Personality and Individual Differences 53 (2012) 50–54

Contents lists available at SciVerse ScienceDirect

Personality and Individual Differences

journal homepage: www.elsevier.com/locate/paid

The social impact of pathogen threat: How disease salience influences conformity

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ARTICLE INFO

Article history:
Received 29 August 2011
Received in revised form 25 February 2012
Accepted 29 February 2012
Available online 18 March 2012

Keywords:
Pathogen threat
Conformity
Social influence

ABSTRACT

Our human ancestors learned to use morphological deviations from the normal population to identify conspecific pathogen carriers and developed group normative practices in fighting local diseases. Modern conformity is still driven in part by disease avoidance. In this study, we tested the association between pathogen threat and conformity in three studies. A survey of 164 college students revealed that perceived vulnerability to disease uniquely predicted conformity tendencies. Results from the next two experiments showed that, in comparison to the control groups, participants primed by pathogen threat conformed more to majority views when evaluating abstract art drawings and rated themselves as more conforming on a questionnaire. There appears to be an evolved pathogen-avoidance mechanism that includes not only out-group avoidance strategies as have been found by other researchers, but also in-group approach strategies such as conformity.

1. Introduction

Pathogens and parasites constitute strong selection pressures under which different physical and behavioral immune adaptations have evolved. Because pathogens are imperceptible to the naked eye, the behavioral immune system works by warding off potential disease connoting cues (Schaller & Duncan, 2007), especially when carried by out-group members because the human physical immune system is particularly vulnerable to out-group germs in comparison to those shared by people living together (Fincher & Thornhill, 2008). Previous research has revealed pathogen effects on attitudes toward different out-group behaviors. For example, xenophobic attitudes were found to respond to disease salience manipulations (Faulkner, Schaller, Park, & Duncan, 2004). Pregnant women evinced greater preference for patriotic in-group members, and greater dislike of outgroup members critical of the in-group, during the first trimester when most vulnerable to infectious diseases (Navarrete, Fessler, & Eng, 2007), and pregnant white women were more wary about black than white male strangers (Navarrete, Fessler, Fleischman, & Geyer, 2009).

Extending the existing research on out-group behaviors, we examined conformity as an in-group behavior in response to pathogen salience. There are several theoretical bases by which pathogens affect conformity. First, because perceptual cues are usually imperfectly correlated with actual infections, the human behavioral system responding to these cues is characterized as hypersensitive and over-general (Schaller & Park, 2011). Thus, many superficial deviations in body morphology are used as cues in registering pathogen presence (Schaller & Duncan, 2007). For example, individuals tend to be particularly sensitive to and disturbed by bodily abnormalities such as deformity and amputation (Haidt, McCauley, & Rozin, 1994). They tend to dissociate themselves from such norm-deviating individuals as the disabled (Park, Faulkner, & Schaller, 2003), obese (Park, Schaller, & Crandall, 2007), and the elderly (Duncan & Schaller, 2009). Conformity by adhering to the norm and clearing away from body deviations may have in part been a response to potential pathogen threats (Fincher, Thornhill, Murray, & Schaller, 2008). Similarly, pathogen sensitivity may drive conformity to behavioral norms, especially among people of high infectious risk. The patient care profession emphasizes a normalizing process by creating structured and regimented behavioral routines to facilitate treatment and recovery (Denham, 2003) because patients are more conforming as compared to healthy individuals (Denham, 2003; Lorber, 1975).

Second, selective sociality including in-group-out-group differentiation may be an adaptive response to pathogen threat. Common germs shared by in-group members are normally less deadly than foreign germs carried by out-group members, promoting in-group affiliation and out-group exclusion. Adhering to local pathogen control strategies in food preparation (Sherman & Billing, 1999) and herbal pharmacology (Gillespie, 1997) further promotes in-group conformity and affiliation. Food and health related practices represent among the strongest norms that help define the culture of a region. The fact that people are more conforming when they are sick than when they are well (Lorber, 1975) further supports the prevailing effect of pathogens on conformity across domains. Other evidence shows that enhanced in-group favoritism and out-group hostility may vary as a function of perceived pathogen threat (Navarrete & Fessler, 2006). Ethnocentrism peaks

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http://dx.doi.org/10.1016/j.paid.2012.02.023

among pregnant women during the first trimester when pathogen threat to the fetus is the highest (Navarrete et al., 2007). Experimentally induced pathogen salience is associated with self-reported introversion and behavioral inhibition (Mortensen, Vaughn Becker, Ackerman, Neuberg, & Kenrick, 2010). In-group conformity has also been theorized as helping to acquire group support and resources to fight disease (Navarrete, Kurzban, Fessler, & Kirkpatrick, 2004). Pathogen threat should have the additional promoting effect on conformity if those who conform to group norms are more likely to be helped and saved by in-group members. Consistent with this hypothesis is evidence that ethnocentrism increases with enhanced pathogen threat among both ordinary people (Navarrete & Fessler, 2006) and pregnant women (Navarrete et al., 2007).

Third, in a larger theoretical framework, dealing with germs and diseases relies more on social than individual learning (Boyd & Richerson, 1985) because the cost of trial and error (i.e., individual learning) is high or fatal (Chang et al., 2011). One of the two major characteristics defining social learning is the conformist model which is to copy the majority (Boyd & Richerson, 1985). Within this model, conformity is viewed as a personality covariate that tends to be activated by and in turn facilitates social learning (Henrich & Boyd, 1998; Mesoudi, 2009) so that, where social learning is practiced, the population should show high rather than low levels of conformity that should also spread across domains (Chang et al., 2011; Mesoudi, 2009). Indirect support for this theorizing is found in existing research showing increased conformity as a function of threat-connoting cues signaling high costs of non-conforming options. For instance, self-imagined threatening scenarios have been found to increase conformity in evaluating abstract art drawings (Renkema, Stapel, & Van Yperén, 2008).

The aforementioned multiple lines of evidence suggest that conformity may function to minimize disease contagion and infection risk. Recent studies support the hypothesized link between pathogen threat and conformity. Schaller and Murray (2008) found correlations between historical pathogen prevalence and personality traits pertaining to conformity. Participants from countries of high historical pathogen prevalence tended to report lower mean scores on openness and extraversion which were negatively correlated with conformity. Other researchers showed that people from collectivistic countries tend to conform more than those from individualistic countries (see Bond & Smith, 1996 for reviews). Pathogen threat may explain these cross-country differences both in conformity and in individualism-collectivism because most collectivistic countries have higher pathogen prevalence than individualistic countries (Fincher et al., 2008; Murray & Schaller, 2010). Murray, Trudeau, and Schaller (2011) showed further that a historical pathogen index was a stronger predictor of conformity than the contemporary index, and concluded that pathogen threat might have caused conformity rather than the other way around.

However, these cross-country studies support only group-level inferences. For any collective phenomenon to exist there must be an individually selected mechanism that makes organisms behave similarly to give rise to the phenomenon. We conducted three studies on the individual level to provide more direct support for the association between pathogen threat and conformity. Study 1 used a questionnaire measure of conformity and examined its association with germ wariness and perceived infectability measured by the perceived vulnerability to disease scale (Duncan, Schaller, & Park, 2009). In the next two studies, we induced pathogen threat by exposing participants to disease relevant stimuli to examine their effects on conformity in evaluating abstract art drawings (Study 2) and in reporting self-perceived conformity (Study 3).

2. Study 1

2.1. Material and methods

2.1.2. Participants

One hundred sixty-four undergraduate students from a university in southern China (Mean age = 20.26, SD = 1.61; 116 female) completed questionnaires in exchange for pay.

2.1.3. Perceived vulnerability to disease

The scale (PVD, Duncan et al., 2009) was used to measure two subscales, germ wariness (e.g., I am very susceptible to colds, flu and other infectious diseases) and perceived infectability (e.g., It bothers me when people sneeze without covering their mouths). Their reliability estimates were .55 and .72. We also used PVD as a single scale ($\alpha = .73$).

2.1.4. Conformity

It was measured by the 13-item attention to social comparison information measure (Lennox & Wolfe, 1984), measuring conformity in different situations (e.g., I actively avoid wearing clothes that are not in style; $\alpha = .70$).

2.1.5. Intolerance of uncertainty

The intolerance of uncertainty scale (Buhr & Dugas, 2002) consists of 27 items rated on a 6-point scale (e.g., When I am uncertain, I can not go forward; $\alpha = .92$).

2.2. Results and discussion

The correlation between PVD and conformity was significant ($r = .30$, $p < .001$) and the correlations between the two PVD subscales, germ wariness and perceived infectability, and conformity were equal ($rs = .23$, $ps = .003$; $r = .38$ between the two subscales). We also conducted multiple regressions by including PVD together with the control variable, intolerance for uncertainty, as predictors of conformity. PVD emerged as a robust predictor of conformity ($\beta = .22$, $p = .004$). Intolerance for uncertainty was also significant ($\beta = .26$, $p = .001$). We also used the two subscales of PVD, germ weariness and perceived infectability, as predictors. They were both statistically significant (perceived infectability $\beta = .17$, $p = .038$; germ wariness $\beta = .17$, $p = .041$) but became marginally or non-significant after the control variable was entered into the equation (intolerance for uncertainty $\beta = .26$, $p = .001$). The results support the association between pathogen threat perception and conformity at the individual level. We next report an experiment where pathogen threat was manipulated to examine its causal effect on conformity.

3. Study 2

3.1. Material and methods

3.1.1. Participants

The participants were 83 high school students (48 female) from southern China with an average age of 16.50 years ($SD = .55$). Informed consent was obtained from the parents of the participants. In a between-subject design, the participants were assigned to one of three conditions – pathogen, accident, or building.

3.1.2. Manipulation of pathogen threat

Participants were individually tested. Upon arrival at the laboratory, participants were asked to complete two unrelated tasks. In the first task, participants watched a slide show of 10 images

on a computer either depicting pathogen (e.g., maggots, gory wounds), accident (e.g., car accidents, derailed trains that do not contain blood or wounds), or buildings. Each image displayed for four seconds during which participants were asked to watch closely in order to answer questions about them.

3.1.3. Conformity

After the slide show, each participant was asked to complete the second task, which, adopted from Renkema et al. (2008), was to rate 30 modern art drawings on a 10-point scale ranging from 1 = "dislike very much" to 10 = "like very much." Every drawing carried a bogus likeability rating. The participants were told that this rating was the average likeability from ratings given by other students like the participants. Conformity was measured by the absolute score difference (ASD) between a participant's rating and the bogus average likeability rating so that a lower ASD score indicates higher conformity. The fictitious average likeability ratings were evenly distributed among three score ranges – high, medium, and low, with 10 drawings falling into each score range. This range was included in subsequent analyses to explore the possibility that ASD (i.e., conformity) might differ depending on whether a perceived majority rating was in the high or low score range.

3.1.4. Affect measures

At the end of the experiment, each participant answered three questions about their mood state on a 10-point scale (Smith, Hogg, Martin, & Terry, 2007). Scores on these questions were averaged to form the mood state index ($\alpha = .90$). Participants also indicated on a 10-point scale the extent to which they felt "uneasy," "anxious," "worried," "grossed out," "disgusted," and "nauseated." Scores on the first three items were averaged into the anxiety index ($\alpha = .81$) and the rest were averaged to form a disgust index ($\alpha = .85$).

3.2. Results and discussion

3.2.1. Manipulation check

Participants under the pathogen and accident conditions were predicted to report more negative mood and anxiety than the building condition, and participants under the pathogen condition were hypothesized to experience more disgust than the other two conditions. Results primarily supported the manipulation. Participants under the pathogen ($M = 4.33$, SD = 2.29) and accident conditions ($M = 5.27$, SD = 1.82) reported more negative mood state than those under the building condition ($M = 6.62$, SD = 1.85; $F(2,80) = 8.72$, $p < .001$). They reported more anxiety under the pathogen ($M = 5.60$, SD = 2.37) and accident ($M = 4.46$, SD = 2.13) rather than the building condition ($M = 2.74$, SD = 1.50; $F(2,80) = 13.12$, $p < .001$). As predicted, participants under the pathogen condition ($M = 6.86$, SD = 2.21) reported more disgust than both accident ($M = 4.20$, SD = 2.17; $t(55) = 4.59$, $p < .001$) and building conditions ($M = 3.01$, SD = 1.13; $t(51) = 8.04$, $p < .001$). Participants under pathogen and accident conditions did not report significantly different mood ($t(55) = 1.71$, $p = .09$) or anxiety ($t(55) = 1.93$, $p = .06$).

3.2.2. Pathogen threat on conformity

A 3 (prime: pathogen, accident, building, manipulated between participants) × 3 (art rating: high, middle, low, within participants) × 2 (gender) mixed ANOVA showed a significant main effect of art ratings ($F(2,77) = 29.77$, $p < .001$, $\eta^2 = .28$) and a significant main effect of priming ($F(2,77) = 5.03$, $p = .009$, $\eta^2 = .12$). There was no significant interaction between art ratings and priming ($F(2,77) = .83$, $p = .44$). There were no gender related effects. Participants showed higher conformity (smaller ASD score) under the pathogen ($M = 2.03$, SD = .56) than the accident condition ($M = 2.35$, SD = .50; $t(80) = 2.14$, $p = .035$; Cohen's $d = .58$) or the building condition ($M = 2.40$, SD = .62; $t(80) = 2.41$, $p = .018$; Cohen's $d = .64$). When ANCOVA was conducted with mood state, anxiety, and disgust as covariates, results were similar, yielding a significant main effect due to pathogen priming ($F(2,74) = 4.78$, $p = .011$, $\eta^2 = .11$).

These results support the hypothesis that compared to the two control conditions, induced pathogen threat led to higher conformity. This is among the first empirical studies to demonstrate a conformity-enhancing effect of contextually elicited pathogen threat. However, the abstract feature of art drawings may have influenced the tendency to conform. Previous studies have shown that unfamiliar and difficult tasks make people conform to majority views more easily than familiar or personal issues (Bond & Smith, 1996; Cialdini & Trost, 1998). In the next experiment, we examined conformity constructed by questionnaire measures of personal beliefs and self-evaluations.

4. Study 3

4.1. Methods

4.1.1. Participants, design, and procedure

Sixty students (average age = 16.58, SD = .74; 44 females) from a high school in southern China participated in this study. Participants were given small gifts for their participation. Informed consent was obtained from the parents. The participants were randomly assigned to one of two conditions with 34 participants under the pathogen-relevant and 26 under the pathogen-irrelevant threat condition. Upon entering the laboratory, participants under the pathogen-relevant condition watched two minutes of film clips containing selected disease-relevant scenes from the movie, *Outbreak*. The sound track was silenced in these clips. Brief Chinese subtitles highlighting disease and pandemic threat appeared on the bottom of the screen. Under the pathogen-irrelevant threat condition, participants watched two minutes of danger-relevant scenes without sound and with brief subtitles highlighting danger. The scene depicting persons and things falling into deep cracks created by massive earthquakes were selected from the movie, *The Day After Tomorrow*. After they viewed the clips, participants responded to conformity and mood assessment questions.

4.1.2. Measurement

The conformity scale (Mehrabian & Stefl, 1995) consists of 10 questions measuring conformity experiences in different situations (e.g., "My friends will be the ones who decide what we do together") on a 10-point scale. We revised some of the items by deleting words such as 'often' and 'usually' in an effort to gear participants' response to the present moment. The 10 items yielded an internal consistency reliability of .50. Two items ("change my opinion in a heated argument" and "make my own way in life") primarily responsible for the low reliability were deleted, and the final reliability was .60. There were no statistical differences on these two items between the two conditions and the results were slightly stronger in favor of our hypothesis with these two items included. Mood states were obtained using the same measures reported in Study 2. The reliability estimates were .92 for negative mood, .90 for anxiety, and .90 for disgust.

4.2. Results and discussion

4.2.1. Manipulation check

The manipulation check supported our expectations for the most part. Participants reported more disgust under the pathogen

(M = 5.20, SD = 2.67) than the danger condition (M = 2.45, SD = 1.38; $t(58) = 5.17$, $p < .001$). Participants reported similar levels of anxiety under the pathogen (M = 5.74, SD = 2.47) and the danger condition (M = 4.78, SD = 2.80; $t(58) = 1.39$, $p = .17$). However, participants experienced lower or more negative mood state under the pathogen (M = 3.73, SD = 1.93) than danger condition (M = 5.60, SD = 1.90; $t(58) = 3.75$, $p < .001$).

4.2.2. Pathogen threat on conformity

A 2 (pathogen-relevant vs. pathogen-irrelevant threat) × 2 (gender) ANOVA yielded no significant main effect due to gender ($F(1,56) = 2.51$, $p = .12$) or the interaction effect between gender and priming conditions ($F(1,56) = .01$, $p = .92$). The only significant effect was that of the priming conditions ($F(1,56) = 4.93$, $p = .03$, $\eta^2 = .08$). Under the pathogen condition, self-reported conformity was higher (M = 5.72, SD = 1.02) than under the danger condition (M = 5.13, SD = 1.15; $t(58) = 2.08$, $p = .042$; $d = .54$). To rule out the potential confounding due to different mood state, ANCOVA was conducted with mood state, anxiety, and disgust as the covariates .Similar results were obtained where only the main effect of priming was significant ($F(1,54) = 4.32$, $p = .04$, $\eta^2 = .07$). These results replicate the conformity enhancing effect of pathogen threat. It seems that pathogen threat not only triggers more conformity in specific tasks but also leads people to evaluate themselves as being more easily influenced by others.

5. General discussion

Questionnaire measures of chronic concerns for disease contagion were positively correlated with conformity while controlling for other questionnaire measures of tolerance for uncertainty. Experimentally manipulated disease salience, as compared to other pathogen-irrelevant threats, made people conform to majority views either in evaluating abstract art drawings or in responding to a questionnaire measure of conformity. These results support the association between experienced pathogen threat and conformity at the individual level. Conformity may have evolved in part to protect humans from disease contagion (Fincher et al., 2008) in addition to serving other functions such as facilitating social learning (Chang et al., 2011). Although pathogens are invisible, the effects of pathogens are often visible. The human behavioral immune system works by responding to abnormal appearances and deviant behaviors for this reason. There may be two kinds of responses aimed at discriminating and avoiding abnormal morphology and deviant behavior on the one hand, and at conforming to the norm in terms of both behavior and morphology, on the other hand. The first, discriminating response relates mainly to out-groups who are likely to carry foreign germs more threatening to human physical immunity. The second, conforming response represents pathogen-intensified human desire and efforts to seek within-group cohesion because in-group members are less likely than out-group members to harbor dangerous germs, and because in-group members are more likely to provide timely and necessary help when people are infected by diseases (Navarrete & Fessler, 2006). Existing research focuses on selective sociality including social behavior and attitudes as pathogen defenses against out-group members (Faulkner et al., 2004; Park et al., 2007). Other researchers have examined conformity as an in-group behavioral defense against pathogens at the country level (Murray et al., 2011). The present study is among the first to present additional evidence on the individual level supporting the anti-disease account of conformity.

Having to deal with pathogens exerts selection pressure to favor conforming behavior and personality. According to Boyd and Richerson (1985), when the potential costs of making errors or failing to find solutions are high, organisms adopt the conformist model by preferentially copying the most widely accepted models or solutions to a problem. The high cost of pathogens should favor the conformist model by copying the majority rather than trying and erring with potentially fatal consequences. The process of social and individual learning, in turn, is expected to activate (and be aided by) personality attributes (Chang et al., 2011; Mesoudi, 2009). When social learning or copying is deemed adaptive, natural selection should favor such personality attributes as conformity, compliance, and gullibility which would become active in the population. This evolutionary account of conformity is also consistent with the "mainstream" social psychological explanation that conformity serves to acquire solutions especially to solve difficult problems (Cialdini & Trost, 1998).

Our studies were based on participants from China. Although the use of Asian participants was out of convenience, the sample selection may provide additional insight into the potential effects of pathogen threat on social behaviors. Most Asian countries occupy lower latitude (18°N to 45°N) and, according to both historical and contemporary pathogen indexes (Fincher et al., 2008; Murray & Schaller, 2010), have a much higher pathogen load (close to 1SD higher) in comparison to Europe and North America. Cross-cultural studies consistently find Asians to be more conforming than other cultural and racial groups (Bond & Smith, 1996). During the recent worldwide outbreak of swine flu, Asians were more reactive to this infectious disease compared with their western counterparts (Hamamura & Park, 2010). Others reach similar conclusions by showing Asians to be more concerned about disease contagion than other groups (Duncan et al., 2009). These studies provide indirect support to our hypothesis and suggest that, if there is an individually selected association between pathogen threat and such social behaviors as conformity, it should be evident especially among Asian participants.

There are several limitations of this study. First, we used only opinion tasks but did not use objective tasks to assess conformity. Even though objective or perceptual tasks have been found to induce conformity more readily than subjective tasks (Cialdini & Trost, 1998), using both types of conformity assessment should strengthen generalizability of our findings. Second, studies by Renkema et al. (2008) have shown that, when mortality is made salient, participants tend to conform to the mainstream views on similar assessment tasks as those used in the present study. However, mortality may be salient in both disease and accident/danger conditions, thus conformity difference between the two conditions should not be predicted or explained entirely by terror management theory (Greenberg, Solomon, & Pyszczynski, 1997). Future studies can explicitly measure death anxiety to rule out any potential confounding as predicted by terror management theory. Third, we compared pathogen threat against non-pathogen threat such as traffic accidents in Study 2. Pathogenic stimuli represent the evolutionarily old, whereas car accidents are evolutionarily novel. Although we used falling scenes in Study 3 which is evolutionarily old, there were other evolutionarily novel events in the vicinity of these scenes. Future studies may improve the manipulation of these control conditions to make them more comparable with the pathogen manipulation. Finally, compared to the control conditions, mood state under the pathogen condition was statistically lower in Experiment 3 and, although not statistically significant, was also lower in magnitude in Experiment 2. This difference in mood state represents potential confounding. However, ANCOVA controlling for this difference yielded the same results supportive of our hypothesis. Despite these limitations, this is among the first studies to test pathogenic influence on conformity at the individual level. Both chronically perceived and temporally primed pathogen threats have now been found to predict individual conformity.

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