The related emotions of disgust and fear are examined in their full range from normal to pathological. We propose that disgust plays a functional role in some anxiety disorders, specific phobias in particular. Basic research in disgust and fear is reviewed, and these emotions are contrasted in terms of their functional value, behavioral intentions, physiological processes, and acquisition mechanisms. Cognitive appraisals of danger and contamination are discussed as a mechanism for the role of disgust in some anxiety disorders. Finally, we evaluate competing explanations regarding the relationship between disgust and fear in these contexts, finding value in the concepts of imprecise emotional labeling and a synergistic model of a bidirectional association between disgust and fear. Implications for treatment are discussed.

Key words: disgust, fear, phobia, emotion, psychopathology. [Clin Psychol Sci Prac 7:291–311, 2000]

Researchers of psychopathology often study emotions individually (cf. Clark & Watson, 1991), but in natural life emotions coexist and blend. Separate interventions are often geared toward emotions such as sadness, fear, and anger, despite the fact that many clients experience trouble with more than one type of disordered emotion. A better understanding of the mechanisms of overlap between emotions in both healthy and clinical populations is likely to improve not only our knowledge of basic emotions but also our ability to understand and treat emotion pathology.

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The construct of anxiety illustrates this point. Early research by Izard and others has shown that the subjective experience of anxiety involves an aggregate of several different emotions, including sadness, shame, and guilt, with fear being the principal feeling (Bartlett & Izard, 1972; Izard, 1972). More recently, there has been some debate about whether anxiety is in fact a blend of emotions, or could more reasonably be construed as a cognitive association or elaboration that connects basic emotions to events or responses (Izard, 1992). Despite these possibilities, the study of anxiety disorders has focused almost exclusively on reducing the fear response, neglecting the impact and role of other emotions. Although cognitive and behavioral approaches to treatment have had remarkable success with the anxiety disorders, not all clients benefit equally. Failing to address emotions related to anxiety disorders (other than fear) may partly explain why current treatments are ineffective for some clients and why relapse occurs for others.

Many areas of overlapping emotions could be examined in an effort to broaden the focus of research on emotion in anxiety disorders. We choose to focus on disgust for this article because researchers have recently begun to examine the role of disgust in specific phobias, providing a starting point for discussion. We will review that literature alongside what is more generally known about disgust and fear, proposing that disgust is a characteristic that may distinguish certain phobias (and perhaps some forms of obsessive-compulsive disorder) from the other anxiety disorders. Although examining these topics is interesting from a theoretical standpoint, we also aim toward a practical goal of improving effectiveness of treatments for these anxiety disorders. To the extent that disgust operates differently from fear, treatment outcomes may be improved with innovations based on knowledge about disgust.

While the literature on fear has a rich and varied tradi-
linking disgust and fear and discuss treatment implications. Finally, we consider possible explanations for research on the role of pathological disgust in phobias. The continuum, from normal to pathological, by evaluating anxiety problems. We then shift to the other end of the better understanding of the overlap of disgust and fear in appraisals of contamination holds promise for promoting logical processes, and acquisition mechanisms. The role of cognitive appraisal is considered in detail, and we argue that explicating fear appraisals of danger and disgust appraisals of contamination holds promise for promoting better understanding of the overlap of disgust and fear in anxiety problems. We then shift to the other end of the continuum, from normal to pathological, by evaluating research on the role of pathological disgust in phobias. Finally, we consider possible explanations for research linking disgust and fear and discuss treatment implications.

**Normative Fear and Disgust**

**Terminology**

**Fear.** The distinction between fear and anxiety has been controversial. Rachman (1998) describes anxiety as the “tense anticipation of a threatening but vague event; a feeling of uneasy suspense” (p. 2). He suggests that fear also includes subjective feelings of tension and unpleasant anticipation, but describes fear as “an emotional reaction to a specific, perceived danger” (pp. 2–3). Other theorists have distinguished fear and anxiety by the degree of cognitive processing involved, with fear requiring substantially less processing than anxiety (Izard, 1992). More recently, theorists have emphasized the imminence of the perceived threat as a key (though not sole) distinguishing feature (Barlow, 1991; Craske, 1999). For the present article, we rely primarily on the conceptualization of fear as a basic emotion in response to the perception of an immediate threat; in contrast, anxiety involves more complex cognitive processing related to anticipation of future threat. Our objective is to compare and contrast fear and disgust responding in terms of how they may both occur in anxiety problems. Thus, we concentrate on specific fear and disgust responses in anxiety disorders, but also note how trait anxiety and anxiety sensitivity may be involved in these responses.

**Disgust.** The word “dis-gust” literally means bad taste. Consistent with this literal translation, many theorists have focused on food rejection and threat of oral incorporation as the central premise around which the disgust response is organized. Darwin (1965/1872) defined disgust as “something revolting, primarily in relation to the sense of taste, as actually perceived or vividly imagined; and secondarily to anything that causes a similar feeling, through the sense of smell, touch, and even eyesight” (p. 253). Other theorists have focused directly on the putative self-protective feature of disgust (Douglas, 1966; Tomkins, 1963) and on its connotation of debasement and corruption of purity (Angyal, 1941; Freud, 1926; Miller, 1997). Characterizing disgust as a defensive response raises a natural parallel with fear, and some researchers have proposed that disgust mediates fear of certain animals, through a protective disease avoidance function (Webb & Davey, 1992). This theory naturally highlights the intersection of fear and disgust, so we will evaluate this hypothesis in some detail when we consider evidence linking disgust and phobias.

Paul Rozin and colleagues, who have examined disgust from the perspectives of both food-rejection and debasement, have done the most comprehensive research on disgust. In early work, they suggested that disgust is a basic food-related emotion (Rozin & Fallon, 1987), but they later proposed a broader theory of disgust elicitors, noting the propensity for anything that reminds humans of our animal origins to evoke disgust (Rozin, Haidt, & McCauley, 1993). They submit that the core disgust response originated as food rejection, and disgust elicitors expand through cultural forces related to morality, debasement, and contamination. Their research has been invaluable in expanding our understanding of normative disgust mechanisms, and we largely base our own use of the term “disgust” on their theoretical and empirical work.

The construct of disgust sensitivity has been proposed as a trait reflecting a tendency to feel disgusted in response to a wide array of stimuli. Early attempts to measure disgust sensitivity focused only on food-related disgust (Rozin, Fallon, & Mandell, 1984), using a questionnaire on which respondents rated how much they would like to eat a bowl of soup that had been contaminated in various ways. Merckelbach, de Jong, Amntz, and Schouten (1993) found scores on the scale to be reliable over a period of 2–6 months (r = .84). Interestingly, the scale items read like a
A series of steps in a behavioral avoidance test, commonly used to evaluate fear and avoidance in anxiety disorders. Steps include eating the soup from a clean but used dog bowl, from a brand new dog bowl, from a soup bowl after the soup had been poured from a clean used dog bowl, and so forth. Disgust sensitivity was later operationalized more broadly in a psychometrically reliable and valid measure (Haidt, McCauley, & Rozin, 1994). The 32-item Disgust Scale evaluates seven disgust-eliciting domains: food, animals, body products, sex, body envelope violations (i.e., inappropriate penetration of a bodily opening or wound), death, and hygiene. In more recent writings, these researchers also include domains of moral and interpersonal disgust (Haidt, Rozin, McCauley, & Imada, 1997).

**Functional Value**

**Fear.** Plutchik’s (1990) influential theory views emotions as communication and survival mechanisms based on evolutionary adaptations. Although adaptiveness per se does not demonstrate evolutionary influence, fear clearly has functional adaptive value. The fear response involves activation of the sympathetic nervous system, commonly known as the “fight or flight” response (see Gray, 1987), and motivates escape and avoidance behaviors that reduce the threat of objective danger. Öhman (1986) further argued that fear has communicative value, not only for warning conspecifics of danger but also for maintaining dominance-based social order.

**Disgust.** Disgust responding can also be examined from a functional perspective. Like fear, disgust appears to serve a protective role, most obviously by motivating avoidance of potential sources of disease. In addition, disgust may play a similar role to fear in maintaining the social hierarchy through contempt for individuals of a different social rank, and reinforcing appropriate social behaviors (e.g., disgust associated with breaching incest taboo). These parallels between the protective and communicative features of fear and disgust may have important implications for understanding how the same stimuli can evoke both emotions. The overlap of fear and disgust in phobias and perhaps obsessive-compulsive disorder may be partly understood as the inappropriate generalization or overuse of similar adaptive mechanisms.

**Behavioral Intentions**

**Fear.** Fear most often motivates a desire to diminish the sense of danger through withdrawal or avoidance, and avoidance is a central part of the problem in most anxiety disorders. Mowrer (1960) outlined a two-factor theory whereby fear motivates avoidance, which in turn reduces fear, thus reinforcing avoidance. More recent observations challenge this theory. For example, clients with severe anxiety disorders sometimes become so accustomed to avoiding that they no longer feel afraid. Hayes (1976) argued that approach contingencies (i.e., whether approach behavior would provide access to reinforcing events) also play a role in determining phobic behavior.

**Disgust.** Disgust is also characterized by a desire to withdraw, and it may be further associated with efforts to repel the objectionable sensory input—the smell, sight, sound, feel, or taste of the stimulus. While fear and disgust both motivate withdrawal, they may do so for different reasons. Fear-motivated avoidance protects the person from perceived danger, while disgust-motivated avoidance may be more often linked to sensation or imagery. Clearly, these motivations can overlap. For example, fear-motivated avoidance in response to sensations is evident in reaction to pain stimuli, and disgust-motivated avoidance in response to perceived danger is evident in reaction to contaminating stimuli. Further, Lang (1979) proposed that imagery and autonomic arousal are central to fear, serving to activate perceptual-motor memories in the fear network.

In conjunction with the urge to withdraw from fear- and disgust-evoking stimuli, both emotions may elicit a simultaneous urge to approach. In the case of fear responding, amusement parks provide a clear example of the sought-after adrenaline rush accompanying moderate levels of fear. Analogously, the common morbid curiosity about road kill demonstrates the approach motivation in disgust. In the conflict between attraction and avoidance, several factors likely mediate behavior, including the intensity of the emotion and degree to which the situation is appraised as threatening. Additionally, Rozin (1990) and McCauley (1998) suggest that humans can enjoy being disgusted and frightened if the emotions are framed as unreal, thus providing a protective frame or distance from the aversive material.

**Physiological Processes**

**Fear Versus Disgust.** For decades, researchers have searched for specific markers of autonomic reactivity to discriminate between the basic emotions (e.g., Ax, 1953), and this area of research may hold particular promise for
distinguishing between fear and disgust (Collet, Vernet-Maury, Delhomme, & Dittmar, 1997). Elevated heart rate and other signs of sympathetic activation characterize the fear response. In contrast, disgust may evoke a decline in heart rate, perhaps due to parasympathetic activation (Ekman, Levenson, & Friesen, 1983), although this result is far from well established (cf. Vrana, 1993).

Neural substrates in fear and disgust responding may also distinguish the emotion profiles. Gray (1987) has developed a conceptual map of the nervous system as a plausible system to explain fear-mediated avoidance behavior. The septohippocampal system features prominently in this mapping, as well as a focus on the amygdala, which is implicated in both control of the unconditioned fight or flight response, and also in the classical conditioning of reward and punishment. Far less is known about neural correlates of disgust, and research thus far has produced mixed results. Lane, Reiman, Ahern, Schwartz, and Davidson (1997) conducted a PET study in which they elicited emotions of happiness, sadness, and disgust, and found no evidence of disgust-specific brain regions. In contrast, Davidson, Ekman, Saron, Senulis, and Friesen (1990) demonstrated that viewing disgusting films was associated with activation in right frontal and anterior temporal regions, as compared to either happy films or baseline.

If reliable differences exist between physiological responding in disgust and fear, there may be theoretical implications for certain anxiety disorders. In particular, Page (1994) focused on physiology in his theory about the role of disgust in blood/injury phobia, and we discuss this theory later. Additionally, given that the physiological aspect of fear is relatively well understood (and in part defines the fear response), understanding the physiology of disgust will enable clearer comparisons with fear. Currently, disgust is defined in a more limited way based primarily upon self-report and expressive profiles.

**Acquisition Mechanisms**

The process by which a stimulus acquires the power to evoke fear or disgust has important implications for understanding both normative and pathological emotional responding. The acquisition of fear and disgust responses seems to involve a combination of conditioned learning, intergenerational transmission via modeling and heredity, and cultural influences. Although little research has been done to address each of these mechanisms in disgust, we can use our knowledge about the conditioning of fear responses as an informative comparison point.

**Fear.** Over the last 40 years, learning (conditioning) theory accounts have come to dominate the study of fear. In this view, phobias are regarded as (directly or indirectly) conditioned responses. Fear of a neutral stimulus is attributed to a co-occurrence of the stimulus with an aversive incident such as pain or spontaneous panic attack. Fear evoked by the aversive incident is presumed to generalize beyond the original stimulus to include the neutral stimulus as well. (For a nonassociative account, see Menzies & Clarke, 1995.) The classical conditioning paradigm has been very useful for studying fear, because there are clearly unconditioned stimuli that reliably inspire fear. Pain is one such response, and people (and animals) do show fear of previously neutral stimuli that are perceived to predict painful experiences. There is some debate regarding the frequency with which phobias are typically due to a conditioning process (McNally & Steketee, 1985; Öst & Hugdahl, 1981). Some of the inconsistent findings are due to different criteria for determining what qualifies as a conditioning event, with some theorists focusing on stimulus-stimulus learning, while others focus on the stimulus-response association (McNally & Steketee, 1985).

**Disgust.** Intense disgust can also fit a traditional classical conditioning model, assuming that certain stimuli reliably evoke disgust independent of previous experience. Although no research has addressed this question, we suspect that unconditioned disgust-evoking stimuli would involve sensory (rather than moral or ideational) stimuli—decay odors in particular. For example, one may not need a conditioning experience to recoil from the smell of severely spoiled milk. Neonates have been observed to exhibit a disgust facial expression in response to olfactory stimuli (Soussignan, Schaal, Marlier, & Jiang, 1997), although one might argue whether this expression represents the full emotion of disgust at such a young age. Furthermore, humans and other omnivores appear to be predisposed to caution regarding new foods (Capaldi, 1996; Pliner & Pelchat, 1991), and disgust may play a mediating role here. Conditioning has also been studied in relation to disgust as conditioned taste aversion. Individuals who become sick soon after eating a meal, whether due to food poisoning or a virus, often observe that...
the specific food continues to evoke nausea or disgust long after the illness is over (Schafe & Bernstein, 1996).

While classical conditioning has been a prominent explanation for fear acquisition, and may explain the acquisition of some disgust responses, evaluative conditioning may be a more useful rubric for understanding disgust. Evaluative conditioning, as described by Levey and Martin (1987), involves a hedonic judgment about the stimulus: “Do I like this or not?” Not liking something may then be elaborated into a more complicated judgment. Much of the research on disgust has framed the question as one of dislike, and research participants often respond as though they perceive the disliked stimulus to be contaminated. For example, after having seen a roach dropped into a glass of juice, respondents indicated reduced preference for a new glass of the same type of juice, even though the roach had never come in contact with the new glass (Rozin, Millman, & Nemeroff, 1986).

Although evaluative conditioning is considered a variant of classical conditioning, the mechanisms guiding evaluative conditioning are not well understood (see Rozin, Wrzesniewski, & Byrnes, 1998; Shanks & Dickinson, 1990). This form of learning may be important in disgust, since there are few clearly recognizable disgust-relevant unconditioned stimuli (critical to the classical conditioning paradigm), as compared to stimuli that provoke an unconditioned fear response (e.g., pain). While “likes and dislikes” may not seem to have much relevance for psychopathology, evaluative conditioning may have important treatment implications because there is some evidence that hedonic evaluations acquired in this way are relatively resistant to extinction (Baeyens, Crombez, Van den Bergh, & Eelen, 1988; Baeyens, Eelen, Van den Bergh, & Crombez, 1989).

An intriguing questionnaire study by Rozin (1986) provides conceptual support for the hypothesis that both fear and disgust can be rapidly acquired through conditioning. He explored participants’ recollections of one-trial learning of likes and dislikes, as well as the acquisition or loss of fear, by asking respondents to recall instances where a single event led to a strong change in their attitude toward a particular object. The single event could cause their attitude to change in one of four ways: from like to dislike, from dislike to like, from unafraid to afraid, or from afraid to unafraid. Rozin found that food or another object paired with a disgusting stimulus was the main reason reported for a hedonic shift from like to dislike. In contrast, actual or perceived threat of physical harm was the most frequently reported association related to a shift from unafraid to afraid.

**Appraisal**

Building from cognitive theories of emotion that focus on the centrality of appraisal in determining emotion (e.g., Lazarus, 1966, 1991; Oatley, 1987), we turn our attention to cognitive appraisals in fear and disgust. Appraisal is highlighted because threat appraisal may be responsible for at least some of the observed overlap between fear and disgust in phobias. We will discuss normative appraisals in fear and disgust and consider how similar sources of perceived threat may elicit both emotions. Next, we address the rationality of perceived threats that normally evoke fear and disgust, noting that the demarcation of pathological fear has typically been related to the rationality or objectivity of the threat, but this rule of thumb does not appear to be valid in disgust. Finally, we consider what is known about appraisals in normal disgust responding and then consider whether a parallel process exists in the fear domain, particularly as it relates to contamination concerns in obsessive–compulsive disorder (OCD).

**Appraisals of Danger and Contamination Leading to Fear and Disgust.** An appraisal of a stimulus as potentially threatening or dangerous is associated with a fear response. Appraisals in disgust may overlap with fear in their shared assessments of danger, but disgust appraisals seem to focus more specifically on the threat of contamination (either physical or symbolic/social), rather than on a broad range of perceived threats. Rozin and his colleagues have conducted a series of studies to identify implicit rules that normally guide appraisal of contamination threat, termed “laws of sympathetic magic” (Rozin & Nemeroff, 1990). These laws outline the conditions under which people typically perceive a threat of contamination, even if there is no objective danger of impurity. The law of contagion suggests that things transfer some of their properties when they touch other things, so that the effect of contact remains even after the actual connection has been broken (“once in contact, always in contact”). The law of similarity holds that things that resemble one another share fundamental properties. In a series of studies, Rozin, Nemeroff, and colleagues have reported consistent evidence of these “magical” contagion beliefs across domains as disparate as wearing a contaminated item of clothing (Nemer-
off & Rozin, 1994; Rozin, Markwith, & Nemeroff, 1992), following a Kosher diet (Nemeroff & Rozin, 1992), and acquiring attributes of ingested foods (Nemeroff & Rozin, 1989).

An intriguing study by Davey (1993) highlights the relationship between contamination appraisals and animal fears. Given a description of an animal they had never heard of (an Australian quoll), research participants who were told that people usually fear the quoll were more afraid than participants who received no statement about fear (Davey, 1993). Furthermore, participants who were told that people usually fear the quoll were also more convinced that they would catch a disease from the quoll. The appraisal of the quoll’s contaminating properties following information about the fearfulness of the animal highlights the impact of overlapping appraisals of threat in fear and disgust.

At least three diverse sources of perceived threat can elicit both fear and disgust based on a common appraisal of danger. First, individuals may perceive a threat of bodily harm. Such an appraisal of bodily danger may evoke fear, as in the case of a panic attack when a person believes feelings of dizziness indicate an impending stroke. An appraisal of bodily danger may also evoke disgust, such as viewing an open wound after an accident. Second, perceived threat may be social in nature. Fear of being negatively evaluated or rejected by others drives many people to avoid social situations such as meeting new people. Disgust may also be evoked from social stimuli in the form of shame, as outlined in the framework presented by Power and Dalgleish (1997). In this case, shame involves an appraisal of the self as an object of disgust, such as when a socially anxious person begins to sweat during a public presentation. Socially related disgust can also be directed outward when an individual is judged to have defied social norms, such as the disgust felt toward a couple kissing too passionately in public. Finally, a perceived threat to one’s emotional control can elicit both fear (such as fears of going insane) and disgust (self-disgust or shame due to lack of control). Fear of intense emotional experiences, and the consequent anticipated loss of physical and mental control, may be a common vulnerability factor for emotional dysregulation and may explain some of the comorbidity evident among various clinical populations.

Rationality of Appraisal. Fear in response to situations that are judged to be objectively dangerous is considered natural, and fear in situations where harm is unlikely or minimal is considered neurotic or pathological. One might be tempted to use the same criteria for evaluating disgust responses, with the threat being that of contamination. Obviously, avoiding contaminated substances that have the power to cause illness or death is adaptive, and the functional role of disgust in this type of contamination avoidance is intuitive. We might assume that people follow laws of contagion based on this type of contamination-related threat. In essence, we would ordinarily expect that the laws of contagion followed by average people would be rational and related to disease-avoidance, corresponding to the rationality criterion used to determine pathological fear responding. Not so, according to studies by Rozin’s group, who have discovered some of the features of the law of contagion by pushing the limits of disgust in normal subjects. They have shown that the perception of contamination threat does not necessarily correspond to objective danger. People appear to respond with disgust and avoidance to a variety of situations that do not objectively have the power to make them ill—the usual motivation people ascribe for their avoidance of such a situation.

In an engaging study, Rozin et al. (1992) asked undergraduates to rate how pleasant they would find eating with a fork or wearing a sweater previously used by a healthy man versus a man with AIDS. Researchers interpreted an effect of contagion if respondents rated AIDS-related stimuli as less pleasant than stimuli from the healthy man. As expected, physical contact was an important moderator of the contagion effect, but exposure time was surprisingly irrelevant. For the AIDS-infected man to wear the sweater for 5 minutes or eat one bite with the fork was nearly as bad as a full year of use. In addition, Rozin et al. examined the effect of time since exposure and concluded that the sense of contamination was relatively permanent. The hypothetical sweater and fork remained negative even a full year after being used just once by a man with AIDS. The effects of physical contact, exposure time, and permanence were comparable for most participants in the study. Although the general avoidance of harmful germs provides some rational basis in terms of avoiding contamination, none of these properties of contagion is rational based on what we know about transmission of HIV. In a later study, these researchers reported that factual knowledge about how HIV is transmitted was not particularly predictive of contamination...

The devaluing of a sweater or fork because of its history of being used by a person with disliked attributes (i.e., HIV infection) represents an example of evaluative conditioning discussed above. In addition to evaluative conditioning, two other types of irrational contamination can be observed among normal populations. First, backward contagion occurred when participants judged using an object that eventually would be acquired by a man with AIDS to be less pleasant than one that would subsequently be acquired by a healthy man (Rozin et al., 1986). Second, associational contamination is rejection of a stimulus based on mere ideational association with a contaminant (with no physical trace). The example commonly used by Rozin’s group is reluctance to drink from a brand new dog bowl.

In considering parallels with irrational fear, we note that clients with some types of OCD have strong fears of contamination, and they appear to follow similar rules of “sympathetic magic” as Rozin’s research volunteers. Specifically, a sense of contagion is influenced by physical contact, but not by duration of contact, and time alone does not remove the sense of contagion. We illustrate our point with an example of a client with OCD whose obsessional behavior at first seems incomprehensible. However, considered in the light of normal appraisals related to contagion, his rules for contamination appraisal are less alien, although he still clearly had an emotional disorder.

Mr. C was afraid of being contaminated by cancer. He had once seen a bald young man at a store where he worked, and because he associated baldness in a young person with chemotherapy, he was terrified that this young man might have cancer. Mr. C. thus avoided areas of the store where he had seen the man because he was afraid he might touch some surface the young man had also touched. Further illustrating the importance of contact, upon returning home each evening, he removed all his clothing in the entryway and sprinted to the bathroom for a lengthy showering ritual. Because he left his clothing on the carpet, he always asked his wife to vacuum the foyer while he showered (thus saving himself from recontacting the contaminant). He had only seen the bald young man on one occasion at the store, yet his feeling of contagion was as strong as if the man had worked there every day for years, demonstrating the irrelevance of exposure time. In addition, Mr. C showed signs of evaluative conditioning, as he came to strongly dislike (and perhaps fear) the make and color of car he had seen the young man drive. Finally, Mr. C had a mental list of places around town where he had seen people he suspected of having cancer. He avoided these places if at all possible, and no amount of time rendered these places uncontaminated.

Certainly, there are important differences between OCD and normal contamination appraisals, but drawing the line between pathological and normal is not as easy as it might seem. We must identify precisely what is pathological about obsessional behavior. When normal individuals behave irrationally in accord with the law of contagion, we may see the process of appraisal of contamination in OCD as less pathological than it first appears. What distinguishes normal and obsessional groups in terms of the law of contagion and procedures for removal of contamination? Obviously, this is a fascinating question for research, and some possibilities immediately present themselves. Individuals with OCD may be generally less able to tolerate disgust (i.e., have a higher disgust sensitivity; cf. Quigley, Sherman, & Sherman, 1997), although this does not explain why the pathological sense of contamination would remain limited to a small number of potential contaminants, as it typically does in OCD.

Rozin and Fallon (1987) hypothesize that ordinary people cope with potential contamination by setting limits on the kind and degree of contamination that “counts” and avoiding thoughts about contamination possibilities. Although people with obsessive contamination fears are certainly attentive to the many possible ways contamination may occur, we suggest that their intolerance of uncertainty may prevent them from ignoring or confidently reframing any of these possibilities. Along these lines, objective contamination, in terms of disease avoidance, would be particularly difficult to reframe since it is riddled with doubt. The conditions under which contact with a pathogen will result in illness vary widely, depending on the pathogen and the individual. Alternatively, we note that individuals who are unable to either ignore, reframe, or limit threats of contamination may be those for whom concepts such as being uncontaminated or pure are very closely aligned to their self-concept, making such threats personally significant.

Another possibility involves the importance of having thoughts about contamination. Nemeroff and Rozin (1992) propose that, rather than actually believing in the laws of sympathetic magic, people use magical contagion
as a heuristic guiding associations, appraisals, and behavior. In the cool light of reflection, ordinary people may recognize that their initial response of revulsion is not related to the actual dangerousness of the situation. For people with OCD, however, thoughts themselves are much more highly valued. Although the thoughts are experienced as intrusive, uncontrollable, and distressing, they are also interpreted as significant and dangerous. For example, persons with OCD may believe that having a thought about a bad event makes the event more likely to occur, or that having the thought means they secretly want the bad event to occur (Freeston, Rhéaume, & Ladouceur, 1996). While individuals without OCD may show similar contagion appraisals as those with OCD, normal persons may be able to recognize this as a “gut” response with little meaning. Individuals with OCD are likely to attribute far more significance to the same thought about potential contamination.

The relationship between normal irrational appraisals of contamination threat and pathological responding in OCD is intriguing, but at this point there is little research to evaluate the validity of these ideas. However, researchers have been looking at the potential role of disgust in some phobias, and we now turn to a review of the direct evidence, building from the comparisons we have outlined in normative disgust and fear responding.

EVIDENCE FOR A ROLE FOR DISGUST IN PHOBIAS

Although we hypothesize an interesting role of disgust in complex anxiety disorders like OCD, most of the research thus far conducted on this topic has involved phobias of small animals like spiders and snakes. Some researchers have also investigated the possibility of a functional role of disgust in blood/injury phobias. We review each of these areas of literature in turn, focusing on major theoretical issues and methodological concerns.

Phobias of Small Animals

Animal fears are a natural place to begin an evaluation of the role for disgust, given the visceral response many people describe toward various “creepy-crawlies.” Hypothesizing a relationship between disgust and fear, Davey (1993) pointed out that animal phobics cannot bear to be touched by the animal they fear. This phenomenon apparently goes beyond the concept of simple exposure to the animal. As an example, one of our clients had a phobia of chickens and other edible fowl, and she was often unable to distinguish between strong disgust and fear during exposure sessions. During history taking, she reported that a chicken had once brushed against her leg. She had felt a burning sensation in that spot for several hours afterward and had felt so contaminated that she threw away the jeans she had been wearing. Beyond phenomenological descriptions, researchers have examined the role of disgust in animal phobias along four lines of study: relationship of the phobia to disgust sensitivity, disgust as a part of the phobic response, familial influences in the development of disgust and phobia, and disgust-motivated avoidance.

Disgust Sensitivity. Based on the idea that disgust evolved to protect humans from disease, and that some phobias are also evolutionarily prepared, several studies have examined the relationship between general disgust sensitivity and fear of small animals. Early studies in this area used the first version of the Disgust Scale (Rozin et al., 1984), which focused on food-related disgust. Despite the limited scope of this questionnaire, intriguing results were observed. Davey, Forster, and Mayhew (1993) found the relationship between food-related disgust sensitivity and general fearfulness on the Fear Survey Schedule (Wolpe & Lang, 1964) was comparable in magnitude to the relationship between spider fear and general fearfulness ($r = .34$ and .32, respectively). Additionally, respondents who reported high fear of snakes had significantly greater disgust sensitivity than those who reported low fear (Klieger & Siejak, 1997). Compatible results have been found using actual phobics. Young women with spider phobia showed higher food-related disgust sensitivity than women who were not afraid of spiders (Merckelbach et al., 1993). Higher disgust sensitivity among spider phobics was also observed in 9–14-year-old girls (de Jong, Andrea, & Muris, 1997).

In contrast, Thorpe and Salkovskis (1998) found no differences in disgust sensitivity between groups of participants with spider phobia, other phobias, and no clinical disorders. Several procedural differences may account for their discrepant results. Most important, participants in the Merckelbach et al. (1993) and de Jong et al. (1997) studies were seeking phobia treatment, rather than being classified by questionnaire, so they may represent a more fearful sample. In addition, Merckelbach et al. carefully screened the normal comparison group, excluding fully 15% because they expressed fear of spiders. Screening procedures for the Thorpe and Salkovskis nonphobic
group are unclear. Finally, the samples used in the de Jong et al., Merckelbach et al., Klieger and Siejak (1997), and Mulkens, de Jong, and Merckelbach (1996) studies included female participants only, while Thorpe and Salkovskis included some men. Sex differences in both phobics and disgust sensitivity may have led to different results.

What makes these results interesting is that the measure of disgust sensitivity did not include questions about spiders or snakes. Most of the questions relate to the comparative appeal of eating soup after it had been contaminated in various ways (e.g., poured from a dog bowl or stirred with a comb). Respondents who rate the soup as generally unappealing across such circumstances are considered to be disgust sensitive, but this type of disgust does not have a strong conceptual link to fears of snakes or spiders. On the other hand, Thorpe and Salkovskis (1998) point out that several of the items on this measure do involve small animals (i.e., “washed, dead grasshopper” and “flyswatter”). They suggest that spider phobics may be sensitized to such insects because of their physical similarities to spiders. Although this explanation has the appeal of parsimony, the finding of a similar relationship between disgust sensitivity and snake phobia (Klieger & Siejak, 1997) suggests a more complicated story.

The more comprehensive updated version of the Disgust Scale (Haidt et al., 1994) might be expected to reveal stronger links between disgust sensitivity and fear of animals. The 1994 scale samples a wide variety of disgust-eliciting domains, including those that might be conceptually expected to relate to fear or aversion toward animals, such as body envelope violations and animals themselves. Examining this idea, Tolin, Lohr, Sawchuk, and Lee (1997) compared spider phobics, blood/injury phobics, and normal controls. Members of the phobia groups (taken together) were higher than controls on five subscales of the Disgust Scale and five subscales of the Disgust Emotion Scale (Walls & Kleinknecht, 1996), representing a wider array of elevated disgust responding beyond simple food-related disgust.

**Disgust as Part of the Phobic Response.** The studies reviewed thus far have been based on the idea that sensitivity to disgust in some way predisposes an individual to be afraid of small animals. Accordingly, researchers have looked for differences between phobics and nonphobics in terms of general disgust sensitivity. Another approach is to examine whether phobics respond to phobic stimuli with disgust in addition to fear. Several studies have addressed this question using photographic stimuli, since individuals with clinical phobias often become very agitated simply from seeing a photograph of their feared animal.

When participants in the Tolin et al. (1997) study viewed photographs of spiders, those with spider phobia endorsed fear and disgust with equivalent magnitude. As expected, the spider phobics showed higher levels of these emotions in response to the spider photographs than did participants with blood/injury phobia. Thorpe and Salkovskis (1998) similarly showed photographs of spiders to participants with spider phobia, other phobias, and those with no phobias. Spider phobics were more fearful of and more disgusted by the spider photos than the other groups were, and self-rated disgust and fear in response to the spider photos were strongly correlated in all three groups ($r = .64$ to $r = .73$). These studies indicate that the phobic response likely involves a more complex emotional response than fear alone.

**Familial Influences.** Rozin et al. (1984) reported that parents and their children showed a moderate positive correlation in food-related disgust sensitivity. Extending this work to spider fear, Davey et al. (1993) examined correlations between disgust sensitivity and spider fear for parents and their college-age children. In a regression analysis, parental food-related disgust sensitivity was the only significant predictor of offspring spider fear—not parental fear of spiders. Parents’ disgust sensitivity correlated moderately with offspring disgust sensitivity ($r = .33$), offspring Fear Survey Schedule total score ($r = .39$) and offspring spider fear ($r = .45$). Pointing to studies showing familial aggregation of animal phobias, Davey et al. suggested that disgust may mediate the transmission of animal phobias in families. Importantly, Davey et al. did not examine phobics in their study. de Jong et al. (1997), who studied phobic girls, were unable to replicate the Davey et al. finding. In the de Jong et al. study, mothers of phobic girls considered spiders to be especially disgusting (compared to the viewpoint of mothers of nonphobic girls), but overall parental food-related disgust sensitivity was not related to spider phobia in their daughters. The discrepancy between these two studies points to the probable importance of using phobic samples to study mediators of familial phobias, as well as the importance of specifying whether the theoretical
models of disgust involve disgust sensitivity or disgust in relation to a specific stimulus.

Avoidance Motivation. Although fear is not always accompanied by avoidance, avoidance often disrupts functioning for phobic persons. As discussed above, disgust and fear are both likely to motivate an urge for behavioral withdrawal, so one interesting question about the relationship between disgust sensitivity and phobia is the degree to which phobic avoidance is motivated by disgust versus fear. Two studies have addressed this question.

Klieger and Siejak (1997) used two methods to examine the role of disgust in strong fear of snakes (not clinical phobias). First, they asked participants to rate the desirability of using their lips to hold a rubber snake versus a rubber tube and rubber vomit versus a rubber sink stopper. All participants rated the snake as less desirable to hold between the lips than the rubber tube, but the effect size was larger for those with a strong fear of snakes. Likewise, all participants rated the rubber vomit as less desirable than the sink stopper, but there were no differences in these ratings based on snake fear. The second method Klieger and Siejak used was an ingenious twist on the usual behavioral tests conducted in phobia research. Following a behavioral avoidance test in which they approached a terrarium containing a snake, participants engaged in a disgust behavior test related to the same terrarium. After experimenters removed the snake from the terrarium, participants were asked to return to the testing room and retrieve a plastic pen from the terrarium where the snake had been. Contrary to expectation, participants with high fear of snakes did not take longer to retrieve and use the pen, and their subjective ratings of disgust were equivalent to those of participants with low fear of snakes.

Klieger and Siejak (1997) argue that avoidance motivated by disgust is different from that motivated by fear. While their study presents a promising method for studying disgust-motivated avoidance of phobic stimuli, several critical flaws prevent such a strong conclusion. First, every member of the sample of 73 undergraduates fully completed the behavior test involving the snake, probably because the most challenging step in the test involved touching the outside of the terrarium rather than actually touching the snake. Because all participants fully completed the test, there was no avoidance to serve as a comparison for the disgust behavior test later in the procedure. A bigger problem with the study, from the perspective of studying disgust, was that participants wore a plastic glove to retrieve the plastic pen from the terrarium, thus practically eliminating fear of contamination. This methodology is quite promising, but the snake behavior test should be more challenging, and participants should not be protected from the secondary stimulus (i.e., pen). Procedures used in behavioral assessment and treatment of OCD can be adapted for use in this context. For example, after touching a “contaminated” stimulus, participants might be asked to rub their hands over their clothes, hair, face, and lips to maximize the intimacy of their contact with the stimulus.

Mulkens et al. (1996) also used a variation on the behavioral avoidance test for phobias. In addition to the usual behavioral avoidance test with a spider, their study involved asking 24 spider-phobic women and 45 undergraduate women to engage in a challenging spider-related disgust behavior test and a general disgust behavior test. In the general disgust behavior test, participants were asked to do an ostensible “taste test” of three cups of tea. One of the cups was stained with unsightly tea scale, and the other two were clean. Dependent variables were latency to drink from each of the cups, quantity consumed, and self-reported pleasantness. In the spider-related disgust behavior test, each participant chose a cookie she would like to eat. The experimenter then encouraged a spider to walk across the cookie. Dependent variables were the degree to which participants wanted to eat the cookie and whether they actually did. Although all participants were somewhat disgusted by the spider in this test, 71% of control women eventually ate the cookie, compared to only 25% of spider phobics. Yet, members of the two groups were equivalently disgusted by the tea cup test. All drank less and took longer to drink from the dirty cup, thus demonstrating that the spider phobic participants were not simply showing a general sensitivity to food-related dirt in the cookie test.

Most studies on disgust have used questionnaires to evaluate state and trait disgust, but these studies demonstrate that evaluating disgust-related behavior is both feasible and important. By demonstrating that phobics respond with what appears to be disgust-motivated avoidance to spider-contaminated food but not to other dirty foodstuff, Mulkens et al. (1996) provide evidence against the idea that phobics are generally avoidant of disgusting stimuli. This result stands in contrast to questionnaire studies showing a relationship between food-related general disgust sensitivity and phobias.

Another important issue that can be addressed with
such behavioral studies involves the parameters of stimulus generalization. In arguing that questionnaire-assessed disgust sensitivity may be related to spider phobia because phobics are sensitized to other leggy creatures included on the disgust questionnaire, Thorpe and Salkovskis (1998) are raising an essential question of generalization. We know that similarity in stimulus characteristics can promote generalization of fear, such as when a snake phobic responds fearfully to a garden hose, but are there also characteristics of the emotional response that can facilitate generalization? Perhaps having a phobia of a disgusting thing raises one’s sensitivity to other things that evoke similar feelings. Similar ideas have been put forward in an attempt to explain stimulus generalization in cases of post-traumatic stress disorder (Chemtob, Roitblat, Hamada, Carlson, & Twentyman, 1988; Foa, Steketee, & Rothbaum, 1989). In the case of trauma, stimuli that evoke similar feelings (emotions or even muscle movements) can later provoke a fear response similar to that provoked by stimuli actually associated with the traumatic event.

Explanation for Findings Related to Disgust and Animal Phobias

Research we have reviewed thus far is equivocal on whether individuals with phobias of small animals are more sensitive to disgust toward elicitors beyond the phobic stimuli themselves, although a specific role of disgust in animal phobias has been more consistently reported. What factors are responsible for these findings? The relationship between disgust sensitivity and animal phobias may be due to individual differences factors that spuriously elevate scores of both. Another explanation may be that disgust serves some functional role in phobias, such as providing additional motivation for avoidance or impairing the process of habituation, effectively augmenting fear. Finally, much of the research in this area has been driven by an evolutionary theory about how disease avoidance has shaped emotional and behavioral responses to small animals. We consider each of these ideas in turn.

Neuroticism and Trait Anxiety. Several researchers have hypothesized that the relationship between disgust and phobias may be spurious, an artifact of individual differences that would produce both disgust sensitivity and general fearfulness. Neuroticism, or emotionality, and trait anxiety are obvious factors to examine, given that several studies have shown a relationship between neuroticism and disgust sensitivity (Quigley et al., 1997; Temple, King, Brooner, & Corgiat, 1984; Wronska, 1990). A recent study using a simplified version of the food-related disgust scale with normal primary school children found that disgust sensitivity was positively correlated with a broad range of anxiety disorder symptoms (Muris, Merckelbach, Schmidt, & Tierny, 1999). However, each of these significant relations either disappeared or dramatically weakened when the investigators controlled for level of trait anxiety.

On the other hand, a quasi experiment designed to follow-up on questionnaire studies found that participants’ level of neuroticism was not related to their self-report of disgust in response to a disgust-eliciting film (Hennig, Possel, & Netter, 1996). Furthermore, when Mulkens et al. (1996) controlled for neuroticism, the relationship between disgust sensitivity and spider fear did not change appreciably. This result contrasts somewhat with the Muris et al. (1999) finding on trait anxiety and suggests that more research is necessary to clarify this important issue.

Sex Differences. Robust sex differences in disgust sensitivity and fear responding led Davey (1994) to conclude that food-related disgust sensitivity mediates the sex differences found in animal fears. However, a follow-up study by Arrindell, Mulkens, Kok, and Vollenbroek (1999) criticized the statistical analyses conducted by Davey as an inadequate test of mediation. Arrindell et al. found that although women were more sensitive to disgust and reported more fear of animals, disgust sensitivity did not mediate the observed sex-fear relationship. Tucker and Bond (1997) conducted a more comprehensive questionnaire study on the roles of gender, sex role, and disgust in fear of animals. Regression analyses indicated that feminine sex role and general disgust sensitivity were both significant predictors of fear of harmless animals. Furthermore, they observed that femininity predicted fear of predatory animals (but disgust did not), whereas disgust predicted fear of repulsive animals (but femininity did not). These results led Tucker and Bond to suggest that the feminine sex role is predictive of fear of animals in general, while disgust sensitivity is predictive of disease avoidance, a theory we will discuss in more detail below.

Functional Role. If disgust plays a functional role in phobias of small animals, then this relationship might be observed in a number of ways. Those who are very disgust
sensitive might be more responsive to a conditioning experience involving an animal. Another possibility might be that experiencing disgust in addition to fear might make one’s experience with the animal particularly aversive, especially if the individual has a low tolerance for negative affect. No systematic investigations of the functional role of disgust in fear have taken place, but several studies have examined disgust in the context of phobia treatment.

Merkelbach et al. (1993) examined whether high disgust sensitivity (in the food-related domain) would impair treatment outcome. Because many animal phobics do not recall a traumatic event marking the onset of their phobia, and the phobic stimulus (e.g., spiders) is considered by most people in the culture to be unpleasant, Merkelbach et al. proposed that evaluative conditioning is the mechanism by which many animal phobias are acquired. Given evidence that evaluative conditioning is resistant to extinction through mere exposure (Baezyns et al., 1988, 1989), Merkelbach et al. hypothesized that high levels of food-related disgust sensitivity would impair outcome of exposure-based treatment. Contrary to their hypotheses, the high and low disgust sensitive phobia clients \( n = 46 \) achieved similar outcomes in self-reported fear of spiders, perceived dirtiness of spiders, and a spider behavioral avoidance test. This finding leaves open several possibilities, other than the obvious conclusion that disgust does not impact on treatment outcome. First, the study examined food-related disgust sensitivity, but disgust specific to spiders may still have a functional role in the phobia. Alternatively, general disgust sensitivity may have a more complex role in phobia than the Merkelbach et al. study was designed to test. For example, disgust might augment fear without impairing the treatment response.

Turning the question around, de Jong et al. (1997) examined whether treatment would impact on disgust sensitivity. In a study with spider phobic girls, de Jong et al. found that treatment did not affect general food-related disgust sensitivity, but they did report that specific disgust of spiders declined in correlated fashion with fear of spiders \( r = .43 \). de Jong et al. interpreted this finding as indicating that disgust is an important feature of the phobic response to spiders and that disgust sensitivity represents a vulnerability factor for development of spider phobia. Although this explanation is consonant with the results, we note that the findings are also consistent with the idea of disgust as an epiphenomenon of spider phobia.

One would need a prospective study to establish disgust sensitivity as a vulnerability factor in the development of phobias or return of fear following treatment. Additionally, manipulating disgust levels while clients are exposed to various intensities of feared stimuli would help to clarify how fear and disgust interact in phobic responding.

**Disease Avoidance Model.** We briefly alluded to the disease avoidance model above because it has inspired much of the research on the topic of disgust and animal phobia. The essence of the disease avoidance model, sketched out by Davey and his colleagues over the course of several papers, is that evolutionary pressure has shaped a disgust response to certain animals by preventing the transmission of disease (Davey, 1992; Davey et al., 1993; Matchett & Davey, 1991; Webb & Davey, 1992). These writers intimate, but do not specifically state, that ancestral humans with relatively strong disgust sensitivity had an adaptive advantage in that revulsion-motivated avoidance protected them from certain types of animal-borne disease or illnesses. They suggest that through its adaptive value, the disgust response has mediated evolutionary influence in animal phobias.

Following from this model, Davey’s group hypothesized that disgust sensitivity would mediate fear of certain animals but not others. They suggested that fears of animals that are appraised as harmless may really be related to disgust rather than fear of physical harm. Matchett and Davey (1991) sorted lists of animals into three conceptual categories: (a) predatory animals that evoke fear (e.g., tiger), (b) animals that do not prey on humans but nevertheless evoke fear (e.g., rat), and (c) animals that primarily evoke revulsion (e.g., slug). They found that food-related disgust sensitivity was related to fear ratings for animals in the nonpredatory and revulsion categories, but not in the predatory category.

Although these findings were intriguing, they have not held up in replication studies, possibly because of overlapping stimuli between the three categories (e.g., snakes appeared on all subscales). In a factor analysis, disgust sensitivity was equally related to factors representing predatory and nonpredatory animals, and no single factor was devoted to revulsion (Ware, Jain, Burgess, & Davey, 1994). Thorpe and Salkovskis (1998) did replicate some of the correlations reported by Matchett and Davey. However, when Thorpe and Salkovskis removed items that had been placed on more than one factor, the hypothesized...
pattern of correlations between disgust sensitivity and fears of specific subsets of animals was not confirmed.

The disease avoidance model should perhaps be regarded as a theory under construction, as it has not been fully tested or articulated. The theory nicely dovetails with Seligman's (1971) preparedness theory of phobias to explain how evolutionary pressure might have formed an association between the tendency to easily experience disgust and fear (and avoidance) related to animals. However, the theory has been criticized from several perspectives. First, it does not adequately explain why people are generally more afraid of snakes than of mosquitoes, despite the ubiquity of mosquitoes, infamous examples of mosquito-borne epidemics, and no examples of diseases transmitted from snakes to humans. In addition, the model appears to imply that phobics should engage in general avoidance of disgusting stimuli that have the potential to transmit disease. However, results from the Mulkens et al. (1996) study indicate that spider phobics did not avoid drinking from a dirty teacup any more than nonphobic participants did.

To be useful, the theory needs to be expanded to explain the circumstances under which disgust and disease avoidance would lead to phobia versus some other response. For example, Thorpe and Salkovskis (1998) point out that if disgust motivated by disease avoidance were an important feature in development of phobias, then people should become phobic of shellfish, for example, after an episode of food poisoning. While people do sometimes develop a strong aversion following such an experience, they apparently do not develop phobias.

**Blood/Injury Phobia**

Research on disgust and blood/injury phobia has stemmed from a different tradition. Although phobias of seeing blood or having injections are categorized (along with phobias of animals) as specific phobias, one feature of blood/injury phobia has set it apart and intrigued researchers. Typical anxiety disorders are marked by sympathetic nervous system activity in the presence of the phobic stimulus, activating the body in preparation for the strong metabolic demands of fighting or fleeing. Blood/injury phobia, in contrast, is often associated with a diphasic response, in which the typical sympathetic activation is followed by a vasovagal response involving a marked drop in heart rate and blood pressure (Öst, Sterner, & Lindahl, 1984). Many individuals with blood/injury phobia actually faint in the presence of phobic stimuli such as having blood drawn. For these reasons, and because of the commonness of disgust as a response to scenes of mutilation, researchers became interested in the role of disgust quite apart from its link to other specific phobias.

As would be expected, blood/injury phobics (compared to spider phobics and normal controls) show elevated sensitivity to disgust on subscales involving body envelope violations, death, injection/blood draws, and mutilation/death (Tolin et al., 1997). While the evidence reviewed above suggested that persons with small animal phobia may experience relatively equal elements of disgust and fear when confronted with the phobic stimulus, blood/injury phobics appear to respond to injection stimuli more with feelings of disgust than of fear (Tolin et al., 1997). Even with disgust stimuli unrelated to injection (e.g., maggots), undergraduates with a high fear of injection responded to a disgusting video with more intense disgust than their less fearful peers reported (Sawchuk, Lohr, Lee, & Tolin, 1999). Notably, the students with a high fear of injections also reported higher levels of other negative emotions, again raising the question of whether overall neuroticism or negative affect is responsible for the observed relationship between disgust and fear.

While treatments developed for blood/injury phobia have tended to follow the same plan as used in the other specific phobias (i.e., in vivo or imaginal exposure), clinical researchers have recently developed unique approaches that address the complication of fainting (Öst, Fellenius, & Sterner, 1991; Öst & Sterner, 1987). While Öst et al. (1984) demonstrated that fainting is related to parasympathetic responding, Page (1994) has hypothesized that disgust mediates the fainting, a theory that will be described in more detail below. Building from a bioinformational account of emotions in which fear-relevant information is stored in a propositional network, Hepburn and Page (1999) further reasoned that disgusting images related to blood and injury represent unconditioned stimuli that may interfere with habituation in exposure treatment.

To test the idea that disgust-evoking images would retard habituation or extinction of fainting, Hepburn and Page (1999) used an analogue sample of undergraduates selected for having good imagery ability and some symptoms of blood/injury phobia. Participants observed slides of blood/injury stimuli and then imagined the slide while hearing a script designed to evoke fear, disgust, or frustration (which served as a negative affect control condition).
Upon seeing the original slide again, participants rated the degree to which they felt fear and sensations of fainting. Over four weeks of repeated sessions, fear and feelings of faintness were reduced in every condition. However, relative to the control condition, the fear-provoking script was associated with higher levels of both fear and faintness, whereas the disgusting script increased symptoms of faintness but not fear. This finding suggests that disgust may impact on fear through its effect on faintness symptoms in blood/injury phobia. Nevertheless, Hepburn and Page found no evidence that disgust-evoking images retard habituation or extinction.

The experimental link between faintness and disgust in blood/injury fear found by Hepburn and Page stands in contrast to a study conducted by Kleinknecht, Kleinknecht, and Thorndike (1997). Using structural equation modeling, Kleinknecht et al. reported that disgust sensitivity (using their own broad-based Disgust Emotion Scale) was inversely related to fainting symptoms. A complicated series of analyses revealed that general disgust sensitivity was not directly related to fainting in the final model. Some analyses suggested an overlap in the influence of fear of fainting and disgust on faintness, but trait anxiety was not an explanatory factor in the model.

Thus, Hepburn and Page (1999) found that manipulated disgust images contributed to symptoms of faintness, but Kleinknecht et al. (1997) reported no relationship between disgust sensitivity and fainting symptoms in blood/injury fear. As was the case with disgust in phobias of animals, there may be a difference between a general propensity to be disgusted by various stimuli (disgust sensitivity) and a state of feeling disgust in response to a particular stimulus. The data analysis used by Kleinknecht et al. did not allow them to test the viability of a relationship between fainting symptoms and specific domains of disgust sensitivity that have been shown to be elevated among blood/injury phobics, such as body envelope violation, mutilation, and blood/injury/injection. While various aspects of disgust are clearly related, the function of disgust in relation to fainting symptoms may depend on the context area as well as whether the disgust involves state versus trait responding.

In an intriguing theory that has yet to be adequately tested, Page (1994) proposes that disgust may mediate fainting in blood/injury phobia through the parasympathetic response. Although he does not directly address the issue of state versus trait disgust, the details of his theory suggest he is proposing that a specific state of disgust (related to blood/injury stimuli) is involved. Coupled with the normal homeostatic parasympathetic response following from the sympathetic activation during fear, Page proposed that the parasympathetic nervous system does its job too well, resulting in vasovagal syncope (fainting). Aside from the fact that a prominent parasympathetic response in disgust has not been convincingly demonstrated, Page's theory is problematic when the natural extension is applied to phobias of animals. If these phobias also involve a disgust response in combination with their clear fear response, then animal phobics should also faint, but they do not.

**CONCLUSIONS AND FUTURE DIRECTIONS**

**Evidence on Disgust and Phobias**

Although research regarding a possible link between disgust and anxiety disorders is still in its infancy, the evidence thus far can be summarized as follows:

- Research on the trait of food-related disgust sensitivity indicates elevated disgust sensitivity among those with strong fears of animals (Davey et al., 1993; Klieger & Siejak, 1997) and among female animal phobics (de Jong et al., 1997; Merckelbach et al., 1993). However, this latter finding may not be robust with procedural variations (Thorpe & Salkovskis, 1998), and the relationship between animal fears and disgust may be confounded with insect items on the most common disgust sensitivity scale.

- Specific disgust sensitivity related to blood and injury stimuli is elevated among those with blood/injury phobia (Tolin et al., 1997). These links between disgust sensitivity and specific fears and phobias do not appear to be explained by neuroticism (Mulkens et al., 1996) or trait anxiety (Matchett & Davey, 1991).

- The experience of the phobic response seems to blend disgust and fear for those with animal phobias (Thorpe & Salkovskis, 1998; Tolin et al., 1997), but the blood/injury phobia response may involve disgust more than fear (Tolin et al., 1997).

- Cues that evoke disgust related to blood/injury stimuli do not appear to increase fear of those stimuli, although they appear to evoke sensations of faintness, as do fear provoking cues (Hepburn & Page, 1999).

- Treatment for spider phobia diminishes the sense of disgust related to spiders but does not affect more general disgust sensitivity (de Jong et al., 1997). Additionally,
strong disgust sensitivity does not impair the success of exposure treatment (Merckelbach et al., 1993), but state disgust has not been examined in this context.

In reviewing these specific findings, we discussed possible explanations that relate to either phobias of small animals (e.g., Davey’s disease avoidance theory) or blood/injury phobia (i.e., Page’s theory on disgust and fainting). However, until relevant distinctions between these two phenomena are demonstrated empirically, it appears more parsimonious to consider explanations for the observed disgust-fear link that apply to both types of phobia as well as other anxiety disorders in which we hypothesize a role for disgust.

Broad Explanations for the Disgust-Fear Link

Although Page and Davey have proposed their ideas as formal theories, other general explanations have also been proposed, although in a less explicit way. In this section, we review some of those ideas and propose some of our own. As we see it, two basic theories have been used to explain links between disgust and fear: the imprecise labeling model and the synergy model. These models seem to apply broadly to phobias of animals and blood/injury as well as to OCD.

Imprecise Emotional Labels Model. No theorist has specifically put forth a model with this name, but we see this model underlying some theoretical writings (e.g., Matchett & Davey, 1991) and physiological studies on disgust and fear (e.g., Davidson et al., 1990). Essentially, this model holds that respondents confuse fear and disgust. Mulkens et al. (1996) submit that the aversion to spiders is an expression of disgust rather than a fear of being attacked. As we reviewed in the first half of this paper, the phenomena of disgust and fear have many objective differences, including evocative stimuli, physiological profiles, and facial expression (Roseman, Wiest, & Swartz, 1994). However, there are also similarities between these emotions.

Especially in the case of emotions of moderate intensity, research participants may not be attuned to using these emotional labels as precisely as psychologists who construct the questionnaires. Some evidence does indicate that women more carefully distinguish the disgust and fear constructs than men do (Kleinknecht et al., 1997). However, even if everyone were to agree on just how to define the experiences of fear and disgust, stimuli that are designed experimentally to evoke disgust may instead evoke a mixed set of emotions—particularly if the emotions are of moderate intensity.

This confusion between two clearly defined emotional states is not just a matter of inattention on the part of research participants. Even when concentrating on the distinction between these emotions, the client with a phobia of chickens described earlier was often unable to discern whether she was experiencing a strong disgust or fear reaction during exposure sessions. At some moments during exposure therapy, she had a clear opinion that she was experiencing relatively pure fear or disgust, but at other times disgust and fear seemed to blend into one unpleasant reaction. Researchers can sometimes be faulted for adding to the confusion. For example, Tolins et al. (1997) presented participants with statements designed to delineate their experience of disgust versus fear in response to phobic stimuli. However, some items appear to capture overlap between fear and disgust (e.g., “This picture makes me feel like running away”).

We suspect that imprecise emotional labeling is more likely to occur when the emotion is of mild or moderate intensity than when intense emotions are involved. If so, then more research needs to be done with samples involving true phobics. By definition, phobics have a more intense emotional response to feared stimuli, so the degree to which they use fear or disgust labels under conditions (e.g., appraisal) that would seem appropriate for the other emotion is important to understand. Furthermore, findings might become clearer if multimodal approaches to assessment were more commonly used in this area of research. Including physiological and behavioral measures along with self-report may provide clarity.

The imprecise labeling of disgust is surely not limited to its overlap with fear. Anger, contempt, and shame are also related to disgust. Vrana (1993) maintains that experimental scenarios designed to evoke either disgust or anger can be expected to produce self-reports of disgust. The term is commonly used in the context of disapproval of another’s actions or principles, which is semantically related to being cheated (an anger theme). This argument is closely related to the one offered by Power and Dalgleish (1997) on the relationship between disgust and contempt in which contempt is seen as a feeling of superiority. Rozin’s group has suggested a continuum from disgust to contempt to anger, following social mores (Rozin et al., 1993). Tomkins (1963) also linked disgust, contempt, and shame with the idea that disgust and contempt from oth-
ers can evoke shame in the self. Taking a somewhat different approach, Ortony, Clore and Collins (1988) focus on the appraisal of objects as unappealing, suggesting that a range of emotion labels, including disgust, hate and loathing, are all part of a larger rubric of “disliking emotions.”

From the perspective of imprecise emotional labeling, the many studies using the 1984 Disgust Scale by Rozin et al. may be limited by imprecision in this measure. Items on the scale ask respondents to rate how much they would like to eat a favorite soup or cookie on a 1 (“dislike extremely”) to 9 (“like extremely”) scale. Disgust of various contaminants is assumed to be the reason respondents give “dislike” ratings to foods they like, but respondents are never directly asked about disgust. Although the scale appears to assess disgust, as the items involve food contamination, there have been few validation efforts. We would like to see a wide-ranging behavioral measure of disgust compared to responses on the revised version of this scale (Haidt et al., 1994). At any rate, it is easy to see how general aversion, or intolerance of aversion, may produce correlations between this scale and fears of animals or blood/injury stimuli. Until this possibility is convincingly ruled out, we cannot make firm conclusions about the meaning of such correlations.

**Synergy Model.** Another idea is that disgust and fear may be related because they exacerbate each other in a bidirectional way. Merckelbach et al. (1993) proposed a germane explanation for the observed relationship between food-related disgust sensitivity and spider phobia, speculating that latent inhibition may be at work. Individuals who are prone to experiencing disgust may be more likely to avoid spiders, and thus their lack of experience with spiders would render them relatively more responsive to the effects of subsequent conditioning experiences. The Merckelbach et al. model still relies on some other (unspecified) mechanism to explain why spiders would be differentially targeted by such a mechanism, rather than squeamish individuals developing phobias of all types of animals considered repellant by our culture.

We propose that the synergy model can be extended beyond specific phobias to explain the relationship between fear and other negative affect more generally, applying to other anxiety disorders as well as normative behavior. Research in the area of potentiated startle responses has demonstrated that the startle response during negative emotional imagery is larger and faster than during neutral or positive emotional imagery (Cook, Hawk, Davis, & Stevenson, 1991; Vrana & Lang, 1990). Consistent with findings related to anger, sadness, and fear, both auditory and visual disgust imagery enhance a startle response (Vrana, 1994). Erlichman, Kuhl, Zhu, and Warrenburg (1997) replicated two earlier studies by showing that unpleasant odors also potentiate the startle response, having the same effect on startle magnitude as aversive stimuli in other sensory modalities. They attribute their results to differences in hedonic experience and mood induced by the odors (i.e., coconut vs. Limburger cheese). This suggests that negative emotional experience and imagery may increase vigilance and arousal and may even intensify conditioning experiences. Disgust appears to be associated with especially vivid imagery, particularly in the olfactory, tactile, and visual domains. This imagery may be one mechanism by which disgust and fear enhance one another. More research along the lines of Hepburn and Page’s (1999) study exploring the effects of disgust and fear imagery on exposure to feared stimuli (in fear domains other than blood/injury phobia, which has the complication of parasympathetic activation related to fainting) would help to resolve these questions.

In addition to the role of imagery and emotional responding, the synergy model is also related to the earlier discussion on appraisal. We discussed several ways in which disgust and fear may be evoked by similar appraisals of threat to bodily, social, or emotional integrity. Specific threat appraisals can evoke different emotions, depending on the meaning of the threat to the individual. From a semantic perspective, we have argued that many cognitive appraisals appropriately evoke different emotions, and there is no reason why they cannot evoke different emotions within the same person. Rachman (1991) has forwarded a similar argument to explain comorbidity of different emotional disorders. Essentially, he proposes that some maladaptive cognitions can be expected to evoke several negative emotions. For example, the thought “I am boring” can be associated with social anxiety or depression. Rachman points to such cognitions with multiple emotional implications as a potential explanation for observed patterns of comorbidity.

**Research Linking Disgust and Other Anxiety Disorders**

Considering basic research in disgust alongside findings linking disgust and fear raises some interesting questions.
For example, although we reviewed research that examined links between disgust and specific phobias, there are phenomenological indicators of a role for disgust in OCD and perhaps posttraumatic responses and some types of social phobia. In OCD, the possibility of a role of disgust is most convincing in contamination obsessions and cleaning rituals. In one salient example, a client who was afraid of being contaminated in washrooms recited a litany of threatening germs that may be found in such places. The main cue that provoked her obsessions and rituals was a feeling of disgust, which was elicited not only by visible matter such as a hair on the toilet seat but also by tactile cues like the slippery feel of her hands while rinsing them after washing.

In addition to the similar role of contamination in some types of OCD and in disgust responses, there is also a moral or social threat in OCD (and potentially other anxiety disorders as well) that may be relevant to disgust. Clients may feel wary of being judged to be disgusting by engaging in behavior that they or others find to be disgusting. In the case of OCD, having to do something that is disgusting (such as use a “dirty” toilet) evokes shame for having breached the social norms of propriety, even if other people do not agree that the stimulus is dirty enough to reach the threshold for disgust. People are generally careful to avoid evoking disgust in others, and failing to be properly fastidious can do just that. This social element of disgust and shame may also be evident in posttraumatic stress disorder, as manifested in being disgusted with one’s behavior during the trauma or feeling permanently defiled (and disgusting). The taboo against breaching disgust barriers may also add a layer of resistance to exposure treatment.

Although there has been scant research directly examining disgust in the context of OCD, one study investigating perception of facial expressions of affect has raised some intriguing questions. Sprengelmeyer et al. (1997) reported that 12 people with OCD and five people with Tourette’s syndrome with prominent obsessive-compulsive behaviors were extremely impaired in their ability to recognize facial expressions of disgust. Comparison groups included six people with panic, two with generalized anxiety disorder, seven with Tourette’s without obsessive-compulsive behaviors, and 40 normal controls. The results were remarkably strong: every person with OCD showed the impairment in recognizing disgust, and none of the other participants showed the effect. Results were not due to an unwillingness to give “disgust” as a response, which the investigators tested with a task involving emotional words but not facial expressions.

Sprengelmeyer et al. interpreted these results as being due to a failure to recognize the configuration of features that signal disgust, a deficit that they propose emerges in childhood. One idea they suggest is that the difficulty in recognizing disgust expressions may occur as a by-product of abnormalities in the frontostriatal regions that have been observed in OCD. Another idea mentioned in their report is that individuals with OCD may have learned not to attend to the potential threat cue represented by others’ disgust expressions because they learned at an early age that what disgusts them does not necessarily disgust others. This hypothesis seems to imply that clients with washing compulsions would have more difficulty recognizing expressions of disgust than those with other obsessional themes like hoarding or checking.

Unfortunately, Sprengelmeyer et al. (1997) offered no details about how they assessed OCD or obsessive-compulsive behavior. The authors indicate that all participants showed checking compulsions, but many clients with OCD show symptoms in more than one domain. In addition, there was no assessment of level of depression in the OCD patients, which might be important given findings that depressed persons also show problems in recognizing facial expressions of affect (Rubinow & Post, 1992). The strength of the Sprengelmeyer et al. finding is impressive, but the mechanism and implications of this effect are still unclear.

Other research into the potential link between OCD and disgust is just beginning. In an unpublished study using the multidomain Disgust Scale, Tolin, Brigidi, Donde, and Foa (1999) found that clients with washing compulsions showed elevated disgust sensitivity relative to nonanxious controls. However, those with washing compulsions were not more disgust sensitive than a comparison group with generalized social phobia. At this stage, there is too little evidence to draw firm conclusions on the link between disgust and OCD.

Treatment implications
Current theory-based treatment approaches for anxiety disorders are primarily based on conditioning and cognitive theories, but these interventions rarely take into account the interplay of fear with other negative emotions, which may have different, even competing, pro-
cesses that maintain them. If disgust operates in precisely the same way as fear, then a distinction between these emotions may have little practical import. However, differences between the functioning of disgust and fear, such as distinctions regarding acquisition and maintenance of factors related to physiology and avoidance, may make a critical difference in treatment. The Hepburn and Page (1999) results discussed earlier are a good example. Although they used an analogue sample, they found differences in the effect of imagery designed to evoke fear versus disgust on symptoms associated with blood/injury phobia. They suggest that clinicians consider whether their clients are concerned with images of fear or disgust and consider manipulating appropriate images in graded exposure hierarchies. The implication is that ignoring these distinctions may leave the client with disturbing images that can interfere with exposure treatment in specific ways.

From a cognitive perspective, contextual framing clearly influences the sense of contamination and degree of disgust experienced. As we discussed earlier, the history of a stimulus can enhance its power to disgust based on associational contamination. Likewise, knowing the history may diminish the sense of contamination. For example, we are able to ignore dingy soap scum in our own bathtub but would be repelled by the same substance in a hotel or even in a friend’s home. A problem related to disgust for cognitive interventions is that people seem to cling to their negative hedonic evaluation of the stimulus even if all possibility of germ contamination is removed. Even when given reassurances that a cockroach has been sterilized, people still do not want it floating in their drink. It appears that cognitive re-evaluation in the case of contamination ideation does not inspire subjects to rescind their judgment that a stimulus is disgusting (Fallon, Rozin, & Pliner, 1984). Thus, although the perceived threat of contamination may be attenuated, the evaluation of the stimulus as disgusting is not modified. This de-synchrony may imply that cognitive approaches used in the treatment of fear (in which reformulation of maladaptive ideation about the feared object is presumed to lead to affective change) may require adjustment before they would affect disgust. These problems notwithstanding, we see some similarities between the goals of treatment of excessive anxiety and treatment goals related to pathological disgust. As is the case with clients who show high anxiety sensitivity (Reiss, 1988), clients who respond intensely to disgust stimuli may need to learn to tolerate mild to moderate feelings of disgust in order to freely engage with their environment. Other clients may need to learn that disgust does not reliably signal contamination. However, as we have seen, drawing the line between reasonable adaptive disgust and hypersensitivity to disgust is not straightforward.

The task of determining what is “normal” and adaptive in disgust responding is indeed a challenge. It is clear that disgust, like fear, has protective value and serves effectively as a defensive emotion. As we noted above, disgust functions to protect the organism both in terms of disease avoidance and by maintaining social boundaries. However, just as fear has “false alarms” where no objective danger is present (e.g., in panic disorder where bodily signals are misinterpreted as signals of impending catastrophe), too disgust can appear out of context, irrationally signaling threat. This occurs most often when we feel contaminated despite the absence of an objective threat. It is at this point that disgust and fear intersect, and the individual may be vulnerable to emotional dysregulation.

We are not proposing that disgust is the secret key to understanding all anxiety disorders. However, disgust may play an important role in OCD, blood/injury phobia, animal phobias, and perhaps other anxiety disorders as well. To the extent that we are ignorant about the way disgust functions and interacts with fear and anxiety, we undoubtedly miss an opportunity to better understand these disorders and intervene more effectively.

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