

# EVOLVED DISEASE-AVOIDANCE PROCESSES AND CONTEMPORARY ANTI-SOCIAL BEHAVIOR: PREJUDICIAL ATTITUDES AND AVOIDANCE OF PEOPLE WITH PHYSICAL DISABILITIES

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*ABSTRACT:* Drawing on evolutionary psychological logic, we describe a model that links evolved mechanisms of disease-avoidance to contemporary prejudices against individuals with physical disabilities. Because contagious diseases were often accompanied by anomalous physical features, humans plausibly evolved psychological mechanisms that respond heuristically to the perception of these features, triggering specific emotions (disgust, anxiety), cognitions (negative attitudes), and behaviors (avoidance). This disease-avoidance system is over-inclusive: Anomalous features that are not due to disease (e.g., limb amputation due to accident) may also activate it, contributing to prejudicial attitudes and behaviors directed toward people with disabilities. This model implies novel hypotheses about contemporary variables that may amplify or reduce disability-based prejudice. We discuss past research within this context. We also present new evidence linking chronic and temporary concerns about disease to implicit negative attitudes toward and behavioral avoidance of disabled others. Discussion focuses on the conceptual and practical implications of this evolutionary approach.

*KEY WORDS:* disability; disgust; evolved disease avoidance; prejudice; stigmatization.

Despite the achievement of a certain degree of public tolerance, people often experience discomfort in the presence of individuals with physical disabilities, which presumably underlies the persistence of discrimina-

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tory behaviors directed toward these individuals. Researchers have demonstrated that the perception of disability clearly elicits pity, compassion, and desires to be helpful, but that it also elicits distinctly negative and anti-social reactions as well. These negative reactions are evident in emotions such as disgust and anxiety, in attitudes and judgments such as the tendency to blame individuals for their disabling conditions (Ryan, 1971), and in a host of subtle and not-so-subtle nonverbal forms of behavior, such as the tendency to physically avoid contact with disabled individuals (Snyder, Kleck, Strenta, & Mentzer, 1979). A number of conceptual explanations have been offered for these anti-social reactions to disability, implicating a multitude of processes such as interactional uncertainty, attitudinal ambivalence, belief in a just world, and magical thinking (Goffman, 1963; Haidt, McCauley, & Rozin, 1994; Katz, Hass, & Bailey, 1988; for reviews, see Heatherton, Kleck, Hebl, & Hull, 2000; Jones et al., 1984).

In this article, we articulate a theoretical perspective—an evolutionary psychological approach—that conceptually complements these other perspectives and contributes to a more complete understanding of these phenomena. This undertaking is not without precedence. A number of investigators have recently articulated evolutionary accounts of stigmatization (Kurzban & Leary, 2001; Neuberg, Smith, & Asher, 2000). We take these analyses as our starting point, and develop further a set of hypotheses bearing specifically on nonverbal prejudicial reactions against people with physical disabilities.

Evolved psychological mechanisms tend to be domain-specific in their application (Kenrick, Sadalla, & Keefe, 1998). This has some conceptually important and practically useful implications for the study of disability-based prejudice. In many other conceptualizations, stigmatization and prejudice processes are treated as fairly general in application; some general-purpose process (e.g., desire to feel good about an ingroup) is hypothesized to have prejudicial consequences (e.g., relative derogation of outgroups) that apply to all sorts of target populations. In contrast, the line of reasoning presented in this article is fairly specific to physical disability and other physically disfiguring conditions. Additionally, many other conceptual approaches imply some generally negative response to a target group, but do not yield hypotheses about the more specific contents of those evaluative responses. In contrast, the perspective outlined here yields clear hypotheses about specific sorts of negative emotional, cognitive, and behavioral reactions to physical disability. Finally, this evolutionary perspective also yields hypotheses about specific circumstances under which these prejudicial reactions are likely to be amplified or reduced.

In this article, we begin by outlining evolutionary processes pertaining

to disease avoidance and describe how this process has implications for predicting prejudicial responses against individuals with physical disabilities. We then review some of the relevant literature that demonstrates prejudicial responses directed toward physically disabled individuals; these responses are consistent with those implied by an evolutionary disease-avoidance model. We proceed to describe some of the testable hypotheses generated by the evolutionary model pertaining to the identification of contemporary psychological variables (e.g., individual differences in perceived vulnerability to disease) that may amplify or dampen these prejudicial responses, and describe new evidence testing some of these hypotheses. Finally, we discuss some of the loose ends and intriguing questions that are raised by these results, we identify other classes of stigma that may also trigger the evolved disease-avoidance mechanism, and we suggest some directions for future research. Our goal is not merely to describe how an evolutionary perspective adds a useful historical layer of explanation to existing knowledge about disability-based prejudice, but, more importantly, to show how this perspective can serve as a useful tool for generating new hypotheses and novel discoveries about the operation of this prejudice in the here-and-now.

### **Evolutionary Roots of Stigmatization: A Disease-Avoidance Mechanism**

During much of human and pre-human evolutionary history, individuals lived in relatively small tribal groups. Group living conferred many survival benefits, but also introduced specific problems to be solved. Consequently, specific psychological adaptations likely evolved in response to those problems. There are countless such adaptations, many of which have been documented elsewhere (Barkow, Cosmides, & Tooby, 1992; Buss, 1999; Crawford & Krebs, 1998; Simpson & Kenrick, 1997). Some of these adaptations pertain to mate-choice, altruism, and other domains of interpersonal "approach"; other adaptations pertain to cheater-detection, aggression, and other domains of interpersonal "avoidance." Psychological processes pertaining to stigmatization and prejudice fit into the latter category. Within an evolutionary perspective, these processes can be viewed as functional means of impelling the avoidance of individuals who might pose some sort of interpersonal threat. Different sorts of individuals may pose different types of threats in various domains of group living (Kurzban & Leary, 2001; Neuberg et al., 2000). We focus here on just a single type of threat identified by Kurzban and Leary (2001): the interpersonal transmission of parasites (viruses, bacteria, worms, etc.) that may cause ill health. The "disease-

avoidance" model identifies psychological processes that may have evolved to help protect against this threat.

Given the potentially high costs of interacting with diseased others (those who were already infected with disease-causing parasites), it would have been functional for individuals—and ultimately adaptive within populations—to readily identify diseased individuals and to avoid contact with them. People clearly respond to explicit linguistic labels ("AIDS," "cholera," etc.) indicating the presence of contagious diseases in others (Bishop, Alva, Cantu, & Rittiman, 1991; Crandall & Moriarty, 1995). But linguistic labels are an historically recent means of identifying diseased individuals. More relevant to an evolutionary analysis is the fact that many contagious diseases are accompanied by visible physical and/or behavioral cues: "markers, lesions, discoloration of body parts . . . and behavioral anomalies" (Kurzban & Leary, 2001, p. 198). Psychological mechanisms that attended to and precipitated avoidant reactions to these cues would have been adaptive. Consequently, in present-day populations, we should expect these cues to trigger specific affective (e.g., disgust), cognitive (e.g., activation of disease-connoting concepts), and nonverbal behavioral (e.g., avoidance) responses in the perceiver. As with most evolved mechanisms, these responses are likely to occur quickly, with little conscious or rational deliberation.

Many historical anecdotes suggest that people do react especially strongly to visible signs of disease (Covey, 1998). People with diseases that are accompanied by visible symptoms (e.g., leprosy) tend to arouse stronger anti-social responses than people with diseases that are more easily concealed. Indeed, Jones et al. (1984) list "visibility-concealability" as one of the psychologically most important dimensions of stigma, with the implication that more visible stigmatizing conditions have greater negative impact. Similar anti-social responses to visible indicators of disease are observed in nonhuman primates as well. For instance, Goodall (1986) observed that chimpanzees maintained physical distance from other chimpanzees that, as the result of polio, had lost the use of some of their limbs.

Of course, many physically disfiguring and behaviorally disabling conditions result from causes—such as accidents—that are not contagious, and this would have created a signal-detection problem. It is unlikely that (in the absence of germ theory or other contemporary perspectives on the etiology of disease) the psychological disease-avoidance processes would have evolved to make fine distinctions between actual symptoms of contagious disease and the broader category of peculiar physical and behavioral features that may be unrelated to contagious disease. Moreover, because the functional consequences of a "false positive" (erroneously judging a

healthy individual to be diseased) are minimal compared to the potentially grave consequences of a “false negative” (erroneously judging a diseased individual to be healthy), it’s likely that this disease-avoidance mechanism evolved to be biased toward false positives, and thus over-inclusive in classifying individuals as diseased (Kurzban & Leary, 2001). In other words, the evolved disease-avoidance mechanism is likely to be sensitive to a wide range of physical or behavioral features that are perceived simply to be anomalous (Schaller & Park, in press).

This analysis has some interesting implications. In contemporary environments, the disease-avoidance mechanism may respond to disease-connoting cues such as physical disabilities, facial disfigurements, and other unusual morphological characteristics even though these features may be objectively unrelated to contagious disease. At a conscious and rational level, one may know that another person’s disfiguring condition is the result of an automobile accident and so is clearly not contagious. But the response to that individual may be influenced by an evolved disease-avoidance mechanism that responds heuristically—and thus fallibly—to the simple perception of the disfiguring condition. Similarly, within an accuracy/overgeneralization framework, Zebrowitz and Collins (1997) note that “people whose physical qualities resemble those observed in a particular physical or mental disorder may be perceived to have psychological qualities that are associated with that disorder” (p. 215). Taken together, the specific emotional, cognitive, and behavioral responses to physical disability are likely to match the responses typically accorded to individuals who really are carriers of contagious diseases. Although we focus here on target groups that are traditionally labeled as disabled (i.e., physically impaired), the relevant factor is the presence of visible abnormality, not disability per se. We expect other visually unusual stigmas (e.g., facial disfigurement) to fall under the scope of the disease-avoidance model, even if individuals with these stigmas are not physically impaired.

### **Disease-Related Responses to Physical Disability: Evidence from Previous Research**

Historically, disability has often been associated with disease. People with disabilities were often perceived as being unclean (Covey, 1998), a condition clearly associated with disease. Disabled persons have also experienced the sort of quarantine and social exclusion accorded to those suffering from actual diseases. A review of such cases is beyond the scope of this paper, although some of the implications of our analysis—see below—

generate hypotheses that plausibly bear on historical studies. We wonder, for instance, whether harsh treatment of disabled individuals increased during epidemics and other historical periods of amplified vulnerability to contagious diseases.

Psychological evidence of negative responses to people with disabilities is complicated by perceivers' self-conscious attempts to avoid displaying obviously prejudicial responses. There often are discrepancies between verbally expressed attitudes toward disabled individuals and nonverbal responses in their presence (e.g., Kleck, 1968, 1969). It is these automatic, nonverbal responses (e.g., evidence of anxiety, acts of physical avoidance) that most clearly indicate the operation of an evolved disease-avoidance mechanism.

#### *Indicators of Anxiety in the Presence of People with Physical Disfigurements and Disabilities*

Many nonverbal behavioral indicators suggest anxiety and discomfort during interactions with physically disfigured and/or disabled individuals. Some studies show evidence of behavioral "stiffness"; participants move around less frequently and engage more in unusual self-manipulatory behavior (e.g., touching one's face or playing with one's hair) when interacting with a physically disabled individual (Kleck, 1968; Sigelman, Adams, Meeks, & Purcell, 1986). People also smile less frequently in these interactions (Comer & Piliavin, 1972). There is also evidence that people may gaze more at physically disabled others than at "normal" others (Comer & Piliavin, 1972; Kleck, 1968; Sigelman et al., 1986), which may indicate a perception of threat requiring vigilance. However, there are conflicting findings (e.g., Thompson, 1982), and the fact that people's desire to gaze at disabled individuals is partly driven by the novelty aspect of the disability (Langer, Fiske, Taylor, & Chanowitz, 1976) complicates what we can conclude from studies of visual attention and gaze.

Additional nonverbal indicators of discomfort and anxiety emerge from the reports of observers who watch individuals interact with physically disabled others. Heinemann, Pellander, Antje, and Wojtek (1981) found that judges rated participants interacting with physically disabled individuals to be relatively less relaxed and less comfortable. These observer reports are consistent with self-report data. In one study, participants who sat next to a disabled individual while watching a movie described themselves as "tense," "jittery," and "on edge" (Snyder et al., 1979).

These measures based on observable nonverbal behavior are complemented by results from studies employing indicators of physiological arousal. Several studies show increased galvanic skin response in the pres-

ence of physically disabled others (Heinemann et al., 1981; Kleck, Ono, & Hastorf, 1966). Additionally, recent studies have shown that interactions with facially disfigured individuals trigger specific patterns of cardiovascular reactivity—patterns typically associated with the perception of threat (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001).

### *Physical Avoidance of People with Physical Disabilities*

Perhaps the most striking and informative nonverbal response toward disabled individuals is a very specific form of behavior: physical avoidance. Several experiments with adults have found that participants choose greater interpersonal distances when interacting with physically disabled others (Heinemann et al., 1981; Langer et al., 1976). Another study found that participants terminate interviews with a physically disabled confederate sooner, thereby physically removing themselves from the interaction (Kleck et al., 1966). Similar findings have been found in field studies with children. In summer camp settings, visibly disabled children were least preferred as interaction partners, and camp counselors perceived that disabled children were less likely to have intimate best-friend relationships (Kleck & DeJong, 1981, 1983; Richardson, Ronald, & Kleck, 1974).

The literature on nonverbal behavioral responses to physical disability has revealed occasional exceptions to this general tendency toward avoidance (Sigelman et al., 1986; Snyder et al., 1979), but these exceptions are readily explained as the consequence of additional, mitigating concerns such as self-presentation. In a cleverly designed study, Snyder et al. (1979) provided participants with the choice of sitting next to a confederate with or without a physical disability. Most participants actually chose to sit next to the disabled confederate when they had no face-saving justification for avoidance. However, when their avoidance could masquerade as a movie preference, an overwhelming majority chose not to sit next to the disabled confederate.

This sort of physical avoidance is exactly the behavior that individuals demonstrate in response to truly infectious objects and people. When confronted with physically disabled individuals who pose no realistic health risk whatsoever, people prefer to avoid them, as the saying goes, like the plague.

### **New Hypotheses and Novel Findings: Moderating Effects of Personality, Context, and Culture**

The disease-avoidance model offers a coherent explanation for why people react to physical disability in the specific ways that they do, and is consis-

tent with existing evidence documenting these reactions. But the primary value of this model is not that it is explanatory; it also implies a number of novel hypotheses about variables that may moderate the magnitude of prejudicial reactions to people with physical disabilities.

Some of these moderating variables are individual differences in beliefs and concerns about disease. Evolved structures and mechanisms are not invariant across individuals. The complex structures that comprise the human visual apparatus evolved because the ability to see was adaptive. Nevertheless, visual acuity varies from person to person. Adaptive too were motivational systems that compelled organisms to eat, have sex, and avoid dangers. But there are vast individual differences in appetites for food and sex, and in aversions to dangerous things. The same logic applies to evolved psychological mechanisms designed to prevent the contraction of infectious diseases. In general, human beings are wary of diseases and things that transmit diseases; we all—with rare exceptions—have the capacity to experience disgust in the presence of cues connoting potential contagion. Nevertheless, wariness of disease and sensitivity to disgust are highly variable from person to person (Haidt et al., 1994; Schaller et al., 2003). This fact has interesting implications. Regardless of the reasons underlying these individual differences, a greater chronic wariness or sensitivity to the threat of disease is expected to compel a more powerful prejudicial response to individuals—such as those with physical disabilities—who superficially seem to pose such a threat.

A similar logic applies to contextual variables that may temporarily amplify or dampen one's wariness about the threat of disease. Psychological processes that evolved because they were generally functional in ancestral environments (e.g., the acoustic startle reflex) are not invariant across contextual circumstances. These processes are triggered more strongly under circumstances that heuristically suggest especially acute need for the specific functional benefits (e.g., the acoustic startle reflex is facilitated under conditions of ambient darkness; Grillon, Pellowski, Merikangas, & Davis, 1997). The same principle applies to the disease-avoidance mechanism and reactions to physical disability. Any contextual information that makes one feel temporarily more vulnerable to the transmission of disease may also lead to more negative reactions toward and avoidance of individuals with physical disabilities. Conversely, anything that makes one feel temporarily less vulnerable to disease may reduce the magnitude of this prejudicial response.

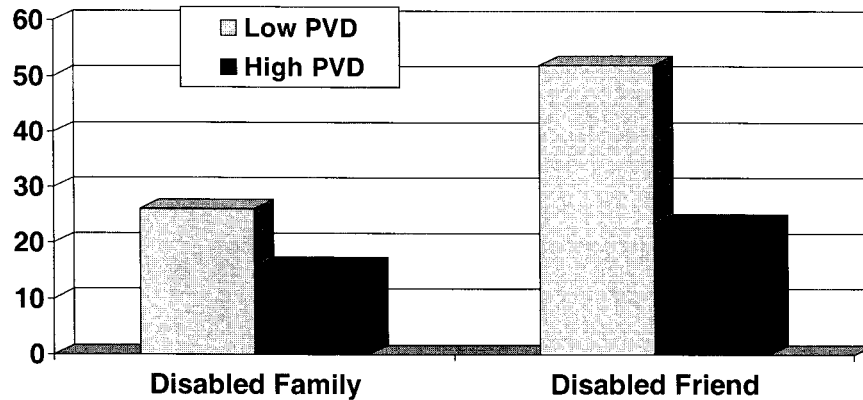


*Chronic Wariness of Disease Predicts Behavioral Avoidance of People with Physical Disabilities*

Very little prior research directly tests the hypothesis that avoidance of people with disabilities is more pronounced among individuals who are more chronically fearful of disease. Results reported by Crandall, Glor, and Britt (1997) do provide some indirect support. These investigators examined the extent to which "Heterosexuals' Attitudes Toward Homosexuals" (HATH; Larsen, Reed, & Hoffman, 1980) predicted prejudice (assessed with social distancing measures) against people with AIDS. They found that social distancing from the person with AIDS was very highly correlated with HATH scores when the person with AIDS was homosexual and modestly correlated when the person was heterosexual. Interestingly, exactly the same pattern of correlations was found when the target was presented not as an AIDS victim, but as an amputee who had lost a leg from a motorcycle accident. The same personality construct similarly predicted social distancing from both people with contagious disease and people with a disabling condition that was clearly non-contagious. This result suggests, indirectly, a relation between concerns about disease and the desire to avoid physically disabled individuals.

We tested the hypothesis more directly in a study conducted at the University of British Columbia. The relevant procedures were very simple. One hundred-one undergraduate students completed a questionnaire assessing individual differences in "Perceived Vulnerability to Disease" (PVD). This was an expanded version of the PVD scale reported in Schaller et al. (2003), and included items that loaded on two conceptually distinct subscales. One subscale, comprised of 8 items, assessed general beliefs about personal susceptibility to disease (items include "In general, I think I am very susceptible to colds, flu, and other infectious diseases;" and "My immune system protects me from most illnesses that other people get."). Another subscale, comprised of 10 items, assessed discomfort with specific situations or behaviors through which disease-causing germs might be transmitted (items on this subscale include "I'm comfortable sharing a water bottle with a friend;" and "I don't like to write with a pencil someone else obviously chewed on."). These participants also completed a different questionnaire on which they were asked the following questions: "Do you have immediate family members with disabilities?" and "Do you have friends or acquaintances with disabilities?" Responses to these questions were coded 0 for "no" and 1 for "yes."

Both PVD subscales were negatively correlated with the report of having a family member with disabilities (both  $r$ 's =  $-.17$ ,  $p$ 's =  $.10$ ). Both



**Figure 1.** Percentage of low-PVD and high-PVD participants reporting family members or friends with disabilities (PVD refers to scores on an individual difference measure of “perceived vulnerability to disease”).

subscales correlated more highly with the report of having a friend with disabilities ( $r$ 's =  $-.22$  and  $-.20$ ,  $p$ 's =  $.026$  and  $.042$ ). We also created an overall PVD score by combining responses across all 18 items from the two subscales. This overall PVD score correlated negatively ( $r = -.21$ ,  $p = .039$ ) with the “family” measure and the “friends” measure ( $r = -.26$ ,  $p = .008$ ). To illustrate these effects, it's instructive to examine the percentage of participants who responded “Yes” to the family and friends questions, depending on whether they scored low or high (below or above the median) on the overall PVD measure (see Figure 1). Clearly, participants who chronically felt more vulnerable to disease reported having less contact with people with disabilities.

These results can be interpreted in several ways. Being in the presence of people with disabilities may lead individuals to habituate to infirmity, which consequently may lead to reduced chronic concerns about disease. This sort of causal relation seems a likely explanation for the relation between PVD and family disability. More interesting, however, is the observed correlation between PVD and disability among friends and acquaintances. Some part of this relation might be explained by habituation. But if that was the only process operating, it seems likely that the effect on the “friends” measure would be weaker than on the “family” measure (because participants would have had far more contact over their young lives with family members than with friends). In fact, the opposite was true: The correlation was slightly stronger with the “friends” measure. This suggests the possible operation of a causal relation in the opposite direction as well.

Individuals with chronically higher concerns about the threat of disease may avoid social contact (and thus avoid forming friendships) with physically disabled persons.

*Wariness of Disease and Sensitivity to Disgust Predict Implicit Cognitive Associations Linking Disability with Disease*

In another recent investigation, we examined jointly the influence of both personality and contextual variables connoting disease on the automatically activated cognitions that presumably contribute to avoidance behaviors.

Personality variables included individual differences in perceived vulnerability to disease (PVD) and sensitivity to disgust—an emotion believed to have evolved because of its disease- and contamination-preventing function (Rozin & Fallon, 1987). To create a context in which wariness of disease was temporarily heightened (or not), we introduced a manipulation designed to make the threat of contagious diseases especially salient for some individuals, but not for others. Within this design, we assessed automatically activated cognitive associations linking physical disability to disease and other negative concepts.

These cognitive associations were measured with the “implicit association test” (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT is a computer-based reaction time method that measures differential cognitive association of social categories (e.g., disabled, able-bodied) with semantic information (e.g., disease, health). Participants were presented with a series of categorization trials in which they responded to a target stimulus by pressing one of two keys on the computer keyboard. Participants completed word-categorization tasks in which they judged whether stimulus words were “health” words or “disease” words (these stimulus words had been rated by a pre-test sample as clearly relevant to either health or disease). Participants also completed person-categorization tasks in which they judged whether stimulus individuals were “disabled” or “able-bodied.” These individuals were well-known real people who were either physically disabled or not. In order to provide a strong test of the hypotheses, the set of disabled individuals was comprised entirely by people who were generally well-thought-of, and whose disabilities resulted from non-contagious means (to ensure that participants knew that these disabled target persons posed no real threat of disease, we presented participants with brief biographical sketches of each stimulus person prior to the IAT task).

Implicit cognitive association of disability and disease was indicated by the difference in response times across two critical blocks of 40 categor-

ization trials. Both blocks randomly mixed word-categorization and person-categorization trials. For one block of trials, "disease" was paired with the same response key as "disabled," and "health" was paired with the same key as "able-bodied." For the other block of trials, "disease" was paired with the same response key as "able-bodied," and "health" was paired with the same key as "disabled." Given these methods (see Greenwald et al., 1998, for elaboration), the difference in average response times across the two blocks of trials serves as an indicator of implicit cognitive association: Relatively shorter response times on trials in which "disability" shared a response key with "disease" implicates a stronger implicit association between disability and disease.

Participants also completed an additional IAT task designed to assess the association between physical disability and the general evaluative category "unpleasant." The format was identical, but a different set of stimulus words was used on the word categorization trials (words which had been rated by a pre-test sample to be either highly unpleasant or pleasant, but to be largely irrelevant to disease or health) and participants were instructed to categorize these words as either "unpleasant" or "pleasant." Therefore, on this task, relatively shorter response times on trials in which "disability" shared a response key with "unpleasant" implicates a stronger implicit association between disability and unpleasantness. The order of the two IAT tasks was counterbalanced across subjects.

The purpose of the study was to test whether the strength of the two implicit associations is predicted by chronically and/or temporarily heightened concerns with disease transmission. A stronger effect of these variables on the disability-disease association, relative to the disability-unpleasant association, would demonstrate a certain degree of domain-specificity inherent in the disease-avoidance mechanism.

Participants (students at the University of British Columbia) completed the "Perceived Vulnerability to Disease" questionnaire (PVD), as well as a questionnaire assessing individual differences in "Sensitivity to Disgust" (revised from Haidt et al., 1994). In addition, a manipulation was introduced prior to the IAT procedure. Under the guise of assessing impressions of news-based Web sites on the Internet, we provided participants with a page allegedly printed from a Web site specializing in health news. The page contained five brief paragraph-long news items. Participants were asked to read the news items and then to answer some questions assessing their reactions. Two versions of this "news article" were created. One version contained news items pertaining specifically to the transmission of contagious diseases (e.g., "Hepatitis A outbreak could hit Vancouver"). The other version contained news items pertaining to other, non-contagious

health matters (e.g., “Lifestyle changes can thwart diabetes”). Participants were randomly assigned to read either the disease article or the control article.

Demographic features of the participant sample also allowed us to examine moderating effects of one additional variable: participants’ cultural background. The majority of participants ( $N = 45$ ) were of East Asian (primarily Chinese) heritage, and grew up in families that were relatively recent immigrants to North America. Another 29 participants were of European heritage; most were from families that had lived in North America for generations. This is a conceptually important distinction, as East Asian and European / North American cultures have traditionally had quite different mythologies and belief systems pertaining to the etiology of disease (etiological beliefs among Euro-Americans are influenced by theories about interpersonal transmission of diseases, whereas those of East Asians are influenced by the traditional tenets of Chinese medicine. We discuss these cultural differences more fully below). Indeed, in this study, cultural background had an important influence on the results.

Consider first the results for Europeans. IAT measures of implicit cognitions were not meaningfully predicted by either sensitivity to disgust or the general-beliefs PVD subscale. But both IAT indices were substantially correlated with the germ-aversion PVD subscale. Individuals who were more wary of the situations in which germs are transmitted also showed stronger cognitive associations linking disability to disease ( $r = .38$ ,  $p = .043$ ), and to unpleasantness in general ( $r = .38$ ,  $p = .040$ ). The disability-disease IAT measure also revealed an effect of the manipulation. Compared to participants in the control condition, those who read news items about contagious diseases showed a substantially stronger disability-disease association:  $M$ ’s were 300.28 and 462.42 milliseconds, respectively,  $t(27) = 2.36$ ,  $p = .026$ ,  $d = .82$ . No such effect of the manipulation was found for the disability-unpleasant association. The differential effect of the manipulation suggests the presence of a domain-specific mechanism.

The results looked somewhat different among participants of East Asian heritage. The disease-salience manipulation did not lead to stronger effects on either IAT measure, nor did either PVD subscale correlate strongly with either IAT measure. On the other hand, both IAT measures were somewhat correlated with an overall sensitivity to disgust score, effects that were driven primarily by a subscale assessing disgust in the presence of death and body envelope violations. Individual differences on this disgust subscale were positively correlated with the strength of the disability-disease association ( $r = .37$ ,  $p = .012$ ) and, somewhat more weakly,

with the strength of the disability-unpleasant association ( $r = .29$ ,  $p = .053$ ).

Overall, there are some results in both samples that are consistent with the hypothesis that a heightened fear of disease—either chronic or temporary—leads to increased prejudicial responses to people with physical disabilities. The results for participants of European heritage are most clearly interpretable within this framework, as both chronic and contextual variables referring explicitly to contagion triggered more negative disease-related cognitive associations with disability. In contrast, among participants of East Asian heritage, these prejudicial associations were predicted primarily by personal sensitivity to disease-related emotional responses.

It is intriguing that neither of the variables (PVD scale, experimental manipulation) referring explicitly to interpersonal transmission of contagious diseases exerted the same effects among East Asians as they did among Europeans. One explanation for these cultural differences lies in the well-documented differences in cultural mythologies and belief systems pertaining to the etiology of ill health. Beliefs based on germ theory and interpersonal transmission have penetrated European cultures more deeply than East Asian cultures, which are more heavily influenced by the traditional (and, to most Westerners, somewhat magical) tenets of Chinese medicine. East Asian ways of thought tend to attribute the presence of disease to internal rather than external factors (Ohnuki-Tierney, 1984; Pachuta, 1996; Wang, 1991; Wilson & Ryan, 1990). Consequently, Europeans' cognitive responses to physical disability may be more powerfully influenced by explicit thoughts about interpersonal transmission of germs, whereas East Asians' cognitive responses may be more directly linked to visceral affective reactions. Thus, even though physical disability is stigmatized across a wide variety of cultures (Ustun et al., 2001), there may be subtle cross-cultural differences in the specific variables that amplify or reduce the magnitude of that prejudice across persons and situations. These thoughts are speculative, of course. It remains for future research to more fully document these cultural differences (see below for discussion of integrating the evolutionary and cultural perspectives).

Given the correlational nature of these results, it is impossible to rule out the possibility that the predictive effects of PVD reflect, in part, the operation of other constructs that are correlated with PVD. Additional pieces of evidence, however, help to rule out some of the most plausible alternative explanations. For instance, PVD is only weakly correlated with the general personality dimension of neuroticism (Schaller et al., 2003). And in the studies summarized here, individual differences in another specific fear-related construct ("belief in a dangerous world"; Altemeyer, 1988)

failed to meaningfully predict implicit cognitions about or behavioral avoidance of persons with disabilities.

### *Summary*

The results of these new studies offer preliminary support for some of the novel hypotheses derived from the evolutionary disease-avoidance model. These results suggest that individual differences in concerns about disease (or sensitivity to disease-relevant emotional responses such as disgust) predict immediate cognitive responses that link physical disability to disease, and also predict behavioral avoidance of people with physical disabilities. In addition, contextual information arousing greater awareness of contagious diseases can exert similar effects—at least within some cultural populations. Clearly, there is considerable need for further testing of these hypotheses, and for further exploration of some of the complexities such as cultural differences in disease-relevant mythologies. A key conclusion, we suggest, is this: The evolutionary model generates novel hypotheses and facilitates the discovery of previously undocumented phenomena. Quite separate from the evolutionary logic that led us to design these studies, the studies themselves have yielded findings that contribute to our knowledge of contemporary prejudicial reactions to physically disabled people and the variables that moderate those prejudices.

## **Additional Issues and Implications**

### *Evolution, Culture, and Development*

Although not immediately intuitive, the observation of cross-cultural differences is not inconsistent with an evolutionary analysis. Many evolved mechanisms manifest differently within different human populations. For example, evolutionary processes contributed to the pan-human tendency to salivate at the sight and smell of desirable foods, and to respond with disgust when presented with strange foul-smelling foods. Nevertheless, individuals spend years learning which foods are desirable and which are not—and so the same food may elicit strong salivary responses among individuals from one culture while eliciting disgust among those from another. Similar processes may operate in domains of person perception and social stigma. There may be evolved, pan-human psychological mechanisms that precipitate negative reactions and avoidant behavior toward others who are perceived as morphologically unusual; but individuals must learn those specific features that define morphological unusualness—and

so the features that emerge as eliciting cues may be somewhat different across different cultural environments. Rozin and Fallon (1987) note that disgust is an emotion that develops during the first few years of life as children learn which objects are offensive. Thus, while disgust is clearly a universal emotion, the specific things that elicit disgust are expected to vary across cultures (aside from the few basic things that are obviously harmful if ingested). Moreover, there may be evolved pan-human tendencies to respond even more avoidantly under circumstances that imply greater vulnerability to disease; but individuals from different cultures may learn somewhat different sets of rules about the circumstances that imply this vulnerability.

This type of evolutionary analysis illustrates the error of assuming that evolved psychological mechanisms are simply "hard-wired" into individual brains. Some rudimentary mechanisms may fit this caricature; but the more complex and flexible processes that govern human social cognition and behavior are, even when sculpted by evolutionary pressures, influenced by input from local environments (e.g., Öhman & Mineka, 2001). As inquiries into both evolutionary psychology and cultural psychology become more sophisticated, important lines of research are starting to reveal the complicated conceptual connections between universal human tendencies and cross-cultural differences (e.g., Kenrick, Li, & Butner, 2003).

One class of evidence that is often seen to support the evolutionary perspective is that found in developmental psychology (i.e., studies conducted on infants and children). The presence of a particular psychological mechanism in very young children can indeed serve as evidence for the innateness of that mechanism. However, because each psychological mechanism follows a unique developmental trajectory (Bjorklund & Pellegrini, 2000), the absence of a particular mechanism at a particular developmental period does not imply that the mechanism does not have evolutionary origins. In any case, it is of interest how children respond to stigmatized individuals. Children do appear to show avoidant responses toward both young and old stigmatized individuals. As mentioned earlier, visibly disabled children are less preferred as interaction partners (Kleck & DeJong, 1981, 1983; Richardson et al., 1974). And even very young children show prejudicial responses toward the elderly, often holding stereotypic beliefs of the elderly as being sickly and physically unattractive (Montepare & Zebrowitz, 2002). This is noteworthy because there may be important parallels between physical disability and old age, as well as other stigmas.



*Asymmetry, Obesity, and Other Possible Triggers of the Disease-Avoidance Mechanism*

We have focused thus far on physical disability as a heuristic marker that triggers the disease-avoidance mechanism. In theory, other morphological anomalies are likely to operate as triggers as well. Facial disfigurements (e.g., scars from wounds or burns) are one obvious set of cues that almost certainly elicit the same suite of affective, cognitive, and behavioral reactions. Indeed, facial disfigurement is often grouped with physical disability in discussions of stigma. Prejudicial reactions to facially disfigured individuals, therefore, may be similarly influenced by contextually and dispositionally induced concerns about disease. The same conceptual analysis also yields hypotheses about reactions to morphological symmetry and asymmetry. Facial and bodily symmetry appear to be indicators of physical health and fitness, and so are related to perceptions of attractiveness (Grammer & Thornhill, 1994; Langlois & Roggman, 1990; Rhodes, Proffitt, Grady, & Sumich, 1998; Rhodes, et al., 2001; Shackelford & Larsen, 1997). Specifically, asymmetric individuals are perceived to be less attractive than symmetric individuals. The disease-avoidance model suggests that this phenomenon may also be moderated by feelings of vulnerability to disease.

Another characteristic that is highly stigmatizing—but is less obviously related to contagious disease—is obesity. Subjectively overweight individuals arouse emotional and behavioral responses similar to those aroused by disfigurement and disability: disgust, distancing, and social exclusion (Crandall, 1991, 1994; Crandall & Biernat, 1990). Like most prejudices, weight-based prejudice is surely the result of multiple causes. Some of those causes—such as those based on attributions and ideologies (Crandall, 1994)—have little to do with disease. Although Kurzban & Leary's (2001) evolutionary analysis of stigma explicitly resists linking obesity-based prejudice to disease-avoidance processes, it is worth considering the possibility that an unusually large body size may serve as a trigger similar to that of physical disability. It is unlikely that humans have evolved psychological mechanisms that respond specifically to obesity (because obesity is historically recent), but if the disease-avoidance mechanism is responsive to crude visual signals—bodily features that are simply morphologically anomalous—then gross obesity may fall within the scope of the disease-avoidance process. If so, prejudices against obese individuals may be moderated by dispositional and contextual variables that connote vulnerability (or invulnerability) to disease.

A similar analysis suggests possible implications for predicting atti-

tudes and reactions toward elderly persons. Some of the physical features characteristic of older adults may be perceived as unusual and thus may automatically trigger psychological mechanisms designed to detect disease. Consistent with this speculation is evidence that elderly adults with highly visible cues of old age are more prone to stigmatization (Hummert, 1994), and stereotypes of older people often consist of traits that suggest the presence of illness (Montepare & Zebrowitz, 2002).

Finally, it's worth noting that the disease-avoidance mechanism may be triggered not only by cues indicating morphological unusualness, but also cues indicating the unusualness of disease-relevant habits and practices. It can be argued that certain cultural rituals and practices—especially those pertaining to personal hygiene, diet, and food preparation—emerged as buffers against the transmission of disease. Therefore, any individual who violates those practices may be stigmatized in a manner similar to individuals who are morphologically unusual, eliciting both disgust and behavioral avoidance (Rozin, Haidt, McCauley, & Imada, 1997; Schiefel-hovel, 1997). Consistent with this analysis, recent empirical evidence reveals that individual differences in perceived vulnerability to disease predict unfavorable attitudes toward immigrants from subjectively foreign cultures (who engage in subjectively unusual practices pertaining to hygiene and food) but not toward immigrants who are culturally familiar (Schaller et al., 2003).

#### *Automatic Responses, Controlled Responses, and Ambivalence*

Our disease-avoidance analysis has focused exclusively on negative, anti-social responses to people with disabilities and other physically stigmatizing features. Obviously, these responses comprise only part of the larger, more complicated psychological picture. Physically disabled individuals inspire a number of prosocial responses as well (compassion, admiration, assistance), and there is an important line of research exploring the psychological juxtaposition of these ambivalent responses (Katz, Hass, & Bailey, 1988).

One evolutionary perspective on this ambivalence has been derived from an analysis of the conflict between responses to good intentions and responses to actual non-reciprocity (Neuberg et al., 2000). Humans are a highly social species and there are rewards for responding positively to well-meaning others. We are also highly tuned to actual reciprocity of resources and effort, and it appears that we have evolved psychological “cheater-detection” mechanisms that sensitize us to individuals who fail to reciprocate (Cosmides & Tooby, 1992). Individuals who are physically dis-

abled are, despite their intentions, often unable to reciprocate fully the assistance that they receive from others. Consequently, Neuberg et al. argue that ambivalence toward disabled individuals arises from the “natural desire to approach and invest in one’s well-intentioned group members competing with the desire to avoid making costly, nonreciprocable investments” (p. 40).

Additionally, the disease-avoidance mechanism may conflict with the desire to respond positively to well-intentioned others. The conflict between these different psychological processes may operate at different levels of awareness, and so it is useful to invoke the distinction between automatic and controlled aspects of stigmatization and prejudice (Devine, 1989; Pryor, Reeder, & Landau, 1999). We might conceptualize the automatic and controlled levels as loosely corresponding to nonverbal and verbal forms of behavior, respectively. The disease-avoidance process discussed in this paper is triggered heuristically, and is expected to operate fairly automatically, thus having the greatest implications for nonverbal forms of behavior. People may be unaware of these responses, and may have difficulty controlling them even if they are aware of them. More positive reactions may be more thoughtful, rational, and controlled responses. For these reasons, positive responses to disability are commonly detected in overtly and verbally expressed attitudes, whereas anti-social avoidant responses are typically observed in the sorts of nonverbal behaviors that perceivers do not consciously monitor.

### *Practical Implications for Intervention and Change*

The evolutionary disease-avoidance model complements other approaches to stigma, while offering some new and useful implications. The model implies a fairly specific set of features that trigger disease-avoidance mechanisms, thus demarking a distinct category of stigmas and prejudices that share certain similarities and that are distinct from other stigmas and prejudices (Kurzban & Leary, 2001). The model also implies a fairly distinct suite of negative reactions—emotional, cognitive, and behavioral—that are distinct from other equally negative responses. This model also generates testable hypotheses identifying specific variables—pertaining to both chronic individual differences and to situational context—that are likely to moderate these negative reactions.

The conceptual implications suggest a number of practical implications as well. If we can more completely uncover the variables that moderate anti-social responses to physical disability, then we can more expertly design interventions that might inhibit these responses. In addition, it is

useful to appreciate just how automatic these negative responses are. It is certainly not easy to control automatically activated responses, but it is not impossible. When perceivers are aware of their implicit emotional and cognitive reactions to others—and the reasons why these responses exist—they are in a better position to prevent these reactions from influencing their behavior.

Visible features of stigmas contribute to awkward interactions between non-stigmatized and stigmatized individuals (Hebl, Tickle, & Heatherton, 2000). Thus, it is useful to know that our subjective unease and our nonverbal displays of anxiety in the presence of disabled individuals arise from irrational concerns about disease. These concerns may be overcome if people are placed in situations that, over time, expose the irrationality and encourage more thoughtful behavior (Kleck, 1969; Langer et al., 1976). Our evolutionary analysis suggests that methods designed to reduce irrational concerns about disease—especially in the context of dealing with disabled individuals—may be useful in combating disability-based prejudice.

Awkward or otherwise negative interactions between people with and without disabilities may occur due to self-fulfilling prophecies in which the behavior of disabled individuals confirms the negative expectations held by non-disabled perceivers. These expectations may manifest in several ways—in verbally expressed forms and in subtle, nonverbal displays. As people reduce their irrational concerns about disease or learn to control their nonverbal displays of anxiety, the likelihood of self-fulfilling prophecies would diminish, leading to improved interactions between people with and without disabilities.

For people with physical disabilities, the awareness of these processes will help them understand why interactions are often awkward, and their self-views may improve with the realization that the prejudice that they experience is partly due to irrational concerns about disease.

### **Conclusion**

Any theoretical perspective that contributes to our understanding of prejudice is valuable. A theoretical perspective is even more valuable if it generates new conceptual hypotheses and leads to the discovery of novel findings. It is more valuable still if it has implications for positive interventions and social change. A consideration of previous research suggests that concerns about disease—which are plausibly rooted in the evolutionary history of humans—may play a role in prejudice against individuals with

physical disabilities. New empirical evidence offers preliminary support for some of the hypotheses derived from the disease-avoidance model, specifying a set of contemporary variables that may moderate nonverbal forms of disability-based prejudice. These and other recent findings suggest that prejudice may be composed of several specific processes, rather than a broad and general process. Additionally, these findings offer potentially useful ideas for intervention. Still, we have barely scratched the surface of this conceptual approach to anti-social behavior and interpersonal prejudice. What we have presented here is only the beginning of what we hope will be a rich and instructive program of research.

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