



Can the emotion of disgust be harnessed to promote hand hygiene? Experimental and field-based tests

Renata Porzig-Drummond, Richard Stevenson*, Trevor Case, Megan Oaten

Department of Psychology, Macquarie University, North Ryde, Sydney, NSW 2109, Australia

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ABSTRACT

Two studies carried out in Sydney, Australia explored whether inducing disgust may be a useful addition to hand-hygiene interventions. Experiment 1 employed a novel laboratory measure of hand hygiene, and tested whether a brief (3-min) video-based intervention using disgust/education, improved hand hygiene relative to education alone and a control condition. On test, a week later, the disgust intervention significantly exceeded the education and control condition combined, although the effect size was modest. Experiment 2 examined the generality of this effect in a field study. During a baseline period, soap and paper towel use in a series of washrooms were covertly monitored. This was followed by an intervention period, in which two washrooms received disgust/education-based posters and a further two, educational posters, exhorting participants to wash their hands. A follow-up period, after the posters were removed, was also monitored. The disgust-based intervention was significantly better at promoting hand hygiene. These findings suggest that even brief disgust-based interventions may be successful and that these can be tested and developed under laboratory conditions.

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Introduction

Hand hygiene has a central role in preventing the transmission of gastroenteritis and respiratory illnesses, both in industrialised and developing nations (Luby *et al.*, 2005). Estimates based upon meta-analysis suggest that improved hand hygiene reduces rates of gastrointestinal illness by 31% and respiratory illness by 21% (Aiello, Coulborn, Perez, & Larson, 2008). Prevention through hand hygiene is therefore a *potentially* easy, effective, and low-cost defence. However, hand hygiene is often neglected and observational and self-report studies suggest it rarely exceeds 50% in either the community (Guinan, McGuckin-Guinan, & Severeid, 1997) or in professional domains (Pittet *et al.*, 2004).

Health concerns have been found to have little impact on hand-hygiene behaviour (O'Boyle, Henly, & Larson, 2001). It is difficult for individuals to recognise the association between preventive behaviour and adverse outcome, because inadequate hand hygiene does not always result in illness and the consequences may be delayed (Pinfold, 1999). Several factors that influence hand-hygiene behaviour have been identified. These include: (i) gender, with females more likely than males to engage in post-toileting hand washing (Guinan *et al.*, 1997); (ii) hand-hygiene habits, which are

mostly acquired in childhood and are difficult to change (Whitby, McLaws, & Ross, 2006); (iii) social facilitation, with increased hand washing in the presence of another person in the washbasin area (Drankiewicz & Dundes, 2003); (iv) modelling, with hand hygiene improving among health-care workers when senior medical staff practice hand hygiene (Pittet *et al.*, 2004); and (v) environmental barriers, where lack of facilities or inconvenience prevent hand hygiene (Scott, Curtis, Rabie, & Garbrah-Aidoo, 2007).

It has been suggested that the emotion of disgust may be a further factor involved in the chain of events leading to an act of hand hygiene (Curtis, Garbrah-Aidoo, & Scott, 2007). The disgust elicitors most closely linked to hand hygiene are bodily secretions such as faeces and mucus, items that look soiled, and certain animals (Curtis & Biran, 2001). Many disgust elicitors are rich sources of pathogens so, from an evolutionary perspective, disgust can be viewed as an adaptive emotional response to protect people from disease (Oaten, Stevenson, & Case, *in press*). Whitby *et al.* (2006) suggest that the emotional concepts of dirtiness and cleanliness are closely linked to disgust and drive individuals to clean visibly soiled hands. However, it has also been observed that objects (e.g. food) that come into contact with a disgust elicitor (e.g. an insect) can acquire disgust-evoking qualities. In this case the object becomes 'invisibly dirty', or ideationally contaminated, and hence disgusting (Curtis & Biran, 2001).

To date, two studies have included disgust components in hand-hygiene interventions. The first was a full-scale national campaign

* Corresponding author. Tel.: +61 98808098.

E-mail address: richard.stevenson@psy.mq.edu.au (R. Stevenson).

conducted in Ghana (Curtis et al., 2007). The campaign's television advertisement made contamination visible following toileting. The contaminant was seen to be transferred from a mother to her child's meal during food preparation. Reported hand washing after toileting increased by 13%, and before eating by 41% (Curtis et al., 2007). The second was a social marketing campaign conducted in Burkina Faso, in which disgust also served as an element in several components of the intervention. Here, hand washing after toileting increased by a similar amount (16%; Curtis et al., 2001). Whilst these findings are suggestive, both studies employed a variety of marketing tools not all of which contained an element of disgust – making it difficult to determine the unique contribution disgust made to the increase in hand washing.

Unpublished disgust-based hand-hygiene interventions have also been described. Cedars-Sinai Medical Centre in Los Angeles used an image of a physician's bacteria-ridden hand as a screen saver on hospital computers, making the previously invisible contamination of the hand visible. Hand-hygiene compliance was reported as increasing to nearly 100% (Dubner & Levitt, 2006). Similarly, a school included pictures of bacteria-ridden items that students frequently touched in its hand-hygiene campaign. This significantly increased students' use of hand gel before eating lunch (du Pré, 2005). Additionally, anti-smoking campaigns have employed the emotion of disgust by showing graphic images, such as gangrenous toes, in advertisements and on cigarette packets. These techniques appear to work (Mackinnon & Nohre, 2006).

Although the emotion of disgust prompts hand hygiene primarily when dirt is visible (Whitby et al., 2007), there appears to be no research testing whether contact with dirty objects that leave the hands visibly clean can prompt hand hygiene. Clearly, this is of practical significance. Many instances where hand washing is needed involve touching objects that leave no visible dirt but that have been in contact with core-disgust elicitors. Disgust may have an important part to play in promoting hand hygiene on these occasions. Consequently, Experiment 1 tested whether the disgust-evoking qualities of objects that are dirty (i.e. ideationally contaminated) but leave the hands clean, can trigger hand-hygiene behaviour.

The principal aim, however, of the two studies reported here, was to directly test the assertion that the emotion of disgust may be especially useful as an intervention strategy in promoting hand hygiene (e.g. Curtis, Voncken, & Singh, 1999). This was examined under laboratory conditions (Experiment 1) where we developed a novel procedure to assess hand hygiene, and in a more naturalistic field-based study (Experiment 2). We did not attempt to assess the source of any effect – for example whether disgust may facilitate attention to the message or become associated with invisible dirt – as our interest at this stage was simply to determine if it was more effective than control conditions. This appeared a reasonable goal given the lack of prior work on this topic.

Experiment one

Experiment 1 set out to explore three things. First, it attempted to develop and evaluate a novel laboratory-based behavioural measure of hand hygiene derived from research on disgust (see Rozin, Haidt, McCauley, Dunlop, & Ashmore, 1999). Self-report measures of hand hygiene alone were considered insufficient because it is well documented that desirable behaviours are often over-reported and vice versa (e.g. Biran et al., 2008). Second, it also assessed whether the disgust-evoking qualities of dirty objects can trigger hand hygiene even when they leave the hands visibly clean. Third, it assessed whether a disgust-evoking intervention would be more successful than comparable control conditions, all of which were presented on video.

Participants attended two sessions, one week apart. The first session included baseline self-report measures and then an intervention. Assignment to the intervention was random, so as to control for individual differences in hand-hygiene behaviour. However, participant gender was employed as an independent variable, not only as this is known to affect hand hygiene, but because females are also more disgust sensitive (e.g. Curtis, Aunger, & Rabie, 2004) and so might respond differently to disgust interventions relative to men. The second session, a week later, assessed the intervention effect, both in terms of self-report (i.e. had behaviour changed in the intervening week?) and on the new experimental measure.

Method

Participants

Participants were drawn from an Australian urban center. Of the 103 participants who started the experiment, data from seven were excluded. Five failed to return for Session 2, one reported suffering from obsessive-compulsive disorder, and one failed to comply with the instructions (refused to touch certain test items). Of the 96 participants remaining, 62 were undergraduates recruited via the subject pool and 34 responded to campus advertisements. There were 39 males and 57 females, aged between 16 and 59 years ($M = 21.8$, $SD = 6.9$). There were no significant differences between the conditions in terms of age, gender (i.e. distribution across conditions), disgust sensitivity, and employment in a health-care or food-based setting. Both studies reported here were approved by the Macquarie University Ethics committee. Participants were informed that the study concerned emotion and hygiene behaviour, but no further details were provided. Participants were given more details in a post-experiment debriefing. Finally, all testing took place between April and June 2007.

Experiment one: laboratory-based test

Session 1. In Session 1, one to three people were tested at a time, each for an average of 30 min, seated facing away from each other. Demographic data were obtained, followed by the hand-hygiene questionnaire. The few available validated questionnaires that ask about hand-hygiene practice were not suitable for this study because the questions were specific to particular settings. As a more general measure was needed, the Hand Hygiene Scale (HH-Scale), an inventory for measuring routine hand-hygiene behaviour, was employed. The HH-Scale is a 17-item subset of the 50-item self-report Hygiene Behaviour Inventory (HBI; Stevenson, Case, Hodgson, Porzig-Drummond, & Oaten, in press). A preliminary analysis revealed that both the HBI and the HH-Scale have good internal consistency ($\alpha = 0.85$) and that both correlate significantly with the Disgust Scale (DS; Haidt, McCauley, & Rozin, 1994), 0.59 for DS and HBI, and 0.46 for DS and HH-Scale. The 17 questions of the HH-Scale were classified into four domains: time spent on hand washing (1 question); frequency of hand washing (1 question); technique when washing hands (6 questions); and occasions leading to hand washing (9 questions). Answers were given on 4-point scales, with higher scores denoting higher levels of hygiene. Participants then completed the Disgust Scale (Haidt et al., 1994).

To determine whether the disgust-inducing hand-hygiene video intervention did indeed induce disgust, a self-report emotion scale was administered before and after viewing each intervention video. Although disgust was the emotion of interest, the six basic emotions (Ekman, 1992) were included to determine the specificity of any change. Participants indicated how much they experienced happiness, surprise, fear, sadness, disgust and anger at that moment. Each emotion was rated using a 7-point scale, from 1 (*not at all*) to 7 (*very*).

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