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The bright side of the COVID-19 pandemic: Public coughing weakens the overconfidence bias in non-health domains

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1. Introduction

The world is now confronted with an unprecedented global health threat. The ongoing COVID-19 pandemic had a substantial impact on individuals’ well-being and on the world’s economy. For instance, Patrick et al. (2020) found that parents in the United States reported both deterioration in psychiatric health for themselves and in behavioral health for their children as the coronavirus disease was continuing its spread across the country. Additionally, Fernandes (2020) provided evidence that a global recession seems almost inevitable and the economic costs of a recession might be extremely high in some countries and industries (e.g., tourism) due to the coronavirus outbreak. While much previous research has focused on the dark side of the COVID-19 pandemic, including a devastating human toll and a new set of challenges to almost every aspect of life, the present work investigates whether the coronavirus crisis also possesses a bright side. Across two field experiments, we show that exposure to public coughing in times of the COVID-19 pandemic can weaken individuals’ overconfidence bias in two unrelated domains, namely, self-evaluation in job hunting (Experiment 1) and in general knowledge tests (Experiment 2).

One well-established phenomenon in behavioral decision making and judgment is the overconfidence bias (Alicke et al., 1995; Lichtenstein et al., 1982). Overconfidence refers to an egoistic belief in which people’s subjective confidence in judgments and knowledge is reliably higher than their objectively reasonable performance and abilities (Ručević et al., 2020; Yates, 2010). The vast majority of individuals, regardless of their ages, genders, races, and cultural backgrounds, demonstrate different degrees of overconfidence in many areas of professional and non-professional life, including public health (Harris et al., 2008; Niu, 2010). For instance, Monzani et al. (2020) found that individuals displaying a high degree of overoptimism, one type of overconfidence, tended to underestimate the risk of the COVID-19 pandemic and thus showed less compliance with preventive measures.

Although this heuristic of overconfidence is one of the most consistent and robust biases reported in the literature, much evidence suggests that a wide range of methods including argument recruitment customs (Yates et al., 1997), thinking styles (Li et al., 2011), and language experiences (Li & Shen, 2020) can significantly reduce people’s overconfidence bias. For example, Li and Shen (2020) found that both monomodal (e.g., Chinese-English learners) and bimodal bilinguals (Chinese-Chinese Sign Language learners) exhibited overconfidence to a lesser degree than monolinguals, which suggests a negative relationship...
between bilingualism and overconfidence biases. In this paper, we investigated whether exposure to public sneezing, an underexplored factor, would counteract people’s overconfidence and nudge them to make rational decisions.

Existing research has shown that one salient health hazard can lead to a heightened perception of risk posed by other totally unrelated hazards (Johnson & Tversky, 1983; Lee et al., 2020). To test the possibility that everyday behaviors like sneezing in times of a flu pandemic may increase perception of unrelated risks, Lee et al. (2010) stationed a confederate on campus and asked her to simulate real-life experience by sneezing and coughing. The experimenter then instructed participants to complete a survey regarding the risk of contracting a heart attack or dying from a crime or accident. The results showed that participants, who were exposed to a sneezing person, estimated a higher likelihood of getting the serious disease or dying in an accident than did those in the control condition, even if these health concerns cannot possibly be directly linked to the flu pandemic. Such findings suggest that humans tend to rely on current feelings to assess risk, which allows emotion profiles associated with one threat to increase one’s perceived risk of other unrelated threats (Loewenstein et al., 2001; Schwarz & Clore, 2007).

We propose that over and above these possible psychological consequences, health threats also entail cognitive benefits. More specifically, we conjecture that exposure to signals related to the COVID-19 should enable people to diminish overconfidence in their judgments and decision-making in unrelated domains. Why might be the case? According to risk compensation theory, humans adjust their behaviors to dealing with different types of risks and to achieve maximum fitness benefits (Maxin et al., 2016; Wilde, 1982). On the one hand, people will act more carefully when they discern a high level of risk for damage. For example, since Sweden switched from driving on the left-hand side of the road to the right-hand side in 1967, there were fewer car accidents and serious injuries. This possibly because changing sides posed an apparent risk on drivers (Adams, 1985). The increased degree of uncertainty caused them to show greater compliance with traffic laws and to use extra caution when driving (Rudin-Brown & Jamson, 2013).

On the other hand, risk compensation can also be understood as the fact that people will engage more reckless and thrill-seeking behaviors when they feel less risk. For instance, Dellono et al. (2017) found that religious priming related to a forgiving God can significantly increase participants’ likelihood of committing unethical behavior (e.g., stealing more money). This pattern of results showed that individuals may act incautiously when they feel protected even in a high-risk setting. Thus, risk compensation theory provides an evolutionary framework which explores the trade-offs between behavioral adjustment and perceived levels of risk.

The global media reports frequent updates about COVID-19 epidemiological situation and official cases of infection, death counts, and transmission classifications. Since the pandemic has heightened health concerns, coughing, a common symptom of coronavirus infection, may serve as a reminder to the high risk of the COVID-19 disease. According to risk compensation theory, humans become more cautious when they are at high risk and less cautious when at low risk. As shown above, this heightened perception of the risk can even generalize across domains (Johnson & Tversky, 1983). If this is the case, we would expect to see that a salient health threat (e.g., public coughing) in the context of COVID-19 would contribute to individuals’ tendency to exhibit less confidence even in non-health domains.

We presented two filed experiments, which modeled after Lee et al. (2010), to test our hypothesis. Experiment 1 directly tested the prediction that public coughing would significantly weaken the strength of overconfidence bias in the peer-comparison problem about self-evaluation in getting a job among Chinese university students. Experiment 2 used an alternative measure of overconfidence to test the same prediction in a non-student sample. Overall, we hope to provide converging evidence to support the hypothesis that exposure to a salient health threat leads to a weaker overconfidence bias in different domains which are unrelated to the COVID-19 pandemic. Since one well-established finding in the literature is that men exhibited a higher level of overconfidence than women (Bengtsson et al., 2005), we also expected to replicate sex differences for the overconfidence in both studies.

2. Experiment 1

2.1. Method

2.1.1. Participants

The sample size was based on the number of subjects who were willing to participated in the experiment. A total of 182 undergraduate students (92 females, mean age = 19.1, SD = 1.9) voluntarily participated in the study. They received payment as compensation for time and burdens associated with research participation.

2.1.2. Materials and procedure

Participants were approached individually in public areas on campus while walking by a confederate who did (experimental condition) or did not (control condition) cough loudly. Then, a trained research assistant greeted each person and asked if they would be willing to help with her class project by completing a one-page self-administered questionnaire. 94 (48 females) completed the short survey in the coughing condition and 88 (44 females) completed the same survey in the control condition.

In this pen-and-pencil testing, participants read and respond questions in writing. Following informed consent, participants answered questions concerning demographical characteristics (e.g., age, gender, and native language). Next, they were instructed to provide a response to one experimental question: the peer-comparison problem. It is one of the best replicable paradigms gauging people’s overconfidence bias in Chinese populations as shown in many published studies (Li & Shen, 2020). A Chinese version of the peer-comparison problem, which was adapted from Li et al. (2006), appears as follows:

Imagine that there is a random sample of 100 university undergraduates who are of the same gender as you and entered the university the same year you did. Assume that you are one of those 100 students. Suppose all 100 students in the sample are ranked by the date they get a job. What is your best estimate of the number of students in the sample (0–99) who gets hired earlier than you?

2.2. Results and discussion

Participants were asked about the true purpose of the short survey. Participants’ debriefing reports revealed no conscious awareness of the relationship between coughing and overconfidence. According to Lee et al. (1995), if respondents on average were neither overconfident nor underconfident, their average position estimate among 100 peers should be at the middle point (the 50th). A specific score is greater than the 50th. A Chinese version of the peer-comparison problem, which was adapted from Li et al. (2006), appears as follows:

| Table 1 | Descriptive statistics for all variables: Effects of exposure to a public coughing on overconfidence bias in the peer-comparison problem and sex differences in Experiment 1. |
|---------|-----------------------------------------------------------------------------------------------------------|
|         |                                                                                                           |
|         | Men                                                        | Women                                                               |
| Coughing condition | 0.07(0.15)        | -0.01(0.19)            |
| Control condition  | 0.15(0.17)        | 0.09(0.12)             |
hired before the participant represents greater overconfidence, and a larger number with less overconfidence. Table 1 summarizes the descriptive statistics for all variables. A 2 (Condition: coughing and control) by 2 (Gender: Male and Female) ANOVA revealed that a main effect of the coughing manipulation was significant, \( F(1, 180) = 14.18, p < .001, \eta^2_p = 0.07 \). Concretely, in comparison to participants in the control condition (\( M = 0.12, SD = 0.15 \)), participants who had just walked by a coughing confederate (\( M = 0.03, SD = 0.17 \)) estimated that more people would get a job before them. The main effect of gender was also significant, \( F(1, 180) = 8.68, p = .004, \eta^2_p = 0.05 \). This pattern of results suggests that male participants (\( M = 0.11, SD = 0.17 \)) in both coughing and control conditions showed greater overconfidence than their female counterparts (\( M = 0.04, SD = 0.16 \)), respectively. However, there was no interaction between Condition and Gender, \( F < 1 \).

These findings offer an initial demonstration that individuals indeed evidenced a lower level of overconfidence if they were exposed a salient health threat related to COVID-19. To further substantiate these findings, we conducted a second field experiment in which we used a non-student sample and a different measure of overconfidence bias, namely, the general knowledge test.

3. Experiment 2

3.1. Method

3.1.1. Participants

The sample size was based on the number of subjects who were willing to participated in the experiment. A total of 168 non-student (88 females, mean age = 40.3, \( SD = 14.1 \)) voluntarily participated in the experiment. They received payment as compensation for time and burdens associated with research participation.

3.1.2. Materials and procedure

Participants were approached individually in shopping centers. Coughing was manipulated after they agreed to participate in the brief survey allegedly conducted for a class project about general knowledge tests. In the experimental condition, with the booklets that contained the general knowledge test in his right hand, the trained confederate coughed three times into his upper sleeve before handing the questionnaire over to respondents in the coughing condition (\( n = 84, 42 \) females); in the control condition (\( n = 84, 46 \) females), the same confederate did not cough.

In this pen-and-pencil testing, participants read and respond questions in writing. After providing their demographic information (e.g., age, gender, and native language), participants were asked to complete a general knowledge test measuring their overconfidence bias, which was adapted from Lichtenstein et al. (1982). It consisted of twenty general knowledge questions such as ‘Which of historical event happened first (e.g., Wu Cheng'\textquotesingle en wrote Journey to the West vs. Cao Xueqin wrote Dream of the Red Chamber)?’ First, participants were asked to choose between the two alternatives which they thought correct. They then estimated a probability that their choices are indeed correct. For instance, if a respondent answered half of the questions correctly (the proportion correct, PC), whereas the average probability judgment (AJ) of that person was 65%. Thus, the respondent demonstrated overconfidence in the correctness of the choices than his or her actual performance. The overconfidence bias can be calculated as: \( AJ(65\%) – PC(50\%) = \text{Bias} \) (15%). This general knowledge test has been used extensively to explore the strength of overconfidence bias across many cultures (e.g., Lichtenstein et al., 1982; Yates et al., 1997).

3.2. Results and discussion

Participants were asked about the true purpose of the short survey. Participants’ debriefing reports revealed no conscious awareness of the relationship between coughing and overconfidence. Table 2 summarizes the descriptive statistics for all variables. A 2 (Condition: coughing and control) by 2 (Gender: Male and Female) ANOVA revealed that a main effect of the coughing manipulation was significant, \( F(1, 166) = 9.37, p = .003, \eta^2_p = 0.05 \). Concretely, in comparison to participants in the control condition (\( M = 0.11, SD = 0.12 \)), participants who had just walked by a coughing confederate (\( M = 0.06, SD = 0.10 \)) estimated that more people would get a job before them. The main effect of gender was also significant, \( F(1, 166) = 17.34, p < .001, \eta^2_p = 0.10 \). This pattern of results suggests that male participants (\( M = 0.12, SD = 0.09 \)) in both coughing and control conditions showed greater overconfidence than their female counterparts (\( M = 0.05, SD = 0.13 \)), respectively. However, there was no interaction between Condition and Gender, \( F < 1 \).

These findings provided further evidence that the activation of a salient health threat related to the COVID-19 pandemic prior to a task gauging people’s overconfidence bias can significantly boost their overconfidence in a domain that has no apparent relationship with the coronavirus disease. In addition, we also replicated sex differences for the overconfidence bias in a non-student sample.

4. Discussion

Since the beginning of the COVID-19 pandemic, a growing body of empirical research has revealed the negative impact of novel coronavirus on people’s physical and mental health. In contrast, the current inquiry identified an important bright side: reduce the overconfidence bias. Our aim in the present research was to investigate the effect of everyday behaviors like coughing in times of COVID-19 on individuals' overconfidence bias in non-health domains. In Experiment 1, we found that student participants passed a confederate who cough loudly displayed a lower level of overconfidence in the peer-comparison problem regarding self-evaluation in getting a job than did participants in the control condition. In Experiment 2, we replicated and extended these findings in two important ways. First, we used a more representative population to minimize the influence of sample characteristics. Second, we administered an alternative measure of overconfidence bias to exclude the possibility that the findings of Experiment 1 merely arise from idiosyncrasies in the specific measures employed. Moreover, across two experiments, we replicated prior findings that men scored higher than women in overconfidence.

Previous research indicated that exposure to a salient and enormous health threat can exert predictable influence on people’s perceptions of risk and fearfulness about virus and many other unrelated things (Lee et al., 2020). In other words, these signals (e.g., public sneezing and coughing) can transform and overgeneralize risk perception and health concerns into unrelated domains such as federal spending (Lee et al., 2010). Based on risk compensation theory, individuals will become more careful and shun overconfidence in response to a higher likelihood of acquiring the infection (Wilde, 1982). Thus, risk overgeneralization triggered by disease salience may in turn counteract overconfidence unrelated to the COVID-19 pandemic.

Importantly, we recognize that the high salience of disease might not be the only possible mechanism explaining the effect of health threat on overconfidence. The COVID-19 is a new disease with multiple faces. The unfamiliarity of the threat may also heighten peoples’ risk perception and overconfidence bias (Alter & Oppenheimer, 2006). For instance, Song and Schwarz (2009) showed that the perceived health hazards of ostensible food additives were rated as higher when they had a relatively
hard-to-pronounce name with respect to a relatively easy-to-pronounce name. In addition, the researcher identified that the perceived novelty of the substance mediates the effects. Thus, when individuals experience an unfamiliar health threat, their overall fearfulness about virus may increase, which may make them more prone to avoiding overconfidence. These different mediation mechanisms warrant future investigation.

In the past few decades, much research has shown that numerous methods including mastering two languages (Li and Shen, 2020), recruiting more arguments (Yates, 2010), and anticipating a group discussion (Arkes et al., 1987) can induce a reduction of overconfidence bias. However, these methods usually need a long implementation period (e.g., language and critical thinking skills training), which may limit their use in real-life contexts. The current investigation highlights the role of the ongoing COVID-19 pandemic especially its value of salience in reducing the overconfidence bias. Compared to aforementioned methods, a salient disease threat is a more feasible and convenient tool to counteract overconfidence. Thus, the present findings have important practical implication for health officials and policymakers. As some countries (e.g., China) have made significant progress in controlling the pandemic, people may show overconfidence in underestimating their likelihood of being infected and relax their COVID-19 vigilance. Our research indicated that highlighting the magnitude of enormous risk from coronavirus is an important way to reduce the overconfidence bias even in domains unrelated to the pandemic.

We acknowledge that the present research has some limitations, which offer promising avenues for future research. To start, one limitation is associated with the use of self-report data which can be distorted by error in the retrieval processes relates to social desirability bias. Thus, such data does not allow us to determine whether participants’ overconfidence bias in actual performance matched their responses under hypothetical conditions. However, some research has shown that individuals’ overconfidence bias in hypothetical judgment can truly reflect their actual bias in real-life behavior, providing evidence for the validity of the peer-comparison problem (Bi et al., 2013).

Future research employing different research methodologies, designs, and paradigms to examine overconfidence would be valuable.

A second potential limitation relates to the sample used in our studies. Although participants in the present research were culturally, politically, and economically distinct from WEIRD (Western, Educated, Industrial, Rich, and Democratic) populations in a majority of studies (Henrich et al., 2010), it is important to be cautious in extrapolating these results to other populations. Our findings may not generalize outside of China since different cultures may show different risk perceptions of the COVID-19.

Finally, due to time and money budgeted for the program, there was no sufficient information pertaining to participants’ personality characteristics and sociolinguistic profile in the present research. Many studies have shown that these factors are robustly associated with the overconfidence bias (Macenzak et al., 2016). Thus, a use of a wider array of variables in future research would allow scholars to conduct more sophisticated statistical tests, such as a regression analysis, which could perhaps provide more insights into the proportion of variance explained by the model.

CRediT authorship contribution statement

Heng Li: Conceptualization, Methodology, Writing – original draft, Writing – review & editing. Yu Cao: Data curation, Formal analysis.

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