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The emotional profiling of disgust-eliciting stimuli: Evidence for primary and complex disgusts

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The present paper reports the results of two studies that used a hierarchical agglomerative cluster analysis to categorise the emotional profiles of disgust-evoking stimuli. Study 1 revealed three clusters of stimuli corresponding to: (1) nondisgust or “disgust-irrelevant” items, (2) “primary” disgust items containing a range of disgust-relevant items characterised by their ability to elicit fear of oral incorporation and their animal origin; and (3) “complex” disgusts, consisting mainly of behaviours or activities that are considered to be socially or morally unacceptable. The emotional profiles of these three categories also differed significantly, with “primary” and “complex” disgusts showing higher levels of disgust than the “disgust-irrelevant” items. However, whereas the “primary” disgusts showed no evidence of elevated ratings on negative emotion scales other than disgust, the “complex” disgusts revealed high scores on all negative emotions in the profile (sadness, contempt, fear, and anger). Study 2 confirmed both the cluster analysis and emotional profile findings from Study 1, and also indicated that males and females did not differ significantly either on the cluster solution itself or the shape of the emotional profile. Female participants, however, did respond more intensively across all relevant negative emotions in the profiles than did males. The advantages of using emotional profiling as a means of categorising disgust stimuli are discussed, as are the implications of these findings for an understanding of the functions of disgust.

Disgust is one of the least studied of the emotions, although it is almost always considered as basic and universal (e.g., Ekman, Friesen, & Ellsworth, 1982; Oatley & Johnson-Laird, 1987). It has a distinct facial expression (e.g., Ekman & Friesen, 1986), distinct behavioural manifestations (e.g., avoidance, fear of oral incorporation: Davey, 1994a; Rozin & Fallon, 1987), and a particular subjective experience (e.g., nausea and sickness; Rozin & Fallon, 1987). It is

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considered to have originated as a food-rejection emotion, differing from other food-rejection responses (such as distaste) because of its cognitive component relating to the contaminating properties of disgusting stimuli.

Rozin and colleagues have proposed a four-factor taxonomy of disgust, arguing that disgust elicitors can be classified into four broad categories: core disgusts, animal-nature disgusts, interpersonal disgusts, and moral disgusts (Rozin, Haidt, & McCauley, 1993, 2000). *Core disgust* serves primarily as a food-rejection response and centres on the avoidance, or oral incorporation, of the disgusting stimulus. Stimuli in this category usually are (or resemble) soft body products, and this environment is ideal for germs. Disgust of this type of stimuli serves to prevent the spread of disease through avoiding contact with germ-ridden stimuli. Thus, core disgust serves a disease-avoidance function where disgust facilitates the rejection of stimuli that may act as vehicles for the spread of disease and illness (e.g., faeces, mucus, etc.) (Davey, 1994a; Izard, 1977; Rozin & Fallon, 1987).

Rozin et al. (1993, 2000) have also argued for a derived function for disgust that is related to cultural values. These *sociomoral disgusts* are related to a function of disgust as a powerful means of transmitting negative affect. For example, the activities of groups that violate accepted social and moral values (e.g., Nazis) are often labelled as disgusting, and colloquialisms for faeces are used almost universally as a derogatory term (Rozin & Fallon, 1987). Endowing culturally unacceptable behaviours with disgust makes the event salient, helps ensure internalisation and therefore makes it more resistant to change (Rozin et al., 1993).

In addition to these two putative functions of disgust, Rozin et al. (1993, 2000) have argued for a further category of disgust encompassing four noncore disgust domains (sexual acts, hygiene, death, and violations of the body envelope). They propose that these are *animal-nature disgusts*, and argue that humans in many cultures try to distinguish themselves from animals because of fear of their own mortality. As a result, any stimulus and behaviour that reminds humans of their animalness and their animal origins is viewed as disgusting (Becker, 1973; Leach, 1964; Ortner, 1973; Tambiah, 1969).

Finally, Rozin et al. (1993, 2000) propose that direct or indirect contact with other people can elicit disgust. The amount of *interpersonal disgust* elicited has been found to depend on four components: strangeness, disease, misfortune, and moral taint (Rozin, Markwith, & McCauley, 1994). So that, for example, an item of clothing worn by a stranger and then washed is less desirable than a sweater that has never been worn. It becomes even less desirable if the stranger has had a disease, a misfortune (e.g., an accident), or a moral taint (e.g., they have committed a murder).

Although Rozin et al.'s (1993, 2000) taxonomy is theoretically plausible, thus far there have been few papers providing empirical evidence for this four-factor classification. A number of recent studies have attempted to both categorise

disgust-evoking stimuli and use these categorisations to construct inventories for measuring disgust. In an early study, Haidt, McCauley, and Rozin (1994) asked 20 participants for the three most disgusting experiences of their lives. From these they developed a 66-item preliminary disgust questionnaire covering eight domains in total. This was completed by 454 participants and subjected to a principal components analysis. From this they identified three core disgust domains (food, body products and animals) and four further domains (sexual acts, hygiene, death and violations of the body envelope). They argued that “disgust can be aroused by a wide variety of culturally variable elicitors” (p. 712) and that the common factor was our desire to defend in some way against these stimuli. Haidt et al.’s (1994) disgust scale has been found to be related to behavioural measures of disgust (Rozin, Haidt, McCauley, Dunlop, & Ashmore, 1999).

Using a factor analytic method, Barker and Davey (1997) reported results very similar to Haidt et al. (1994). They asked 40 participants to list anything that made them feel either disgust or revulsion. From this, a 50-item questionnaire was developed, which was completed by 300 participants. Results from this were subjected to a factor analysis, and from this five statistically and psychologically coherent categories emerged (foodstuffs of animal origins, human body and body products, sexual practices, gastroenteric products, invertebrate animals). Despite some minor differences, both factor analysis studies show a great deal of convergence on the stimuli people view as disgusting. Furthermore both Haidt et al. (1994) and Barker and Davey (1997) argue that disgust-elicitors can be separated into two or three distinct types related to the different functions of disgust.

However, while factor analytic studies of disgust stimuli have been helpful in providing an initial basis for categorising such stimuli, they tell us very little about our reactions to these stimuli. In addition, in everyday life emotions rarely appear on their own and we tend to experience blends of emotions (e.g., Izard, 1972; Polivy, 1981; Zelenski & Larsen, 2000). For example, studies involving the inducement of mood in laboratory setting have found that procedures designed to induce discrete moods usually induce several similarly valenced emotions (e.g., Martin, 1993; Polivy, 1981). Thus, in order to complement existing categorisations of disgust stimuli based on simple factor analysis methods, this paper reports the results of two studies that have attempted to address the issue of the emotional profiling of disgust-relevant stimuli. If disgust is not merely a discrete emotion, but is linked to other negative emotions in the underlying emotional network, then the emotional profiling of disgust-relevant stimuli will be helpful in creating a taxonomy of such stimuli. Such a taxonomy is likely to be revealed by differences in the emotional profiles elicited by difference categories of disgusting stimuli. The emotional profiling technique used in the present studies has been developed from Izard’s (1972) differential emotional scale (DES), which measures 10 different emotions on a total of 30

scales. In the present studies a smaller scale of six emotion terms was used. This technique not only provides a fuller picture of emotional reactions to a stimulus, it can also be represented graphically as an emotional profile (e.g., Izard, 1972, 1977).

Study 1 aims to provide a taxonomy of disgust by asking participants to rate disgust-eliciting stimuli on a variety of different emotions. This should reveal a broader picture of reactions to disgusting stimuli, and provide a means for distinguishing between different types of disgusting stimuli on the basis of the emotional profiles elicited by these stimuli. Study 2 aims to replicate findings of Study 1, and to investigate whether there is a gender difference in the profile of emotions elicited by disgusting stimuli.

STUDY 1

Study 1 aims to produce a taxonomy of disgusting stimuli by asking participants to rate disgust-eliciting stimuli on six different emotions. A cluster analysis will then be performed on the six emotion scales in order to investigate whether distinct categories of disgusts can be identified on the basis of human emotional reactions.

METHOD

Participants. A total of 119 people completed the emotional profile questionnaire (EPQ), of these 88 were female, 28 male, and 3 did not report their gender. The age ranged from 18 to 60 with a mean age of 24.81 years. The majority (87) of the sample were students at Sussex University, 25 were in full-time employment, 5 were in part-time employment, and 2 were unemployed; 86 of the total sample were single, 29 were married/cohabiting and 4 were divorced; 24 of the total sample were vegetarian, 91 were nonvegetarian, and 4 did not report. The participants were volunteers who were naive to the purpose of the experiment.

Confirmation sample: In order to see if there were significant differences between the emotional profiles generated by the three clusters, data from a separate sample of participants was collected ($N = 28$). A separate sample was necessary as the cluster analysis was based on the original sample and so would lead to a higher likelihood of significant differences being found between the clusters. Of this sample, 7 were male, 21 were female; 26 were students, 2 were full-time employed; 3 were married/cohabiting, 25 were single; 10 were vegetarian, 18 were nonvegetarian. The mean age was 23.6, ranging from 18 to 46 years.

Materials. The emotional profiling questionnaire (EPQ) consisted of 27 items. Each item was rated on a separate 7-point Likert scale for each of six emotions (sad, contempt, disgust, fear, happy, and anger). The scale ranged from

1 (not felt) to 7 (very strongly felt). Sad, disgust, fear, anger and happy were chosen as they are usually considered to be the five basic emotions (e.g., Power & Dalgleish, 1997). “Contempt” was added as it is often closely linked with disgust (Izard, 1977; Rozin, Lowery, Imada, & Haidt, 1999).

Selecting the items for the EPQ. Three items were included from each of the five categories of disgust found by Barker and Davey’s (1997) factor analysis of disgust-eliciting items. Three further items from the “envelope violations” domain reported in the study by Haidt et al. (1994) were also included. In order to represent sociomoral disgust-eliciting items (which represented 6% of disgust descriptions found by Haidt et al., 1994), a small sample ($n = 10$; 5 male, 5 female, mean age = 35.8 years) of independent participants were asked to generate a list of things that they found disgusting. From these lists, three items were selected to represent sociomoral disgust elicitors.

In order to compare disgust-eliciting emotional profiles to profiles of nondisgust-eliciting stimuli, a different small sample ($n = 5$; 3 male, 2 female; mean age = 37.2 years) of independent participants responded to a questionnaire instructing them to “list five foods that you like” and “list five animals that you like”. From these responses six control items were selected to represent control categories of nondisgust-eliciting animals and non-disgust-eliciting foods. The final 27 items can be found in Table 1. In the final questionnaire their order was randomised.

Procedure. Each participant was given a copy of the questionnaire, preceded by the following caution “Warning! This questionnaire contains some items that some people may find offensive. Should this be the case, then please do not continue”. After filling in a section on demographic information, they received the following instructions: “Imagine the following items, behaviours or activities as vividly as possible. For each of them, circle a number on the scales of 1–7 (where 1 = not felt and 7 = very strongly felt), the extent to which the words describe the emotions you feel *as you are imagining*”. Participants then completed the questionnaire in their own time.

Results

Cluster analysis. A cluster analysis was performed on all emotional profile ratings to explore the data for groups of items that share similarities in the emotional responses they evoke. The 27 items were subjected to a hierarchical cluster analysis. Ward’s hierarchical agglomerative cluster analysis (SPSS 9.0; Ward, 1963) was used as it has high interpretability, is frequently used in the behavioural sciences (Aldenderfer & Blashfield, 1984) and is very effective in recovering underlying structure (Borgen & Barnett, 1987). The resulting dendrogram indicated a three cluster solution (Figure 1). The items falling into

TABLE 1
The 27 items comprising the EPQ and their sources

<i>Domain</i>	<i>Item</i>	<i>Source</i>
Foodstuffs of animal origin	Eating cooked human meat	Barker & Davey (1997)
	Eating cooked sheep's eyes	Barker & Davey (1997)
	Eating cooked dog flesh	Barker & Davey (1997)
Human body and body products	Bad breath	Barker & Davey (1997)
	Phlegm/mucus	Barker & Davey (1997)
	Body odour	Barker & Davey (1997)
Invertebrate animals	Maggots	Barker & Davey (1997)
	Slugs	Barker & Davey (1997)
	Flying insects	Barker & Davey (1997)
Gastroenteric products	Smell of human vomit	Barker & Davey (1997)
	Touching dog faeces	Barker & Davey (1997)
	Diarrhoea	Barker & Davey (1997)
Sexual practices	People having sex with children	Barker & Davey (1997)
	People having sex with animals	Barker & Davey (1997)
	Incest	Barker & Davey (1997)
Body envelope violations	A crash victim with their intestines exposed	Haidt et al. (1994)
	Someone accidentally sticking a fish hook through their finger	Haidt et al. (1994)
	A human hand, preserved in a jar	Haidt et al. (1994)
Sociomoral disgusts	Racism	Survey 1
	Corrupt politicians	Survey 1
	Gluttony	Survey 1
Control items (animals)	Foxes	Survey 2
	Cats	Survey 2
	Deer	Survey 2
Control items (foods)	Eating cheese	Survey 2
	Eating crisps	Survey 2
	Eating bread	Survey 2

Cluster 1 were eating cheese, eating crisps, eating bread, deer, cats, and foxes. The items falling into Cluster 2 were slugs, maggots, a human hand preserved in a jar, someone accidentally sticking a fish hook though their finger, phlegm/mucus, the smell of human vomit, bad breath, body odour, diarrhoea, touching dog faeces, and eating sheep's eyes. The items falling into Cluster 3 were racism, people having sex with children, gluttony, corrupt politicians, eating dog flesh, eating human flesh, incest, people having sex with animals, and a crash victim with their intestines exposed. To assess the stability of this solution the dataset was randomly split into two subsamples and both were separately

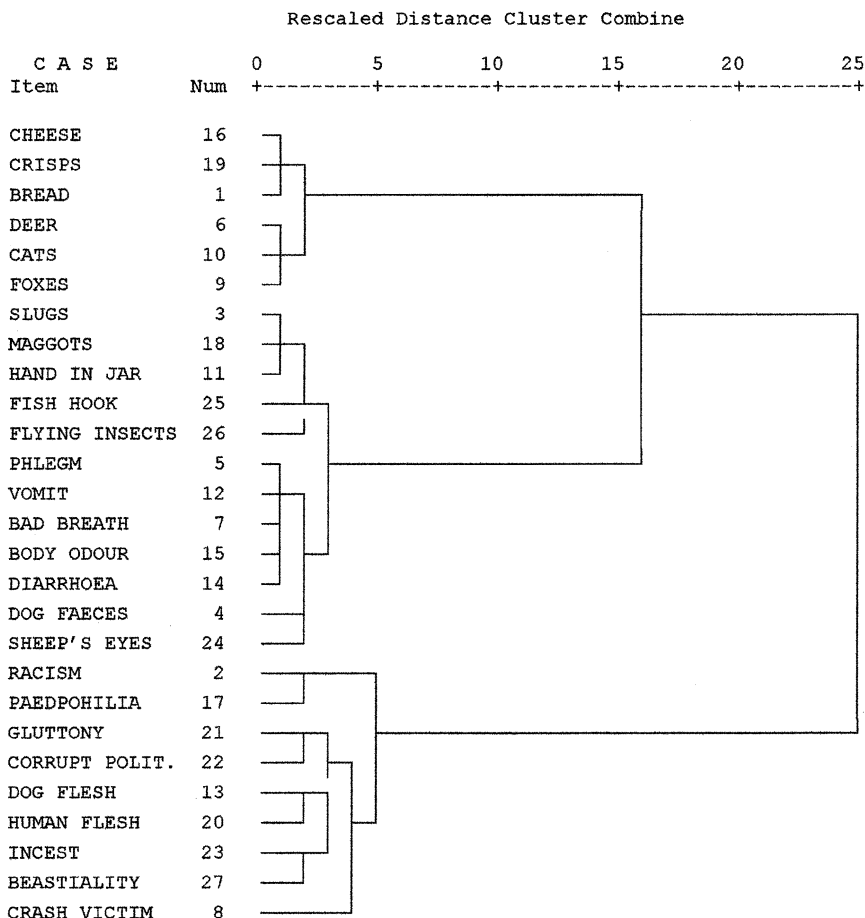


Figure 1. Dendrogram of Ward's cluster analysis of the entire dataset (Study 1).

submitted to Ward's hierarchical agglomerative cluster analysis. Both samples produced almost identical dendrograms promoting a three-cluster solution, therefore the data showed satisfactory split-half replication.

Emotional profiles. Figure 2 shows the emotional profiles for each of the three clusters. Cluster 1 is characterised by low mean scores on the negative emotions (sadness, contempt, disgust, fear, and anger) and a moderately high happiness mean. Cluster 2 is characterised by a low happiness mean, a fairly high disgust mean, and moderately low means for the remaining negative emotions. Cluster 3 is characterised by a low happy mean and high means on all the negative emotions.

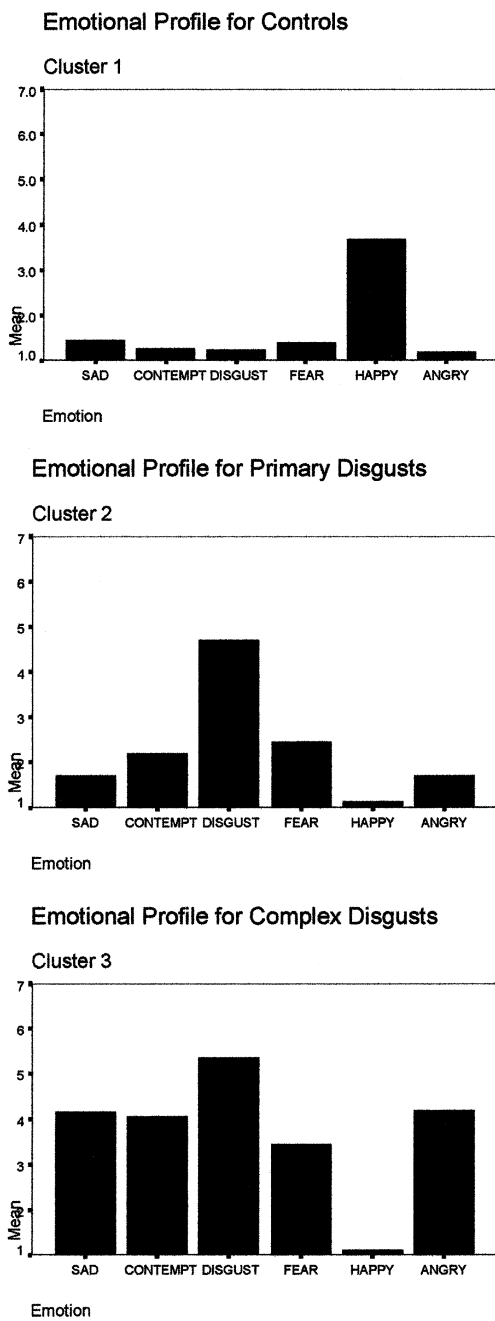


Figure 2. Emotional profiles for the three clusters from Study 1.

In order to see if there were significant differences between the emotional profiles generated by the three clusters, data from a separate sample of participants was collected ($N = 28$).

A repeated measures MANOVA was performed on the data from the confirmation sample. The within-subjects factor was cluster, with three levels corresponding to the three clusters. The dependent variables were the six emotions (on a score of 1–7). Pillai’s Trace F is used for all of the MANOVAs. There was a significant main effect of cluster, $F(12, 100) = 53.27, p < .001$, and follow-up univariate ANOVAs revealed significant main effects of group on sad, contempt, disgust, fear, happy and anger emotion scales (all F s > 35 , all p s $< .001$). Subsequent within-subjects contrasts showed significant differences between each cluster on each emotion scale (see Table 2), with the exception of the happiness score of Cluster 2 and Cluster 3, which does not differ significantly.

In order to investigate whether the patterns of emotion means observed in the first sample were statistically significant, several specific hypotheses were tested on the confirmation sample. First, for Cluster 1 (control items) the hypothesis that happiness is higher than the other emotions was tested using a repeated

TABLE 2
Within-subjects contrasts on each emotion scale for the confirmation sample in Study 1

<i>Emotion scale</i>	<i>Contrast</i>	<i>Result</i>
Sad	Control vs. Primary disgusts	$F(1, 27) = 8.59, p = .007^*$
	Control vs. Complex disgusts	$F(1, 27) = 159.17, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = 107.03, p < .001^*$
Contempt	Control vs. Primary disgusts	$F(1, 27) = 2.94, p = .098$
	Control vs. Complex disgusts	$F(1, 27) = 35.35, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = 64.42, p < .001^*$
Disgust	Control vs. Primary disgusts	$F(1, 27) = 285.06, p < .001^*$
	Control vs. Complex disgusts	$F(1, 27) = 469.60, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = 19.71, p < .001^*$
Fear	Control vs. Primary disgusts	$F(1, 27) = 26.69, p < .001^*$
	Control vs. Complex disgusts	$F(1, 27) = 54.93, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = 27.12, p < .001^*$
Happy	Control vs. Primary disgusts	$F(1, 27) = 85.39, p < .001^*$
	Control vs. Complex disgusts	$F(1, 27) = 90.25, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = < 1$
Anger	Control vs. Primary disgusts	$F(1, 27) = 18.25, p < .001^*$
	Control vs. Complex disgusts	$F(1, 27) = 297.05, p < .001^*$
	Primary vs. Complex disgusts	$F(1, 27) = 226.59, p < .001^*$

* Significant at $p < .01$.

measures ANOVA. The within-subjects factor was emotion, with six levels (happiness, sadness, contempt, disgust, fear, anger). The dependent variable was the score on each emotion scale (1–7) for items in group 1. For all the repeated measures ANOVAs, a Greenhouse-Geisser corrected values was used as all Mauchly's tests of sphericity were significant indicating that in each case the assumption of sphericity had been violated. An overall effect of emotion was found, $F(2.18, 59.04) = 45.08, p < .001$. Within-subjects contrasts confirmed the hypothesis showing that the happy emotion scale was significantly higher than the sad, contempt, disgust, fear and anger emotion scales (all $F_s > 48$, all $p_s < .001$).

For Cluster 2 (primary disgusts) the hypothesis that disgust is higher than the other emotions was tested. A similar repeated measures ANOVA was used. An overall effect of emotion was found, $F(3.12, 84.32) = 100.93, p < .001$. Within-subjects contrasts confirmed the hypothesis showing that disgust was significantly higher than sad, contempt, fear, happy, and anger emotion scales (all $F_s > 156$, all $p_s < .001$).

For Cluster 3 (complex disgusts) the hypotheses that disgust is higher than the other emotions, and that happiness is lower than the other emotions were both tested. A similar repeated measures ANOVA was again used. An overall effect of emotion was found, $F(3.64, 98.14) = 68.65, p < .001$. Within-subjects contrasts confirmed the hypothesis showing that disgust was significantly higher than sad, contempt, fear, happy, and anger emotion scales (all $F_s > 33$, all $p_s < .001$). Within-subjects contrasts also confirmed the hypothesis that happiness was significantly lower than sad, contempt, disgust, fear, and anger emotion scales (all $F_s > 66$, all $p_s < .001$).

Thus, data from the confirmation sample support the findings from the original sample, and have shown that the emotional profiles characteristic of each of the three clusters differ significantly.

Discussion

A cluster analysis conducted on the six emotion ratings given to a selection of disgust-relevant and disgust-irrelevant stimuli revealed a three-cluster solution. These three clusters appeared to represent: (1) nondisgust or "disgust-irrelevant" items (Cluster 1) comprising those items selected to represent nondisgust control items (e.g., eating cheese, cats); (2) "primary" disgust items (Cluster 2) containing a range of disgust-eliciting items consisting mainly of invertebrate animals (slugs, maggots) and body products (phlegm/mucus, bad breath); and (3) "complex" disgust items (Cluster 3) mainly representing behaviours or activities that are considered to be socially or morally unacceptable (e.g., racism, paedophilia, gluttony, eating human flesh). Apart from their identification in the cluster analysis, these three categories of items also differed significantly in terms of their emotional profiles. Both "primary" and

“complex” disgusts exhibited significantly higher levels of disgust than the “disgust-irrelevant” items, but more importantly, the “complex” disgusts were differentiated from the “primary” disgusts by exhibiting relatively high scores on all negative emotion scales.

These findings support the view that disgust-evoking stimuli that can be differentiated on the basis of the profile of emotions that they elicit. The first cluster we have labelled “primary” disgusts, and these items appear to correspond very closely to what Rozin, Haidt, and McCauley (1999) have called “core disgust”. Stimuli eliciting core disgust are characterised by their ability to elicit fear of oral incorporation (and as such are physically discrete enough to be orally incorporated) (Nemeroff & Rozin, 1989; Rozin & Fallon, 1987) In addition, core disgusts are deemed to be of animal origin (Rozin & Fallon, 1987). In general, these features of core disgust described by Rozin and colleagues are characteristic of the majority of items found in Cluster 2 (primary disgusts).

The second cluster contains items that elicit a much broader range of negative emotions than mere disgust, and we have labelled this category “complex disgusts”. Primary disgusts appear to elicit only elevated levels of disgust and there is no evidence for increased levels of other negative emotions. However, complex disgusts exhibit not only increased levels of disgust, but also comparatively higher levels of all other measured negative emotions (sadness, contempt, fear and anger). This category includes items from a number of different domains identified in those factor analytic studies by Haidt et al. (1994) and Barker and Davey (1997). For example, this cluster contains items from the sexual practices and foodstuffs of animal origin domains identified by Barker and Davey (1997), from the body envelope violations domain identified by Haidt et al. (1994), and the sociomoral disgusts category selected for the purposes of this experiment. These items appear to represent ways in which disgust has been extended into the social domain as a means of instilling certain stimuli or activities with negative affect, and as such, may represent an evolved use of disgust to convey culturally and morally acceptable attitudes. This function of disgust can be most obviously seen in cases where current socially and morally unacceptable activities are labelled as “disgusting” (e.g., racism, corrupt politicians, bestiality, incest), but it has also been argued that this evolved use of disgust has been used for more general civilising and socialising purposes. For example, Rozin et al. (1993, 1999) have argued that disgust is used to affirm our unique humanity in the form of animal nature disgusts, and examples of these animal nature disgusts are such things as body envelope violations (Haidt et al., 1994). They view this association between disgust and reminders of our animal origin as an important process in the civilising process of *Homo sapiens* (see also, Elias, 1978; Miller, 1997). Interestingly, the items taken from Haidt et al. (1994) body envelope violations category fell into both the primary (“someone accidentally sticking a fish hook through their finger”, “a human hand

preserved in a jar”) and the complex (“a crash victim with their intestines exposed”) disgust categories, suggesting that body violation disgusts might not be a unitary category conveying general negative affect associated with reminders of the animal nature of humans. This finding does not necessarily invalidate the view that disgust has the animal-nature “civilising” function hypothesised by Rozin et al. (1993, 1999, 2000). However, if disgust is being used as a means of imbuing man’s animal nature with negative affect, then we would expect that items used in such a way should also be associated with elevated levels of other negative emotions and thus appear in the complex disgust cluster.

While this first study has identified two distinct clusters of disgust-evoking stimuli differentiated on the basis of their emotional profiles, the participants contributing to the data were primarily female, and it is clear from the existing literature that there are some consistent gender differences in the way that disgust is experienced (Davey, 1994b; Haidt et al., 1994; Wronska, 1991). Study 2 is both an attempt to replicate the cluster solution found in Study 1 and to examine cluster analyses separately for male and female participants.

STUDY 2

Previous studies which have examined gender differences in disgust have found that: (1) females tend to exhibit higher levels of disgust sensitivity to males (Davey, 1994b; Haidt et al., 1994; Wronska, 1991); and (2) factor analytic studies of disgust stimuli can reveal subtle gender differences in the categories into which disgusting stimuli fall. For example, Barker and Davey (1997) found that although the factor structures obtained for males and females were favourably comparable, only females exhibited a significant factor relating to invertebrate animals, and there were significant differences in the items that made up the factor relating to sexual practices.

Study 2 was conducted to test for any underlying gender differences in the clustering of disgust stimuli on the basis of emotional profiles, and to confirm the cluster patterns revealed in Study 1.

METHOD

Participants. A total of 191 participants who had not taken part in Study 1 completed the second version of the emotional profiling questionnaire (EPQ). Of these 82 were male, 105 were female, and 4 did not report their gender. The age ranged from 17 to 55 with a mean of 22.23 years ($SD = 5.34$). The vast majority of the sample (182) was students, 7 were employed, and 2 were unemployed. Most were single (163), 23 were married or cohabiting, and 5 were divorced; 159 of participants were meat-eaters, 29 of the sample were vegetarian, and 3 did not report. The participants were volunteers who were naive to the purpose of the experiment.

Materials. The EPQ was made of the same 27 items as in the first emotional profiling questionnaire presented in a different random order. Each item was rated on a separate 7-point Likert scale for six different emotions (sadness, contempt, disgust, fear, happiness, and anger). The scale ranged from 1 (not felt) to 7 (very strongly felt).

Procedure. The procedure was identical to Study 1.

Results

Cluster analysis on the whole sample. As in Study 1, the 27 items were subjected to Ward's hierarchical agglomerative cluster analysis (SPSS 9.0; Ward, 1963). The resulting dendrogram clearly indicated exactly the same three-cluster solution found in Study 1 (Figure 3).

Cluster analysis for males. Data from the 82 males who completed the EPQ were subjected to Ward's hierarchical agglomerative cluster analysis (SPSS 9.0; Ward, 1963). The resulting dendrogram indicated a similar three-cluster solution to that found in Study 1. Exactly the same items made up the three clusters as in Study 1 and in the analysis for the whole sample in Study 2.

Cluster analysis for females. Data from the 105 females who completed the EPQ were subjected to Ward's hierarchical agglomerative cluster analysis (SPSS 9.0; Ward, 1963). The resulting dendrogram indicated a three-cluster solution similar to that found in Study 1 and the cluster analysis of the whole sample in Study 2. However, in this solution, one item (gluttony) is included in the second cluster (primary disgusts) whereas in Study 1, the analysis of the whole sample and the analysis of the males, gluttony is included in Cluster 3 (complex disgusts).

Further analysis of gender differences. The cluster analysis does not provide evidence for large gender differences in reactions to disgusting items. To confirm that the emotional reactions to these groups of items were not statistically different, a 3×2 mixed design MANOVA was performed on the six emotion scales. The independent variables were group (control, primary, complex) and gender (male vs. female) and the dependent variables were the six emotion scales on a scale of 1–7. Significant main effects of gender, $F(6, 180) = 11.89, p < .001$, and group, $F(12, 174) = 223.67, p < .001$ were found. These findings were qualified by a significant interaction effect of group by gender, $F(12, 174) = 6.87, p < .001$. This suggests that although both sexes may cluster the same items together, they are not responding to them in the same way. Follow-up univariate analyses on each of the emotion scales show a significant interaction effect of group by gender on the sad,

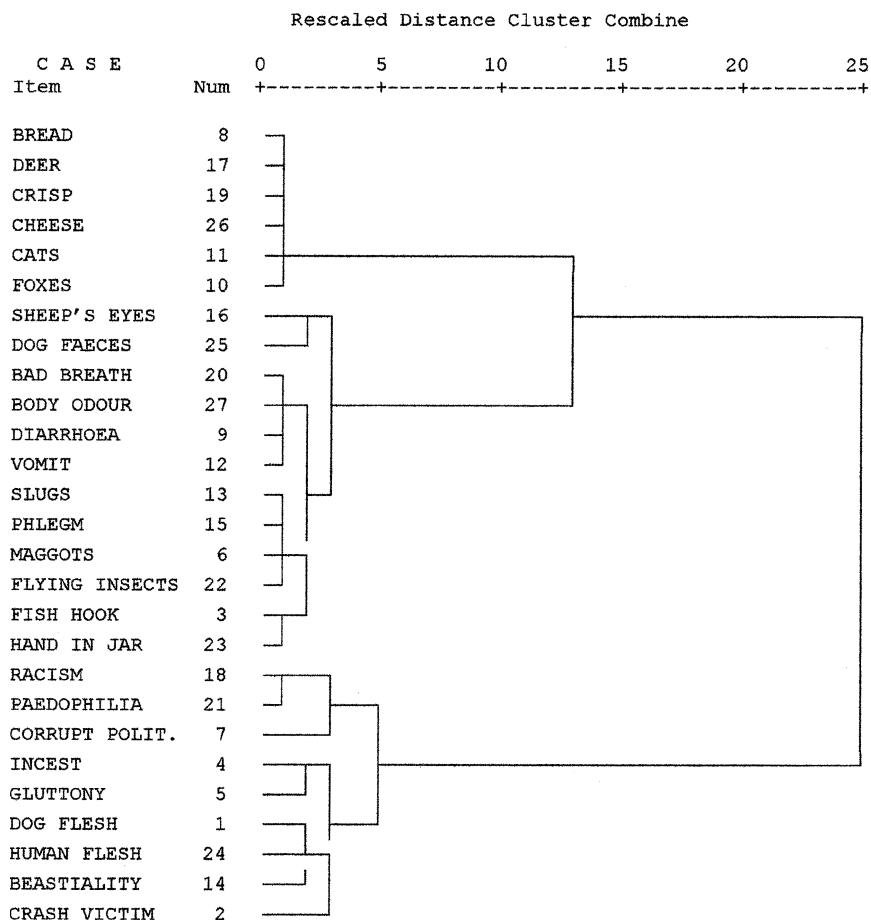


Figure 3. Dendrogram of Ward's cluster analysis of the entire dataset (Study 2).

contempt, disgust, fear, and anger emotion scales (all $F_s > 5$, all $p_s < .005$). There was no significant interaction effect on the happy scale, $F(2, 370) < 1$, $p = .375$ (see Figure 4).

For each emotion scale, group by gender interaction contrasts were specified between the control group and the primary disgust group, and the control group and the complex disgust group. Figure 4 shows that there is no difference between males and females in response to the control items. The gender by group interactions compare the relationship between the males and females in response to the control items (where we know there is no difference between the sexes) with the relationship between males and females in response to the other groups of items.

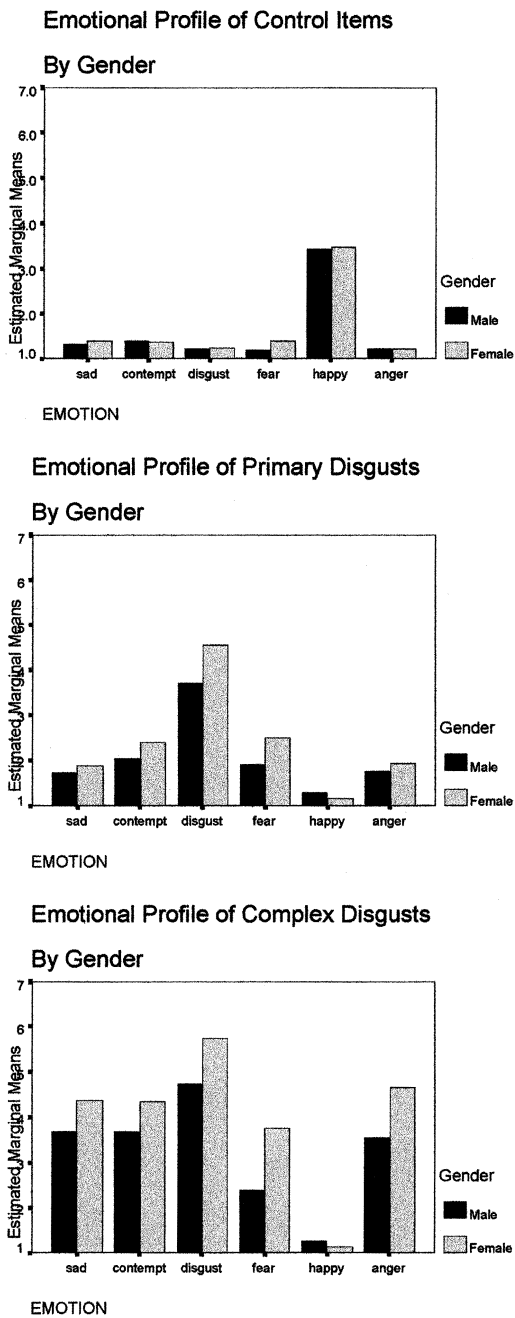


Figure 4. Emotional profiles for the three clusters from Study 2 (by gender).

The analyses indicate significant contrasts between control and primary disgust items on contempt, disgust, fear, and anger emotion scales (all $F_s > 4$, all $ps < .05$). The contrast was not significant for the sad emotion scale, $F(1, 185) < 1$. Females responded to primary disgusts with higher contempt, disgust, and fear ratings than males. There are also significant contrasts between control and complex disgust items on sad, contempt, disgust, fear, and anger scales (all $F_s > 7$, all $ps < .01$). Females responded to complex disgusts with higher ratings than males on all of the negative emotions.

Discussion

The cluster analysis carried out in Study 2 replicated the original study exactly, producing the same clusters and almost identical emotional profiles. Males and females produced very similar clusters with the exception of one item, “gluttony”, which was considered a primary disgust for the females and a complex disgust for the males.

The main gender difference found in Study 2 reflected females responding more intensely across all relevant emotions. For primary disgusts females responded with higher ratings of disgust, contempt, and fear, which were the highest rated emotions in the primary disgust emotional profile. For complex disgusts females responded with more intense feelings across all of the negative emotions. This is consistent with other self-report measures of emotions that have consistently found that women express more intense emotions than men (e.g., Barrett, Robin, Pietromonaco, & Eyssell, 1998; Diener, Sandrik, & Larsen, 1985). This gender difference in intensity has been found across many specific emotions including sadness (Allen & Haccoun, 1976; Grossman & Wood, 1993), fear (Allen & Haccoun, 1976; Blier & Blier-Wilson, 1989; Brody, 1985), shame and guilt (Tangney, 1990), and disgust (Haidt et al., 1994; Wronska, 1991). Since many disgust stimuli clearly elicit a range of emotional responses as measured by the emotional profiling method, previous gender differences in discrete disgust measures (e.g., Davey, 1994b; Haidt et al., 1994; Wronska, 1991) may reflect not just a heightened disgust reaction *per se* in females, but a more global elevation of all emotions elicited by disgust-relevant stimuli.

There is some doubt about whether this gender effect reflects a real difference in emotionality or is simply an artefact of the self-report methodology. However, gender differences have been found in facial expressions of emotion, where females have been found to be more expressive than males and less able to inhibit their facial expressions of emotion (Grossman & Wood, 1993). Females have also been found to use more emotion in writing (Brody, Wise, & Monuteaux, 1997), talk more about emotional issues and be more sensitive to other’s emotional reactions (Block, 1983), and exhibit stronger electromyogram changes in response to happy and angry faces (Dimberg & Lunquist, 1990),

suggesting that such gender differences in emotional response are not simply artefacts of self-report methodologies.

GENERAL DISCUSSION

The studies reported in the present paper used a hierarchical agglomerative cluster analysis to categorise the emotional profiles of disgust-evoking stimuli. These analyses revealed a three-cluster solution, with each cluster revealing its own characteristic profile of contributing emotions. The three clusters appeared to represent: (1) nondisgust or “disgust-irrelevant” items (e.g., eating cheese, cats); (2) “primary” disgust items containing a range of disgust-relevant items characterised by their ability to elicit fear of oral incorporation and their animal origin (e.g., phlegm/mucus, diarrhoea, slugs, maggots); and (3) “complex” disgusts, consisting mainly of behaviours or activities that are considered to be socially or morally unacceptable (e.g., racism, paedophilia, gluttony, eating human flesh). The emotional profiles of these three categories also differed significantly.

The analysis of disgust-relevant items in terms of the emotional profiles they elicit complements those previous studies which have based categorisation solely on factor analysis of a single disgust rating (e.g., Barker & Davey, 1997; Haidt et al., 1994). These previous categorisations do not reflect the broader characteristics of the emotions elicited by the disgust items, and they tend to provide categorisations that are based primarily on the physical characteristics of the stimulus (e.g., whether it is a food item, a body elimination product, a small invertebrate animal, etc.). Clearly, knowledge of the range of emotions elicited by a disgust-relevant item is of some theoretical importance when attempting to discover the functions that disgust may have. For example, if one function of disgust is to convey culturally and morally unacceptable attitudes, then it would be predicted that the emotional profiles of items which have acquired their disgust-relevance through this process would elicit a broad range of negative emotions (as exemplified by those items in the “complex” disgust category in the present studies).

Apart from the differences in emotional profiles between those items categorised as primary disgust and those categorised as complex disgusts, there appear to be a number of other distinctive characteristics of the items that fall within these two categories.

First, it is clear that the items that fall into the primary disgust cluster are ones that share the distinctive characteristics of “core” disgusts as defined by Rozin et al. (1999). These are: (1) the ability to elicit fear of oral incorporation; and (2) their animal origin (in terms of animals, parts of animals, or animal products, Angyl, 1941). These features suggest that, with this category of items, disgust has primarily a disease-avoidance function whose biological purpose is to prevent the spread of illness, disease, and infection (Davey, 1994a; Matchett &

Davey, 1991). Items in the primary disgust category can be viewed as: (1) having a clear *prima facie* role in the spread of disease and illness (e.g., phlegm/mucus, diarrhoea, human vomit); or (2) have stimulus features which resemble primary disgust-eliciting stimuli (e.g., slugs, and other animals which are frequently perceived to be mucus-like or slimy, cf. Davey, 1992). In almost all cases, these items are of a discrete physical nature that would permit oral incorporation either whole or in part. The fact that disgust is the only significant negative emotion exhibited in the emotional profiles of these items further suggests that disgust is elicited primarily for the purpose of food rejection rather than any broader “socialising” or “civilising” purposes (cf. Rozin et al., 1999).

As outlined in the discussion to Study 1, complex disgusts correspond to those items where disgust has been extended into the social domain as a means of instilling certain stimuli or activities with negative affect. This is supported by the fact that items in this category not only elicit disgust, but relatively high levels of most other negative emotions. While the immediate function of this appears to be to transmit evaluative and affective information about a stimulus or activity, the social or cultural purpose of this function is less clear. In many cases, this function plays a fairly straightforward role in emphasising cultural and moral norms within the society (e.g., by imbuing such activities as paedophilia or Nazism with strong negative affect). However, other theorists see a more general purpose for this communicative function. Rozin et al. (1993, 1999) have suggested that, in this role, disgust serves a general civilising and socialising function by reminding humans of their animal origins, and in helping humans to affirm their unique humanity (cf. Elias, 1978). Others, such as Miller (1997), indicate that this communicative function helps to establish general codes of behaviour by broadcasting a more general, social, civilising, and cultural message about the avoidance of such activities as overindulgence (e.g., gluttony as the “disgust of surfeit”, Miller, 1997).

Primary and complex disgusts may also differ in at least one other important characteristic. Because primary disgusts basically represent disgust as a food rejection response functioning to minimise the spread of disease and illness, such disgusts are likely to be universal and cross-cultural in nature. The primary disgust category contains body-waste products, animals, parts of animals, and animal products, and Rozin and Fallon (1987) have argued that body-waste products and many animal products represent pancultural disgusting objects. Not only does there appear to be universality to primary disgust items representing body-waste and animal products, but there also appears to be universality to the disgust-relevant animals identified in the primary disgust category. In a study of animal fears encompassing seven different countries, Davey et al. (1998) reported that a disgust-relevant category of feared animals could be identified in all cultures. Furthermore, there was a good deal of consistency shown in the animals loading on to the disgust-relevant factor across countries, with cockroach, spider, worm, leech, bat, lizard, and rat loading significantly onto this

factor across all seven countries sampled. The universality of primary disgusts may not be so surprising given that the items in this category have a relatively immediate relationship to food rejection for disease-avoidance purposes (either through directly being vehicles for the spread of disease, having an historical association with the spread of disease, or having features which resemble primary disgust items). As such, the stimuli that reflexively elicit disgust in this way may have been defined very early in the evolution of *Homo sapiens*.

In contrast, complex disgusts appear to have much greater cultural diversity. For example, in a survey of what American and Japanese individuals find disgusting, Imada, Yamada, and Haidt (1993) found that primary or core disgusts account for only 24% and 27% of the American and Japanese responses respectively. This is perhaps not surprising given that a putative function of the complex class of disgusts is to utilise the disgust emotion for the purposes of defining cultural norms in what is either acceptable socially or morally (cf. Haidt, Rozin, McCauley, & Imada, 1997).

It should be noted that the labels primary and complex disgusts are by no means definitive. There is of course a great similarity between the cluster of primary disgusts found by these studies and the category of animal/food disgusts identified by Rozin, Haidt, and colleagues (Rozin et al., 1993, 2000). There is also a great deal of similarity between the cluster of complex disgusts, and the category of sociomoral disgusts (Rozin et al., 1993, 2000). Therefore animal/food and sociomoral would also be appropriate labels for the two disgust clusters revealed by these studies. It could also be appropriate to name these two categories focused and diffuse. The primary disgusts could be labelled “focused”, as the emotional reaction is of a relatively pure disgust. The complex disgusts could be labelled “diffuse” as the emotional response is a broader response spread over several negative emotions.

However, the results of the present research should be viewed in the light of a number of factors. First, there is a possibility that had different items had been selected for inclusion in the EPQ then a different cluster solution might have been identified. This study has identified a two-factor disgust taxonomy, but with different items it is possible that the four-factor taxonomy of core, animal nature, sociomoral, and interpersonal disgusts proposed by Rozin and colleagues (e.g., Rozin et al., 1993, 2000) might have emerged. For example, if items related to interpersonal disgust had been included, these may have constituted a further cluster with a distinct emotional profile. It is also possible that had items related to death been included, which Haidt et al. (1994) argue is a core component of animal nature disgust, these may have constituted an additional separate cluster with a distinct emotional profile. Possibly some items which have been included in Cluster 3 that do not have such a clear moral element (“eating dog flesh”, “eating human flesh”, and “a crash victim with their intestines exposed”) might belong in such an animal nature cluster.

On the other hand, efforts were made to include a wide range of disgust-eliciting stimuli taken from two categorisation studies (Barker & Davey, 1997; Haidt et al., 1994) and a separate small survey. Items related to animal nature disgust were included in the questionnaire and did not form a separate category, so there is no real reason to propose that including items related to a further component of animal nature disgust (i.e., death) should make up a distinct animal nature cluster. Moreover, the proposed items in Cluster 3 may not have such a clear moral element as other sociomoral disgusts, but two are behaviours that are frowned upon by our society (“eating dog flesh”, “eating human flesh”) and as such fit in well with other sociomoral disgusts. Thus, although it is certainly possible that interpersonal disgust may form a separate cluster of disgust-elicitors, the evidence from this study seems to suggest that animal nature disgust is unlikely to form a separate animal nature cluster with a distinct emotional profile. However, this does not necessarily mean that disgusts related to our animal nature do not exist, only that the emotional reactions to proposed animal nature disgust-elicitors are not significantly different from the emotional reactions to complex, or in some cases core, disgusts.

A second limitation is that the stimuli are presented in a linguistic format, which requires participants to imagine the items. Some researchers have argued that there is a hierarchy of threat cues, and that representations closer to the actual stimulus will trigger a stronger and more realistic response (Foa & Kozak, 1986; Lang, 1979). In this view, the actual object or a picture would lead to a more genuine emotional reaction than a linguistic stimulus. However, other researchers have found that linguistic stimuli can have a more pronounced effect than pictorial stimuli (Lavy and van den Hout, 1993). Moreover, Lavy & van den Hout (1993) argue that pictorial and real stimuli are more constrained by reality, whereas a word can mean different things to different people. Thus, linguistic stimuli may be the most effective at uncovering internal representations of what is disgusting.

A third limitation is that self-report measures are used to gauge emotional reactions. Emotions can also be measured using behavioural, physiological, and neurological methods of assessment. However, self-report measures were deemed more appropriate in this paper as they are inexpensive, a large sample can be collected in a relatively short space of time, and most importantly self-report measures can be used to rate more than one emotion at any time. It is difficult to use other methods to measure simultaneous multiple emotions, which is of course the purpose of these studies. Of course, self-report scales do have their problems; most crucially that it is difficult to be certain that when a participant represents a given emotion that they are actually experiencing that emotion. Participants might make false emotion ratings due to experimental demand, or simply because they have difficulty distinguishing how they really feel.

Despite this possibility, it seems likely that participants are reflecting their true emotions. Research has suggested that although demand effects do affect

emotion ratings after a mood induction procedure, they are more likely to inflate rather than produce effects (Berkowitz & Troccoli, 1986; Clark, 1983; Polivy & Doyle, 1980). Although some researchers have suggested that people have difficulty distinguishing between emotions (e.g., Polivy, 1981), in actual fact emotions are often connected with very specific experiential components (e.g., nausea in disgust). Moreover, people have no problem identify facial expressions linked with specific emotions (e.g., Ekman, 1982) and universals in the types of event that give rise to a basic emotion (e.g., Stein & Trabasso, 1992). The fact that people are in agreement over what causes an emotion, as well as the physiological sensations and the facial expressions that accompany it, suggests that people do not have a problem distinguishing between basic emotions. It should also be noted that subjective experience is usually considered to be an important part of emotion (e.g., Izard, 1977), which adds support to the use of self-report measures.

A fourth, related limitation is there is a possibility that when participants report a range of negative emotions for complex disgusts, they are simply trying to use the given scales to represent a higher, general negativity. Although this is feasible, the arguments given above suggest that people do know which emotions they are feeling and are able to use self-report measures to reflect these. A final limitation is that the sample consists entirely of students. A sample from a wider population might have more generalisability.

In conclusion, this paper provides support for the view that there are two types of disgust, primary and complex. Primary disgusts elicit primarily disgust and seem to be related to food-rejection. Complex disgusts elicit a range of negative emotions, and are likely to be related to cultural taboos. Rating disgust-eliciting situations on multiple emotion scales has proved a successful way to distinguish between different types of disgusts. Similarly, using a similar technique on situations linked to other basic emotions (e.g., anger, fear, or sadness) could help to clarify whether other emotions can also be divided into different categories, which may in turn be related to different functions. Therefore, not only has this paper clarified disgust, it also illustrates a useful technique for investigating different categories of emotional situations or stimuli.

The emotional profiling method of categorising disgust-relevant items also has an important benefit when it comes to identifying and understanding the relationships between disgust and other related emotions. For example, disgust has been identified as an important factor involved in a number of anxious psychopathologies, and it is thus important for our understanding of these psychopathologies that we are able to describe the emotional profiles elicited by items relevant to these disorders. Disgust has been shown to be related to measures of obsessive-compulsive washing (Ware, Jain, Burgess, & Davey, 1993), eating disorders (Davey, Buckland, Tantow, & Dallos, 1998), animal phobias (Arrindell, Mulken, Kok, & Vollenbroek, 1999; Matchett & Davey,

1991), and blood-injection-injury phobias (Merckelbach, Muris, de Jong, & de Jongh, 1999; Page, 1994). The emotional profiling methodology will be helpful in identifying the emotional profiles elicited by the stimuli involved in these psychopathologies (e.g., dirt in compulsive washing, food in eating disorders, fear-relevant animals in animal phobias, and blood/injections in blood-injection-injury phobia), and how the relationship between disgust and fear in these profiles might contribute either as a vulnerability factor or as a direct causal factor in the acquisition of these psychopathologies.

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