

## The relation between anger and different forms of disgust: Implications for emotion recognition impairments in Huntington's disease

Andrew J. Calder<sup>a,\*</sup>, Jill Keane<sup>a</sup>, Andrew W. Young<sup>b</sup>, Andrew D. Lawrence<sup>c</sup>, Sarah Mason<sup>d</sup>, Roger A. Barker<sup>d</sup>

<sup>a</sup> MRC Cognition and Brain Sciences Unit, 15 Chaucer Road, Cambridge CB2 7EF, UK

<sup>b</sup> Department of Psychology, University of York, Heslington, York YO10 5DD, UK

<sup>c</sup> Wales Institute of Cognitive Neuroscience, School of Psychology, Cardiff University, Tower Building, Park Place CF10 3AT, UK

<sup>d</sup> Cambridge Centre for Brain Repair, Forvie Site, Addenbrooke's Hospital, Cambridge, UK

### ARTICLE INFO

#### Article history:

Received 8 September 2009

Received in revised form 4 May 2010

Accepted 10 May 2010

Available online 16 May 2010

#### Keywords:

Huntington's disease

Anger

Disgust

Emotion

Facial expressions

Vocal expressions

Striatum

Insula

### ABSTRACT

Initial reports of emotion recognition in Huntington's disease (HD) found disproportionate impairments in recognising disgust. Not all subsequent studies have found this pattern, and a review of the literature to date shows that marked impairments in recognising anger are also often seen in HD. However, the majority of studies have based their conclusions on a single test of facial expression recognition. In the current study we revisit this issue of emotion recognition in HD to address whether the pattern found on one test of facial expression recognition generalised to another, and to different modalities using tests of emotion recognition from facial expressions, vocal expressions, and short verbal vignettes. The results showed evidence of impairments in recognising anger, fear and disgust across the three domains, with recognition of anger the most severely impaired. Given work identifying different subtypes of disgust that are associated with different facial features, a second study examined the recognition of three disgust expressions that healthy participants reliably associate with unpleasant tastes, unpleasant smells, and a more general elaborated or expanded form of disgust that includes reactions to violations of moral standards. The results showed a disproportionate impairment in recognising faces associated with the expanded form, the subtype most closely aligned with anger. We conclude that the related emotions of disgust and anger associated with social disapproval are frequently impaired in HD and discuss factors that might cause one emotion to show more severe impairments than the other.

© 2010 Elsevier Ltd. All rights reserved.

### 1. Introduction

Huntington's disease (HD) is a trinucleotide repeat disorder that classically results in cognitive impairments, motor disorders, and psychiatric and emotional symptoms. The emotional and psychiatric impairments have a dramatic impact on family life and include altered behaviour and impaired interpretation of others' emotional states (Craufurd & Snowden, 2002). Here we focus on the latter.

Sprenghelmeyer et al. (1996) were the first to report that the recognition of facial expressions of disgust was particularly compromised in patients with manifest HD, although marked but less severe impairments were also found for other emotions, in particular anger and fear. Similar results were found in a study investigating a small group ( $n=6$ ) of Chinese patients with manifest HD (Wang, Hoosain, Yang, Meng, & Wang, 2003). A third study by Montagne et al. (2006) found impaired recognition of disgust

and anger from animated sequences of morphed facial expressions ranging between neutral and each of six target expressions; however, the anger deficit was restricted to low-intensity morphs and disgust alone was impaired for sequences ranging between neutral and 100% of the target emotions.

Not all studies have found evidence of a disproportionate disgust deficit in manifest patients, however. Milders, Crawford, Lamba, and Simpson (2003) found impairments for facial expressions of anger, fear, disgust, and sadness, but there was no evidence that the disgust deficit was more severe, and fear showed a more severe impairment than disgust. More recently, Henley et al. (2008) and Snowden et al. (2008) have found disproportionate impairments in recognising angry facial expressions.

Less severe but more selective disgust impairments have been found in premanifest individuals that tested positive for the HD gene mutation (Gray, Young, Barker, Curtis, & Gibson, 1997; Hennenlotter et al., 2004; Sprenghelmeyer, Schroeder, Young, & Eppelen, 2006). Some of these studies compared a group of premanifest gene positive individuals with their partners or a group of gene negative at-risk individuals (Gray et al., 1997; Henley

\* Corresponding author. Tel.: +44 1223 355 294x750; fax: +44 1223 359 062.  
E-mail address: [andy.calder@mrc-cbu.cam.ac.uk](mailto:andy.calder@mrc-cbu.cam.ac.uk) (A.J. Calder).

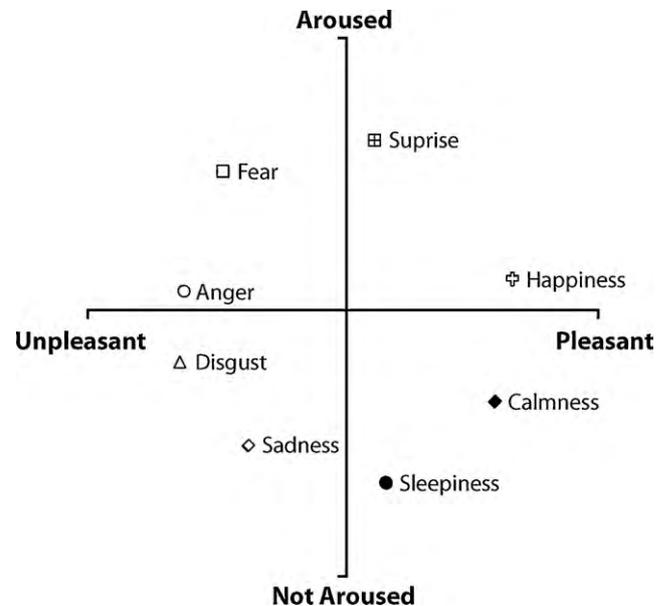
et al., 2008; Johnson et al., 2007; Kipps, Duggins, McCusker, & Calder, 2007; Sprengelmeyer et al., 2006). In other studies the controls were unrelated, healthy, neurologically intact individuals (Hennenlotter et al., 2004; Milders et al., 2003). The clearest evidence of a disgust impairment is from Sprengelmeyer et al. (2006) who found impaired recognition of facial expressions of disgust on three separate testing sessions, separated by approximately 6–7 months. Only on the third occasion was another facial expression (surprise) impaired. Other studies have also found impaired recognition of disgust in asymptomatic Huntington's participants (Gray et al., 1997; Hennenlotter et al., 2004); although Hennenlotter et al. (2004) also found a borderline impairment for anger ( $p=0.052$ ) using the one-tailed criterion they applied to the disgust contrast.

As in the case of manifest HD, not all studies investigating premanifest individuals have found disproportionate problems in recognizing disgust (Henley et al., 2008; Kipps et al., 2007; Milders et al., 2003). The only effect found by Kipps et al. (2007) was a borderline impairment for facial expressions of anger. However, of more interest, they demonstrated that disgust recognition in premanifest HD was significantly correlated with grey matter volume in the anterior insula estimated using voxel-based morphometry (VBM) (Kipps et al., 2007), with decreasing insula volume associated with worse recognition of disgust facial expressions. Similarly, using fMRI, Hennenlotter et al. (2004) showed decreased insula activation to disgust facial expressions in premanifest HD. These findings accord with other research demonstrating the role of the insula in disgust processing using functional imaging (Calder et al., 2007; Phillips et al., 1997; Wicker et al., 2003), intracerebral recording (Krolak-Salmon et al., 2003) and following focal brain damage (Adolphs, Tranel, & Damasio, 2003; Calder, Keane, Cole, Campbell, & Young, 2000); for a review see Calder, Lawrence, and Young (2001).

In the largest study of facial expression recognition in premanifest HD to date, Johnson et al. (2007) investigated facial expression recognition in a group of 475 participants that tested positive for the gene but were yet to manifest the condition. The results showed impaired recognition of negative facial expressions (anger, disgust, fear, and sadness), but no evidence that disgust was disproportionately impaired. The premanifest group in this study was divided into four sub-groups on the basis of a standard motor disorder examination (Unified Huntington's Disease Rating Scale, UHDRS; Kiebertz et al., 1996) relating to the clinicians' confidence that any motor abnormalities were related to HD. Anger was the only emotion impaired in all four subgroups, with the first subgroup (minimal evidence of motor impairments) showing impaired recognition of anger only. The three other subgroups were impaired at recognising anger, fear, and sadness, while the second and third subgroups were impaired on disgust. A comparable analysis of response times to categorise expressions showed slower RTs for anger for all but the first (least evidence of motor impairments) subgroup, whereas subgroups 2 and 3 also showed reduced RTs to happy expressions.

The absence of a disproportionate impairment in recognising disgust in Johnson et al.'s (2007) study, the largest investigation of facial expression recognition in premanifest HD to date, demonstrates that it is in no sense diagnostic of HD. Instead, like many other behavioural deficits associated with this complex neuropsychiatric condition, emotion recognition deficits may show variability in premanifest and manifest gene positive HD individuals (Craufurd & Snowden, 2002). However, from our review it is clear that where deficits have been observed, these usually encompass more than one emotion, particularly disgust, anger, and fear. Moreover, disproportionate impairments have been reported for disgust and also for anger, although the significance of disproportionate anger impairments is generally not emphasised.

These conclusions are drawn from research that has focused largely on recognition of emotion from faces rather than other



**Fig. 1.** The Circumplex model of emotion representation in which emotions are coded in terms of their degree of arousal and unpleasantness; modified from Bullock and Russell (1986).

cues, and conclusions are frequently based on the results of a single test, such that it is unclear whether the variability among studies relates to differences in stimulus materials, subject populations, or whether variable performance might also be observed in a single population across different stimulus materials. There are exceptions, however. Sprengelmeyer et al.'s (1996) and Snowden et al.'s (2008) investigations of manifest HD used at least two tests of facial expression recognition, and both Sprengelmeyer et al. (1996) and Hayes, Stevenson, and Colheart (2007) found disproportionate disgust impairments on tests of vocal emotion recognition. Sprengelmeyer et al.'s (2006) report of impaired recognition of disgust facial expressions in premanifest HD also tested recognition of emotion in the vocal modality but found no evidence of impaired recognition of vocal expressions of any emotion. Impaired perception of disgust from olfactory cues has also been demonstrated (Hayes et al., 2007); see also Mitchell, Heims, Neville, and Rickards (2005). However, these data need to be interpreted in light of more general olfactory impairments associated with HD (Moberg & Doty, 1997). Hayes et al. (2007) also demonstrated impaired access to conceptual knowledge of disgust in the form of fewer generated examples of disgust situations and impaired identification of disgust from pictures of emotional scenes. However, in a study addressing emotion recognition from facial and vocal signals together with emotion recognition from verbal scenarios, Snowden et al. (2008) found the most consistent impairments for anger. Similarly, an investigation of emotion from animated bodies, that did not include stimuli depicting disgust, reported impaired recognition of anger (de Gelder, Van den Stock, de Diego Balaguer, & Bachoud-Lévi, 2008).

So from cues other than faces, there is initial evidence that disgust and anger show evidence of disproportionate impairments. It is therefore of note that these two emotions are often confused, a fact that is reflected by their proximal locations in two-dimensional models of emotion, such as Russell's (1980). Circumplex model in which emotions are coded in terms of the degree to which they evoke arousal and their relative pleasantness/unpleasantness (Fig. 1).

In the current study, we revisited the issue of emotion recognition in manifest HD patients. Since the majority of studies have evaluated emotion recognition using a single test, we addressed

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات