



Original research article

Disgust in response to some arthropods aligns with disgust provoked by pathogens

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ABSTRACT

Insects are widely disliked by the public, despite the fact that they provide valuable ecosystem services and are vital components of ecosystems. Public support toward wildlife conservation is influenced by attitudes toward different taxa, thus, the widespread negativity toward insects shown by the general public almost certainly detracts from conservation efforts for them. Negative attitudes toward insects and other invertebrates take many forms, one of which is the feeling of disgust. Disgust has been widely researched and is typically divided into distinct domains (e.g., moral disgust). In order to determine whether insect-specific disgust is unique from other domains of disgust, we conducted a survey of 704 incoming freshmen at a major Midwestern university with questions pertaining to Moral, Pathogen, and Insect-specific Disgust. Factor analyses indicate that Insect Disgust and Pathogen Disgust are part of the same construct, unique from Moral Disgust. Our results suggest that survey respondents perceived insects in the same way as they would pathogens, at least in regard to disgust. This research provides insight into how the public views insects, and will facilitate educational interventions aimed at challenging negative attitudes toward insects. The Insect Disgust Scale will be a useful measure of insect-related disgust in future studies.

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1. Introduction

The importance of species conservation for ecosystems and human wellbeing is widely recognized. Practices promoting the conservation of wildlife and natural resources are essential for the preservation of biodiversity, which is crucial in all ecosystems and for all populations, particularly in developing countries where people depend on endemic plants and animals for medicines, food, and a source of livelihood (Adenle, 2012). Although the importance of conservation in general is clear, a fundamental inequality exists in the types of organisms that receive the largest conservation efforts; conservation endeavors toward vertebrate animals are more likely to receive support than efforts toward invertebrates, fungi, or plants (Black et al., 2001; Clark and May, 2002; Cardoso et al., 2011). For example, in 2009, the largest expenditures of conservation dollars in the US all went toward vertebrate animals, including salmon, pallid sturgeon, red-cockaded woodpecker, and bull trout (Buck et al., 2012).

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Although invertebrates comprise 80% of all known species on Earth, they are the recipients of only 10% of conservation funding (Cardoso et al., 2011; Collen et al., 2012). The bias against invertebrates partly stems from the negative perception of insects by the general public (Cardoso et al., 2011). The majority of people find insects to be scary, disgusting, dangerous, or ugly. This is problematic for invertebrate conservation because negative attitudes toward specific groups of organisms have been shown to adversely impact people's willingness to support the preservation of those organisms (Maresova and Frynta, 2007; Martín-López et al., 2009; Knight, 2008; Prokop and Fančovičová, 2012; Prokop and Fančovičová, 2013a,b). Though some insects are perceived positively (e.g., butterflies, dragonflies), the majority of insects as well as other terrestrial arthropods are generally regarded in a negative light.

One prominent emotion that is often directed toward insects and their kin is disgust. Disgust is considered to be, at its core, an evolutionary mechanism to avoid ingestion of harmful substances (e.g., feces, spoiled food; Darwin, 1872/1965; Rozin and Fallon, 1987). However, the feeling of disgust can be provoked by a diverse range of stimuli, including concrete objects (e.g., blood, worms, etc.) and individual behaviors (e.g., incest, stealing, etc.) that are unrelated to food habits (Haidt et al., 1994; Oaten et al., 2009; Tybur et al., 2009, 2013; etc.). Disgust has consequently been divided into separate "domains". For example, Haidt et al. (1994) created a survey that divides disgust into seven different domains (e.g., food, sex, hygiene, animals, etc.) and concludes that disgust is a mechanism whose primary purpose is to differentiate humans from other animals. In contrast, some evolutionary psychologists (Tybur et al., 2009, 2013) suggest that disgust can be divided into just three major domains: Moral (e.g., violation of societal norms), Pathogen (e.g., infection by microorganisms), and Sexual (e.g., sexual behaviors that may be damaging to one's reproductive fitness). Thus, according to this interpretation, disgust is not only a mechanism to avoid disease, but also functions as a regulator of mate choice and social relations. We chose to model our Insect Disgust scale on the survey developed by Tybur et al. (2009).

Logically, feelings of disgust inspired by insects can be anticipated to align most closely with Pathogen Disgust, rather than Moral or Sexual Disgust. Insects and other arthropods share commonalities with Pathogens in that they can occur in "outbreak" numbers, are of small size, and often exhibit large populations and rapid reproduction rates. In addition, there are many arthropod species that are "disease-relevant" by being either actively involved in the transmission of disease (e.g., mosquitoes, fleas, and ticks), or associated with unhygienic conditions (e.g., some flies). In one study, ratings of disgusting pictures of insects correlated strongly with Pathogen Disgust (Prokop and Jančovičová, 2013). In contrast, there are no or few conceptual links between insects and moral issues (Prokop and Jančovičová, 2013), or insects and human sexual habits. In our survey, we included both the Pathogen Disgust scale from Tybur et al. (2009) as well as the Moral Disgust scale, in order to compare disgust in response to insects with these two previously validated domains of disgust. We did not include the Sexual Disgust scale because it is not relevant to insect-related disgust, and because the inclusion of the Moral Disgust scale already provided an effective comparison with the Pathogen Disgust Scale and our Insect Disgust Scale.

The current study investigated the disgust responses of incoming freshmen at a large Midwestern university. We chose to focus our invertebrate-specific survey items on a combination of neutral insects (e.g., ants, crickets, bugs) as well as stereotypically unpopular or disease-relevant insects and arachnids (e.g., cockroaches, scorpions, spiders). We avoided the inclusion of charismatic insects that were not anticipated to evoke disgust, with the exception of one item that was specific to butterflies. However, this item was removed from analysis once it became clear that subjects responded to the butterfly question differently than to the other insect-related questions (see Section 3).

We postulated that disgust in response to insects would emerge as a unique construct when compared to disgust in response to non-insect stimuli, with this expectation based on prior research suggesting that Insect and Pathogen Disgust, although different, would be correlated. We also hypothesized that demographic variables would correlate with Insect Disgust. In many studies on disgust, women display higher disgust sensitivity than men (Davey, 1994; Tucker and Bond, 1997; Gerdes et al., 2009; Oaten et al., 2009; Prokop and Jančovičová, 2013; etc.). This may be resultant of the traditionally higher parental investment exerted by women, although this theory has not yielded any strong support (Prokop and Jančovičová, 2013). Other variables are known to affect disgust sensitivity, such as cultural affiliation (Prokop and Fančovičová, 2010) and political affiliation (Inbar et al., 2011), as well as participation in educational programs that feature the disgusting object (Randler et al., 2012). However, gender is considered to be the most dominantly influential demographic (Berger and Anaki, 2014). In our study, we chose to analyze gender and college major, since our respondents were of similar ages and were all occupied as full-time students at the same university. Sherman and Sherman (1998) reported lower disgust sensitivity in nursing majors compared to other majors, though this was specific to items related to their profession (e.g., bodily fluids). We specifically postulated that women would exhibit higher disgust responses than men. We also postulated that non-science majors, who likely had less biology background than science majors, would exhibit higher levels of disgust.

2. Methods

2.1. Participants

College freshmen attending a university orientation program completed several surveys, including a survey measuring disgust. We report on an analysis of 704 completed disgust surveys. The study population was 49% male, had a median age of 18 years old, and an average age of $17.9 \pm .02$ years. Sixty-six percent of participants had declared majors in a STEM (Science, Technology, Engineering, or Mathematics) field.

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