Introduction To Special Issue:

THE ROLE OF THE CHEMICAL SENSES IN DISGUST’S DISEASE AVOIDANCE

Lorenzo D. Stafford

Department of Psychology, University of Portsmouth, U.K.

Correspondence to be sent to: Lorenzo D. Stafford, Department of Psychology, University of Portsmouth, King Henry Building, King Henry I Street, Portsmouth PO1 2DY. U.K. Email: lorenzo.Stafford@port.ac.uk. Tel: 02392 846322. Fax: 02392 846300
Background

All animals are confronted with the ongoing fight against harmful agents (e.g. bacteria, viruses) and as such have developed defensive mechanisms that can be categorised as physiological and separately behavioural ‘immune’ systems (Curtis et al., 2011). The latter relates to the emotion of disgust in humans and has evolved as an efficient protective system, influencing far reaching behaviour including the selection of safe foods to consume, assessing fitness value of potential mates and avoiding sexually transmitted infection.

At the centre of this system is the key role played by the chemical senses which is often overlooked by work in this area, where the focus is more about using odour/taste stimuli to examine some other aspect of behaviour. With the explosion of disgust related research in recent years across many different research domains, it is therefore timely for a special issue to realign and integrate the role of the chemical senses in this important area. In so doing, I hope this special issue will also stimulate further research in disgust and the chemical senses, thereby extending our understanding.

Reflecting on the role played by the chemical senses, the oral rejection of bitter (potentially toxic) constituents is an important aspect of disgust related behaviour, which links to bitter transduction and perception. In contrast, the sense of smell could be viewed as an early warning system, able to detect a potential threat even coming into close proximity to the individual. A good example of this: Whilst I was recently preparing a disgust related chemical (vomit) for a study, a technician entered the lab and immediately reacted with the prototypical facial disgust response of a wrinkled nose and raised upper lip (this also links to Hanah Chapman’s article in this special issue) together with the closely aligned emotion of anger! In addition to help in maintaining a safe distance, this reflexive action would also likely reduce sniffing magnitude, aiding further protection (see also Darwin, 1872).

Interestingly, though the same odour was also repugnant to myself when starting the
preparation, necessarily, my own disgust response had downregulated the odour, presumably via habituation.

When discussing the emotion of disgust, I think it is helpful to distinguish between habitual or ‘trait’ disgust sensitivity, most often measured using various questionnaires (e.g. Three Domains of Disgust, Tyber et al., 2009) and ‘state’ disgust, where a temporary state of disgust is induced in some manner (e.g. exposure to disgust related stimuli) and some measurement is made on the effect. This clarification is especially useful when looking at studies using chemosensory methodology which have the ability to measure trait disgust via for instance, taste and smell threshold detection measures (commonly referred to as ‘sensitivity’, see Ilona Croy article), and also induce state disgust using various odours or tastes (see Anne Schienle article). Additionally, there is the possibility of measuring a disgust response (indicating trait disgust or effect of state disgust) to chemosensory stimuli, (e.g. for odours see Jelena Djordjevic & Marco Liuzza articles).

In the articles that follow, Jelena Djordjevic introduces us to the relation between nutrition and psychophysiological (including Facial Corrugator Electromyogram, EMG) reactions to disgust related odours in young and older populations. Ilona Croy investigated how individuals with low/high olfactory sensitivity to n-butanol differ in questionnaire measures of disgust and tactile discrimination. Rottraut Ille provides an insight into the relation between hyposmia and trait disgust (including ‘self-disgust) perception and how this differs between males and females. Marco Liuzza’s two contributions, firstly developed a novel measure for trait body odour disgust and secondly, demonstrated how this predicted the perception of disgust to human sweat samples. Hanah Chapman examined the effects of various tastants on facial disgust expressions using the Facial Action Coding System (FACS).
Anne Schienle explored changes in Even Related Potentials (P200, P300) in response to facial (e.g. disgust/happy) stimuli paired with a bitter tastant.

**Future Work**

Utilising the chemical senses in disgust research can also help solve further questions in this area. For instance, how does our disgust avoidance system respond in different states of motivation? e.g. the smell of a stale food item (e.g. mouldy cheese) that might normally induce a disgust response would likely be perceived more favourably in a high hunger state.

From a different line of research, it is now well established that the integration of our senses are central to any of our richer experiences, and there is a hierarchy, where for instance, vision can dominate over audition in judgements of spatial location (Alais & Burr, 2004) and separately, in certain aspects of food perception, audition can surprisingly override taste (Zampini & Spence, 2004). This then raises the question of the sensory hierarchy in disgust avoidance behaviour. Finally, studying disgust and the chemical senses may even shed light on the link between olfactory dysfunction and neurodegenerative disease, where it is being theorised that the olfactory bulb might be an entry point for pathogens that subsequently induce olfactory loss and later neurodegenerative disease (Rey et al., 2016).

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**References**


