Are older adults more optimistic? Evidence from China, Israel and the US

Hongmei Lin, MS,[1,2], Yuanqing Chang, MS,[1,2], Chao Chen, MS,[1,2], Yuen Wan Ho, PhD,[3], Wanyu Xi, MS,[4], Xin Zhang, PhD,[1,2], Helene H. Fung, PhD,[5], and Liat Ayalon, PhD[4]

[1.] School of Psychological and Cognitive Sciences, Peking University, Beijing, China

[2.] Beijing Key Laboratory of Behavior and Mental Health, Peking University, Beijing, China

[3.] Department of Psychology, Northeastern University, MA, US

[4.] Louis and Gabi Weisfeld School of Social Work, Bar-Ilan University, Ramat Gan, Israel

[5.] Department of Psychology, Chinese University of Hong Kong, Hong Kong, China

Author Notes: Correspondence regarding this article should be addressed to Dr. Xin Zhang, School of Psychological and Cognitive Sciences, Peking University, Beijing, China, 100871. Email: zhang.x@pku.edu.cn. The study received financial support from Beijing New Sunshine Foundation, National Natural Science Foundation of China (#31871121 to Dr. X. Zhang) and a direct grant from the Faculty of Social Science, Chinese University of Hong Kong (to Dr. Helene Fung).

Abstract

Objectives. Optimistic bias refers to the phenomenon that individuals believe bad things are less likely to happen to themselves than to others. However, whether optimistic bias could vary across age and culture is unknown. The present study aims to investigate: 1) whether individuals exhibit optimistic bias in the context of COVID-19 pandemic; 2) and whether age and culture would moderate such bias.

Method. 1051 participants recruited from China, Israel and the US took the online survey. Risk perceptions consists of three questions: estimating the infected probability of different social distance groups (i.e., self, close others, and non-close others), the days that it would take for the number of new infections to decrease to zero and the trend of infections in regions of different geographical distances (i.e., local place, other places inside participants' country and other countries). Participants in China and the US also reported their personal communal values measured by Schwartz's Value Survey.

Results. Results from HLM generally confirmed that 1) all participants exhibited optimistic bias to some extent, and 2) with age, Chinese participants had a higher level of optimistic bias than Israeli and US participants. Compared to their younger counterparts, older Chinese are more likely to believe that local communities are at lower risk of COVID-19 than other countries.

Discussion. These findings support the hypothesis that age differences in risk perceptions might be influenced by cultural context. Further analysis indicated that such cultural and age variations in optimistic bias were likely to be driven by age-related increase in internalized cultural values.

Keywords: Optimistic Bias, Social Distance, Age Difference, Cross-Cultural Difference, COVID-19

The outbreak of the novel coronavirus disease (COVID-19) since January 2020 is an urgent global challenge. Despite official warnings worldwide, individuals showed wide variations in risk perceptions and responses to the novel pandemic (Bavel et al., 2020; Bottemanne, Morlaas, Fossati, & Schimdt, 2020). Specifically, people exhibited an optimistic bias about the consequences of the new threat, and the majority of people believed that they were less likely to be infected by the virus compared to someone else (Druica, Musso, & Ianole-Calin, 2020).

Optimistic bias is one of the most robust phenomena in human risk awareness and judgement (Bottemanne et al., 2020). People consider themselves significantly more likely to experience positive and less likely to experience negative events relative to comparable others (Weinstein, 1980, 1987). The concept has been applied in various fields of research, such as clinical psychology (Strunk, Lopez, & DeRubeis, 2006), health psychology (Park & Ju, 2016) and natural disasters studies (Trumbo, Lueck, Marlatt, & Peek, 2011). Recently, there is also research evidencing the existence of optimistic bias in the COVID-19 pandemic (Bottemanne et al., 2020; Druica et al., 2020). Data collected in Western countries during the peak of the COVID 19 pandemic showed that citizens in the US, Germany and the UK gave a lower estimation of the probability of their own infection with coronavirus, relative to the probability of others' infection (Dolinski, Dolinska, Zmaczynska-Witek, Banach, & Kulesz, 2020; Kuper-Smith, Doppelhofer, Oganian, & Rosenblau, 2020). As previous studies in the field are mainly conducted in Western countries among younger adults, it remains unclear whether and how optimistic bias varies across age and cultures in the context of COVID 19 pandemic. Thus, the present study aims 1) to examine the extent to which optimism bias is present in three different countries (China, Israel and the US), and 2) to test whether age and culture (measured by cultural values) would moderate such bias.

Optimistic bias and potential age-related differences

Studies have suggested that optimistic bias is a common phenomenon under a pandemic (Bavel et al., 2020). According to socioemotional selectivity theory (SST, Carstensen, Isaacowitz, & Charles, 1999), in the face of life-threatening events such as the COVID-19 pandemic where perceived future time becomes more limited, individuals would prioritize emotionally meaningful goals over future-related goals through effortful emotion regulation. Empirical studies have suggested that optimistic bias can be one of the emotion regulation strategies through which people can develop and maintain positive beliefs about themselves (Bavel et al., 2020; Shepperd, Waters, Weinstein, & Klein, 2015). Optimistic bias enables people to engage in a "positive illusion" that negative events are less likely to happen to themselves, to reduce negative emotions (Chambers & Windschitl, 2004).

Although, optimistic bias is arguably an effective way to manage negative emotional experience for any age group, from the perspective of the socioemotional selectivity theory, older adults have a stronger tendency for emotion regulation than their younger counterparts (Carstensen, Isaacowitz, & Charles, 1999). Accumulating evidence showed that older adults tended to avoid negative emotions to a larger extent compared with younger adults (Isaacowitz, Toner, Goren, & Wilson, 2008; Urry & Gross, 2010). As such, people who are relatively older may regulate their negative emotions by introducing a higher level of optimistic bias in the face of the COVID-19 pandemic. However, there are only limited empirical studies investigating the association between optimistic bias and age under pandemic. To the best of our knowledge, one study conducted in the early outbreak of the COVID-19 pandemic provided initial support that the optimistic bias might increase with age: Compared to younger adults, older adults thought that other people had higher chances to get infected with COVID-19 than themselves (Druica et al., 2020).

Moreover, based on socioemotional selectivity theory (Carstensen, Isaacowitz, & Charles, 1999), when emotion regulation is the primary goal, people are highly selective in their choice of social partners and nearly always prefer closer social partners, reflecting the in-group favoritism – preferences for self or in-group members over outgroup others. For example, studies found that older adults exhibit more obvious in-group favoritism to achieve their goal of maintaining socioemotional satisfaction, compared with younger adults (Cassidy, Hughes, Lanie & Krendl, 2020; Li & Fung, 2013). Taken together, it is expected that older adults, relative to younger adults, would exhibit a higher level of optimistic bias, which could help them to regulate emotions and maintain socioemotional satisfaction in the context of the COVID-19 pandemic.

Cultural variations in age differences in optimistic bias

The age differences in optimistic bias might possibly be influenced by the cultural context. The second purpose of the present study is to examine age differences in optimistic bias in the face of the COVID-19 across cultures. Following up on the postulate of the socioemotional selectivity theory (Carstensen, 2006) that individuals increasingly prioritize emotionally meaningful goals as they age, Fung (2013) argues that what is considered emotionally meaningful could differ across cultures. This model, known as "Aging in Culture," suggests that cultural differences in aging may occur if 1) different cultures consider different goals as emotionally meaningful, and 2) with age, individuals in different cultures each pursue the goals they consider to be emotionally meaningful. This model has been confirmed in domains such as age differences in social network composition (Fung, Carstensen, & Lang, 2001), personality (Fung, Ho, Tam, Tsai, & Zhang, 2011) and social cognition (Fung, Isaacowitz, Lu, & Li, 2010).

Although prior cross-cultural studies yielded inconclusive results on whether people in particular cultures endorsed a stronger optimistic bias (Chang, Asakawa, & Sanna, 2001; Joshi & Carter, 2013), some studies indeed found that the optimistic bias was stronger among collectivistic cultures (e.g., Chinese) than among individualistic cultures (e.g., Canadians, see Ji, Zhang, Usborne, & Guan, 2004). These previous studies only compared cultural differences in optimistic bias among younger adults. It remains unclear whether such cultural differences in optimistic bias would be influenced by age. There is evidence suggesting that optimistic bias is highly associated with in-group favoritism (Chen, Brockner, & Chen, 2002; Wann & Grieve, 2005), with both emphasizing more positive evaluation of self/close others relative to less close others. Like cultural differences in optimistic bias, studies showed that in-group favoritism was emphasized more in collectivistic cultures such as China than in individualistic cultures such as the US (Huang & Rau, 2019; van Hoorn, 2015). Specifically, in societies with higher collectivistic values, because people are closely tied within relatively small communities (e.g., family) or cooperation partnerships, they have a higher preference for people inside their own social groups than more socially distant others (Li & Fung, 2013). Moreover, this cultural value prioritizing small close communities over socially distant groups (i.e. in-group favoritism) is internalized with age. Consistent with the "Aging in culture" model, it was found that country-level individualism moderated age differences in in-group favoritism (Fung, 2013; Li & Fung, 2013), such that in-group favoritism was more positively associated with age in countries that were less individualistic than countries that were more individualistic.

Thus, we expect that the association between optimistic bias and age would be stronger in collectivistic cultures such as China than individualistic cultures such as the US, given that collectivistic cultures (e.g., China) had a higher level of in-group favoritism than did individualistic cultures (e.g., US; Huang & Rau, 2019; van Hoorn, 2015).

The present study

Previous studies (Druica et al., 2020; Ji et al., 2004) focused on either age-related or cultural differences in optimistic bias. To the best of our knowledge, no previous research has investigated both the effects of age and of culture on optimistic bias. As the COVID-19 pandemic is still on-going, our real-life experiences of risks and uncertainties during the pandemic are ubiquitous. The present study sampled participants from China, Israel and the US (to represent a continuum of the individualism-collectivism dimension) to investigate the optimistic bias in individuals' risk perception of COVID-19 and further explore how two moderators (i.e., age and culture) could moderate the level of the optimistic bias. Understanding variations of the optimistic bias across age and culture is essential for developing prevention strategies, which could help potential at-risk groups (i.e., older adults, see Ayalon, et al., 2020) to improve their physical health and well-being during the pandemic.

Two hypotheses were tested. First, given the prevalence of optimistic bias in previous studies (Bottemanne et al., 2020; Bavel et al., 2020), we hypothesized that regardless of culture and age, people would exhibit optimistic bias under the COVID-19 pandemic. Specifically, we predicted that compared with non-close others, people would estimate a lower probability of getting infected with COVID-19 for themselves and close others (Hypothesis 1A); compared with other countries, people would perceive that their local place and other places inside their country could use fewer days to defeat the outbreak in the future (Hypothesis 1B); compared with other countries, people would perceive that number of infections would be less likely to show an increasing trend in their local place and other places inside their country (Hypothesis 1C).

Second, based on the "Aging in Culture" model (Fung, 2013), we hypothesized that the association between optimistic bias and age among Chinese participants would be larger than among Americans and Israelis; such that with age, Chinese participants were expected to have a higher level of optimistic bias than Americans and Israelis. We also hypothesized that the above moderation of culture would be driven by differential endorsement of communal values across cultures such that personal endorsement of communal values would moderate age differences in optimistic bias in the same way as culture would. Ideally, the best way to test whether the above cultural differences, if observed, are driven by differential emphasis on particular values in the respective cultures is a mediated moderation model that directly examines whether cultural differences in age-related optimistic bias are mediated by cultural differences in values. However, our study only sampled from one-time point and cross-sectional mediation analysis has been much criticized in the literature (Deboeck & Preacher, 2016; Maxwell & Cole, 2007). Hence, we employed a second-best approach by conducting a follow-up analysis to examine if personal endorsement of communal values (values that are positively associated with collectivism) moderates age differences in optimistic bias in the same way as culture does.

Method

Participants

Sample size was determined by conducting a power analysis in G*power. It indicated that for a small to medium effect size of .15 to be detected with 95% power and significance at 5% level, a sample of 831 participants would be sufficient. A total of 1311 participants were recruited from China, Israel and the US via online survey platforms (Credamo in China, IPanel in Israel and Amazon M-turks in the US). The data were collected at the beginning of the outbreak in each country (from February 17th to March 6th in China, April 5th to April 14th in Israel and March 12th to March 21st in the US). According to news reports, the COVID-19 was declared as a global pandemic by WHO on the 11th of the March 2020. We assumed that people throughout the world had realized the severity of the pandemic during the period of our data collection. All participants provided informed consent to this online survey, and each of them on average received 14.5 Chinese Yuan (or equivalent in local currency) as an incentive after they completed the survey. Two hundred and sixty participants were excluded due to incomplete responses to the key variables. Finally, 1051 valid participants (Chinese: N=270, Israelis: N=520 and US Americans: N =261) were included in the final analysis. All questions were asked in participants' native language (i.e., Mandarin for Chinese participants, Hebrew for Israeli participants and English for US participants).

Measures and procedure

After providing informed consent online, participants were asked to respond to the following questions in order, among which risk perception questions were asked first, followed by demographics.

Risk perceptions. Three questions regarding 1) the probability of being infected (Probability), 2) subjective estimation of the time that the number of infected cases would decrease to zero (Days), as well as 3) the trend (increasing or decreasing) of the number of infections in different regions (Trend) were asked. The details are as follows:

Probability. This variable was the self-rated probability of infection in the following month of three specific groups clustered by social distance, including self, close others and non-close others. Participants were required to give a number (0-100), which quantified the infected probability they perceived for each group. A larger number indicated a higher perceived risk of infection.

Days. The days needed for infected cases to decrease to zero were separately estimated in three regions grouped by geographical distance (i.e., local place, other places inside participants' country and other countries). The question was "Please estimate the days needed for the number of COVID-19 infected cases to decrease to zero in the following places". Participants were asked to give a number (must be above 0). A larger number indicated a later estimate to end the pandemic. Outliers that were over 3 standard deviations away from mean were replaced as missing value (only data from 14 participants were detected as outliers; including these participants did not change the results reported below).

Trend. Participants needed to estimate the trend of infected cases in three regions by geographical distance (i.e., local place, other places inside participants' country and other countries). They were asked to "estimate the trend of the number of COVID-19 infections in the following places for next month" and then gave a number from -100 to +100, which represented the trend of the number of infected cases from a sharp decrease (-100) to a significant increase (+100). A larger positive (negative) number indicates a more remarkable increase (decrease) of the number of infections.

Personal communal value. It was measured by a 5-item short version of Schwartz's Value Survey (SVS, Lindeman & Verkasalo, 2005). Participants were asked to rate the importance of each of the following values (security, conformity, tradition, benevolence, and universalism) on an 8-point-Likert scale from 1 (the value is not important) to 8 (the value is of supreme importance). The Cronbach's alpha coefficient for these 5 items was .66 for Americans and .73 for Chinese. Participants in Israel did not complete this measure. A larger value indicated a higher endorsement of the communal values. Communal values can be easily mapped onto work on dimensions of cultural variation and studies have demonstrated that communal value is one of most representative predictors of collectivistic cultures (Fung, Ho, Zhang, Zhang, Noels, & Tam, 2016).

Demographics. Demographic information including age, culture (0 = US; 1 = China; 2 = Israel), sex (1 = males, 2 = females), marital status (1 = single, 2 = married) and self-rated health (from 1 = very poor to 6 = excellent) were also measured. In addition, self-reported socioeconomic status (SES) (from 1 = lowest to 10 = highest) was also measured by the MacArthur Scale of subjective social status (Adler et al., 2007), which is a widely accepted indicator of an individual's perceived position in the social hierarchy (Jackman & Jackman, 1973).

Control variables. In order to rule out potential confounding factors, we statistically controlled for some key variables related to COVID-19 for each country in the analysis, including cumulative deaths, daily increased deaths, the slope of increased deaths (= daily increased deaths/yesterdays' cumulative deaths), cumulative positive cases, daily increased positive cases, the slope of increased positive cases (= daily increased positive cases/yesterdays' cumulative positive cases), and cumulative cured cases. All data were derived from the World Health Organization and other reliable news agencies. All the control variables were counted based on the time frame of when each participant finished the survey.

Data analytic strategy

SPSS (version 22.0) was used to conduct descriptive statistics. Then, a series of two-level random Hierarchical Linear Modeling (HLM, Raudenbush & Bryk, 2002) was performed by Mplus 7.0 to test whether age and culture were associated with individuals' risk perception of the COVID-19 pandemic. For the first set of HLM analyses, the dependent variables (DVs) were probability, days and trend. The within-person (level-1) predictor was distance (either social distance for probability estimation or geographical distance for the rest of the DVs). The between-person (level-2) predictors included culture, chronological age, marital status, self-reported health, sex, self-reported socioeconomic status (SES) and all the control variables mentioned above. Considering that culture was a categorical variable, two dummy variables culture 1 (1 = Chinese, 0 = non-Chinese) and culture 2 (1 = Israel, 0 = non-Israel) were generated to represent different cultures. The equation for the model was shown below.

Level 1: Within-person:

$$\text{Risk-Perception(Probability/Days/Trend)} = \beta_0 + \beta_1 \text{Distance} + \gamma_{ij}$$

Level 2: Between-person:

$$\beta_0 = \gamma_{00} + \gamma_{01}\text{Age} + \gamma_{02}\text{culture1} + \gamma_{03}\text{culture2} + \gamma_{04}\text{culture1} \times \text{Age} + \gamma_{05}\text{culture2} \times \text{Age}$$
$$+ \gamma_{06}\text{Marital Status} + \gamma_{07}\text{Health} + \gamma_{08}\text{Sex} + \gamma_{09}\text{SES}$$
$$+ \gamma_{10}\text{Cumulative deaths} + \gamma_{11}\text{Daily increased deaths} + \gamma_{12}\text{The slope of increased deaths}$$
$$+ \gamma_{13}\text{Log(Cumulative positive cases)} + \gamma_{14}\text{Log(Daily increased positive cases)}$$
$$+ \gamma_{15}\text{The slope of increased positive cases} + \gamma_{16}\text{Log(Cumulative cured cases)} + \mu_{0j}$$

$$\beta_1 = \gamma_{10} + \gamma_{11}\text{Age} + \gamma_{12}\text{culture1} + \gamma_{13}\text{culture2} + \gamma_{14}\text{culture1} \times \text{Age} + \gamma_{15}\text{culture2} \times \text{Age} + \mu_{1j}$$

Notes: Probability: the probability of being infected;

Days: the days for infected cases to decrease to zero;

Trend: the trend (increasing or decreasing) of the number of infections;

Culture 1 (1 = Chinese, 0 = non-Chinese); Culture 2 (1 = Israel, 0 = non-Israel)

Marital Status: 1 = single, 2 = married; Sex: 1 = males, 2 = females;

SES: Socioeconomic status; the cumulative positive cases, daily increased positive cases and cumulative cure cases were log-transformed.

In addition, we added another set of analyses to examine whether personal communal values would moderate age differences in optimistic bias. We expected personal communal values at the individual level to moderate age differences in optimistic bias in the same way as the cultural differences observed in the main analysis. For such analyses, the dependent variables (DVs) and the within-person (level-1) predictors were the same as the first part, we only replaced the culture variable with personal communal values at level 2.

Results

Descriptive Statistics

The demographic details of participants are shown in Table 1. The final sample consisted of 270 Chinese (51.9% males, 18-88 years of age, M_{age} = 39.57, SD = 12.95), 520 Israelis (47.7% males, 18-79 years of age, M_{age} = 43.05, SD = 14.85) and 261 US Americans (56.3% males, 19-74 years of age, M_{age} = 44.75, SD = 15.05).

There was no significant difference on sex (χ^2 =5.56, *d.f.* = 2, $p > 0.05$) between different countries, but a significant country differences was found on marital status (χ^2 =79.54, *d.f.* = 2, $p < 0.001$), such that the Chinese sample had the highest percentage of married respondents, while the American sample had the lowest percentage of married respondents. One-way ANOVA was conducted on age, self-related health and SES. A significant main effect for culture was found on three variables, Age: $F_{(2,1050)} = 9.25$, $p < .001$; self-rated health: $F_{(2,1050)} = 55.88$, $p < .001$; SES: $F_{(2,1042)} = 40.76$, $p < .001$. Post hoc tests showed no difference in age between Americans and Israelis, but the age of these two samples was older than that of the Chinese sample. US Americans and Chinese reported similar levels of health, but they had significantly higher levels of self-reported health than Israelis. Moreover, the self-reported social-economic status of US Americans was the lowest while Israelis' was the highest, with Chinese in-between.

An independent samples *t* test was performed on personal communal values between Chinese and Americans. A significant cultural difference was found, $t_{528} = -11.11$, $p < .001$, 95% *CI* [-1.28, -.90]. The personal communal values of Chinese ($M = 6.40$, $SD = .89$) was higher than those of US Americans ($M = 5.31$, $SD = 1.33$), as expected.

Optimistic Bias across Age and Cultures

Results from 3 Hierarchical Linear Models are shown in Table 2. We first confirmed that individuals indeed exhibited an optimistic bias in risk perception under the COVID-19 pandemic, by observing a significant main effect of distance for all indicators of risk perception. Probability: b = 10.49, SE = .32, t = 32.78, p < .001; Days: b = 36.67, SE = 1.57, t = 23.26, p < .001; Trend: b =5.71, SE = .72, t = 7.93, p < .001. The results suggest that, generally people believe that non-close others are more likely to be infected than themselves/close others; and compared with their local place and other places inside their country, other places are more likely to defeat the outbreak in a more distant future, and the number of infections is more likely to go up in other places. These results support our first hypothesis that people are exhibiting an optimistic bias under the pandemic.

Moreover, such bias was moderated by age and culture, as indicated by the significant three-way interaction of Distance × Age × Culture for the risk perception of days and trend. For example, in terms of estimation of days that the pandemic will end, a significant three-way interaction was only found for culture 1 (which represented Chinese vs. non-Chinese): b = .72, SE = .31, t =2.32, p < .05. In estimation of the pandemic trend, a significant three-way interaction was found for culture 1: b = .33, SE = .14, t =2.36, p < .05. As for probability, no significant interaction was found for either culture 1: b = -.02, SE = .06, t = -.003, p > .05, or culture 2: b = -.05, SE = .05, t = -1.00, p > .05. A simple slope analysis (see Table 3) indicated that the correlation between distance and age was positive for Chinese (*b* = .22, *SE* = .07, *t* = 3.14, *p* <.001) with regard to the days needed for infections to decrease to zero, whereas the correlation was negative for non-Chinese (*b* = -.61, *SE* = .14, *t* = -4.36, *p* <.001). These findings suggested that compared to their younger counterparts, older Chinese exhibited a higher level of optimistic bias whereas older Americans and Israelis exhibited a lower level of optimistic bias.

Similarly, for estimation of pandemic trend, distance was positively related to age for Chinese (*b* = .22, *SE* = .11, *t* = 2.00, *p* < .05) but not for non-Chinese (*b* = -.06, *SE* = .06, *t* = 1.00, *p* = .31), suggesting that only older Chinese exhibited a significant optimistic bias as the geographical distance increased, Americans as well as Israelis of all ages did not differentiate by geographical distance when they estimated the trend of the pandemic (please refer to Figure 1).

Moderation Effect of Personal Communal Values

We then repeated the above analysis by replacing culture with personal communal values (see Table 4). Results showed a similar significant three-way interaction of Distance × Age × Personal communal values for the risk perception of Probability: *b* = .06, *SE* = .03, *t* =2.00, *p* < .05; as well as Days: *b* = .29, *SE* = .09, *t* =3.22, *p* < .01. A simple slope analysis (see Table 5) indicated that distance was positively associated with age at higher levels of communal values for both Probability (*b* = .11, *SE* = .04, *t* = 2.75, *p* < .01) and Days (*b* = .34, *SE* = .13, *t* = 2.62, *p* < .01), whereas the correlation was non-significant at lower levels of communal values for both Probability (*b* = .02, *SE* = .05, *t* =.40, *p* = .75) and Days (*b* = -.31, *SE* = .21, *t* = -1.48, *p* = .14). As for the estimation of days, optimistic bias did not amplify with age at higher levels of personal communal values but decreased with age at lower levels of personal communal values, which in general mirrored the main analyses reported above (please refer to Figure 2).

Discussion

Risk perception is not only a function of the objective risk information, but also includes a set of 'biases' (Sharot, 2011). The present study explores whether individuals would exhibit optimistic bias in risk perception of the COVID-19 pandemic and how age and culture could moderate such a bias. As expected, the results demonstrated that people indeed exhibited an optimistic bias for the COVID-19 pandemic, and such bias was moderated by age and culture. More specifically, compared to their younger counterparts, older Chinese were more likely to believe that in-group members (i.e. self/close-others or local place/other places inside participants' country) were at lower risk of COVID-19 than out-group members (i.e. non-close others or other countries). These age differences were nonsignificant or reversed for Americans and Israelis. These results remain unchanged even after statistically controlling for country-level variables related to the pandemic.

Cultural variations in age differences in optimistic bias

Furthermore, our second analysis regarding the moderation effect of personal communal values confirmed that the observed cultural differences in optimistic bias might be driven by cultural differences in endorsement of communal values associated with collectivism rather than demographic factors. According to the "Aging in Culture" model (Fung, 2013), emotionally meaningful goals can vary across cultures. When individuals in different cultures each prioritize different emotionally meaningful goals as they age, cultural differences in aging are resulted. Our result highlights that the process of cultural socialization with age might have an impact on individual's risk perception. The Chinese culture has a strong tradition emphasizing kinship, and distinction between self/close others (ingroup) and non-close others (outgroup), in comparison with western societies (Markus & Kitayama, 1991). Such cultural preferences might be intensified with age, making older Chinese even more likely than their younger counterparts to set very clear boundaries between ingroup members and outgroup members, exhibiting a stronger in-group favoritism. For example, Chinese older adults were more generous for socially close over distant others compared to younger adults (Gong, Zhang, & Fung, 2019). In this vein, Chinese may show a greater preference towards in-groups with age, which may enlarge the discrepancy between self/close others (or local place) and non-close others (or other countries) when they estimate the risks of the pandemic, leading to a higher level of optimistic bias (please refer to supplement for further analyses). As for Americans (as well as Israelis), they (vs. Chinese) care less about differentiating between ingroup and outgroup, which is deepened with age, making optimistic bias more likely to decrease with age among Israelis and Americans. There was no difference for estimation of pandemic trend between Americans and Israelis, probably because Israel is highly influenced by Western individualistic cultures although it is in the Middle East.

Moreover, the present study has practical implications for regulatory behaviors under a pandemic (Park & Ju, 2016; Trumbo et al., 2011). Although optimistic bias can reduce negative emotions (Strunk, Lopez, DeRubeis, 2006), it might at times lead people to ignore negative information including public health warnings (Bavel et al., 2020). In the context of the COVID-19 pandemic, such bias could have dire consequences. For example, there has been news (Bos, 2020) reported that thousands of younger Americans participated in protesting against lockdown even during the severe spread of the COVID-19 pandemic, which might be due to their higher level of optimistic bias relative to their older counterparts. Similarly, in China, it is reported in the news that older adults, compared with younger adults, are more likely to neglect potential risks, thereby refusing to accept protective measures, such as social-isolation or wearing masks in public. These observed differences in behaviors could be due to both age and cultural differences in risk perceptions (i.e., the optimistic bias).

Limitations and future directions

In closing, we acknowledge several limitations of the study. Firstly, results showed that the overall attitude towards the pandemic of older Americans were more pessimistic than younger Americans, which is not particularly in line with postulation from socioemotional selectivity theory that older adults would be generally more optimistic than younger adults. This could probably be attributable to the nature of the disease (e.g., older adults indeed have higher mortality risks if infected) and the way in which COVID-19 was initially framed in the US (often portrayed in their media as a disease that primarily affected older people). Future studies should consider using “Aging in Culture” or other related models to assess the impacts of culture on SST phenomena.

Secondly, the time point of our data collection was not synchronous. Whereas China and Israel were under lockdown during the periods of data collection, this was not the case for the US (which has not gone into a strict lockdown throughout the pandemic). This could have influenced individual’s risk perception due to the objective difference of the COVID-19 pandemic effects in each country. We tried to take these factors into consideration by controlling for key variables related to the pandemic, such as cumulative deaths, positive cases or cured cases. Although the results remained the same after controlling for these variables, we cannot rule out the possibility that some other differences between the countries could have confounded our results.

Lastly, the age range of the sample seems a little bit younger than a typical lifespan sample, particularly for the Chinese sample. In fact, older Chinese over the age of 65 have received less education and most of them are unfamiliar with online tools, which made it difficult to recruit older Chinese participants for the online survey during the pandemic. From a life-span perspective, previous studies have found that emotion regulation tendencies increased with age (Jumentier, Barsics, & Van der Linden, 2017; Urry & Gross, 2010). We thus speculate that the age differences in optimistic bias we observed across cultures might be even more profound in older samples. Future studies should test this.

Despite these limitations, the present study is the first to comprehensively investigate the interactive effects across age and cultural contexts on the optimistic bias during the COVID-19 outbreak. This provides evidence to support the "Aging in Culture" model (Fung, 2013). Moreover, the present study might have practical implications in terms of prevention strategies in different cultures. On the one hand, we may need to raise public awareness, particularly among groups with high optimistic bias, as the optimistic bias would reduce behavioral intentions for health behaviors (Park & Ju, 2016) and self-protection behaviors in the context of disasters (Trumbo et al., 2011). On the other hand, there is accumulating evidence suggesting that the COVID-19 pandemic has caused a large amount of public fear, which can lead to mental health problems, with potential also for increased suicidality (Gavin, Lyne, & McNicholas, 2020; Hansel, Saltzman, & Bordnick, 2020). We might need to develop age-friendly measures to help groups with low optimistic bias, such as older adults in the US and Israel, to manage their pandemic-induced anxiety.

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Table 1

Participants Characteristics in Three Countries (N=1051)

Measure	America (*N*=261) *M* (*SD*)	China (*N*=270) *M* (*SD*)	Israel (*N*=520) *M* (*SD*)	F/χ^2
Age	44.75 (15.05)	39.57 (12.95)	43.05 (14.85)	9.25***
Sex (male %)	56.30	51.90	47.70	5.56
Marital status (married %)	46	82.6	57.3	79.54***
Self-rated Health	2.60 (1.18)	2.52 (0.83)	1.95 (0.84)	55.88***
SES	4.87 (1.80)	5.71 (1.61)	6.18 (2.10)	40.76***

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

Table 2

Multi-level Analysis of the influence of distance on risk perception(N=1051)

Parameter	Probability			Days			Trend		
	B	*SE*	95% *CI*	*B*	*SE*	95% *CI*	*B*	*SE*	95% *CI*
Intercept									
Age (γ_{01})	-.16**	.05	[-.27, -.06]	-.15	.26	[-.66, .28]	.09	.10	[-.10, .28]
Culture1 (γ_{02})	-33.89	53.18	[-138.13, 70.35]	-38.71	257.33	[-543.08, 384.60]	-268.87**	99.46	[-463.82, -73.92]
Culture2 (γ_{03})	5.36	44.57	[-81.99, 92.72]	-18.61	215.27	[-440.54, 335.52]	-196.52*	83.16	[-359.52, -33.52]
Culture1 x Age (γ_{04})	-.48**	.16	[-0.79, -0.18]	-.60	.78	[-2.14, .69]	-.92**	.29	[-1.50, -.35]
Culture2 x Age (γ_{05})	-.33**	.12	[-0.58, -0.09]	-.84	.62	[-2.06, .18]	-.61**	.23	[-1.06, -.17]
Marital status (γ_{06})	-.37	1.32	[-2.95, 2.21]	-7.19	6.31	[-19.56, 3.18]	-6.25*	2.44	[-11.05, .04]
Health(γ_{07})	1.13	.63	[-0.11, 2.37]	4.61	3.03	[-1.34, 9.60]	-.19	1.18	[-2.51, 2.85]
Sex(γ_{08})	1.49	1.17	[-0.81, 3.78]	-11.35*	5.62	[-22.37, -2.10]	-2.98	2.20	[-7.29, 2.67]
Ses (γ_{09})	.12	.31	[-.49, .74]	.74	1.51	[-2.21, 3.23]	.58	.59	[-.57, 2.09]
Cumulative deaths (γ_{10})	.003	.01	[-.02, .03]	-.05	.05	[-.16, .04]	.03	.02	[-.01, .07]
Daily increased deaths (γ_{11})	.01	.03	[-.04, .06]	-.06	.2	[-.30, .15]	.02	.05	[-.08, .11]
The slope of increased deaths (γ_{12})	-15.02	20.59	[-55.39, 25.34]	31.82	98.66	[-161.55, 194.11]	-10.22	38.20	[-85.09, 64.65]
Log $_{\text{(Cumulative positive cases)}}$ (γ_{13})	1.16	17.21	[-32.57, 34.90]	-21.97	83.19	[-185.02, 114.88]	-57.44	32.29	[-120.71, 5.84]
Log $_{\text{(Daily increased positive cases)}}$ (γ_{14})	2.75	12.23	[-21.21, 26.72]	-11.22	59.09	[-127.03, 85.98]	46.67*	23.02	[1.54, 91.79]
The slope of increased positive cases (γ_{15})	-28.77	152.16	[-327.01, 269.47]	408.06	734.17	[-1030.91, 1615.76]	-612.74*	284.58	[-1170.52, -54.97]
Log $_{\text{(Cumulative cured cases)}}$ (γ_{16})	-2.62	6.56	[-15.48, 10.24]	72.78*	31.59	[10.86, 124.75]	-6.19	12.16	[-30.04, 17.65]
Distance(γ_{10})	10.49***	.32	[9.85, 11.12]	36.67***	1.57	[33.59, 39.74]	5.71***	.72	[4.31, 7.12]
Age (γ_{11})	-.03	.02	[-.07, .01]	-.37***	.11	[-.59, -.19]	.004	.05	[-.09, .10]
Culture1 (γ_{12})	-11.05***	.90	[-12.81, -9.28]	-31.99***	4.32	[-40.46, -24.87]	-9.67***	2.02	[-13.63, -5.70]
Culture2 (γ_{13})	-2.47**	.79	[-4.01, -.92]	11.23**	3.80	[3.78, 17.49]	-	1.72	[-20.88, -14.14]

							17.51***		
Culture1 x Age (γ_{14})	-.02	.06	[-.15, .10]	.72*	.31	[.11, 1.23]	.33*	.14	[0.05, .61]
Culture2 x Age (γ_{15})	-.05	.05	[-.15, .06]	-.14	.25	[-.63, .28]	.07	.11	[-.15, .30]
ICC		.58			.68			.65	

Notes. * $p < .05$, ** $p < .01$,*** $p < .001$; *ICC* = intra-class correlation, represents the ratio of the between-person variance to total variance.

Culture1 = Chinese (1) vs. non-Chinese (0). Culture 2 = Israeli (1) vs. non-Israeli (0). Marital Status (1 = single, 2 = married)

The slope of increased deaths = Daily increased deaths/yesterday's cumulative deaths; The slope of increased positive cases = Daily increased positive cases/yesterday's cumulative positive cases. The model became non-convergent after adding the strictness of quarantining. The results were still consistent when added the strictness of quarantining as a control variable separately.

Table 3

Multi-level Analysis of the influence of distance on risk perception (days/trend) for cultures

parameters	Days				Trend			
	Chinese		Non-Chinese		Chinese		Non-Chinese	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept								
Age (γ_{01})	-.44*	.20	.05	.28	-.27	.23	.29***	.09
Marital status (γ_{02})	2.57	6.05	-13.41	7.99	-10.99	7.45	-7.32**	2.64
Health(γ_{03})	-.47	2.66	12.60***	3.86	-.69	3.46	3.05*	1.27
Sex(γ_{04})	-.49	4.13	-23.85**	7.61	-.73	5.36	-6.98**	2.51
Ses (γ_{05})	-1.14	1.31	-2.96	1.91	2.77	1.71	-1.87**	0.63
Distance(γ_{10})	7.40***	.86	46.54***	2.06	6.21***	1.39	4.99***	.87
Age (γ_{11})	.22***	.07	-.61***	.14	.22*	.11	-.06	.06

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. Marital Status (1 = single, 2 = married)

Table 4

Multi-level Analysis of the influence of distance on risk perception (N=1051)

Parameter	Probability			Days			Trend		
	B	*SE*	95% *CI*	*B*	*SE*	95% *CI*	*B*	*SE*	95% *CI*
Intercept									
Age (γ_{01})	.09	.06	[-.02, .21]	1.26***	.31	[.66, 1.86]	.78***	.15	[.48, 1.08]
Personal communal values(γ_{02})	-2.78***	.72	[-4.20, -1.37]	-23.47***	3.73	[-30.77, -16.16]	-7.99***	1.87	[-11.67, -4.32]
Personal communal values x Age (γ_{03})	-.06	.05	[-.15, .04]	.25	.25	[-.23, .74]	.13	.12	[-.11, .37]
Marital status (γ_{04})	-5.30**	1.86	[-8.95, -1.64]	-38.22***	9.11	[-56.07,-20.37]	-30.86***	4.74	[-40.16, -21.57]
Health(γ_{05})	-1.31	.82	[-2.92, .29]	-3.95	4.14	[-12.01, 4.12]	-3.74	2.15	[-7.97, .48]
Sex(γ_{06})	2.89	1.66	[-0.37, 6.15]	-3.67	8.36	[-20.05, 12.72]	3.03	4.42	[-5.64, 11.70]
Ses (γ_{07})	.19	.50	[-.78, 1.16]	-.26	2.49	[-5.15, 4.62]	-.12	1.31	[-2.69, 2.45]
Distance(γ_{10})	9.01***	.45	[8.13, 9.90]	22.83***	1.63	[19.65, 26.02]	11.50***	.97	[9.60, 13.40]
Age (γ_{11})	.07*	.03	[.004, .13]	.04	.12	[-.18, .27]	.09	.07	[-.04, .22]
Personal communal values (γ_{12})	-1.69***	.36	[-2.39, -.98]	-6.95***	1.31	[-9.51, -4.39]	-1.03	.77	[-2.54, .48]
Personal communal values x Age (γ_{13})	.06*	.03	[.006, .11]	.29**	.09	[.10, .47]	-.02	.05	[-.12, .09]
ICC		.58			.68			.65	

Notes. * $p < .05$, ** $p < .01$, *** $p < .001$; *ICC* = intra-class correlation, represents the ratio of the between-person variance to total variance. Marital Status (1 = single, 2 = married)

Table 5

Multi-level Analysis of the influence of distance on risk perception (probability/days) for different levels of communal values

	Probability				Days			
	Low communal values		High communal values		Low communal values		High communal values	
parameters	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Intercept								
Age (γ_{01})	.23**	.09	-.02	.08	1.09*	.55	1.46***	.34
Marital status(γ_{02})	-2.92	2.65	-8.51**	2.64	-23.68	15.62	-52.77***	10.22
Health(γ_{03})	-1.56	1.11	-.45	1.20	-.02	6.76	-4.30	4.75
Sex(γ_{04})	1.57	2.52	1.94	2.17	-15.81	15.62	-3.42	8.63
Ses (γ_{05})	.07	.72	.04	.67	.77	4.44	-2.56	2.63
Distance(γ_{10})	11.31***	.78	7.23***	.52	32.31***	2.93	15.73***	1.79
Age (γ_{11})	.02	.05	.11**	.04	-.31	.21	.34**	.13

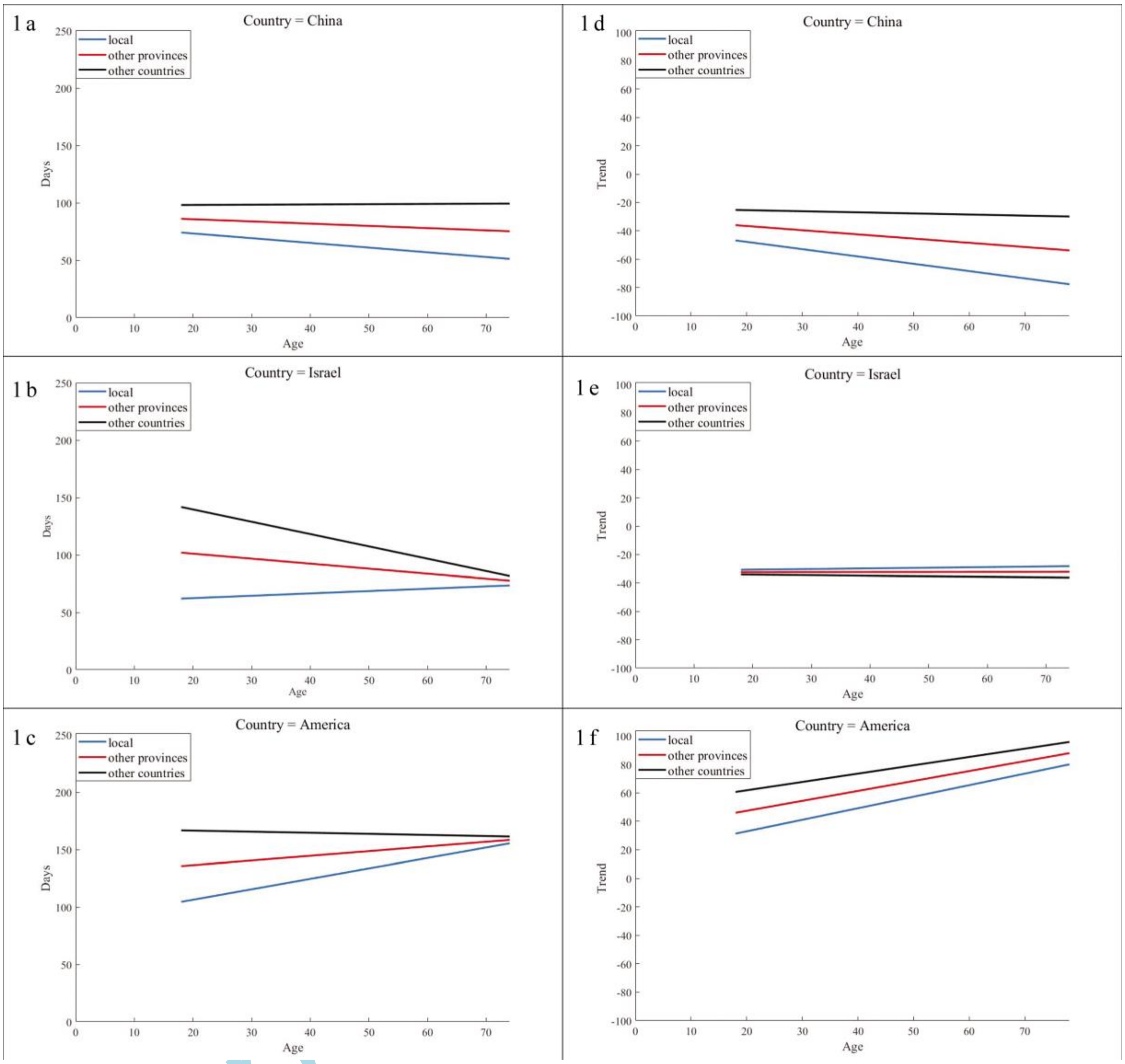
Notes. * $p < .05$, ** $p < .01$, *** $p < .001$. Marital Status (1 = single, 2 = married)

Figure Captions

Figure 1. The culture differences of risk perceptions at different distance levels with age

Figure 2. The age differences of risk perceptions at different distance for different levels of communal values.

Figure 1


1 a
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local
other provinces
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Days
Age
1 b
Country = Israel
local
other provinces
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Days
Age
1 c
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local
other provinces
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Trend
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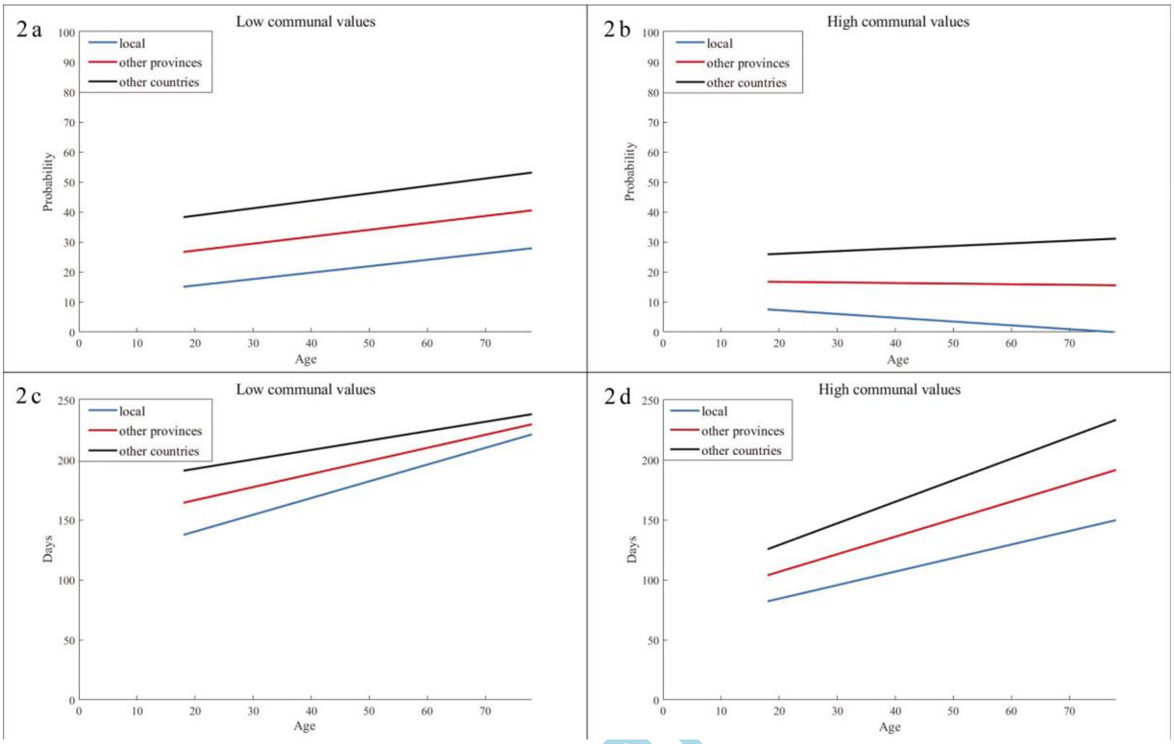
Age

Figure 2


2 a
Low communal values
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other provinces
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