757.

440 Dawes, R. M., & Thaler, R. H. (1988). Anomalies: cooperation. *The Journal of Economic*
441 *Perspectives*, 187-197.

442 De Castro JM, Brewer ME. The amount eaten in meals by humans is a power function of the number
443 of people present. *Physiol.Behav.*1992; 51(1):121-125.

444 de Cremer, D., & van Vugt, M. (1998). Collective identity and cooperation in a public goods
445 dilemma: A matter of trust or self-efficacy? *Current Research in Social Psychology*, 3, 1-11.

446 de la Haye, K., Robins, G., Mohr, P., & Wilson, C. (2010). Obesity-related behaviors in adolescent
447 friendship networks. *Social Networks*, 32(3), 161-167.

448 Deutsch M, Gerard H. A study of normative and informational social influences upon individual
449 judgment. *J Abnorm Soc Psychol.*1955;51(3):629-636.

450 Eagly, A. H., & Carli, L. L. (1981). Sex of researchers and sex-typed communications as determinants
451 of sex differences in influenceability: a meta-analysis of social influence
452 studies. *Psychological Bulletin*, 90(1), 1.

453 Englis, B. G., & Solomon, M. R. (1995). To be and not to be: lifestyle imagery, reference groups, and
454 the clustering of America. *Journal of Advertising*, 24(1), 13-28.

455 Feeney JR, Polivy J, Pliner P, Sullivan MD. Comparing live and remote models in eating conformity
456 research. *Eat Behav.* 2011;12(1):75-77.

457 Fehr, E., and Fischbacher, U. (2004). Third-party punishment and social norms. *Evol. Hum. Behav.*
458 25, 63-87

459 Feunekes, G. I., de Graaf, C., Meyboom, S., & van Staveren, W. A. (1998). Food choice and fat
460 intake of adolescents and adults: associations of intakes within social networks. *Preventive*
461 *medicine*, 27(5), 645-656.

462 Galef, B. G., Jr & Wigmore, S. W. 1983. Transfer of information concerning distant foods: a
463 laboratory investigation of the 'information-centre' hypothesis. *Animal Behaviour*, 31,
464 748e758

465 Grabenhorst, F., Rolls, E. T., & Bilderbeck, A. (2008). How cognition modulates affective responses
466 to taste and flavor: top-down influences on the orbitofrontal and pregenual cingulate
467 cortices. *Cerebral Cortex*, 18(7), 1549-1559.

468 Goldman SJ, Herman CP, Polivy J. Is the effect of a social model attenuated by hunger? *Appetite*;
469 17:129–140.

470 Haun, D., Rekers, Y., & Tomasello, M. (2012). Majority-biased transmission in chimpanzees and
471 human children, but not orangutans. *Current Biology*, 22(8), 727-731.

472 Herman CP, Roth DA, Polivy J. Effects of the presence of others on food intake: A normative
473 interpretation. *Psychol Bull.* 2003; 129(6):873–886.

474 Hermans, R. C., Larsen, J. K., Herman, C. P., & Engels, R. C. (2008). Modeling of palatable food
475 intake in female young adults. Effects of perceived body size. *Appetite*, 51(3), 512-518.

476 Hermans, R. C. J., Engels, R. C. M. E. , Larsen, J. K., & Herman, P. C. (2009). Modeling of palatable
477 food intake. The influence of quality of social interaction. *Appetite*, 52, 801–804.

478 Hermans R, Herman PC, Larsen J, Engels R. Social modeling effects on young women's breakfast
479 intake. *Journal of the American Dietetic Association* 2010; 110:1901–1905.

480 Hermans R, Herman PC, Larsen JK, Engels RCME. Social modeling effects on snack intake among
481 young men. The role of hunger. *Appetite* 2010; 54:378-383.

482 Hill, K. (2002). Altruistic cooperation during foraging by the Ache, and the evolved human
483 predisposition to cooperate. *Human Nature*, 13(1), 105-128.

484 Howland, M., Hunger, J. M., & Mann, T. (2012). Friends don't let friends eat cookies: Effects of
485 restrictive eating norms on consumption among friends. *Appetite*, 59(2), 505-509.

486 Iacoboni M, Woods RP, Brass M, Bekkering H, Mazziotta JC, Rizzolatti G. Cortical mechanisms of
487 human imitation. *Science* 1999; 286:2526-2528.

488 Izuma, K. (2013). The neural basis of social influence and attitude change. *Current opinion in*
489 *neurobiology*, 23(3), 456-462.

490 Jacobson, R.P., Mortensen, C.R., & Cialdini, R.B. (2011). Bodies obliged and unbound:
491 Differentiated response tendencies for injunctive and descriptive social norms. *Journal of*
492 *Personality and Social Psychology*, 100, 433-448.

493 Lakin, J. L., & Chartrand, T. L. (2003). Using nonconscious behavioral mimicry to create affiliation
494 and rapport. *Psychological science*, 14(4), 334-339. Laland, K. N. 2004. Social learning
495 strategies. *Learning and Behavior*, 32, 4e14

496 Klucharev, V., Hytönen, K., Rijpkema, M., Smidts, A., & Fernández, G. (2009). Reinforcement
497 learning signal predicts social conformity. *Neuron*, 61(1), 140-151.

498 Lally P, Bartle N, Wardle J. Social norms and diet in adolescents. *Appetite*. 2011; 57(3):623-627.

499 Leone, T., Pliner, P., & Peter Herman, C. (2007). Influence of clear versus ambiguous normative
500 information on food intake. *Appetite*, 49(1), 58-65.

501 Looy, H., Dunkel, F. V., & Wood, J. R. (2013). How then shall we eat? Insect-eating attitudes and
502 sustainable foodways. *Agriculture and Human Values*, 1-11.

503 McFerran B, Dahl D, Fitzsimons G, Morales A. I'll have what she's having. Effects of social
504 influence and body type on the food choices of others. *Journal of Consumer Research* 2010;
505 36:915–929.

506 Morgan, T. J. H., Rendell, L. E., Ehn, M., Hoppitt, W., & Laland, K. N. (2012). The evolutionary
507 basis of human social learning. *Proceedings of the Royal Society B: Biological*
508 *Sciences*, 279(1729), 653-662.

509 Pachucki, M. A., Jacques, P. F., & Christakis, N. A. (2011). Social network concordance in food
510 choice among spouses, friends, and siblings. *American Journal of Public Health*, 101(11),
511 2170.

512 Pliner P, Mann N. Influence of social norms and palatability on amount consumed and food choice.
513 *Appetite*. 2004; 42(2):227-237.

514 Pliner, P., & Chaiken, S. (1990). Eating, social motives, and self-presentation in women and
515 men. *Journal of Experimental Social Psychology*, 26(3), 240-254.

516 Povey R, Conner M, Sparks P, James R, Shepherd R. The theory of planned behaviour and healthy
517 eating: examining additive and moderating effects of social influence variables. *Psychol &*
518 *Health*. 2000; 14(6):991-1006.

519 Prinsen, S., de Ridder, D. T., & de Vet, E. (2013). Eating by example. Effects of environmental cues
520 on dietary decisions. *Appetite*, 70, 1-5.

521 Ravis A, Sheeran P. Descriptive norms as an additional predictor in the Theory of Planned Behaviour:
522 a meta-analysis. *Current Psychology* 2003; 33: 218-233.

523 Rizzolatti G, Craighero L. The mirror-neuron system. *Annual Rev Neurosci* 2004;27:169-162.

524 Robinson E, Benwell H, Higgs S. Food intake norms increase and decrease snack food intake in a
525 remote confederate stud. *Appetite*. 2013; 65(1):20-24.

526 Robinson E, Fleming A, Higgs S. Prompting Healthier Eating: Comparing the use of health and social
527 norm based messages. *Health Psychology*, in press.

528 Robinson E, Higgs S. Making food choices in the presence of ‘healthy’ and ‘unhealthy’ companions.
529 *Br. J. Nutr.* 2013;109(4):765-771.

530 Robinson E, Tobias T, Shaw L, Freeman E, Higgs S. Social matching of food intake and the need for
531 social acceptance. *Appetite*. 2011;56(3):747-752.

532 Robinson, E., Blissett, J., & Higgs, S. (2013). Social influences on eating: implications for nutritional
533 interventions. *Nutrition research reviews*, 26(2), 166

534 Robinson, E., Thomas, J., Aveyard, P., & Higgs, S. (2014). What everyone else is eating: a systematic
535 review and meta-analysis of the effect of informational eating norms on eating
536 behavior. *Journal of the Academy of Nutrition and Dietetics*.

537 Roth DA, Herman CP, Polivy J, Pliner P. Self-presentational conflict in social eating situations: A
538 normative perspective. *Appetite*. 2001; 36(2):165-171.

539 Rozin, P. (1996). The socio-cultural context of eating and food choice. In *Food choice, acceptance*
540 *and consumption* (pp. 83-104). Springer US.

541 Salmon, S. J., Fennis, B. M., de Ridder, D. T., Adriaanse, M. A., & de Vet, E. (2014). Health on
542 impulse: When low self-control promotes healthy food choices. *Health Psychology*, 33(2),
543 103.

544 Stok FM., de Ridder DT, de Vet E, de Wit JB. Minority talks: the influence of descriptive social
545 norms on fruit intake. *Psychol & Health*. 2012; 27(8):956-970.

546 Stok, F. M., Ridder, D. T., Vet, E., & Wit, J. B. (2014a). Don't tell me what I should do, but what
547 others do: The influence of descriptive and injunctive peer norms on fruit consumption in
548 adolescents. *British Journal of Health Psychology*, 19(1), 52-64.

549 Stok, F. M., Verkooijen, K. T., Ridder, D. T., Wit, J. B., & Vet, E. (2014b). How Norms Work: Self-
550 Identification, Attitude, and Self-Efficacy Mediate the Relation between Descriptive Social
551 Norms and Vegetable Intake. *Applied Psychology: Health and Well-Being*.

552 Terry, D.J., Hogg, M.A., & McKimmie, B.M. (2000). Attitude-behaviour relations: The role of in-
553 group norms and mode of behavioural decision-making. *British Journal of Social Psychology*,
554 39, 337-361.

555 Tomasello, M. (2008). *Origins of human communication*. Cambridge: MIT press.

556 Turner J, Oakes P. The significance of the social identity concept for social psychology with reference
557 to individualism, interactionism and social influence. *Br J Soc Psychol* 1986; 25(3):237-252.

558 van de Waal, E., Borgeaud, C., & Whiten, A. (2013). Potent social learning and conformity shape a
559 wild primate's foraging decisions. *Science*, 340(6131), 483-485.

560 Vartanian, L. R., Herman, C. P., & Polivy, J. (2007). Consumption stereotypes and impression
561 management: How you are what you eat. *Appetite*, 48(3), 265-277.

562 Zaki, J., Schirmer, J., & Mitchell, J. P. (2011). Social influence modulates the neural computation of
563 value. *Psychological Science*, 22(7), 894-900.

564