Egocentric, Altruistic, or Hypocritic?: A Cross-Cultural Study of Choice between Pedestrian-first and Driver-first of Autonomous Car

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November 8, 2023

Abstract

How should the autonomous car behave when faced with an unavoidable fatal accident? The answer may vary depending on the perspective from which the choice is made. If people answer this question as a driver, choosing a car that prioritizes the driver’s safety looks egocentric, and choosing a car that prioritizes pedestrians’ safety looks altruistic. On the other hand, if people’s attitudes change depending on whether one’s choice is visible to others, this time that looks hypocritic if they tend to choose the pedestrian-first car when others can see the choice. At the same time, we may also expect that these answers vary culturally. However, if there are such cultural differences, that should affect policies of governments, lawmakers, car manufacturers, and consumers’ choices. To investigate people’s safety preference from the driver’s perspective and their possible hypocritic tendency, together with its possible cultural variance, we conducted a survey ($N = 683$) with Japanese, Chinese, and American participants. We found some interesting and unexpected cultural differences in their answers, which should provide valuable new data for future discussions on the issues surrounding the autonomous car.
Egocentric, Altruistic, or Hypocritic?: A Cross-Cultural Study of Choice between Pedestrian-first and Driver-first of Autonomous Car

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This work was supported by JST SPRING, Grant Number JPMJSP2102.

ABSTRACT How should the autonomous car behave when faced with an unavoidable fatal accident? The answer may vary depending on the perspective from which the choice is made. If people answer this question as a driver, choosing a car that prioritizes the driver’s safety looks egocentric, and choosing a car that prioritizes pedestrians’ safety looks altruistic. On the other hand, if people’s attitudes change depending on whether one’s choice is visible to others, this time that looks hypocritic if they tend to choose the pedestrian-first car when others can see the choice. At the same time, these answers may also vary culturally. However, if there are such cultural differences, that should affect the policies of governments, lawmakers, car manufacturers, and marketers. To investigate people’s safety preference from the driver’s perspective and their possible hypocritic tendency, together with its possible cultural variance, this study conducted a survey (N = 683) with Japanese, Chinese, and American participants. The result indicated some interesting and unexpected cultural differences in their answers, which should provide valuable new data for future discussions on the issues surrounding the autonomous car.

INDEX TERMS Autonomous car, Safety priority choice, Responsibility, Cultural differences, Hypocritic tendency

I. INTRODUCTION

WHEN driving a car, we must check our surroundings continuously for safety and perform precise maneuvers in response to the road conditions. It means that we are processing multiple tasks simultaneously while we drive. As a result, carelessness can easily occur, and this is a hotbed of traffic accidents. Previous research showed that human factors cause most traffic accidents [1] [2].

In recent years, autonomous cars that can drive without human operations have been developed for practical use. The widespread use of autonomous cars is expected to lead to a significant reduction in traffic accidents [3] [4]. However, on actual roads, multiple factors of traffic conditions such as weather, road surface condition, as well as speed, pedestrians, other cars, etc., change in complex ways. Therefore, it is challenging for autonomous cars to drive stably at all times while being affected by all these factors [5] [6].

Then, how should the autonomous car behave when faced with an unavoidable accident? In particular, in situations where either the driver or the pedestrian will inevitably be killed, whose safety should the autonomous car prioritize? As system contains artificial intelligence (AI), such as autonomous cars, the practical application becomes realistic, and this kind of moral dilemma is attracting more and more attention [7] [8] [9]. However, importantly, the response to such a dilemma may vary depending on the perspective, though this point has not been sufficiently emphasized or investigated. Although Awad et al. conducted a large-scale survey to compare the selection tendency of moral dilemma questions in various situations across cultures [10] [11], even
though their study involved the choice in which the driver becomes the victim to save the pedestrians, the participants did not judge the cases from the driver’s perspective.

If we focus on the driver’s perspective, from this perspective, choosing a car that prioritizes the driver’s safety looks egocentric, and choosing a car that prioritizes pedestrians’ safety looks altruistic. It is then also expected that people’s attitudes change depending on whether one’s choice is visible to others or not, to the extent that people have a certain hypocritic tendency.

However, if that is the case, we should also expect that these tendencies, whether people choose an egocentric or an altruistic option and whether people tend to be hypocritically concerning that choice, culturally vary. In some cultures, people may tend to be egocentric, while in others, people may be more altruistic. Also, in some cultures where people tend to be altruistic, their choices may be hypocritically, while in other altruistic cultures, people may not show any such hypocritic tendency.

These issues are no doubt important for anyone who is interested in the future of autonomous cars, possibly affecting not only consumers’ choices but also the policies and decisions of governments, lawmakers, and car manufacturers. Thus, in order to investigate people’s safety preferences from the driver’s perspective and its hypocritic tendency, together with their possible cultural variance, this study conducted a survey (N = 683) with participants from Japanese, Chinese, and American backgrounds.

II. RELATED RESEARCH

A. A MORAL DILEMMA AND AUTONOMOUS CARS

As previous research [12] [13] [14] mentioned, it is important to program the AI of autonomous cars to minimize harm. However, there can be cases where sacrificing the driver would be the best solution to maximize lives and minimize deaths [12]. And we also need to consider the possibility that the victim could be ourselves [15]. As autonomous cars become more widespread, it is expected that more people will purchase and drive autonomous cars in the future. Therefore, it is imperative to explore people’s preferences for priority settings when driving.

“Trolley problem” is a classic example of a moral dilemma. In the standard trolley problem, participants have to choose between sacrificing five people fixed in ano ther path by doing nothing against the running trolley or sacrificing one person to save five people in the way by moving a lever [16] [17].

Previous research applied the trolley problem to the context of autonomous cars. For example, Awad et al. [10] conducted a large-scale survey to compare the selection tendency of moral dilemma questions in various situations across cultures. The results suggested that there are cultural differences in selection tendencies. More specifically, multiple cultural backgrounds, such as religious beliefs and history, influence the selection. However, even though their study involved the choice in which the driver becomes the victim to save the pedestrians, the participants did not judge the cases, particularly from the driver’s perspective.

The driver’s perspective is important, especially when studying people’s choices in a moral dilemma. For example, from the third-person perspective, choosing the option that prioritizes the children’s or pregnant pedestrians’ safety over the drivers’ may be reasonable. But can we make the same decision when driving an autonomous car? Would you be willing to buy and drive a car that can kill you if the situation allows? For example, Valdesolo and DeSteno [18] suggested that even if we and others choose the same action, our moral judgments about our own actions and other people’s actions may differ due to motivated reasonings. This kind of asymmetry is all the more expected in a moral dilemma.

For example, Hussain and Zeadal [3] mentioned the driving behavior of autonomous cars under an unforeseen emergency situation as one of the social challenges. They supposed a situation that a child chased a ball into the middle of the road in an urban locality. Although this paper also considers such an emergency situation, it mainly focuses on:

- people’s preferences of the priority setting and their cultural differences especially when they can choose the safety priority setting of autonomous cars
- the responsibility of the driver’s safety priority choice when the autonomous car had an accident

B. “EGOCENTRIC ASYMMETRY” AND “HYPOCRITE BIAS”

This study explored people’s choices in the face of a possible moral dilemma situation from the driver’s perspective by asking which safety setting of the car they prefer, the pedestrian-first or the driver-first, and it is possible cultural variance. Bonnefon et al. [19] have already shown that while people agree that autonomous cars make utilitarian decisions, they prefer automated vehicles that protect themselves. Let us call this egocentric asymmetry.

To investigate it, three types of autonomous cars are considered in this study, as shown in figure 1: (a) cars that prioritize pedestrians’ safety, (b) cars that prioritize the driver’s safety, (c) cars that the driver can choose which to prioritize (personal ethics setting [15]). The important feature of (c) is that, unlike the first two, the driver can secretly set (and change) the safety priority.

If both type-(a) cars and type-(b) cars are on the market and their priority settings are widely known, there can be a
tendency to select a type-(a) car (an altruistic choice), rather than a type-(b) car (an egocentric choice), considering the impression the choice gives to other people. However, if only type-(c) cars are on the market, the tendency of the safety priority setting may be different because the setting is hidden from other people. Thus, some people may select the setting that prioritizes the driver’s safety where the priority setting is not visible (the private choice condition) while they would select the car that prioritizes pedestrians’ safety where the choice were visible (the public choice condition). This bias can be shown if the rate of publicly choosing type-(a) cars is significantly higher than the rate of privately choosing the pedestrian-first setting for type-(c) cars. If this happens, the visibility affected their choice in a hypocritic way, such that the altruistic choice increased in the public choice condition. Call such an effect the hypocritic bias.

However, it is also natural to expect cultural variance in this tendency. Awad et al. [11] explained the cultural differences in judgments in their moral machine experiment using the notion of relational mobility. Relational mobility refers to the number of opportunities people have to establish new relationships [20]. Thomson et al. [21] indicated that relational mobility is affected by the country’s traditional subsistence styles, such as herding, wheat farming, and paddy rice farming. In a society with low relational mobility, people are in-terdependent and in stable relationships because they have few opportunities to establish new relationships. Therefore, people tend to avoid making decisions that do not make a good impression on society to keep good relationships [11]. On the other hand, in a society with high relational mobility, people are not necessarily interdependent and often in unstable relationships because they have more opportunities to establish new relationships. Therefore, the percentage of people making decisions that do not make a good impression on society increases [11]. According to Yuki and Schug [20], and Thomson et al. [21], East Asia, including Japan and China, is a low relational mobility society, and North America is a high relational mobility society.

Prioritizing the pedestrians’ safety looks altruistic, and prioritizing the driver’s safety looks egocentric and, in general, altruistic choices give a better impression to other people than egocentric choices. It can therefore be expected that in a society with low relational mobility, more people choose the pedestrian-first (type-(a)) car in the public choice condition than in the private choice condition because they consider the impression the choice gives to other people. If so, people’s egocentric choice tends to be suppressed there. Therefore the hypocritic bias is likely to be observed in a society with low relational mobility, or at least, this bias is expected to be stronger there than in a society with high relational mobility.

C. SAFETY PRIORITY CHOICES

Another aim of this study is to investigate the cultural variance of the preference between the pedestrian-first and driver-first settings of the autonomous car from the driver’s perspective.

1) Altruistic or egoistic?

Awad et al. [10] showed that Japanese people especially tended to prioritize pedestrians’ safety over drivers compared to people in other regions. However, the participants were not judging the situation, particularly from the driver’s perspective. Therefore, whether the same pattern can be observed even when the participants chose the setting from the driver’s perspective should be investigated.

As mentioned, prioritizing pedestrians’ safety looks altruistic. However, even if one chooses the pedestrian-first setting, the reason may not be so altruistic. For example, it might be that one does not want to take responsibility for an accident involving pedestrians, assuming that one would be blamed for not choosing the pedestrian-first setting in such a case. Similarly, even if one chooses the driver-first setting, the reason may not be so egoistic. For example, it might be optimistic about the AI technology of autonomous cars, thinking that even under the driver-first setting, the autonomous car should be able to avoid accidents better than human drivers. Thus, the underlying assumption about the responsibility, or who is responsible for avoiding the accident, may explain the people’s choice, where the safety is left either to the driver’s ethics or AI technology.

Hansson et al. [7] proposed three alternatives of responsibility: 1) the vehicle manufacturers, 2) the artificial intelligence built into the vehicles responsible, and 3) no one is held responsible (it means treating the accident as a natural accident). As Coeckelbergh [22] mentioned, we cannot take responsibility for what completely autonomous cars do, since we do not have control over it. However, if the driver can choose the safety priority setting of autonomous cars, the driver can control the behavior of autonomous cars and can know what the autonomous car will do when the emergency situation is in advance.

Thus, a question about responsibility attribution was added, asking which side (the driver or the AI) is responsible for the fatal accident, which would have been avoided if the driver had chosen the pedestrian-first setting. Those who chose the pedestrian-first setting to avoid responsibility would blame the driver if they chose the driver-first setting. On the other hand, those who chose the driver-first setting simply because they are optimistic about the AI assume that the AI (or the manufacturer) is responsible for whatever accident involving an autonomous car; therefore, all subjects will choose the driver-first setting.

2) Collectivists or individualists?

Since this study focused on the cultural variance of people’s choices and responsibility attribution, the driver’s
control level ("Driver-Programmed condition" in [23]) is fixed throughout the groups and conditions.

McManus and Rutchick [23] investigated people’s moral judgment about the driver when an autonomous car causes an accident. Participants have to choose whether the driver should sacrifice themselves or the people in the course of the car in a situation where an accident is inevitable. The results show that the more control the driver has over the accident, the stronger the blame for selfish choices.

Alternatively, there may be a deeper reason for the safety priority choice, that is, one’s social value orientation [24] [25] (although the dimension of cooperative/competitive is not so apt in this context). Those who choose the pedestrian-first setting are certainly pro-social but may not be particularly altruistic. They may be just collectivists, assuming that everyone must do the same. Similarly, those who choose the driver-first setting are pro-self but may not be particularly egocentric. They may think that the pedestrian-first setting is ideal, but when it comes to one’s own car, choose the driver-first setting. If so, they may rather be individualists, assuming that everyone should protect oneself on one’s own responsibility. To distinguish these underlying attitudes, a question was asked as to whether the car company should produce cars that prioritize pedestrians’ safety or cars that prioritize the driver’s safety.

As mentioned above, according to the results of Awad et al. [10], Japanese people tend to prioritize pedestrians’ safety over drivers. If this is also the case when they choose the priority from the driver’s perspective, that is most likely to be collectivists. It can be explained by Japanese society’s low relational mobility. On the other hand, people in a high relational mobility society are expected to choose the driver-first setting freely. If they are individualists, they even recommend others to do the same.

Thus, these additional questions not only supplement the first question of the preference of the safety setting of the autonomous car by distinguishing the reasons for participants’ choice but also help predict the cultural difference in the preference of the safety setting.

III. METHOD
This study explored people’s choices in the face of a possible moral dilemma situation from the driver’s perspective by asking which safety setting of the car they prefer, the pedestrian-first or the driver-first, and d it s po sible cultural variance. Moreover, this study also investigated the cultural variance of the preference between the pedestrian-first and driver-first settings of the autonomous car from the driver’s perspective using participants from Japan, China, and the United States. (See Appendix II for current situation surrounding autonomous cars in these countries.)

Note that although this study assumed the existence of a driver, it does not consider a fully driverless car (level 5 of autonomous driving levels of SAEJ3016)\(^1\). The setting of pedestrian-first or driver-first is relevant from cars in which

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\(^1\)https://www.sae.org/standards/content/j3016_202104/
B. PARTICIPANTS
The number of participants analyzed was 205 in Japan (Male: 153, Female: 49, Others: 3, Mean age: 45.0, SD: 9.54), 228 in China (Male: 129, Female: 99, Mean age: 32.5, SD: 7.9), and 250 in USA (Male: 128, Female: 121, Others: 1, Mean age: 35.9, SD: 11.7). In the U.S. survey, we also asked about the native language of the participants. Then, we excluded participants whose native language was not English and participants whose native language was English outside the U.S. (e.g., India) even if their native language was English to secure the cultural comparison.

C. HYPOTHESIS
Since it is generally thought that Japanese and Chinese societies (or Eastern societies in general) are low relational mobility societies while American society (or Western societies in general) is a society with high relational mobility, stronger hypocritic biases in Japanese and Chinese participants than in Americans are expected to be observed. And if the Japanese and Chinese are truly hypocritic, there will be no cultural difference in the private setting condition. Thus, in Japanese and Chinese, the rate of driver-first setting in group A is expected to be higher than that of group B.

As for the general cultural difference in the priority setting, it is expected that both Japanese and Chinese tend to choose the pedestrian-first setting with no significant cultural difference. However, they are more likely to be principled collectivists, rather than idealistic altruists. Therefore, they will attribute responsibility to the driver in the second question. On the other hand, Americans tend to choose the driver-first setting, but it is mainly because they are principled individualists. Therefore, they will attribute responsibility to the AI or its developer in the second question.

IV. RESULTS
All tests for statistical significance were two-sided, and a p-value less than 0.05 was considered significant.

A. MODEL ESTIMATION
For data analysis, a logistic regression analysis was first conducted to see if age, gender, and driving frequency predict the choice of the safety priority choice (answers to Q1) for each country. Logistic regression analysis is an analysis method to create prediction models for data consisted binary outcomes (see, e.g., Stoltzfus [26] as a manual). It turned out that these factors did not significantly predict the choice in all cultures.

Logistic regression models were then constructed with the safety priority choice as the objective variable and group (G), responsibility attribution (R), and ideal car type (I) as explanatory variables. Equation (1) is the model without interactions (the base model), and equation (2) is the model with interactions (the interaction model).

\[
\logit(\pi) = \alpha + \beta_1 D_G + \beta_2 D_R + \beta_3 D_I \quad (1)
\]

\[
\logit(\pi) = \alpha + \beta_1 D_G + \beta_2 D_R + \beta_3 D_I + \beta_4 D_G \times D_R + \beta_5 D_G \times D_I
\]

Likelihood ratio tests showed that the basic model was a significantly better fit than the null hypothesis in all countries. Also, comparing the base model with the interaction model in terms of the Akaike information criterion (AIC) showed that the interaction model was not a significantly better fit than the base model in all countries.

Next, the three factors in the base model were examined with Wald tests. In all countries, the ideal car-type choice (answers to Q3) was a significant predictor of the safety priority choice (answers to Q1). Still, while in the Chinese data, all three factors (group, responsibility, ideal car type) were significant predictors of the priority choice, in the Japanese and American data, the other two factors were not. None of the interaction terms in (2) was a significant predictor.

Finally, a Wald test was conducted on the model in which the element of the country (C) was added as an independent variable to the base model (culture model), shown below as equation (3), comparing the three countries pairwise.

\[
\logit(\pi) = \alpha + \beta_1 D_C + \beta_2 D_G + \beta_3 D_R + \beta_4 D_I \quad (3)
\]

Against the prediction, the regression coefficients of culture significantly predicted the results only in Japan-China and Japan-US comparative models, but not in the China-US model (Table 1).

<table>
<thead>
<tr>
<th>Table 1. Wald statistics of culture model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
</tr>
<tr>
<td>(p-value)</td>
</tr>
<tr>
<td>Culture</td>
</tr>
<tr>
<td>(p-value)</td>
</tr>
<tr>
<td>Group</td>
</tr>
<tr>
<td>(p-value)</td>
</tr>
<tr>
<td>Responsibility (Q2)</td>
</tr>
<tr>
<td>(p-value)</td>
</tr>
<tr>
<td>Ideal Car-Type (Q3)</td>
</tr>
<tr>
<td>(p-value)</td>
</tr>
</tbody>
</table>

Each of the three instances of (3) was then compared with the corresponding interaction model that uses the cultural factor as a focal independent variable, shown below as equation (4).

\[
\logit(\pi) = \alpha + \beta_1 D_C + \beta_2 D_G + \beta_3 D_R + \beta_4 D_I + \beta_5 D_C \times D_G + \beta_6 D_C \times D_R + \beta_7 D_C \times D_I \quad (4)
\]

According to likelihood ratio tests, (4) was a significantly better fit than (3) only in the Japanese-Chinese comparison (p = 0.0015). However, according to the Wald tests of (4), the overall cultural difference disappeared there (culture failed to be a significant predictor in any instance of (4)), and only the interaction term of culture and ideal car type
(answers to Q3) was a significant predictor in the Japanese-Chinese comparison and the Japanese-American comparison. No other interaction term was a significant predictor (Table 2).

TABLE 2. Wald statistics of culture interaction model

<table>
<thead>
<tr>
<th></th>
<th>JP*CN (p-value)</th>
<th>JP*US (p-value)</th>
<th>US*CN (p-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>10.563 (0.001)</td>
<td>10.563 (0.001)</td>
<td>8.692 (0.003)</td>
</tr>
<tr>
<td>Culture</td>
<td>3.002 (0.083)</td>
<td>0.318 (0.572)</td>
<td>3.395 (0.065)</td>
</tr>
<tr>
<td>Group</td>
<td>3.426 (0.064)</td>
<td>3.426 (0.064)</td>
<td>10.635 (0.001)</td>
</tr>
<tr>
<td>Responsibility</td>
<td>0.88 (0.348)</td>
<td>0.88 (0.348)</td>
<td>4.643 (0.031)</td>
</tr>
<tr>
<td>Ideal Car-Type</td>
<td>46.938 (&lt; 0.001)</td>
<td>46.938 (&lt; 0.001)</td>
<td>52.884 (&lt; 0.001)</td>
</tr>
<tr>
<td>Culture &amp; Group</td>
<td>0.044 (0.834)</td>
<td>0.89 (0.345)</td>
<td>2.237 (0.133)</td>
</tr>
<tr>
<td>Culture &amp; Responsibility</td>
<td>0.15 (0.698)</td>
<td>0.069 (0.792)</td>
<td>0.711 (0.399)</td>
</tr>
<tr>
<td>Culture &amp; Ideal Car-Type</td>
<td>10.285 (0.001)</td>
<td>4.972 (0.026)</td>
<td>2.234 (0.133)</td>
</tr>
</tbody>
</table>

B. INDIVIDUAL COMPARISONS

Let us also look at the detail of the results of questions individually based on the results of these analyses. Here Fisher’s exact test was carried out (following Fisher [28]) for statistical significance and $\phi$ was used (following Pearson [30]) for measuring effect size (where the effect size is small if $\phi = 0.1$; medium if $\phi = 0.3$; large if $\phi = 0.5$).

1) Answers to Q1

Figure 2 is the percentage of participants who selected the driver-first setting. (The bars in the graphs are all 95% confidence intervals throughout this section.) The rate of participants who chose the driver-first setting in group A (private choice condition) was significantly lower than those of Chinese and Americans both in group A (compared with Chinese: $p = 0.0003$, $\phi = 0.24$, Americans: $p < 0.0001$, $\phi = 0.27$) and in group B (compared with Chinese: $p < 0.0001$, $\phi = 0.34$, Americans: $p = 0.017$, $\phi = 0.17$).

2) Answers to Q2

Since there was no significant difference in answers to Q2 between group A and group B, only the compound data is reported here. Figure 3 is the percentage of respondents who selected the AI (or design manager) as responsible for the accident. The rates of Chinese and American participants were significantly higher than that of Japanese participants.

![FIGURE 3. Rate of participants that select the AI in Q2](image)

3) Answers to Q3

Figure 4 shows the rates of participants who selected the AI in Q2 broken down by the answers to Q1. In all countries, those who selected the driver-first setting in Q1 had a significantly higher rate of selecting the AI than the rate of those who selected the pedestrian-first setting. But the difference is much larger (in terms of effect size) in the Japanese results. Also, even though there was no significant cultural difference among those who chose the driver-first setting, among those who chose the pedestrian-first setting, the Japanese participants who attributed responsibility to the AI were significantly lower than both Chinese ($p = 0.011$, $\phi = 0.18$) and Americans ($p = 0.025$, $\phi = 0.14$), suggesting the Japanese who preferred the pedestrian-first setting as a driver tend to blame the driver much more than Chinese and Americans.

Figure 5 shows the rates of participants who chose the car with the driver-first setting in response to Q3. (One American subject did not answer this question.) To examine the egocentric asymmetry, this result was compared with answers to Q1, and found that the rates of the Chinese participants and the American participants who chose the driver-first setting were significantly lower (despite the small effect sizes) than their answers to Q1 (Chinese: $p = 0.018$, $\phi = 0.11$; Americans: $p = 0.020$, $\phi = 0.11$).

However, the breakdown of the answers by the answers to Q1 shows that participants were surprisingly consistent...
FIGURE 4. Rate of participants who select the AI in Q2 in relation to the answers to Q1

FIGURE 5. Rate of participants who chose a driver-first setting in Q3 in relation to Q1

FIGURE 6. Rate of participants who chose a driver-first setting in Q3 in relation to Q1

between these questions, and there was no cultural difference in the rate of those who chose the driver-first setting (figure 6).

Still, the cultural difference in the overall distribution of social value orientation was still impressive (table 3). Nearly 70% of the Japanese were collectivists, while only 30% of the Chinese were. The distributions of Chinese and Americans were generally very similar, with striking contrasts with the Japanese distribution.

TABLE 3. Distribution of Social Value Orientation

<table>
<thead>
<tr>
<th></th>
<th>JP</th>
<th>CN</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Principled collectivist (Q1: Pedestrian, Q3: Pedestrian)</td>
<td>66.8%</td>
<td>32.5%</td>
<td>41.6%</td>
</tr>
<tr>
<td>Idealistic altruist (Q1: Pedestrian, Q3: Driver)</td>
<td>1.0%</td>
<td>6.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Realistic egoist (Q1: Driver, Q3: Pedestrian)</td>
<td>7.5%</td>
<td>17.5%</td>
<td>14.4%</td>
</tr>
<tr>
<td>Principled individualist (Q1: Driver, Q3: Driver)</td>
<td>24.9%</td>
<td>43.9%</td>
<td>40.4%</td>
</tr>
</tbody>
</table>

As the figure 7 shows, if the rates of principled collectivists and the rates of principled individualists are compared, the rate of Japanese collectivists is significantly higher than those of Chinese and Americans, and the rate of Japanese individualists are significantly lower than the other two.

V. DISCUSSION

The results were not consistent with both the two main hypotheses.

As for the first hypothesis (about hypocritic bias), regardless of the relational mobility, the hypocritic bias was not found in any of the cultures. Although the rate of participants who chose the driver-first setting in group A (private choice condition) was supposed to be higher than the corresponding rate in group B (public choice condition) in Japanese and Chinese, the former rate turned out to be significantly lower than the latter rate (figure 2). This is the opposite effect of the hypocritic bias.

One possible account of this is that compared to the private ethics setting, choosing a car to purchase is not taken as a particularly ethical decision for Japanese and Chinese, where the car company already makes the ethical decision. Therefore the psychological bar (to choose the driver-first setting) is lowered there. However, this is only a psychological effect, not a principled view, since there was no difference.
in responsibility attribution between A and B in the answers to Q2, either Japanese or Chinese.

As for the second hypothesis (about the cultural variance of the priority choice), Japanese participants showed significantly lower rates of the driver-first setting than Chinese and American participants in the answers to Q1 in both group A and group B (figure2). The prediction based on relational mobility was consistent with the low Japanese rates and the high American rates of the driver-first setting (figure3). Still, the high rates of the driver-first setting in Chinese participants were contrary to the authors’ expectations. These results suggest that relational mobility cannot explain the cultural variance of the safety priority choice alone.

Rather, logistic regression analyses showed that only the ideal car type (Q3) was a significant predictor of safety preference in all countries. Furthermore, only the interaction term of the culture and the ideal car type was significant predictor in cultural comparisons. These suggest that the social value orientation is the main cultural difference, which explains the cultural difference in the safety priority choice. In contrast, relational mobility cannot explain the cultural difference in social value orientation itself.

Also, even though the egocentric asymmetry was found in Chinese and Americans, even if this was a within-subjects comparison, the consistency of participants between answers to Q1 and Q3 suggests the robustness of social value orientation. If so, the cultural difference is mainly due to the difference in collectivist/individualist tendencies.

VI. CONCLUSION

This study investigated people’s safety priority choices from the driver’s perspective, which can be egocentric, altruistic, or even hypocritic, depending on their answers. The results did not show any hypocritic bias in people’s answers. It is, however, still plausible to think that such a bias would be found there if alternative methods or approaches were used. Investigating this possibility is left for future studies.

At the same time, if the psychological bar account of the opposite effect of the hypocritic bias discussed in the last section is correct, such a fact may support the claim of those who think that the mandatory ethics setting is better for society so that only pedestrian-first cars should be on the market [15]. Whether this is true or not, however, is an important fact for both car companies and lawmakers.

On the other hand, the results indicated significant cultural differences in people’s safety priority choices. Thus, we cannot say that, as a driver, people generally prefer the driver-first/ pedestrian-first setting, independently of their culture. In particular, it was expected that the low relational mobility of the Japanese and Chinese societies would generate the hypocrite bias, and relational mobility would explain the cultural variance of the safety priority choice. However, the results showed rather contrary effects of hypocritic bias in the Japanese and Chinese data and the tendency of safety priority choice in Chinese contrary to what was predicted by relational mobility.

Admittedly, this study collected data from only three countries, and extending the sample groups (countries) is certainly desirable. The larger-scale study including many more countries, should be the authors’ future project. Still, the present results have shown the existence of cultural difference in the safety priority choice, which provide data that cannot be obtained from the standard moral dilemma surveys, which let participants select victims of accidents from a third-person’s perspective. In particular, this study found consistently higher rates of Japanese preference for the pedestrian-first setting. This strong tendency in Japanese, even from the driver’s perspective, supplements the results of Awad et al. [10].

Moreover, despite the difference in relational mobility, the similarity of the higher rates of the driver-first setting of Chinese and Americans is already interesting enough. (In this connection, the participants’ consistency between answers in Q1 and Q3 should also be noted. It suggests the polarity of the collectivist and the individualist views.) Unlike the ordinary East/West or low/high relational mobility distinction, contemporary Chinese society belongs to the individualist side, at least concerning the ethics of autonomous cars. This unexpected dissociation of relational mobility and the social value orientation found in Chinese deserves further independent exploration.

Finally, the results in this study also provide useful data for legal considerations, especially for lawmakers. Given that people’s preferences significantly differ culturally, the legal system regulating autonomous vehicles in each country should also consider and respect such culture-specific aspects (see Appendix II for more specific legal situations in Japan, China, and the USA). The same applies all the more to the market analysis of future user acceptance of autonomous vehicles for multinational automakers, to which cultural considerations are essential, and that will also strongly influence the policies of developing the control system of such cars. In this sense, the results reported here should provide valuable new data for future discussions in many fields on the issues surrounding the autonomous car.

APPENDIX I

A. QUESTIONS OF GROUP A (ENGLISH)

1) Q1
You buy a car that has auto driving AI. Usually you can drive the car yourself, but the car has an auto braking and an auto steering to avoid collisions. In addition, you need to choose in advance which safety is prioritized, drivers or pedestrians, in an emergency such as collisions that cannot be avoided by auto braking and auto steering. The setting do you choose?
   1) Setting that prioritizes driver’s safety
   2) Setting that prioritizes pedestrian’s safety

2) Q2
The car that has an auto driving AI, had an accident. The victim of the accident was a 10-year-old, elementary school
boy. The boy was taking his dog for a walk. Then a ball had
own from a nearby park, and the dog chased the ball and
pulled the lead strongly. Finally the boy was hit by the car
and died. The car driver claims that the responsibility for the
accident was with auto driving AI. At the time of the
accident, the driver was driving alone, and under the legal
speed of this road. The accident site was a single lane road on
each side. There were sidewalks lined with street trees on
both sides of the road and there were many oncoming cars.
The driver was unable to avoid the accident by his braking
because the boy seemed to suddenly emerge from the blind
spot of the street tree. Therefore the driver had only one
choice whether he mitigate collision with the boy by using
auto braking, or avoid collisions with the boy by colliding
with oncoming vehicles or street trees. Then the auto steering
that put the driver at risk of life, did not work and only the
auto braking worked because the car was set to prioritize
driver’s safety in an emergency. Finally the boy wash it by
the car and died. If the driver’s car had not had an auto
driving AI, the driver would have turned the steering wheel
at the discretion of him and he would be put at risk of injury
but would not be dead, and the boy also would not be dead.
The victim’s family claims that the responsibility for the
accident was with the driver. If the driver’s car had been set
to prioritize pedestrian’s safety in an emergency, the driver
would be put at risk of injury but would not be dead, and the
boy also would not be dead. Which do you consider
responsible for the accident?
   1) Auto driving AI (or design manager of AI)
   2) Driver

B. QUESTIONS OF GROUP B (ENGLISH)

1) Q1
You are going to buy a car that has auto driving AI. Usually
you can drive the car yourself, but the car has an auto braking
and an auto steering to avoid collisions. In addition, the car
has an AI that is predetermined which safety is prioritize,
drivers or pedestrians, in an emergency such as collisions
that cannot be avoided by auto braking and auto steering. It
is different which AI is installed by car types, but almost
people know which car has which AI. Now, you are having
trouble deciding which one to buy, car A or car B. Car A and
car B look very different and they are well known that car A
has an AI that prioritizes driver’s safety and car B has an
another one. If you buy car A, your safety as a driver is
prioritized, but the person who chooses the car A, are
accused as a selfish person in general. On the other hand, if
you buy car B, pedestrian’s safety is prioritized. The person
who chooses the car B, are not that accused in general
because they will be in danger in an emergency, but they are
sometimes accused as a hypocrite. Which car do you buy?
   1) Car A: has an AI that prioritizes driver’s safety
   2) Car B: has an AI that prioritizes pedestrian’s safety

2) Q2
The car that has an auto driving AI, had an accident. The
victim of the accident was a 10-year-old, elementary school
student. He was taking his dog for a walk. Then a ball had

APPENDIX II
CURRENT SITUATION SURROUNDING AUTONOMOUS CARS

The environment surrounding autonomous cars varies
greatly from country to country. Here we present the current
status of autonomous cars in the three countries discussed in
this study. Alawadi [27] provided more detailed
information on the current status in other countries.

A. JAPAN

In Japan, accidents caused by driver assistance technology
are the responsibility of the driver in accordance with Article
70 of the Road Traffic Act. On the other hand, in the complete
automated driving case, the responsibility for accidents is still
not documented. The general view is that the automaker is
responsible for accidents because the system is responsible for
monitoring the surrounding environment, and the automaker
has the responsibility for developing the system [28]. In March
2021, Honda Motor Co. launched the Legend, a luxury sedan
with a safe driving assist system that includes a Level 3 autonomous
driving system. However, it still does not reach the level that the
environment supposed in this study because it imposed
certain restrictions on automated driving, such as traffic
congestion on highways and in bad weather conditions,
such as heavy rain, snowfall, and dense fog.

B. CHINA
In China, accidents caused between cars and pedestrians are the responsibility of the driver unless there is evidence that the pedestrian violates traffic safety laws in accordance with Article 76 of the Road Traffic Safety Law. Especially in automated driving cases, the Management Ordinance for Connected Car has been issued with Article 76 of the Road Traffic Safety Law. It states that if a pedestrian violates traffic safety laws in accordance with the said ordinance, currently, in certain areas of China, driverless cars got permission to provide ride-hailing services.

C. USA
In USA, traffic laws are developed in each state. For this reason, the National Highway Traffic Safety Administration has established guidelines to serve as standards. According to NHTSA, the driver has to share the responsibility for the accident that occurs by autonomous cars for the foreseeable future. For example, the safety driver of an Uber autonomous car that killed a pedestrian has been charged with negligent homicide. In this case, there was clear negligence by the safety driver. However, a situation supposed in this study was that the accident was unavoidable and the driver’s choice was already finished long before encountering the accident. Although in some states, driverless cars that do not have a handle and brake for humans are already tested, the same situation assumed in this study can be adopted. If such cars occurred in an unavoidable accident and killed pedestrians to save passengers, which should be the passengers who ride while knowing about the passenger-first setting or the car manufacturer who set the passenger-first setting responsible? It will be an important future work to widespread driverless cars.

ACKNOWLEDGMENT
S. Ono thanks to Z. Han, S. Kaneda, T. Ohashira, and Y. Osato for collaboration on the early stages of this work.

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