ELSEVIER

Evolution and Human Behavior 28 (2007) 410–414

Evolution and Human Behavior

Pathogen-avoidance mechanisms and the stigmatization of obese people☆

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Initial receipt 22 December 2006; final revision received 25 May 2007

Abstract

Humans possess pathogen-avoidance mechanisms that respond to the visual perception of morphological anomalies in others. We investigated whether obesity may trigger these mechanisms. Study 1 revealed that people who are chronically concerned about pathogen transmission have more negative attitudes toward obese people; this effect was especially pronounced following visual exposure to obese individuals. Study 2 revealed that obesity is implicitly associated with disease-connoting concepts; this effect was especially pronounced when the threat of pathogen transmission is highly salient. Evolved pathogen-detection mechanisms are hypersensitive, and they appear to play a role in the stigmatization of obese people.

Keywords: Behavioral immune system; Disease avoidance; Obesity; Pathogen cues; Stigma

1. Introduction

In response to the threat of communicable pathogens, many animal species have evolved immune systems that detect and destroy pathogens when they enter the body. A sort of "behavioral immune system" appears to have evolved as well, characterized by mechanisms that allow individuals to detect and avoid pathogen-carrying conspecifics. Avoidance of infected conspecifics is observed in many animal species, including humans (e.g., Behringer, Butler, & Shields, 2006; Crandall & Moriarty, 1995; Kavaliers & Colwell, 1995; Kiesecker, Skelly, Beard, & Preisser, 1999).

Most pathogens are microscopic and not directly perceptible. However, people are highly sensitive to bodily cues (e.g., lesions, rashes) that are correlated with the presence of pathogens. The perception of such cues triggers responses such as disgust and the activation of disease-relevant thoughts, which, in turn, compel negative attitudes and aversive behavioral responses (Schaller & Duncan, 2007).

The correlation between bodily cues and the presence of pathogens is imperfect, giving rise to a signal-detection problem. An adaptive approach to the signal-detection problem suggests that inferential mechanisms evolved to be biased toward minimizing the more costly form of error, although this inevitably leads to an increase in the less costly form of error (Haselton & Nettle, 2006; Nesse, 2005). For pathogen-detection mechanisms, the following errors are possible: perceiving a healthy individual to be a pathogen carrier (false positive) and perceiving a pathogen carrier to be healthy (false negative). The costs associated with these two errors are asymmetrical. In this domain, false negatives impose substantially greater fitness costs than false positives; consequently, the inferential mechanisms are likely to be biased toward minimizing false negatives (Haselton & Nettle, 2006; Kurzban & Leary, 2001; Nesse, 2005). The upshot is that perceivers tend to be biased toward inferring that healthy people are diseased, rather than the reverse.

This inferential bias is reflected in a tendency for people to implicitly associate the risk of infection with a broad range of superficial cues. Any gross deviation from species-typical morphological norms may be interpreted as evidence of parasitic infection, triggering an aversive response (Kurzban & Leary, 2001; Schaller & Duncan, 2007).

☆ This research was supported by a grant from the Social Sciences and Humanities Research Council of Canada and a University of British Columbia Graduate Fellowship.

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doi:10.1016/j.evolhumbehav.2007.05.008

Consistent with this analysis, the perception of individuals with facial birthmarks and physical disabilities has been found to automatically activate disease-relevant cognitions, even when perceivers are explicitly aware that these individuals do not harbor contagious diseases (Park, Faulkner, & Schaller, 2003; Schaller & Duncan, 2007). Other kinds of nonnormative morphology may inspire the same sort of antipathy. For instance, disease-relevant cognitions and emotions may be inspired by the perception of people who are skeletally thin. Less obviously, perhaps, the same psychological responses may be inspired by the perception of people who are obese.

There are two reasons to suggest that perceived obesity may trigger the behavioral immune system. First, there is evidence that infectious agents play a causal role in obesity (e.g., Whigham, Israel, & Atkinson, 2006). Although it is unclear how prevalent infection-based obesity is in contemporary (much less ancestral) human populations, this evidence provides some basis from which to speculate that obesity might serve as a heuristic cue for the presence of pathogens. Even if infection-based obesity is a relatively uncommon and historically recent phenomenon, there is a second reason to hypothesize that obesity may serve as a heuristic signal of pathogen infection: gross obesity represents deviation from species-typical morphological norms. If the behavioral immune system is triggered by the perception of any substantial morphological deviation, then it may be triggered by the perception of obesity.

To empirically test whether obesity serves as a pathogen-connoting cue, we drew on an additional piece of conceptual logic—the logic of functional flexibility (Schaller, Park, & Kenrick, 2007). Evolved psychological responses are associated with specific benefits, but their actual operation may entail some costs as well. Consequently, these responses are flexibly engaged in response to information signaling the relative costs and benefits of the response. Any salient information that indicates greater vulnerability to pathogen transmission may inspire more powerful aversive responses to pathogen cues (Schaller & Duncan, 2007). People who chronically feel more vulnerable to disease show stronger responses (Faulkner, Schaller, Park, & Duncan, 2004; Navarrete & Fessler, 2006; Park et al., 2003). People also show stronger responses when the threat of transmission is temporarily acute (Faulkner et al., 2004; Navarrete, Fessler, & Engs, 2007; Park et al., 2003). If obesity does serve as a pathogen cue, it follows that aversive responses to obese individuals will be stronger among people with heightened concerns about pathogen transmission.

2. Study 1: chronic concerns about pathogens and antipathy toward obese people

People vary considerably in how vulnerable they feel to infectious disease. Do those who feel more vulnerable also harbor greater antipathy toward obese people? To test this hypothesis, we exploited the fact that, in the context of several separate studies, we had collected data on (a) chronic concerns about pathogens and (b) antipathy toward obese people.

Across the five samples from which data were collected, some participants completed the antipathy measure immediately after seeing photos depicting obese target persons, while others did not. These data allowed us to test the additional hypothesis (based on the premise that it is the *visual* perception of morphological deviation that triggers the behavioral immune system) that this correlation might be stronger following visual exposure to obese individuals.

2.1. Methods

Two hundred eighty-six students (209 women, 76 men, 1 unknown) at the University of British Columbia participated in exchange for extra credit.

Participants took part in one of five studies designed for other purposes (the exact details are not germane to the specific hypotheses tested here). As a standard part of those procedures, they completed questionnaires assessing individual differences. Among the measures were separate questionnaires assessing (a) chronic concerns about pathogens and (b) antipathy toward obese people. The first of these variables was measured with a 10-item subscale of the Perceived Vulnerability to Disease scale (PVD; Faulkner et al., 2004; Park et al., 2003; α=.78). This subscale assesses discomfort with situations posing the risk of pathogen transmission (e.g., "It really bothers me when people sneeze without covering their mouths"). Antipathy toward obese people was measured with a 7-item Dislike subscale of the Anti-Fat Attitudes scale (AFA; Crandall, 1994; α=.82). This includes items such as "If I were an employer looking to hire, I might avoid hiring a fat person." Participants completed the PVD questionnaire at the outset of the study session and the AFA later in the same session.

As part of procedures that occurred prior to completion of the AFA, some participants viewed photos of obese individuals (n=136) and others did not (n=150). The photos were either embedded in questionnaires or presented on computer screens.

2.2. Results and discussion

In support of the primary hypothesis, the results revealed a positive correlation between the PVD subscale and antipathy toward obese people [$r(284)$=.25, p<.001]. Additional analyses ruled out several possible third-variable explanations for this correlation. One analysis examined whether the effect is independent of a previously documented contributor to antifat prejudice: attributions about lack of willpower (Crandall, 1994; Crandall et al., 2001). We conducted an analysis in which the antipathy measure was regressed simultaneously on PVD and a measure of willpower attributions (Crandall, 1994). Results revealed that PVD [partial $r(283)$=.24, p<.001] and willpower attributions

[partial $r(283)=.30$, $p<.001$] exerted entirely independent effects on antipathy toward obese people. Another analysis examined whether the effect of PVD might simply reflect general anxiety about others (rather than a concern specific to pathogens). All participants had also completed the Belief in a Dangerous World scale (BDW; Altemeyer, 1988), which assesses broad concerns about social dangers (e.g., "There are many dangerous people in our society who will attack someone out of pure meanness, for no reason at all"). When the antipathy measure was regressed on PVD and BDW, the predictive effect of BDW was minimal [partial $r(283)=.091$, $p=.13$] and the effect of PVD remained essentially unchanged [partial $r(283)=.21$, $p<.001$].

To test for the moderating impact of visual exposure to obese individuals, we conducted a regression analysis to assess the interactive effect of chronic concerns about pathogens and visual exposure on the measure of antipathy toward obese people. The results revealed the predicted interaction [$t(282)=2.49$, $p=.013$]. Among participants who had not viewed photos of obese individuals prior to completing the antipathy measure, PVD had a weak predictive effect on antipathy toward obese people ($\beta=.12$, $p=.14$); among participants who had viewed photos of obese individuals, PVD exerted a much stronger predictive effect ($\beta=.40$, $p<.001$).

These results support the hypothesis that concern with pathogen transmission predicts antipathy toward obese people. This correlation cannot be explained by some of the more obvious potential confounding variables. Moreover, the correlation was especially strong following visual exposure to obese individuals—consistent with the idea that perception of morphological deviation activates the behavioral immune system.

3. Study 2: contextual variation in implicit associations between obesity and disease

If obesity serves as a pathogen cue, perceiving obesity should activate disease-relevant concepts into working memory—especially when the risk of pathogen transmission is high. To test this hypothesis, we conducted an experiment that manipulated the salience of infectious pathogens. Following the manipulation, participants completed computer-based reaction-time tasks that assessed the extent to which unpleasant semantic concepts were implicitly associated with obese individuals more than with nonobese individuals (cf. Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003). We employed two variants of this reaction-time task. One task assessed associations linking obesity specifically to disease; the other assessed associations linking obesity to a broader category of unpleasant (but disease-irrelevant) concepts.

3.1. Methods

Sixty students (47 women, 13 men) at the University of British Columbia participated in exchange for extra credit.

Participants were randomly assigned to watch one of three slide shows on a computer screen. One slide show (*pathogens salient condition*) consisted of 10 images portraying germs, infections, and the prevalence of disease-causing pathogens. The second slide show (*accidents salient condition*) consisted of 10 images depicting accidents, hazards, and other non-disease-related health threats (e.g., electrocution in the bathtub). The third slide show (*work ethic salient condition*) presented 10 images that made salient the value of hard work (e.g., one slide depicted individuals training at a gym, accompanied by the slogan "no pain, no gain").

The latter two slide shows represented different types of comparison conditions. To the extent that implicit associations in the pathogens condition are stronger than those in the accidents condition, these results may be attributed specifically to the salience of pathogens rather than to a more general concern with personal well-being. To the extent that implicit associations in the pathogens condition are stronger than those in the work ethic condition, the results implicate effects independent of another process linked to antifat attitudes, namely, that antifat attitudes stem in part from the belief in the effectiveness of will power (Crandall, 1994).

Following the slide show, participants completed two versions of the implicit association test (IAT; Greenwald, Nosek, & Banaji, 2003; Park & Schaller, 2005). In an IAT task, participants are presented with stimuli and are asked to categorize each stimulus as quickly as possible into one of two categories by pressing keys on the computer keyboard.

For one task (*fat–disease IAT*), participants judged whether stimulus words (e.g., *strong*, *contagious*) connoted either *health* or *disease* and also judged whether specific target persons (presented in photos) were either *thin* or *fat*. (The stimulus words had been rated by a pretest sample as clearly relevant to health or disease. The photos were dieters' before-and-after photos, taken from a Web site for a weight-loss program; therefore, the fat and thin target people were actually the same people.) For one critical block of trials, *fat* and *disease* (and *thin* and *health*) shared a response key; for the other critical block, *fat* and *health* (and *thin* and *disease*) shared a response key. The difference in mean reaction times across these two blocks of trials served as an indicator of implicit cognitive association: relatively shorter reaction times on trials in which *fat* shares a response key with *disease* indicated a stronger association linking obese people to disease concepts.

The other task (*fat–unpleasant IAT*) was procedurally identical, but a different set of stimulus words was used on the word-categorization trials. These words (e.g., *smart*, *nasty*) had been pretested to be strongly evaluative (highly pleasant or unpleasant) but largely irrelevant to health and disease. Participants categorized these words as either *pleasant* or *unpleasant*. Relatively shorter reaction times on trials in which *fat* shared a response key with *unpleasant* indicated a stronger cognitive association linking obese people to unpleasant concepts in general. The order

in which participants completed these two IAT tasks was counterbalanced.

3.2. Results and discussion

To calculate implicit associations linking fat people to semantic concepts, we used a scoring algorithm that minimizes the biasing effects of extremely short or long reaction times and of individual differences in response speed (Greenwald et al., 2003). Positive mean values on these indices revealed that, in general, participants associated obese people (relative to thin people) with *disease* (mean=0.51) and with *unpleasant* (mean=0.60; both p values <.001). Of primary conceptual interest is the extent to which these IAT responses were influenced by the slide-show manipulation. Results indicated that the effects of the manipulation were short-lived and produced no interpretable effects on the second of the two IAT tasks completed by each participant. Therefore, we report analyses just on the first IAT task, completed immediately after the slide-show manipulation.

A 2×3 (IAT Task×Slide Show Condition) analysis of variance revealed an interaction [$F(2,54)=3.32$, $p=.044$]. The slide-show manipulation influenced implicit associations, but this effect differed across the two IAT tasks. The specific nature of this interaction is illustrated in Fig. 1 and is illuminated by the results of two planned contrasts. The fat–disease association was stronger in the pathogens condition (mean=0.72), compared to the accidents and work ethic conditions [means=0.53 and 0.47, respectively; $t(28)=1.83$, $p=.078$]. On the other hand, the less specific fat–unpleasant association was stronger in the work ethic condition (mean=0.76), compared to the pathogens and accidents conditions [means=0.54 and 0.60, respectively; $t(28)=2.05$, $p=.050$].

Consistent with the hypothesis, obese people were implicitly associated with disease-relevant concepts, and this association was especially strong following experimentally induced pathogen salience. It is notable that the amplifying effect of the pathogen-salience manipulation emerged only on implicit associations linking obesity to *disease*; it did not increase associations between obesity and *unpleasant*. On the other hand, the obesity–unpleasant (but not obesity–disease) association was amplified after making salient the value of hard work. These results offer the first experimental evidence indicating a causal impact of pathogen concern on pejorative perceptions of obese people. Moreover, they further indicate that pathogen-avoidance processes are psychologically independent of other processes that have been previously linked to antifat attitudes.

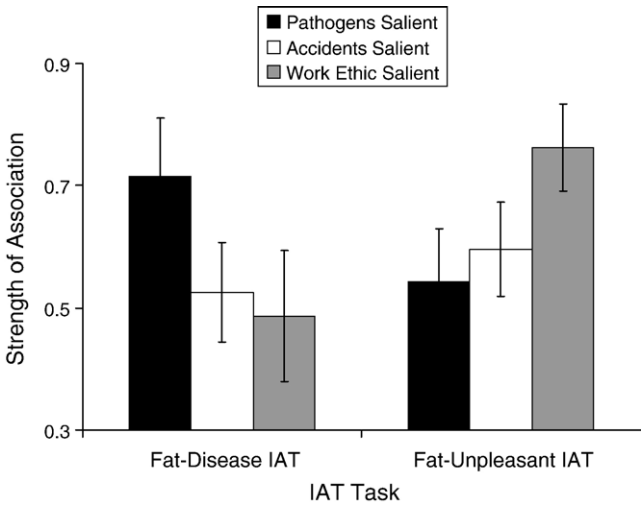

Fig. 1. Effect of slide-show manipulation on implicit associations linking fat people to *disease* and to *unpleasant* (error bars indicate ±S.E.).

While these results are provocative, some methodological limitations should be noted. This study focused exclusively on the stigmatization of obese individuals; thus, we cannot rule out the possibility that pathogen salience might enhance negative responses to any category of disliked people (even those who are not morphologically anomalous). Also, although the use of before-and-after photos allowed many potential confounds to be controlled (as the obese and nonobese targets were the same individuals), such photos may differ along dimensions other than just body weight (e.g., people tend to smile more in the after photos). It would be valuable for future studies on this topic to employ additional methodologies that address these limitations.

Future research might also explore whether perceivers' own body weight moderates the tendency for obesity to serve as a pathogen-connoting cue. Previous research has generally revealed perceivers' own body weight to be unrelated to antifat attitudes (e.g., Crandall, 1994); however, recent results suggest that there may be some relation (Schwartz, Vartanian, Nosek, & Brownell, 2006). If such a relation exists, we suspect that it follows from psychological processes independent of the pathogen-avoidance mechanisms implicated by our results. This conjecture can only be addressed by future empirical study.

4. General discussion

Results from two studies, employing different methodologies, revealed that the perception of obesity inspires greater antipathy when perceivers feel more vulnerable to disease. There is no readily apparent alternative explanation that can account for the full set of results found across both studies. Together, these results provide the first evidence that obesity serves as a heuristic cue for pathogen infection.

These results complement other research on the behavioral immune system. With the addition of obesity to the list of pathogen-connoting characteristics, it is apparent that a wide range of superficial cues may trigger the specific set of psychological responses that evolved to inhibit social contact with diseased individuals. Of course, this does not imply that each activation of this system serves an adaptive function (Park, 2007). Just as the biological immune system attacks organic matter that is entirely benign (or even beneficial, as

in the case of organ transplants), the behavioral immune system may also respond in an overinclusive manner to the perceived presence of pathogens.

The present findings also have useful implications for the psychology of prejudice. Antipathy toward obese people is a powerful and pervasive prejudice in many contemporary populations (Brownell, Puhl, Schwartz, & Rudd, 2005). Our results reveal, for the first time, that this prejudice may be rooted in multiple, psychologically independent mechanisms. This is sobering but encouraging because it provides clues toward the possible reduction of this form of prejudice. Previous research shows that this prejudice may be reduced through interventions that focus on attribution processes (Crandall, 1994; Teachman et al., 2003). Our results suggest that it might also be ameliorated through interventions that focus on individuals' often-irrational concerns about infectious disease.

Acknowledgments

We thank Nicole Cannon, Lesley Duncan, Jason Faulkner, Christal Fraser, Susan Huang, Dana Leighton, Nicole Mead, and Josh Tybur for their assistance and/or comments.

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