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Empirical Evidence Reveals the Motivation of Subjects Who Switch Tracks in the Trolley Loop Case

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Abstract

This paper investigates the moral intuitions associated with the loop variant of the Trolley Problem, initially proposed by Judith Jarvis Thomson in 1985. Thomson challenged the Doctrine of Double Effect (DDE), which differentiates between intended outcomes and foreseen but unintended consequences. Through an empirical study involving 134 participants from the United States and China, the research explores whether intuitions about the loop variant are influenced by the positioning of track workers and cultural context. The results indicate that a significant number of participants, particularly from China, perceive the permissibility of redirecting the trolley not merely as a means to kill one to save five but as a way to delay the trolley's impact. This suggests that cultural factors and the design of the loop scenario significantly influence moral judgments. The study supports the idea that the loop variant does not serve as a counter-example to DDE, offering insights into the motivations behind moral decisions and highlighting the importance of cultural context in ethical reasoning

Keywords

Trolley Problem, Loop Variant, Judith Thomson, Doctrine of Double Effect, Permissibility

1. Introduction

In her 1985 paper, *The Trolley Problem*, Judith Jarvis Thomson introduced the loop variation which challenged the notion that the Doctrine of Double Effect offered an easy solution to the Trolley Problem (Thomson, 1985). Since Thomson published her seminal article, several philosophers have questioned whether Thomson's reported intuitions about the loop case are universally shared.

Meanwhile, other philosophers have suggested that reported intuitions regarding the loop case are driven by extraneous features of the loop design (see, e.g., Shaw, 2006; Masek, 2010). I wanted to know whether subjects who reported a willingness to switch in the loop variant did so because they felt it was permissible to kill one to save five or rather whether they were comfortable switching because they felt it was permissible to delay impact possibly *despite the fact* that one person would be killed to save five. As a result, I conducted empirical research that tests whether intuitions about the loop variant are sensitive to the distance between the trolley and the track-workers on the loop. My empirical results suggest that a significant number of subjects who are willing to switch the trolley in the standard loop variant do not intend to kill one to save five but rather are merely intending to send the trolley on a detour to delay impact with the larger number of workers on the track.

2. Background

In the original version of the Trolley Problem, Phillippa Foot asked why it would be impermissible to kill one person and harvest their organs to save five; whereas, it would be permissible to switch a runaway trolley heading towards five people onto a side track where it will only kill one person (Foot, 1967). Foot argued that our divergent intuitions could be explained by the Doctrine of Double Effect (DDE), which morally differentiates between intended outcomes and foreseen but unintended consequences of actions. According to this doctrine, it is sometimes permissible to bring about a harmful effect as a side effect (or oblique intention) of an action that is aimed at a good end, even if it would be impermissible to bring about the same harmful effect as a direct intention (Foot, 1967).

Thomson famously rejected DDE, because it apparently failed to account for intuitions about the loop variation of Thomson's creation (Thomson, 1985). In the loop variant, there are not two separate tracks; instead a single track circles around creating a loop. A bystander at the switch can divert the trolley into the loop, where it will kill a single innocent track-worker, grinding the trolley to a halt and resultantly saving the five. However, if not for the single track-worker, the trolley would have continued around the loop and killed the five. In Thomson's words: "Some people feel more discomfort at the idea of turning the trolley in the loop variant than in the original Bystander at the Switch. But we cannot really suppose that the presence or absence of that extra bit of track makes a major moral difference as to what an agent may do in these cases, and it really does seem right to think (despite the discomfort) that the agent may proceed" (Thomson, 1985). Thomson further supposed that in switching the trolley in the loop variant, the bystander at the switch must be acting with the intention of causing impact with the lone track-worker: "On the other hand, we should notice that the agent here needs the one (fat) track workman on the right-hand track if he is to save his five. If the one goes wholly out of existence just before the agent starts to turn the trolley, then the agent cannot save his five" (Thomson, 1985).

Looking back in history, Thomson's loop variant proved to be a pivotal thought experiment that engendered our enduring fascination with trolleys. After all, Foot's solution to the original trolley variant was not in her time a radical suggestion. Thomas Aquinas had introduced DDE centuries earlier in the *Summa Theologica* (Aquinas, 1966, II-II, Qu. 64, Art.7). But if Thomson was right, then this default solution to Foot's trolley problem must be wrong, because in the loop variant, it seemed there was an instance in which it was indeed permissible to intentionally kill the one in order to save the five. Thomson's loop therefore launched a decades-long philosophical project to improve upon and replace DDE in order to accommodate the loop variant (and eventually many others).

But not all philosophers were convinced that Thomson's loop variant was fatal for DDE. Some philosophers denied sharing Thomson's intuition about the loop variant. Meanwhile, other philosophers suggested that while Thomson's intuitions about the loop variant might have been correct, subjects might only be comfortable switching because they hope to send the trolley on a loopy detour (a motivation that is consistent with DDE because it does not involve any intention to harm the lone track-worker by way of saving the five). For example, Joseph Shaw has written that the inclination to switch in the loop variant "could be described as an aesthetic or squamish desire to delay the death of five for a little while, or to do what little one can to protect them" (Shaw, 2006). Similarly, Lawrence Masek posits, "a proponent of [DDE] could argue that the bystander in loop case does not use the one person simply as a means because the bystander could intend only to delay the trolley's hitting the five" (Masek, 2010). If these critics of Thomson are correct, then DDE is unscathed and Thomson's loop variant is less significant than it seems, because there is a plausible motivation for switching in the loop variant that is consistent with DDE. In sum, debunking Thomson's loop variant is a project of critical importance for defenders of DDE and similar intention-based ethical principles.

3. Empirical Results

3.1. Subjects

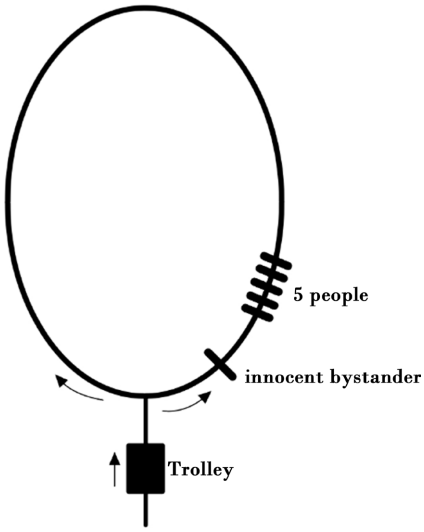
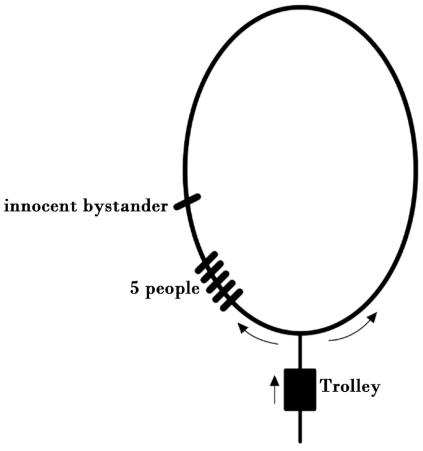
391 participants were recruited via Survey Monkey where the experiment was conducted through an online survey questionnaire. Survey Monkey, which is a platform mainly used for market research, selected participants based on specific targeting criteria such as country, gender, age, income, and additional demographics. All participants were asked the pre-screening question: Have you ever heard of the Trolley Problem, a philosophical thought experiment that poses a scenario in which one must choose between intervening to redirect a runaway trolley onto a track where it will kill one person instead of allowing it to continue on its current course where it will kill five people? Only participants who answered "no" to the pre-screening question were permitted to continue the survey. Out of the 391 participants, 134 responded no. To fulfill the cross-cultural aim of study, 89 subject responses came from China, and 45 responses came

from the United States. All of the subjects were between 18 and 29 years old (100 %), and the sample had a female bias (52%).

3.2. Design

For the China portion of the experiment, 36 participants were subjected to loop variant A, and 53 participants were subjected to loop variant B (see Table 1). For the United States portion of the experiment, 17 participants were subjected to loop variant A, and 28 participants were subjected to loop variant B (see Table 1). No participant viewed both variants. After viewing their respective loop variant and reading a general description of the case, each participant was presented with a claim statement (see Table 1) and was asked to indicate the degree to which they agreed or disagreed with the corresponding claim. Responses were made according to the following range: strongly agree, agree, disagree, strongly disagree. Agreement is read as concurrence with the claim that the

Table 1. Illustration of loop schematic and description of claim statement.

Scenario	Schematic	Description	Claim
A. Close Loop		A runaway trolley is headed towards a large loop and will go left in the direction of five innocent people who are on the track and who will be killed unless something is done. James can hit a button, which will redirect the trolley into the opposite direction of the loop to the right, which will cause the trolley to hit a lone innocent bystander. The runaway trolley would be stopped by hitting the lone innocent bystander, thereby saving the five people but killing the lone innocent bystander. The track loops back towards the five people. Hence, if it were not the case that the trolley would hit the lone innocent bystander and grind to a halt, the trolley would go around and kill the five people.	It is morally permissible for James to push the button to redirect the trolley into the opposite direction of the loop, so that the trolley goes to the right.
B. Far Loop		A runaway trolley is headed towards a large loop and will go left in the direction of five innocent people who are on the track and who will be killed unless something is done. James can hit a button, which will redirect the trolley into the opposite direction of the loop to the right, which will cause the trolley to hit a lone innocent bystander. The runaway trolley would be stopped by hitting the lone innocent bystander, thereby saving the five people but killing the lone innocent bystander. The track loops back towards the five people. Hence, if it were not the case that the trolley would hit the lone innocent bystander and grind to a halt, the trolley would go around and kill the five people.	It is morally permissible for James to push the button to redirect the trolley into the opposite direction of the loop, so that the trolley goes to the right.

action in question is permissible. Additionally, participants were given the opportunity to provide further comments on each scenario. After responding to their respective case, participants were asked three additional questions: 1) How strongly do you agree or disagree with the following statement: I did not cheat on tests when I was in high school 2) How strongly do you agree or disagree with the following statement: It is always wrong to lie on your tax returns 3) How strongly do you agree or disagree with the following statement: The US should do more to reduce income inequality, even if that means slightly more regulation and slightly less personal freedom.

4. Results

For the purpose of this experiment, I grouped the ratings strongly agree and agree as "agreement" with the claim statement. Conversely, I grouped the ratings strongly disagree and disagree as "disagreement" with the claim statement. See Table 2, Table 3 below for a summary of the results:

STATISTICAL ANALYSIS

Chi-Squared Test Results

The chi-squared test has been performed using the data above. Here are the results (Table 4):

- Chi-Squared Statistic: 10.002
- Degrees of Freedom (dof): 3
- P-Value: 0.0185

Expected Frequencies

Table 2. U.S. agreement and disagreement percentages.

Country	Loop Variant	Agreement (%)	Disagreement (%)
U.S.	A (Close Loop)	67.86	32.14
U.S.	B (Far Loop)	82.35	17.65

Table 3. China agreement and disagreement percentages.

Country	Loop Variant	Agreement (%)	Disagreement (%)
China	A (Close Loop)	94.34	5.66
China	B (Far Loop)	77.78	22.22

Table 4. Expected frequencies calculated based on the observed data.

Loop Variant	Agreement	Disagreement
U.S.—Far Loop	14.08	2.92
U.S.—Close loop	23.19	4.81
China—Far Loop	29.82	6.18
China—Close Loop	43.90	9.10

Interpretation

- Chi-Squared Statistic (10.002): This value represents the degree of difference between the observed and expected frequencies.
- Degrees of Freedom (3): This is calculated as (rows − 1) × (columns − 1) (rows − 1)\times (columns − 1) (rows − 1) × (columns − 1).
- P-Value (0.0185): A p-value less than 0.05 indicates that there is a statistically significant difference between the groups.

Since the p-value is less than 0.05, we can conclude that there is a significant difference in the agreement and disagreement responses across the different loop variants and countries.

5. Implications

5.1. U.S. Survey

The U.S. empirical data show that moral intuitions about the permissibility of switching in loop are indeed sensitive to the distances between the trolley and the track-workers along the loop. The key findings are that 1) a sizable minority of subjects disagree with switching in the loop case, and 2) subjects were twice as likely to disagree with switching if the loop decreased distance between the trolley and the track-workers (17.65% versus 32.14%). These findings directly contradict Thompson's supposition that "[w]e cannot really suppose that the presence or absence of that extra bit of track makes a major moral difference as to what an agent may do in these cases." (Thomson, 1985). On the contrary, it turns out that a little bit of extra track does make a moral difference.

The findings also support the suspicions of Shaw and Masek, who proposed that many subjects find it permissible to switch in the loop, not because they hope to kill the one in order to save the five, but rather because they intend to delay the trolley's impact with the five track-workers, even though this action results in the death of one. Therefore, the findings also support the conclusion that the loop case is not a counter-example to DDE.

The U.S. data is consistent with other studies showing that about one third to one half of subjects disagree with switching in loop (see, e.g., Liao, 2011; Hauser, 2006). But unlike those earlier studies, the instant study also explains the motivations of approximately half of those disagreeing subjects. It shows that we can ascribe an intention to subjects who are willing to switch in the loop case other than the intention to kill one to save five. This alternative intention, which is entirely consistent with DDE, is the intention to increase distance between the trolley and the track-workers or else to delay the accident for as long as possible.

Furthermore, this study helps to reconcile the different reported opinions about loops in the literature. Assuming a constant rate of trolley speed, Thomson's original loop (see **Figure 1**) makes it look like switching would delay impact with the larger group of track-workers by about *five times* without changing the time to the trolley's initial impact (i.e., minor crash with the one), making

Thomson's loop a net "time-buyer," which could explain why Thomson feels comfortable switching. In contrast, Matthew Liao reports that a sizable minority of subjects were *not* willing to switch in the loop variant (Liao, 2011). However, it is noteworthy that Liao's loop (see **Figure 1**) makes initial impact happen *twice* as quickly and only imperceptibly delays impact with the five. Hence, Liao's loop does not look like a net "time-buyer," which plausibly explains the reluctance of his subjects to switch. In sum, we are able to now demonstrate empirically that Thomson and Liao were talking about morally distinguishable thought experiments.

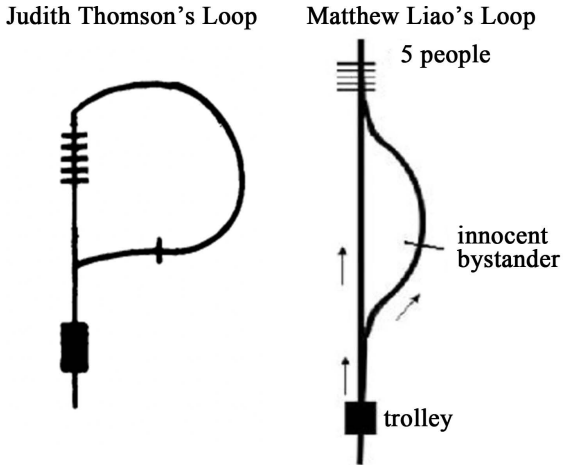


Figure 1. Various loop case illustrations.

5.2. China Survey

The empirical findings from the China portions of the experiment reveal that moral intuitions about the permissibility of switching in loop are significantly influenced by culture. Compared to the U.S. results, the China survey results showed much stronger agreement with the permissibility of switching in both loop variants. With 77.78% agreement in the close loop variant and an overwhelming 94.34% in the far loop variant, the Chinese participants exhibited a higher overall acceptance of switching compared to their U.S. counterparts. This notable difference underscores the importance of cultural context in shaping moral intuitions. In particular, the high agreement rate in the far loop variant among Chinese participants suggests a greater inclination to prioritize the collective good over individual harm, potentially reflecting cultural values that emphasize collective well-being and harmony. The Chinese participants' higher willingness to switch, especially in the far loop variant, may be indicative of a cultural perspective that places greater emphasis on the outcomes of actions rather than the immediate intentions.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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