The Footbridge Dilemma Reflects More Utilitarian Thinking Than The Trolley Dilemma: Effect Of Number Of Victims In Moral Dilemmas

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Abstract

Previous studies on moral judgment have assumed that the trolley and footbridge dilemmas (Thomson, 1985) reflect utilitarian and deontologist thinking, respectively. However, on the basis of the "intervention myopia" hypothesis (Waldmann & Dieterich, 2007) and recent findings in analyses of moral dilemmas (Nakamura, 2011), the current study led a somewhat paradoxical prediction: An effect of the manipulation of the number of victims, considered a utilitarian aspect of moral dilemmas, is larger in the footbridge dilemma than in the trolley dilemma. In order to test this prediction, two experimental studies were conducted in which the number of victims in the trolley and footbridge dilemmas were manipulated. Results of the two studies consistently showed an interaction between the dilemma type and the number of victims, thereby indicating that the manipulation of the utilitarian aspect of moral dilemmas has more effect on the footbridge dilemma, which is believed to reflect deontologist thinking.

Keywords: trolley dilemma, footbridge dilemma, utilitarian, deontologist

Introduction

Is it permissible to sacrifice fewer lives to save more? This is a central question in the debate between utilitarianism and deontology. Utilitarians (e.g., Bentham, 1789; 1948) argue that it is indeed permissible because saving more lives results in greater utility for society than saving fewer ones, whereas deontologists (e.g., Kant, 1965) argue that it is not permissible because life is an ultimate right that should not be violated, irrespective of the number benefit yielded by its sacrifice. This debate has drawn the attention of various researchers who have proposed a number of solutions (see e.g., Singer, 1979; Thomson, 1986; Greene & Haidt, 2002; Mikhail, 2009).

The philosophical debate between utilitarians and deontologists concerns the normative theory of moral judgment. However, psychologists are interested in the descriptive aspect of moral judgment: are people utilitarian or deontologist? The answer to this question is, surprisingly, "it depends on the context." A discrepancy between the trolley and footbridge dilemmas (Thomson, 1985) clearly demonstrates the context dependency in moral judgment. The trolley dilemma can be described in the following manner: A runaway trolley is headed for five people who will be killed if it proceeds on its current course. The only way to save them is to hit a switch that will turn the trolley onto an alternate set of tracks where it will kill one person instead of five. Should one turn the trolley in order to save five people at the expense of one? Most people answer yes to this dilemma. Then, consider a similar problem, the footbridge dilemma. As before, a trolley threatens to kill five people. You are standing next to a large stranger on a footbridge that spans the tracks, in between the oncoming trolley and the five people. In this scenario, the only way to save the five people is to push this stranger off the bridge, onto the tracks below. He will die if you do this, but his body will stop the trolley from reaching the others. Should one save the five others by pushing this stranger to his death? To this question, most people answer no (with regard to precise data, see Greene & Haidt, 2002).

With regard to the dominant responses in these dilemmas, people appear to be utilitarians when solving the trolley dilemma and deontologists when solving the footbridge dilemma. In the former dilemma, a person's choice appears to depend on the number of workmen to be saved, whereas people make much of the right of the man on the bridge in the latter dilemma. Thus, it has been considered that the trolley dilemma reflects the utilitarian way of thinking, whereas the footbridge dilemma reflects the deontologist way of thinking (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Waldmann & Dieterich, 2007). With regard to this discrepancy in the dominant responses between the trolley and footbridge dilemmas, various theoretical explanations have been proposed such as the dual process theory (Greene et al., 2001), moral grammar theory (Hauser, 2007; Mikhail, 2009), or causal decision theory (Waldmann & Dieterich, 2007).

Although theorists of moral reasoning differ in terms of how to explain the discrepancy between the trolley and footbridge dilemmas, they consistently receive correspondence between the two dilemmas and philosophical way of thinking without any doubt. For example, Greene et al. (2001) said that the dominant response in the footbridge dilemma could be justified in a Kantian (deontologist) vein, but this justification has trouble when considering the trolley dilemma (Greene et al., 2001, p2106). Hauser (2006, p113–4) explained the philosophical implication of the trolley and footbridge dilemmas in terms of whether the utilitarian calculation can justify dominant responses in these dilemmas. Waldmann and Dieterich (2007) also argued that throwing the switch in the trolley dilemma is in line with the utilitarian view, whereas the footbridge dilemma is in line with the deontologist perspective (Waldmann & Dieterich, 2007, p247–8). Although there are differing theoretical explanations for the discrepancy between the trolley and footbridge dilemmas, the theorists in moral reasoning research have no doubt in

the assumption that the trolley dilemma reflects utilitarian thinking, and the footbridge dilemma reflects deontologist thinking.

However, current research proposes another interpretation of the difference between the two moral dilemmas: the footbridge dilemma reflects more utilitarian thinking than the trolley dilemma. Although this hypothesis apparently sounds strange when considering the presumption in related studies, it can be naturally derived from a theoretical explanation (Waldmann & Dieterich, 2007) and recent empirical findings (Nakamura, 2011) in moral dilemmas. In what follows, we explain this interpretation more precisely.

Waldmann and Dieterich (2007) proposed the "intervention myopia hypothesis", which insists that moral intuitions are influenced by the locus of the intervention in the underlying causal model, and an attentional focus on the victims is highlighted by the intervention, leading to the neglect of other victims located in the background. More specifically, it treats the trolley dilemma as the intervening agent (trolley) and the footbridge dilemma as the intervening potential patient (victim). Thus, attentional focus on the one victim becomes stronger in the footbridge dilemma than in the trolley dilemma, thereby resulting in deontologist judgments being more likely in the former dilemma. Based on this theoretical explanation for moral dilemmas, Waldmann and Dieterich (2007) performed a series of experiments in which the focus of intervention was manipulated. For example, they compared how participants' moral judgment would differ between "throwing a bomb on the man" and "throwing a man on a bomb" to save many people. In terms of their hypothesis, the former action corresponds to the agent intervention, and the latter action corresponds to the patient intervention. Results of their experiment consistently supported their hypothesis and revealed that sacrificing one victim to save more victims is more permitted in the agent intervention than in the patient intervention.

One crucial aspect of Waldmann and Dieterich's (2007) hypothesis is that it considers the difference between the trolley and footbridge dilemma as that of attentional focus to causal structure. As stated above, according to this hypothesis, people make more of the patient when considering the footbridge dilemma compared to the trolley dilemma; they do not permit the sacrificing of a man in the footbridge dilemma as they do in the trolley dilemma. This explanation is intuitively natural and appears to match the dominant responses in these two dilemmas.

At the same time, the explanation in terms of attentional focus also leads to an interesting prediction. Many studies (e.g., Slovic, Griffin, & Tversky, 1990; Tversky & Koheler, 1994; Tversky, Sattath, & Slovic, 1988; also see Fischer & Hawkins, 1993) have demonstrated that a given attribute or element carries more weight for decision making when it becomes prominent. Although these studies are varied in their research subjects, such as preference reversal (Slovic et al., 1990; Tversky et al., 1988) or probability judgment (Tversky & Koheler, 1994), these studies consistently assume that an attribute or element looms larger when it receives attention and its impact on judgment becomes stronger than when it does not receive attention. If so, the following prediction can be drawn from Waldmann and Dieterich's (2007) hypothesis; *people are more sensitive to a difference in the number of victims in the footbridge dilemma than in the trolley dilemma because the victims are paid more attention in the footbridge dilemma than in the trolley dilemma.* More specifically, the effect of the manipulation of the number of victims is larger in the footbridge dilemma than in the trolley dilemma because the victims in the former dilemma loom larger than in the latter dilemma. As you see, this prediction can be derived from the existing explanation very naturally. However, it contradicts the dominant view that matches the trolley and footbridge dilemmas to utilitarian and deontologist thinking (e.g., Greene et al., 2001).

Although the above prediction appears to be paradoxical, Nakamura (2011) also demonstrates that the footbridge dilemma surely reflects utilitarian thinking more so than the trolley dilemma. He required participants to answer 62 types of moral dilemmas used in Greene et al. (2001) and analyzed the correlation structure of participants' judgments using factor analysis and structural equation modeling. The results demonstrated that the moral dilemmas used in Greene et al. (2001) can be explained by four factors: rationality, life-dilemma, risk averse, and efficiency (see Nakamura, 2011). Among these four factors, the risk-averse factor contributed to the difference between the trolley and footbridge dilemmas. This factor mainly comprises problems similar to Asian disease problems (e.g., Tversky & Kahneman, 1984) that require participants to consider a trade-off between probability and outcome ("90% chance of causing no deaths at all and has a 10% chance of causing 1000 deaths or an 88% chance of causing no deaths and a 12% chance of causing 10 deaths"). This factor can be interpreted as the calculation of expected value for each alternative that can be thought of as a utilitarian aspect of moral dilemmas. Surprisingly, a result of structural equation modeling in Nakamura (2011) demonstrated that the risk-averse factor had a significant effect on the footbridge dilemma but not on the trolley dilemma, which is in accordance with the entailment of the intervention myopia hypothesis stated above. That is, results of the multivariate analysis that deals with the correlation structure among the moral dilemmas also indicate a relationship between utilitarian thinking and the footbridge dilemma.

The above discussion consistently suggests that the footbridge dilemma reflects utilitarian thinking more so than the trolley dilemma. Considering that previous studies, including both psychological and philosophical ones, have positioned these dilemmas as symbols for utilitarian and deontologist thinking (e.g., Foot, 1978; Greene et al., 2001; Thomson, 1985), this implication is very important because it contradicts the prevailing view of these two dilemmas. Additionally, the suggestion of the above discussion is

drawn from a natural deduction of the existing theoretical approach (Waldmann & Dieterich, 2007) that also supports this prevailing view. Thus, an exploration of the utilitarian aspect of these two dilemmas leads to a clarification of the meaning of "utilitarian" and "deontologist."

The purpose of this study is to test the hypothesis that the footbridge dilemma is more related to utilitarian thinking than the trolley dilemma. In order to accomplish this, the current research emphasizes the number of victims. Previous studies combined the trolley and footbridge dilemmas with utilitarian and deontologist thinking in terms of whether participants make much of the number of people to be saved or one man's right to live. In this vein, the number of victims can be considered a utilitarian aspect of the moral dilemmas. The following two studies manipulated the number of victims in both the trolley and footbridge dilemmas and examined its effect on these two dilemmas.

Study 1

Study 1 aimed to investigate how a manipulation of the number of victims in the trolley and footbridge dilemmas would work under a standard experimental procedure. Many studies on moral dilemmas (e.g., Greene et al., 2001; Hauser, Cushman, Young, Jin, & Mikhail, 2009) have adopted a forced choice paradigm in which participants are required to choose whether sacrificing a victim to save more people would be permissible or not and have analyzed the percentage of participants who answered yes. Thus, Study 1 examined how the percentage of participants would change according to the number of victims in the trolley and footbridge dilemmas.

Participants and design

Two hundred eighty-five undergraduates who were naïve to the dilemma tasks participated in Study 1 for course credit. We prepared six types of scenarios in which the story (trolley or footbridge) and number of victims (one/two/five) were manipulated, and each participant received one of the six types of scenarios randomly. As a result, in the trolley dilemma condition, the number of participants who were assigned to the one-, two-, and five-victim condition were 49, 49, and 53, respectively. In the footbridge dilemma condition, the number of participants was 43, 58, and 53 (one-, two-, and five-victim condition, respectively).

Materials and procedure

Participants received a booklet and before they read the booklet, they were told that the study was about moral dilemmas. The instructions on the first page stated that the task was to read descriptions of a situation and to consider an act described in the scene. The second page presented the scenario and included a response format requiring participants to indicate whether the act ("turn the trolley"/"push the man") was morally permissible.

The following was the first paragraph in both the trolley and footbridge dilemma conditions:

> There is an emergency where a trolley runs out of control. Although a driver tries to stop the trolley, it does not appear to stop. Unfortunately, the trolley is rushing toward ten workmen. If the trolley does not stop, it will surely kill all ten workmen.

After this paragraph, participants in the trolley dilemma condition were shown the following scenario:

> There is another railway of the trolley, and if you hit the switch, the trolley changes its course, and the ten workmen will be saved. However, there is #__ workman (or men) on the other course, and if you hit the switch, this workman (or men) will surely be killed by the runaway trolley. Is it permissible to hit the switch to save the ten workmen?

After the first paragraph, participants in the footbridge dilemma condition were shown the following scenario:

> There is a footbridge on the course of the trolley, and #__ man (or men) standing on this footbridge. If you throw the man on the railway, the trolley will stop because the man's body becomes a barrier, and the ten workmen will be saved. However, the man (or men) on the footbridge will be killed. Is it permissible to push the man on the footbridge to save the ten workmen?

The blanks shown in the above texts were replaced by numbers (one, two, or five), depending on the conditions of the number of the victims. The descriptions of these two dilemmas comprised only of sentences and did not employ any pictures. All the participants finished the tasks within 10 minutes.

Results and discussion

Figure 1 depicts the percentage of participants who believed that sacrificing fewer to save more was "morally permissible" in each condition. As this graph demonstrates, the effect of the number of the people on moral judgment differs between the trolley and footbridge dilemmas. In the footbridge dilemma, acceptability for the death of one person to save ten people decreases as the number of lives sacrificed increases, whereas in the trolley dilemma, the percentage of participants who permitted sacrificing the few remains constant. A logistic multiple regression analysis showed that an effect of the number of victims, $B = -0.25$, Wald (1) = 5.47, $p = 0.02$ and interaction between the number of victims and the type of dilemma, $B = -0.33$, Wald (1) = 4.33, $p = 0.37$ were significant, thereby indicating that whether manipulation of the number of people to be sacrificed would affect moral judgment depends on the context of the dilemma. Multiple comparisons among the conditions in the number of the victims indicate significant differences in the footbridge dilemma, (chi-square test: Ps<.01), but not in the trolley dilemma (Ps>.10). Thus, results of Study 1 supported our prediction that the

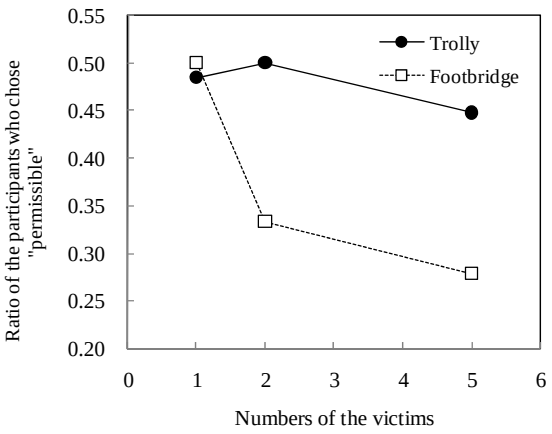

Figure 1 Results of Study 1

footbridge dilemma reflects utilitarian thinking more so than the trolley dilemma.

One noteworthy result of Study 1 is that the difference between the trolley and footbridge dilemmas is not significant when one person must be sacrificed to save ten (P>.10). As far as I know, this is the first example demonstrating that the ratio of participants who chose "permissible" in the footbridge dilemma was equal to that of the trolley dilemma. One plausible reason for this result is that the current research differs in terms of the number of people to be saved and the number of victims. Most previous studies on the trolley and footbridge dilemmas (e.g., Greene et al., 2001; Mikhail, 2009; Waldmann & Dieterich, 2007) used five and one as the number of people to be saved and number of victims, respectively. In contrast to these studies, in order to examine the utilitarian aspect of the moral dilemma, the current study used ten as the number of people to be saved, and three values (one, two, or five) for the number of victims. It is possible that the number of victims affect the difference between the trolley and footbridge dilemmas, although it requires further study. Study 2 will also address this problem in the results and discussion section.

Study 2

Study 2 aimed to replicate the findings in Study 1 under a condition where the following two modifications in the experimental procedure were added. First, Study 2 manipulated the number of victims as a within factor to examine whether the results in Study 1 were due to a reflection of individual differences. Second, Study 2 adopted the number of people to be saved as a dependent variable. Although the current research aimed to examine the utilitarian aspects of the moral dilemmas, the permissibility judgment used in Study 1 appears to be somewhat different from utilitarian calculation because "permissibility" sounds like a subjective impression. Thus, it is not certain whether the same trends would be found if participants are required to make a utilitarian calculation for permissibility to sacrifice few to save more. In order to examine this, Study 2 required participants to estimate the number of people to be saved that seemed to be equal to sacrificing fewer people.

Participants and design

Fifty undergraduates participated in Study 2 for course credit and were randomly assigned to one of two conditions: the trolley dilemma condition or the footbridge dilemma condition. All the experimental materials and response formats were given in the form of a booklet. The first page contained the same instructions as Study1, and the second page described the scenario and included a response format. In both the trolley dilemma conditions, participants read the following:

> There is an emergency where a trolley runs out of control. Although a driver tries to stop the trolley, it does not appear to stop. Unfortunately, the trolley is rushing toward some workmen. If the trolley does not stop, it will surely kill all the workmen.
>
> There is another railway for the trolley, and if you hit the switch, the trolley changes its course, and the ten workmen will be saved. However, there are *some* workmen on the other course, and if you hit the switch, the workmen on the other railway will surely be killed by the runaway trolley.

As shown, these instructions are almost the same as those of Study 1, except that the number of victims and people to be saved were not stated explicitly. In the footbridge condition, the first paragraph shown to participants was the same as that in the trolley dilemma condition, but the second paragraph was as given below:

> There is a footbridge on the path of the trolley, and some men are standing on this footbridge. If you throw the men on the railway, the trolley will stop because the men's bodies become a barrier, and the workmen will be saved. However, the men on the footbridge will be killed. Is it permissible to push the men on the footbridge to save the ten workmen?

After reading the above texts, participants in both conditions were required to answer the following question under three conditions, where the number of victims were one, two, or five:

> Consider that the number of workmen on the other railway (the footbridge) is #__. How many people do you think are enough to justify hitting the switch (pushing them)? Insert a number in the blank.

The blank shown in the response format was replaced by numbers (one, two, or five). All participants finished within 20 minutes.

Results and discussion

The results of Study 2 depicted in Figure 2 indicate that the slope of the function between the number of victims and the dependent variable is steeper in the footbridge condition than in the trolley condition. A 2 (type of dilemma: trolley/footbridge) by 3 (number of people to be sacrificed: 1/2/5) ANOVA demonstrated significant main effects of the two factors: type of dilemma, $F(1, 48) = 7.22$, $p < .01$; number of victims, $F(2, 47) = 16.57$, $p < .01$; and interaction $F(2, 96) = 6.60$, $p < .01$. Analyses of the simple main effect by Ryan's method indicated that the simple effect of the type of dilemma was significant only in the five-person condition, $F(1, 144) = 18.68$, $p < .01$, and the simple main effect of the number of people was significant only in the footbridge condition, $F(2, 96) = 22.05$, $p < .01$. These results replicate the findings of Study 1, which suggest that the effect of the number of victims is stronger in the footbridge dilemma than in the trolley dilemma, thereby supporting our position that the footbridge dilemma reflects the utilitarian aspect of the moral dilemma more than the trolley dilemma. Additionally, Study 2 also failed to find the difference between the trolley and footbridge dilemmas when the number of victims is small. These results replicate the pattern found in Study 1.

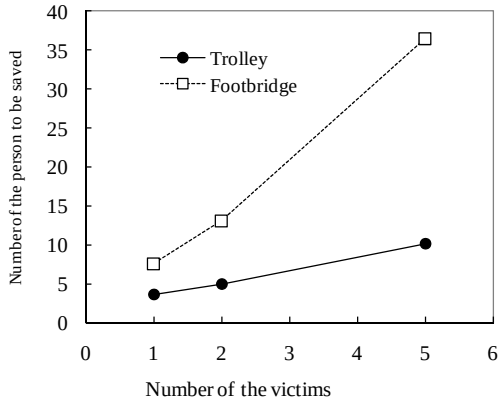

Figure 2 Results of Study 2

General discussion

The results of the two studies consistently demonstrated that the footbridge dilemma was more sensitive to the manipulation of the number of people to be sacrificed than the trolley dilemma. Study 1 demonstrated that as the number of victims increased, the ratio of participants who permitted sacrificing the few in the footbridge dilemma decreased, whereas those in the trolley dilemma did not change. Study 2 asked participants the number of people to be saved to permit a sacrifice and found that the effect of the number of victims was larger in the footbridge dilemma than in the trolley dilemma.

The current results provide the following four theoretical implications. First, this article demonstrates a connection between the footbridge dilemma and the utilitarian aspect of the moral dilemma. Previous studies (e.g., Greene et al., 2001; Hauser, 2007; Waldmann & Dieterich, 2007) have assumed that the trolley dilemma reflects utilitarian thinking, whereas the footbridge dilemma reflects deontologist thinking. These studies mainly draw this assumption from a pattern of the dominant responses of the trolley and footbridge dilemmas. In contrast to these studies, the current research took into account sensitivity to the manipulation of the utilitarian aspect of the moral dilemma and derived a contradictive view. As far as we know, this is the first example that challenges the prevailing view: "utilitarian" trolley and "deontologist" footbridge. In addition, the current results reveal the reason why people consider pushing the man not permissible in order to save the five workmen in the original footbridge dilemma. It is not because they think the man's right to live should not be violated; rather, people think that five people are not enough to sacrifice one person.

Second, the current results are in line with the perspective that causal structure might be key to understanding moral reasoning (Waldmann & Dieterich, 2007). According to Waldmann and Dieterich's (2007) view, intervention to causal path in moral dilemmas plays an important role for moral reasoning because it changes attentional weights on agent and patient. The hypothesis tested in the current study is naturally derived from this explanation because attention is believed to affect sensitivity to the attribute that it focuses on (e.g., Tversky & Koheler, 1994; Tversky et al., 1988). The results of the two studies consistently support the hypothesis, thus indirectly confirming Waldmann and Dieterich's (2007) proposition. Additionally, the current results also support Nakamura's (2011) implication that the footbridge dilemma is considered more consequential than the trolley dilemma because the risk-averse factor solely affected the footbridge dilemma.

Third, the current research also suggests that moral reasoning processes may be easily influenced by the number of victims. Both Studies 1 and 2 failed to find a difference between the trolley and footbridge dilemmas that have been replicated robustly (e.g., Greene et al., 2001; Greene & Haidt, 2002). The main difference between previous studies and the current study is the number of victims and people to be saved. With regard to the number of people to be saved by sacrificing fewer people, this research used "ten" in Study 1, whereas previous studies used "five." Study 2 left the number of people to be saved blank and required participants to provide a number that they would be willing to sacrifice. In this vein, there is a possibility that this difference in the numbers used in the scenario might produce a discrepancy in the results between the current research and previous studies. Although this possibility is an issue for future examination, it would be useful to explore the relationship between numerical value and moral judgment.

Fourth, the current research indicates the importance of exploring not only the dominant response but also sensitivity to manipulation when investigating the moral dilemma. The current research focused on the effect of the number of victims and succeeded to derive a somewhat different conclusion by identifying an interaction between the number of victims and types of dilemma. This result might provide an important implication to a methodology of experimental philosophy (e.g., Knobe, 2004, 2007; Knobe & Nichols, 2009). Experimental philosophy attempts to solve philosophical issues not by speculation but by empirical investigation. In doing so, experimental philosophy mainly deals with average responses in moral reasoning problems, as previous studies on moral dilemmas have done (e.g., Knobe, 2003). However, empirical data are not limited to the average. Correlation among the problems (e.g., Nakamura, 2011) or sensitivity to independent variables can also provide interesting information in understanding the nature of a moral issue. Concern for the data analysis method would benefit experimental philosophy and produce results that are applicable to philosophical issues.

This discussion also leads to an examination of "utilitarian" and "deontologist" thinking. The proposition that the trolley dilemma reflects the utilitarian thinking has its basis on the dominant responses to this dilemma, whereas the current research has its basis on examination to the sensitivity to the number of the victims in moral reasoning. Then, some reader may consider a following question; which is the more plausible evidence to determine the utilitarian thinking? I think this question is a fundamental one for experimental philosophy. That is, one more message of the current research is that empirical studies on the moral reasoning should consider not only the meaning of the moral dilemma but also *how* to interpret empirical evidence in the dilemma. As far as I know, there is no study that considers this problem, and I hope this research would be a first step to this problem.

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