

Magical Thinking About Illness Virulence: Conceptions of Germs From "Safe" Versus "Dangerous" Others

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AIDS-related research has documented overreactions to casual contact and underreactions to sexual risk. This contradiction is explained by "magical contagion," a principle of thinking common in traditional societies, wherein contagion is considered socially discriminating, such that harmfulness depends on the nature of the relationship between source and recipient. In Study 1, 100 undergraduate participants drew germs described as their own, a stranger's, their lover's, or a disliked peer's. Lovers' germs were depicted as less threatening than disliked peers' germs. In Study 2, scenarios described contact with a flu-infected lover, stranger, or disliked peer. New undergraduate participants ($N = 133$) rated how likely they were to become ill and how severely. Although likelihood ratings did not differ, severity ratings followed a linear trend, effects of lover contact being least severe and contact with disliked peer most severe. Behavioral implications of the blurring of feelings about germ source with estimates of germ virulence are discussed.

Key words: magical contagion, perceived vulnerability, perceived susceptibility, health beliefs

Public reactions to AIDS include both extreme overreactions to nonrisky casual contact with people with AIDS and apparent lack of concern over actual risky behaviors, such as sexual intercourse (cf. Becker & Joseph, 1988; Fisher & Misovich, 1990; Nemeroff, Brinkman, & Woodward, 1994). Perceived vulnerability, considered a critical prerequisite for preventive or precautionary behaviors, is an explanatory variable in most theoretical treatments of health behavior (Weinstein, 1989, 1993). The relation of perceived susceptibility to AIDS-preventive behaviors has received mixed support (e.g., Rosenthal, Hall, & Moore, 1992; van der Velde, van der Pligt, & Hooykaas, 1994). However, negative findings may be explainable either in terms of an interaction of perceived susceptibility with self-efficacy or levels of perceived vulnerability being so low as to preclude a proper test of the relationship (van der Velde et al., 1994; Weinstein, 1989).

The health and prevention literature addressing antecedents of perceived vulnerability focuses on unrealistic optimism, which is well-documented regarding AIDS risk (e.g., Bauman & Siegel, 1987; Nemeroff et al., 1994). Explanations for it range from defensive denial, which has not been supported (van der Velde et al., 1994; Weinstein, 1989), to self-esteem protection and nonmotivated cognitive errors, both of which are supported. People select inappropriately high-risk comparison groups when assessing their relative risk status, they show greater optimism regarding controllable (i.e., preventable) and stigmatized conditions, and they overestimate the efficacy of

personal preventive behaviors while underestimating the extent to which others engage in similar behaviors (Gerrard, Gibbons, & Warner, 1991; Weinstein, 1983, 1989). A limitation of this research is that it is unidirectional, whereas, as Weinstein (1989) has noted, overreactions and underreactions to the same hazard are common. Also lacking is exploration of the role of lay conceptions of disease transmission.

The current studies explore the role of a principle of thinking, dubbed "magical contagion," in perceptions of susceptibility to illness. First identified by anthropologist James Frazer (1890/1959) as the basis for magical beliefs and practices worldwide, it was presented as a universal of human thinking. It describes the transfer of properties from a source to a recipient, through contact. Microbial contamination may be viewed as a scientifically valid subcase of magical contagion, however, in the broader concept, transmissible properties include physical or moral properties and may be harmful or beneficial. Thus goodness and evil are as transmissible as influenza. Because the contagious entity reflects the essence of its source, it is socially discriminating: Contact is thought to result in differential effects, depending on the nature of the relationship between source and recipient. If the source bears malice toward the recipient, the contagious entity acts maliciously. Contact may thus be harmful to one recipient and neutral or beneficial to another, depending on their relationship to him. Clearly, microbes do not discriminate in this way.

Rozin, Nemeroff, and colleagues have been investigating the magical contagion principle in the thinking of educated, Western adults. Of particular interest here are findings indicating that people conflate germs with evil as reflected in, for example, wanting Hitler's sweater sterilized before wearing it, being unconcerned about Albert Schweitzer's "good germs," and being satisfied with symbolic purifications of a hepatitis victim's sweater (Nemeroff & Rozin, 1994). Along similar lines, Rozin, Markwith, and McCauley (1994) found that individual concern with risk of infection correlated with

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aversion to immorality, misfortune, and unfamiliarity. Nemeroff, Brinkman, and Woodward (1994) and Rozin, Nemeroff, and Markwith (1992) have identified characteristic features of magical contagion in reactions to AIDS.

Whether or not the magical contagion principle will be operative appears to depend on the exact question asked. For example, in exploring whether personal sense of vulnerability to AIDS is influenced by belief that illness comes of doing bad (immoral) things (a moral-germ conflation), Nemeroff et al. (1994) asked their study's participants how likely they were to contract AIDS, and how worried they were about contracting AIDS. Separate regressions were run on the two variables, each entering AIDS knowledge and personal risk behaviors in the first step and guilt over sexual and drug-related behaviors in the second. For likelihood, knowledge and risk behaviors were predictive of estimates, guilt adding only a tiny increment of explanatory power. But for the more emotional worry measure, knowledge and risk behaviors did not predict responses, whereas guilt did.

Magical contagion makes the following predictions regarding when individuals will feel vulnerable and invulnerable: Contagion should be perceived as most harmful if from a disliked source or enemy, as least harmful if from a loved one, and as intermediate in threat (given that contact occurs at all) if from a stranger. No prediction is made for one's own germs (not a usual transmission scenario, after all). Although the source is innocuous, effects would be highly salient. These studies aimed to determine whether educated Western adults conceive of germs as differentially threatening depending on their source, as predicted by magical contagion. This principle seems likely to operate at a covert level in this population (Nemeroff & Rozin, 1994) or, even if overt, to be denied given the demand to provide rational answers, particularly in a university research setting. Thus the first study employed an indirect method, using open-ended drawings.

Study 1

Method

Participants. Participants were 100 undergraduates (78 female, 22 male) in psychology courses at Arizona State University who identified themselves as currently involved in a romantic relationship. One participant's drawings were considered uncodable by raters, and 2 participants did not complete any drawings after the first one. Final samples were 99 for between- and 97 for within-subject analyses.

Procedure. Participants received crayons and a packet of four pages, each with instructions to imagine a given individual has the flu and then "draw how their flu germ looks to you." Source individuals were self, a stranger, one's boyfriend, girlfriend, or spouse (lover), and a disliked person. Order of sources was randomized across participants so that approximately 25 participants completed each drawing first. Participants were told not to turn to subsequent pages until they had completed the previous ones. Thus they were unaware while doing the first drawing that they would be doing any others. This administration procedure allowed (a) between-subject germ comparisons, using only the first of each participant's drawings, to minimize demand characteristics, and (b) less stringent but more sensitive within-subject germ comparisons, using all of a given participant's drawings.

Two raters, unaware of source, rated participants' initial drawings, on a 5-point Likert-type scale, on six dimensions identified from pilot

testing as being ratable characteristics of such drawings: how Active/Threatening versus Passive/Mild the germ appeared, how Personified versus Abstract, how Reaching/Projecting versus Contained, how Big versus Small, how Complex versus Simple, and how Nice/Happy versus Angry/Threatening the colors. Each rater rated 70 drawings, overlapping on 40 cases to allow calculation of interrater reliability. They then rated all possible pairs of drawings for a given participant (again overlapping on a subset) on a single, global comparative measure: "Germ A is ___ relative to Germ B." Options were "more threatening," "less threatening," or "the same."

Results

Between-subject effects. Interrater reliabilities, calculated separately for each of the six scoring dimensions, ranged from .74 to .96 (Pearson *r*s). Intercorrelations between dimensions are shown in Table 1. On the basis of a factor analysis and subsequent reliability analyses on the factors, three dimensions (Active, Big, Complex) were combined into a composite variable, labeled *Intensity*. A multivariate analysis of variance (MANOVA) on this and the remaining three individual dimensions showed a significant effect of source of contagion, $F(12, 243) = 2.19, p = .013$. Univariate analyses showed that drawings differed by germ source on two of the four variables: the composite Intensity, $F(3, 95) = 3.59, p = .017$, and Color, $F(3, 95) = 2.93, p = .038$. Standardized cell means for effects are shown in Table 2.

Planned orthogonal contrasts were run on self versus stranger (reflecting familiarity) and lover versus disliked person (reflecting affective valence). Self germs differed from stranger germs on intensity, $F(1, 95) = 6.88, p = .01$, with self germs depicted as more intense. Self did not differ from stranger on color tone. The contrast between lover and disliked person germs on intensity was marginally significant, $F(1, 95) = 3.82, p = .054$, with lover germs less intense. Lover germs were less angry in color than disliked person germs, $F(1, 95) = 6.51, p = .012$.

Within-subject effects. For the global threat rating used for within-subject germ comparisons, interrater concordance was calculated as percentage of exact matches (i.e., number of comparisons on which raters assigned identical ratings, out of the total number of overlapping comparisons made). Concordance was .80. Each drawing by a given participant was compared with each of the other three drawings by that

Table 1
Intercorrelations of Dependent Measures

Variable	1	2	3	4	5	6	7
1. Active	—						
2. Personified	-.33***	—					
3. Reaching	.62***	-.26**	—				
4. Big	.56***	-.22**	.39***	—			
5. Complex	.68***	-.31**	.51***	.69***	—		
6. Happy colors	.30**	.06	.09	.19	.24*	—	
7. Global threat	.22*	-.16	.15	.10	.24*	.38***	—

Note. Variables 1 through 6 were the rating dimensions used for between-subject ratings (on participants' first drawings only). Variable 7 was the summed global threat rating used for within-subject germ rankings. (Only the subset of values for first drawings was included in correlations.)

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2
Mean Scores Assigned by Raters on Variables That Differed by Germ Source

Rating	Source							
	Self		Stranger		Lover		Disliked	
	M	SD	M	SD	M	SD	M	SD
Between-subject								
Intensity	.36	.18	-.28	.17	-.26	.17	.20	.16
Angry colors	.00	.21	-.24	.19	-.24	.19	.45	.19
Within-subject								
Global threat	-.54	1.86	-.38	1.64	-.58	1.94	1.46	2.03

Note. Intensity was a composite variable, consisting of the average of activity, size, and complexity. Higher numbers represent more of the attribute being rated. Standardized scores are presented for between-subject ratings. Within-subject ratings represent mean summed rank scores (possible range = -3 to +3).

participant. For each comparison, germs were assigned a -1 if they appeared less threatening than the comparison germ, 0 if the same, and +1 if more threatening. These numbers were then summed for each drawing, reflecting its rank order on threat for a given participant (possible range = -3 to +3). Means (see Table 2) showed disliked person germs to be most threatening by a large margin, and stranger, self, and lover germs to be clustered together. Pairwise difference scores were calculated to represent each contrast (self minus stranger, self minus lover, etc.), and *t* tests were run to determine whether each differed significantly from zero. (A MANOVA could not be done because scores from any three germs determine the fourth, producing a singular matrix.) Self, stranger, and lover germs, although not significantly different from each other, all differed from disliked person germs, which were more threatening in each case: [self-disliked person, $M = -.5, SD = .77, p < .001$; stranger-disliked person, $M = -.54, SD = .74, p < .001$; lover-disliked person, $M = -.47, SD = .82, p < .001$]. Disliked person germs were most threatening for 61% of participants, compared with 18% for lover germs, 12% for self germs, and 9% for stranger germs. Conversely, lover germs were least threatening for 35% of participants, compared with 29% for self germs, 21% for stranger germs, and 15% for disliked person germs.

Discussion

Disliked person germs were indeed most threatening, and lover germs least so. However, stranger germs were not clearly intermediate in threat. It is important to note that no contact was anticipated with the stranger, perhaps making their germs seem irrelevant to participants, hence innocuous. The ambiguity of prediction for self germs was based on their presumptive salience, which might increase threat, versus the innocuousness of their source. In fact, the ranking of self germs differed, depending on the dependent variable. For color tone (between-participant) disliked person germs were worst, stranger and lover germs best, and self germs intermediate but closer to the latter. Similarly, on global threat (within-subject), disliked person germs were again worst, and self, stranger, and lover germs less threatening and similar to each other. On the other

hand, on intensity (between-subject), self germs were highest, most closely resembling disliked person germs. If color tone is taken to reflect threat, and intensity taken as salience, these patterns are consistent with predictions, with self germs salient but not especially threatening. In support of this interpretation, intensity was only weakly related to global threat ($r = .21, p < .05$; nonsignificant with a Bonferroni correction). Color tone was more strongly related ($r = .38, p < .001$).

Study 2

Open-ended drawings have been used by others to explore mental representations of concepts without artificially constraining responses (e.g., Bibace & Walsh, 1979). However, lack of constraint leads to ambiguity regarding just what question participants were answering. An obvious possibility is that drawings reflected not perceived germ virulence, but rather what participants wished on the different sources (e.g., worse germs to an enemy). Study 2 assessed conceptions of germ virulence more directly in an attempt to rule out this explanation of Study 1 effects.

Method

Participants. New participants ($N = 133$) were used in Study 2, drawn from the same population and also romantically involved. Of those who completed the demographic questions, 56% were female, 76% White, 9% Hispanic, 8% Asian, 2.5% Native-American, and 1.5% African-American. Two participants did not complete the second set of ratings, for a final sample of 133 for the first variable and 131 for the second.

Procedure. Participants received a packet of three pages, each with instructions to think of a given person and “Imagine that they have the flu. Now imagine that you are going to spend 1 hour in the same room with him or her, breathing the same air and sharing objects, touching hands briefly but nothing further.” Again, they did not look ahead before completing each page. Each scenario was followed by two questions: (a) Given *only* this amount of contact, how likely are his or her germs to make you sick? (b) If you think you might get sick, how sick do you think you would get? Responses were on a 5-point Likert-type scale, ranging from *not at all likely* to *extremely likely* for the first question and from *minimally sick* to *severely sick* for the second. Sources were “your boyfriend, girlfriend, or spouse” (lover), “an acquaintance that you dislike very much” (dislike), and “a person you don’t know” (stranger). (A “self-germ” condition would not have made sense, given the scenario.) Order of sources was randomized across participants. There were six possible orders of presentation of the three sources.

Results

A 6 (order-between) \times 3 (source-within) repeated measures analysis of variance (ANOVA) on likelihood ratings resulted in a (theoretically uninteresting) main effect of order, $F(5, 87) = 2.81, p = .021$. There was no main effect of source or interaction. An identical ANOVA on severity ratings revealed a marginally significant main effect of source, $F(2, 170) = 2.986, p = .053$, and no main effect of order or interaction. In the absence of the ambiguities raised by a self-germ condition, and given clear occurrence of contact with each source, the magical contagion account predicts a linear trend for the sources included, increasing from lover’s germs, through strang-

Table 3
Mean Scores for Likelihood of Getting Sick and Severity of Sickness, by Source

Source	Ratings	
	<i>M</i>	<i>SD</i>
Likelihood		
Lover	2.57	1.10
Stranger	2.61	.97
Dislike	2.63	1.10
Severity		
Lover	2.30	1.08
Stranger	2.42	1.02
Dislike	2.48	1.12

Note. Ratings were made on a 5-point scale. Higher numbers indicate more perceived risk.

er's, to disliked person's germs. A planned polynomial contrast run to test the linear hypothesis on severity ratings was significant, $F(1, 85) = 5.025, p = .028$, and in the expected direction (see Table 3 for means). Finally, some models of health behavior suggest that perceived likelihood interacts with perceived severity to yield an overall sense of vulnerability. An ANOVA on the product of participants' standardized likelihood ratings multiplied by their standardized severity ratings was not significant.

Discussion

Participants showed no differences in their estimates of how likely they were to contract the flu from various source people but did expect to experience differential illness severity depending on the source of contagion. The linear trend suggests that the results of Study 1 do not simply reflect participants' wishing worse germs on their enemies and nicer ones on their loved ones. The discrepancy between likelihood and severity responses seem consistent with our prior contention that the magical contagion principle is more likely to be operative in affective-experiential rather than cold cognitive processes. Likelihood estimates involve calculation of an odds ratio; the severity question as phrased requires imagining oneself ill and predicting discomfort, danger, or both, a more emotional task.

General Conclusions

These two studies provide preliminary support for the hypothesis that people conceive of germs as differentially threatening, depending on their source. Obviously, a magical contagion explanation is not the only one that can be invoked here. But it does a better job than most alternatives at accounting for the total pattern of findings. Demand characteristics could account for the linear trend on severity but should apply equally to likelihood ratings, and demand cannot account for effects on initial germ drawings. A salience account (wherein more salient germs seem more threatening) similarly fails to explain differential effects on likelihood versus severity, and Study 1 ratings of self-germs and correlations suggest that salience is distinct from threat. Gerrard et al. (1991) showed that optimism increases with a sense of control over relevant behaviors. Participants would likely feel more in control

imagining contact with a loved one than an enemy, because we rarely choose proximity to those we dislike. This could account for the linear trend on severity but not for the lack of effect on likelihood, nor for Study 1 results, where no contact was envisioned. Cost-benefit differences could lead to feeling differentially outraged (and hence bad) at getting sick from their lover versus an enemy, while not believing that likelihood of transmission was any different. This account is not applicable to Study 1 drawings, where no contagious contact was involved. Most difficult to rule out is a simple association account, wherein the feelings associated with sources spill over into both drawings and risk judgments. Magical contagion and association make very similar predictions (Rozin, Millman, & Nemeroff, 1986) and tend to be confounded in the real world. A key distinction is that contact is critical in magical contagion but not association. (Hence association cannot explain why Hitler's worn sweater is worse than a book about his life.) Further work is necessary to firmly rule out a simple associative account of current findings. Once again, though, it is not obvious why such associations would differ across likelihood versus severity ratings.

Blurring one's feelings about the source of germs with estimates of their virulence could lead to inappropriate overconcern about contact with members of socially marginalized groups (e.g., fear of contracting AIDS through casual contact with gay individuals). Similarly, it could lead to inappropriate underconcern about AIDS risk from a trusted person. The extent to which such thinking manifests in behavior remains an empirical question. Rozin (personal communication, 1994) finds substantially more participants indicate aversion to wearing a disliked person's sweater than are actually willing to give up money to avoid doing so. But money has odd properties as a metric, and everyday observation suggests that feelings often prevail. At a general level, these findings point up the inadvisability of assuming that lay thinking about illness is necessarily based on germ theory (see also the work of Pryor and colleagues, e.g., Pryor, Reeder, & Vinacco, 1989, who find avoidance of people with AIDS more linked to symbolic than instrumental concerns). Affective and symbolic antecedents to perceived vulnerability clearly warrant further study.

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