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Uncertainty and utilitarian moral decision-making

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Thesis submitted in fulfilment

of the requirements for the degree of

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Table of contents

Table of Contents 2

List of Figures 7

Acknowledgments 10

Declaration 12

Abstract..... 13

Chapter 1: General Introduction 17

1.1. Overview of the General Introduction..... 18

1.2. Why is it Important to Study Moral Utilitarian Dilemmas?..... 18

1.2.1. Deontological and Consequentialist Approaches in Moral Philosophy..... 22

1.3. Moral Dilemmas, Moral Reasoning and Choice..... 25

1.3.1. Review of Moral Dilemma Studies in Experimental Philosophy and Experimental Psychology 25

1.3.2. Trolley and Footbridge Moral Dilemmas..... 30

1.4. Dual-process Theory of Moral Utilitarian Behaviour..... 32

1.5. Moral Utilitarian Decisions: Normative and Psychological Factors Influencing Moral Choice..... 41

1.5.1. Moral Judgements, Moral Choices and The Influence of Utility Ratios on Moral Rationality..... 44

1.5.2. The Influence of Psychological Rules and Decision Content of Moral Utility on Moral Decision-making..... 50

1.5.3.The Effect of Availability of Information in Human Decision-making 56

1.5.4. Availability and Uncertainty in Moral Decision-making..... 57

1.6. Summary of Chapter 1 and Outline of Experimental Chapters 2, 3, and 4..... 64

Chapter 2: Moral Utilitarian Choice: Exploration of Psychological Uncertainty and Development of New Methodological Approach to the Study of Moral Decision-making..... 66

2.1. Introduction..... 67

2.2. Experiment 1: Explorations of moral utilitarian choice under uncertainty 73

2.2.1. Method 73

2.2.2. Participants 74

2.2.3. Design and Materials..... 74

2.2.4. Procedure..... 76

2.2.5. Results and Discussion 77

2.3. Experiment 2: Availability, context and visualisation of moral utilitarian choice..... 80

2.3.1. Method 81

2.3.2. Participants 81

2.3.3. Design and Materials..... 81

2.3.4. Procedure..... 83

2.3.5. Results and Discussion 84

2.5. Experiment 3: Repeated moral utilitarian choices 91

2.4.1. Method 91

2.4.2. Participants 92

2.4.3. Design and Materials..... 92

2.4.4. Procedure..... 94

2.4.5. Results and Discussion 95

2.5. General Discussion..... 100

Chapter 3: Moral Utilitarian Judgement: Exploration and Assessment of Psychological Uncertainty Under Moral Judgements..... 106

3.1. Introduction..... 107

3.2. Experiment 4: Exploration of moral utilitarian judgements under uncertainty..... 109

3.2.1. Method 110

3.2.2. Participants 110

3.2.3. Design and Materials..... 110

3.2.4. Procedure..... 112

3.2.5. Results and Discussion..... 112

3.3. Experiment 5: Availability, context and visualisation of moral utilitarian judgements..... 116

3.3.1. Method..... 117

3.3.2. Participants..... 117

3.3.3. Design and Materials..... 117

3.3.4. Procedure..... 120

3.3.5. Results and Discussion..... 121

3.4. General Discussion..... 125

Chapter 4: Moral Utilitarian Values: Utility ratios, Content of Utility, Uncertainty and Moral Decision-making..... 128

4.1. Introduction..... 129

4.2. Experiment 6: Moral utility ratios..... 135

4.2.1. Method 135

4.2.2. Participants 135

4.2.3. Design and Materials..... 135

4.2.4. Procedure..... 136

4.2.5. Results and Discussion..... 137

4.3. Experiment 7: Moral utility ratios and uncertainty..... 139

4.3.1. Method..... 139

4.3.2. Participants..... 139

4.3.3. Design and Materials..... 140

4.3.4. Procedure..... 141

4.3.5. Results and Discussion..... 142

4.4. Experiment 8: Content of moral utility..... 148

4.4.1. Method 149

4.4.2. Participants 149

4.4.3. Design and Materials..... 149

4.4.4. Procedure..... 150

4.4.5. Results and Discussion..... 151

4.5. Experiment 9: Content of moral utility and uncertainty..... 154

4.5.1. Method..... 154

4.5.2. Participants..... 154

4.5.3. Design and Materials..... 155

4.5.4. Procedure..... 156

4.5.5. Results and Discussion..... 157

4.6. General Discussion..... 165

Chapter 5: Conclusions and Future Work..... 171

5.1. Discussion and Summary of Main Findings..... 172

5.2. Limitations..... 174

5.3. Future Directions and Applications..... 175

References..... 178

Appendix – Tasks and stimuli used in the experiments 204

List of figures

Figure 1. A visual presentation of the behavioural action with impersonal footbridge dilemma. (Experiment 1)..... 75

Figure 2. A visual presentation of the behavioural action with impersonal trolley dilemma. (Experiment 1)..... 76

Figure 3. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman). (Experiment 2)..... 83

Figure 4. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means. (Experiment 2)..... 86

Figure 5. Mean (Ln) response time (0= irrational; 1= rational). Error bars represent 95% CI of the means. (Experiment 2)..... 88

Figure 6. Mean (Ln) response time with rationality. Error bars represent 95% CI of the means. (Experiment 2)..... 91

Figure 7. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman). (Experiment 3)..... 93

Figure 8. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means. (Experiment 3)..... 96

Figure 9. Mean response time (Ln) with rationality. Error bars represent 95% CI of the means. (Experiment 3)..... 100

Figure 10. A visual presentation of the behavioural action with impersonal footbridge dilemma. (Experiment 4)..... 111

Figure 11. Judgements of appropriateness (0= appropriate; 10= inappropriate). Error bars represent 95% CI of the means. (Experiment 4)..... 113

Figure 12. Mean judgement time (Ln). Error bars represent 95% CI of the means. (Experiment 4)..... 115

Figure 13. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman). (Experiment 5)..... 120

Figure 14. Rational judgements (0= irrational; 1= rational). Error bars represent 95% CI of the means. (Experiment 5)..... 122

Figure 15. Mean judgement time. Error bars represent 95% CI of the means. (Experiment 5)..... 124

Figure 16. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save two workmen; Scene Y = sacrifice two workmen in order to save one workman). (Experiment 7)..... 141

Figure 17. Choice rationality (0=irrational; 1=rational). Error bars represent 95% CI of the means. (Experiment 7)..... 143

Figure 18. Mean response time with rationality. Error bars represent 95% CI of the means. (Experiment 7)..... 148

Figure 19. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means. (Experiment 8)..... 152

Figure 20. A visual presentation of decision consequences (Scene X = sacrifice one TV in order to save five TVs; Scene Y = sacrifice five TVs in order to save one TV). (Experiment 9)..... 156

Figure 21. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI

of the means. (Experiment 9)..... 160

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Declaration

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Abstract

A long history of research in philosophy, psychology and neuroscience has explored moral utilitarian research questions, decision mechanisms and behaviour. For example, in the question 'Is it appropriate for you to sacrifice one workman in order to save five workmen?' moral utilitarian theorists (consequentialism) would answer with 'Yes', as utility maximisation and moral justification is achieved by the consequence of this moral decision ('saving the greatest number'). Accordingly, psychologists have explored the psychological validity and range of behavioural violations of this utilitarian normative prediction. For example, theorists have proposed a dual-process moral utility theory (e.g., Bartels, 2008; Cushman et al., 2006; Greene, 2007; Greene, et al., 2001; Haidt, 2001; Pizarro & Bloom, 2003; Young & Koenigs, 2007; Evans & Stanovich, 2013), and argued that this moral utilitarian model predicts rational and irrational behaviour for morally sensitive decision alternatives.

The dual-process moral utility theory assumes that two psychological systems are involved in moral decision-making: (i) deliberative and effortful (cognitive processing) and (ii) automatic and effortless (emotional activations). Moreover, the theory predicts 'emotional interference' for moral scenarios with personal involvement (to push a stranger on to the track in order to save the five strangers) inducing (i) irrational behaviour and (ii) decision delay (longer response time), even when participants make a rational choice in dilemmas with personal involvement. These predictions were empirically confirmed (e.g., Greene et al., 2001) - respondents judged moral dilemmas with personal involvement ('to push' in footbridge dilemma) as less appropriate, than equivalent moral dilemmas with impersonal involvement ('to hit a switch' in the trolley dilemma). Greene and colleagues concluded that moral

dilemmas with personal involvement were more emotionally salient and cognitively demanding, as respondents took significantly more time deciding about moral dilemmas with personal involvement.

In nine experiments, I have developed further the empirical moral utilitarian method, and empirically explored and identified a generic utilitarian cognitive factor – 'uncertainty' (caused by partial and insufficient descriptions of utilitarian information) – that predicts rationality and irrationality in moral decision-making. As the experimental results confirmed, this factor had an independent influence (beyond the type of dilemma and involvement – previously confounded in experimental research) on moral utilitarian behaviour. An increased accessibility to utilitarian information decreased psychological uncertainty, inducing rational moral utilitarian behaviour across the experiments. Moreover, in contrast to the dual-process utilitarian theory, when making a rational choice respondents took less time with scenarios offering full utilitarian accessibility (full text description of the scenarios and moral choice questions and supported by visualisation of decision consequences), than with scenarios offering partial textual descriptions of moral utilitarian information (as with all moral experimental studies published since Thomson, 1985). This finding is important, as it offers methodological improvements to the study of moral decision-making and reveals issues with the dual-process moral utilitarian theory predictions and assumed psychological mechanisms. Neuroscience research should build upon the methodological improvements and empirical evidence provided in this dissertation, and explore further the plausibility that the emotional activations predicted by the dual-process moral utility theory are, in fact, degree of uncertainty (experiments 1 to 9) caused by limited accessibility to utilitarian information.

Furthermore, the results form experiments 4 and 5 revealed no difference (as

predicted by previous research, e.g., Tassy et al., 2013) in the behavioural utilitarian patterns between moral choice and moral judgements. I found that uncertainty significantly predicted both moral choice and moral judgements – additional evidence of the generalisability of uncertainty as a major factor that should be taken into account by moral utilitarian researchers. Moreover, in experiments 6, 7, 8 and 9 I discovered additional and not previously considered psychological factors influencing moral utilitarian behaviour. In experiments 6 and 7 the respondents, in their effort to maximise utility, were influenced by the utility ratio of the moral trade-offs. For example, and in addition to the eliminated uncertainty (caused by insufficient utilitarian information), the increased number of victims induced respondents' moral rational behaviour. This result can be attributed to enhanced reward activations for utilitarian moral dilemmas, offering 'saving of more victims'. In experiments 8 and 9 I also found that content of utility is a psychological factor predicting moral utilitarian behaviour. Processing moral utilitarian contents, which consist of things we can own or previously have owned (e.g., experience with utilitarian trade-offs) – nonhuman and inanimate stimuli – induced respondents' utilitarian choice rationality.

The results from nine experiments are novel and have the potential to contribute to the theoretical development of both normative and psychological moral decision-making. The research findings will inform theories of judgement, decision-making, moral reasoning, experimental philosophy and neuroscience about the psychological factors (not previously explored) underlying moral decision-making, and their influence on utilitarian rationality. Moreover, it is envisaged that the research findings and knowledge from this dissertation have practical applications. For example, in the development of training interventions (for special security units and law enforcements agencies), the relevant authorities should take into account the influence of decision

uncertainty, content of utility (decision training paradigms), and utility ratios involved in moral trade-offs.

Chapter 1

General Introduction

1.1. Overview of the General Introduction

The General Introduction offers an outline of the importance of studying moral decision-making and a review of published research in moral decision-making, related to philosophical, normative and psychological theoretical arguments and results. Accordingly, I will develop and illustrate my propositions and highlight the role of accessibility of information and psychological uncertainty (not previously investigated) in moral decision-making.

By outlining some of the parallels and differences between the philosophical and psychological theories of moral decision-making, I will propose and argue for new psychological insights needed for human decision-making with morally sensitive scenarios. Accordingly, I will critically review the philosophical, theoretical and experimental psychology research on moral judgements and explore the psychological factors considered to play a major role in moral decision rationality (e.g. personal involvement and emotional factors interfering with cognitive control and decision rationality). Furthermore, this chapter explores and introduces novel psychological parameters – not investigated previously in moral decision-making (accessibility to information, presentation of stimuli and related uncertainty) – and offers various methodological improvements to the field of moral decision-making. Finally, a summary of chapter 1 is presented, and a brief introduction of chapters 2, 3, and 4 outlining the rational and objectives of each completes the present chapter.

1.2. Why is it important to study moral utilitarian dilemma?

For decades utilitarian (normative) theories of moral reasoning (e.g., Bredemeier & Shields, 1984.) have dominated the theoretical and experimental

research in philosophy. This changed in the past decade, and we can now find a major shift in the research interest towards psychological factors interfering with moral utilitarian rationality (Bauman, McGraw, Bartels, & Warren, 2014). Commonly, theorists have explored moral rationality in two utilitarian (and equivalent in a utility sense) moral scenarios - the so-called 'Trolley' and 'Footbridge' moral dilemmas (e.g., Foot, 1967; Thomson, 1976). For example in the trolley dilemma participants are required to consider an action with morally sensitive outcome – whether to hit a switch (and kill one person) in order to save five workers. Under these morally sensitive circumstances, most respondents follow the utilitarian rules (maximising the utility, saving the lives of five workers) and hit the switch killing one worker. In contrast, with Footbridge dilemma (offering equivalent utility) participants are required to consider pushing a person from the footbridge (and killing this person), in order to save five workers. Surprisingly, under these scenarios, respondents do not follow the maximisation utilitarian rule – they reject to push the person off the bridge.

Theorists in psychology proposed a dual-process moral utility theory to account for the differences in moral utilitarian choice and decision time for moral choices (Bartels, 2008; Cushman, Young, & Hauser, 2006; Greene, 2007; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001; Haidt, 2001; Pizarro & Bloom, 2003; Young & Koenigs, 2007; Evans & Stanovich, 2013). The two (dual) elements in the theory are traditionally described in terms of dichotomous, opposing and interfering with each other psychological systems. For example, intuitions versus reasoning, automaticity versus control, and emotion versus cognition. Accordingly, an automatic emotional process is assumed to underlie the respondents' unwillingness to 'push' the worker off the footbridge (personal involvement) and a controlled cognitive process is

expected to underlie the respondents' willingness to hit the switch and sacrifice the worker in the trolley scenario (impersonal involvement). Recently, however, psychologists argued that despite the existence of the dual-process systems these simplistic dichotomies cannot distinguish between, and classify psychological processes purely as emotional versus cognitive. It is plausible that qualitatively different type of affective and cognitive contents are present in each system (Cushman & Greene, 2012; Cushman, Young, & Greene, 2010; Greene, 2007) or as it will be argued in this dissertation, generic cognitive strategies (based on accessibility to information and uncertainty) can accommodate any behavioural differences caused by emotional and controlled psychological processing.

After years of research the field of moral utilitarian decision-making is still a place for debate and discussion, as there are too many explored and unexplored issues with regard to the difference in participant's moral judgements (e.g., Bauman et al., 2014). Conducting psychological research on moral decision-making is important not only because the hypothetical scenarios with morally sensitive contents mirror people's daily moral experiences; it is important as it reveals contesting psychological processes and psychosocial phenomena to the benefit of research and theories in psychology, philosophy, economics and neuroscience.

Moral studies are important for almost all fields in social sciences - economics, philosophy, psychological and medical sciences. In order to make a 'better' choice we should first understand how we could define what is a 'good' or 'bad' choice, and then how people process psychologically the information in an ethical decision (Johnson, 2008). Typically psychological and neuroscience research in moral decision-making employs morally sensitive scenarios based on what Foot (1967) and Thomson (1976) called the 'Trolley Problem'. Traditionally it is assumed that moral

judgement mechanism is central to our personality and comes with strong emotional activations, which are different from other activations cased by non-moral decision-making scenarios (Skitka, Bauman, & Sargis, 2005). In recent years researchers such as Baron and Ritov (2009), Greene, Cushman, Stewart, Lowenberg, Nystrom and Cohen (2009) and Sunstein (2005) conducted studies to assess moral judgement quality by comparing the moral judgements of people to a normative ethical standard (utilitarianism). In philosophy, the normative ethics field customarily has been focusing on findings about whether decisions are correct relative to normative reference point (utility). This philosophical method is utilitarian, which defines what is morally acceptable and what brings the greatest total utility, well-being, and happiness.

The economic theory adopts similar utilitarian system and arguments even if it is not morally neutral. Certain requirements are set out by normative economics, which aims to implement ethical principles, to establish normative order, control and regulations on public institutions and businesses (Teulon, 2014). Very little research has been conducted on the so-called moral motives effect. However, studies revealed that the most important decision for the consumer when purchasing fair-trade products is the moral aspect and values in these products (Lübke, 2002) and (De Pelsmacker, Janssens, Sterckx, & Mielants, 2006). Empirical evidence also revealed that there is a positive influence of moral attitudes on consumer purchases of fair-trade products, when using willingness to pay higher prices for a fair trade product as dependent variable (Ziehlberg & Alvensleben, 1998; De Pelsmacker & Janssens, 2007). Researchers have argued that in order to understand the reasons behind the purchase of fair-trade products, we need to integrate two independent factors, named the economic utility and moral utility (Sunderer & Rössel 2012).

1.2.1. Deontological and consequentialist approaches in moral philosophy

In normative ethics the explanation and evidence of ethical behaviour come from actions (Kagan 1998). Thus, normative ethics can provide a better understanding on how, for example, organisations and individuals should perform actions and resolve problems (Hosmer, 1994). Typically, philosophers propose three theoretical accounts of normative ethics: (i) assets (the object and its moral characteristics is the driving force for ethical behaviour), (ii) consequentialist/utilitarian (the actions are justifiable based on maximised utilitarian outcomes), and (iii) deontological (the ethical actions are determined by obedience to socially accepted policies, principles, laws, and norms, which help the drive to a better ethical actions amongst people (Chakrabarty & Bass, 2015).

Deontology in contemporary moral philosophy is one of the normative theories, which focuses on behaviours and choices that are socially desirable and psychologically acceptable. Before discussing deontology-based arguments, it is important to account for consequentialism first, in order to understand deontology. Consequentialism is about utility maximisations – 'ends over means' or how 'the good' is derived from the consequences of behavioural outcomes (for the majority involved) as a measure of what is a morally right or wrong decision. In contrast, deontological ethic goes further - some choices are morally forbidden (means), no matter how their consequences are beneficial and maximised in terms of utility; so the 'right' choice here is not determined by outcomes of moral actions. One of the deontological weaknesses is that it is hard to treat and employ consistently moral values, and solve conflicts between duties and rights (Alexander & Moore, 2008).

Accordingly, deontological ethics (irrational choice in utilitarian terms) and consequentialism or utilitarianism (rational choice) are two opposing theories in

moral philosophy and normative ethics (Alexander & Moore, 2008). They reflect two different theoretical approaches employed by psychologists in moral judgement research. Consequentialism (Sinnott-Armstrong, 2009) emphases are on actions and utilitarian consequences, which facilitate utility maximisation, whereas deontology (Gaus, 2001a, 2001b) emphasises on the individual obligation, rightness and wrongness of the actions themselves, as opposed of the utilitarian consequences of actions (e.g., Brady & Wheeler 1996; Kant, 1785, 1959). Respecting specific types of moral rules (and not general maximisation/normative rules) is how judgement is made. For instance, killing one person, in order to save more is wrong, even if this act will maximise good consequences (Kagan, 1997): the ends do not justify the means. In contrast, consequentialism is concerned with the moral actions and consequences of moral actions, with expected utility maximisations; 'the greatest happiness for greatest number of people' (Bentham, 1789, 1948). According to this approach, the only possible way to determine morality of any action is by its utilitarian consequences – ends over means. For instance, killing one person to save more is morally right as it maximises the utility of the action and its consequences.

Studying normative frameworks can enhance the development of decision support systems. Moreover, some psychologists view deontological judgements (heuristics) as cognitive errors, making a decision under the deontological principles could not lead us to the best solutions we can have (Baron & Ritov, 2009). Similarly, Sunstein (2005), sees that making a non-utilitarian (heuristics) decision could lead to extensive and risky errors in moral judgement. (Bartels & Pizarro, 2011).

Psychological research revealed that respondents show a consequentialist response in the trolley scenario and a deontological response in the footbridge scenario. However, different explanations were given by philosophers, which suggest

that both responses are reasonable and retrospective justification is possible, as to why respondents treat both dilemmas differently (Fischer & Ravizza, 1992). For instance, in the footbridge scenario, the proposed action is sacrificing the worker (described as a fat person) by pushing him off the bridge in order to save many others. The workman is used as utilitarian tool by the bystander – in other words, as a mean in order to save others which may be seen as wrong. By contrast, in the trolley dilemma respondents have the opportunity to turn a switch and 'only' divert the direction of the trolley, which then causes the death of the workman. Therefore, the trolley scenario may be seen as morally acceptable as the workman just happened to be there, outside of our control or wish, while in the moral footbridge scenario the workman is used and engaged directly as a mean to stop the train (Naylor, 1988; Shaver, 2011; Di Nucci, 2013; Greene, 2007).

Published research that investigated moral decisions from a dual-process viewpoint has mostly focused on the error-prone and biased part of deontology in hypothetical moral dilemmas. Experimental evidence by Greene and colleagues shows that deontological judgements are cognitive errors and usually lead to unfavourable results (e.g., Greene et al. 2001; Greene 2007; Greene & Paxton 2009). Other results show that deontological judgement often leads to general and dangerous errors in moral judgement (e.g., Baron & Ritov, 2009; Xu & Ma 2015). In personal dilemma scenarios according to Greene, Morelli, Lowenberg, Nystrom and Cohen (2008), respondents who make consequentialist (and rational) judgements spend more time when they are under the struggle of cognitive load (emotional system activation), than the equivalent utilitarian trolley scenario where there is no emotional activation (hence, less cognitive load scenario). Greene, Nystrom, Engell, Darley and Cohen (2004) found that when respondents engaged with personal moral decisions

(compared to impersonal ones), the brain regions related to cognitive control and emotions are activated. These results illustrate increased brain activity preceding consequentialist judgements in personal dilemmas, influencing decision-making time (Suter & Hertwig, 2011). In contrast, with deontological choices, no influence was found of cognitive load on time for deontological choices consistent with the dual-process model.

1.3. Moral dilemmas, moral reasoning and choice

1.3.1. Review of moral dilemma studies in experimental philosophy and experimental psychology

Is it acceptable to sacrifice a few people to save many others? Moral philosophers and psychologists have argued for a long time in an attempt to answer this question. Supporters of utilitarianism and deontology have long debated over whether sacrificing a few lives to save a greater number of lives is acceptable. For example, from the utilitarian point of view, Bentham (1789, 1948) noted that it is acceptable, because saving more lives creates greater utility for society than saving fewer lives. In contrast, deontologists such as Kant (1785, 1959) believe that it is not acceptable, because living is a fundamental right for everyone, and no one has the right to take a life, regardless of the benefits that may arise from doing so. This discussion has drawn attention to a number of solutions presented by different researchers, such as Thomson (1985), Greene and Haidt (2002) and Mikhail (2009).

The most prominent examples of dilemmas related to this issue are the trolley dilemma and the footbridge dilemma (Thomson, 1985), which demonstrate the cognitive dependency and interference in this complex puzzle. Typically, the trolley dilemma involves a hypothetical situation, in which the only way to save the lives of

five workers who are about to be hit by a runaway trolley is to turn a switch that would cause the trolley to go onto an alternate track, where it would collide with and kill one worker instead of the original five. According to Greene, Sommerville, Nystrom, Darley and Cohen's (2001) results most people agree that this sacrifice should be made. However, with the footbridge dilemma, which involves pushing a stranger who is on a bridge onto a track to stop the trolley and save the five other people (e.g., Green et al., 2001) results revealed the opposite moral choice pattern, that most people say this should not be done. These moral questions about saving or sacrificing human life are referred to as a dilemma because they involve complicated moral scenarios and decisions about what people should do. Therefore, according to van den Bos, Müller and Damen (2011), people may feel conflicted and uncertain about how they should act when faced with these dilemmas.

For a very long time, the theorists in moral psychology, including Kohlberg (1969), highlight the role of reasoning and higher cognition in moral judgements, whereas recent trends illustrate the role of emotional processes in moral judgements. Many researchers drew attention to this debate and proposed possible psychological explanations (e.g. Thomson, 1985; Greene et al., 2001; Mikhail, 2009; Nakamura, 2013). For example, research was conducted to explain why the footbridge dilemma elicits a stronger negative emotional response than the trolley dilemma, which elicits controlled cognitive processes that support utilitarian (and rational) judgements.

Greene et al. (2001) argued that the harm is more personal and intentional in the footbridge scenario (Cushman et al., 2006; Mikhail, 2000; Borg, Hynes, Van Horn, Grafton, & Sinnott-Armstrong, 2006). An alternative argument supported by empirical evidence is that the footbridge scenario involves interference with a victim (Waldmann & Dieterich, 2007), and the action required is more personal than in the

trolley scenario (Moore, Clark & Kane, 2008; Royzman & Baron, 2002). The personal action results from the fact, that there is a physical contact involved (Cushman et al., 2006), a mixture of both 'personal force' and intention (Greene et al., 2009).

Psychological inhibition functions are assumed to regulate aversive motivations and actions (Carver & White, 1994). Psychologists (e.g., Gray, 1990) have argued that behavioural disinhibition (compelled emotion regulation strategies and deficient emotional expression) leads to psychopathological and antisocial actions. Accordingly, experimental research (e.g., Van den Bos et al., 2011) revealed that behavioural inhibition system is involved in moral decision-making; specifically, if disinhibited system is activated, moral utilitarian actions are more likely than non-utilitarian (in both trolley and footbridge dilemmas). Moreover, social psychology researchers (e.g., Bargh & Chartrand, 1999) investigated the possibility that two psychological moral systems operate during moral decision-making. The first considered to be based on controlled psychological processes, and the second revealing properties of automatic psychological processes (Bargh & Chartrand, 1999). Both conscious reasoning (controlled) and intuition (automatic) systems play important roles in judgement and justification (Cushman et al., 2006; Pizarro & Bloom, 2003; Pizarro, Uhlmann & Bloom, 2003). However, according to Haidt (2001), moral judgement appears to be an intuition produced by automatic cognitive processes, where the role of conscious reasoning is to offer a post-hoc basis for the moral justification.

Recently, Nakamura (2013) proposed an argument supported by empirical evidence, which is that the footbridge dilemma resulted in a more utilitarian way of thinking, compared with the trolley dilemma. He tested 62 types of moral dilemmas

from Greene et al. (2001) and used a factor analysis and structural equation modelling to analyse the correlation structure of participants' judgements. Nakamura (2013) found that the correlation structure for the moral dilemma used by Greene et al. (2001) is based on four factors: rationality, life- dilemma, risk aversion and efficiency. He determined that the risk-averse factor, especially in reference to all other factors, could be attributable to the discrepancies between the two dilemmas. The risk-averse factor may involve an expected value calculation for each choice, which may be considered a utilitarian aspect of moral dilemmas. The structural equation modelling used by Nakamura (2013) showed that the risk- averse factor had a significant effect on the footbridge dilemma, but not on the trolley dilemma, indicating that a connection exists between the utilitarian way of thinking and the footbridge dilemma. Nakamura (2013) found a relationship between utilitarian thinking and the footbridge dilemma. Further research by Nakamura (2012) also found that the utilitarian aspect of the manipulation of moral dilemmas (changing the number of victims) has a larger effect in the footbridge dilemma than in the trolley dilemma. As previously mentioned, he carried out two experimental studies in which he manipulated the number of victims in both dilemmas. The results reflect deontologist thinking in the footbridge dilemma compared with the trolley dilemma, indicating an interaction between the number of victims and the dilemma type, which supported his prediction. However, psychologists are interested in the descriptive aspects of moral judgements. For example, Thomson (1985) believes that the differences between the two dilemmas lie in the dependency of context in moral judgements. The context will control whether people are utilitarian or deontologist when they face the dilemmas.

However, people showed utilitarian responses in the trolley dilemma whereas in

the footbridge dilemma, they responded in a deontologist manner (Nakamura, 2012). Respondents' judgements seemed to depend on the number of workmen to be saved from the trolley. In contrast, their judgements in the footbridge dilemma were influenced by the right of the man on the bridge to live. These differences in response to the dilemmas reflect a utilitarian way of thinking for the trolley dilemma, whereas the deontologist way of thinking is shown in the footbridge dilemma (Greene et al., 2001; Waldmann & Dieterich, 2007).

Many theories attempted to explain the variance in participants' responses in the dilemmas, including the dual process theory (Greene et al., 2001), the causal decision theory (Waldmann & Dieterich, 2007) and the moral grammar theory (Hauser, 2006; Mikhail, 2009). Specifically, the dual process theory of moral judgement (Greene, 2007; Greene et al., 2008; Greene et al., 2004; Greene et al., 2001) illustrates that the deontological way of thinking about the judgements of those who disagree with sacrificing one person to save several others, is driven by automatic emotional responses. This concept is contradictory to utilitarian thinking about judgements, in which people agree to sacrifice one person to save several others, which is driven by controlled cognitive processes. The main question for this line of research is to explain why people respond in different ways to the trolley dilemma and the footbridge dilemma (Greene et al., 2009).

Moral reasoning researchers tend to explain the variances in participants' responses for the trolley dilemma and the footbridge dilemma adopting different approaches. For example, Greene et al. (2001) thought that the responses in the footbridge dilemma could be vindicated in a deontologist manner, although this presents difficulties for the trolley dilemma (Greene et al., 2001). Accordingly, Hauser (2006) focused on the philosophical implications of both dilemmas,

questioning whether utilitarian estimation can be used to validate the main responses in these dilemmas. Theorists, such as Waldmann and Dieterich (2007) also stated that the trolley dilemma could be examined from a utilitarian perspective, whereas the footbridge dilemma could be seen from the deontologist perspective. Overall, they all agreed that the trolley dilemma reflects the utilitarian way of thinking and the footbridge dilemma reflects the deontologist way of thinking.

1.3.2. Trolley and footbridge moral dilemmas

The most popular type of dilemma, which has been used frequently in moral dilemma experiments, is the trolley dilemma. Astonishingly, around 136 articles on the trolley problem have been published in the field of behavioural science since 2000. One of the most notable papers in this field was written by Greene, Sommerville, Nystrom, Darley and Cohen (2001) and published in Science. To date, it has been cited over 2527 times in psychological, economics, business and anthropology journals. In behavioural sciences, trolley problems have played a leading role in understanding sacrificial dilemmas. Researchers have conducted extensive experiments, which brought the sacrificial dilemma phenomenon into mainstream moral psychology (Bauman et al., 2014).

Since their creation, trolley problems have become a popular and recurring topic of morality in psychology. There have been a large number of articles published since 2000 that addressed the trolley problem, and many of them developed and reported adjusted psychological methods and stimuli for experimentation. The topic of morality of behaviour is not only explored in science, but also has received plenty of attention from policy makers, emergency and security units, as well as media outlets. . For example, the New York Times published research papers (e.g., Pinker, 2008; Wade, 2007) on the trolley problem and sacrificial dilemmas which were supported

by empirical evidence, and psychology textbooks now include moral psychology and judgement chapters based on published research (e.g., Myers, 2010; Schacter, Gilbert, & Wegner, 2011). It is evident that the trolley problems – the most prominent example of sacrificial dilemmas – received so much research attention and applications that are worth of educating students and general audience (Bauman et al., 2014).

The trolley problem was first introduced by Foot (1967) as a thought experiment in ethics. She looked at whether an action that is permissible should depend on whether undesired consequences are preferred by an individual, or occur due to an expected yet unintended side effect. In her experiment, a driver of a tram is faced with two possible scenarios to choose from, to steer the tram away from five working men on it or one man working on it. Foot expected to find that the respondents would consider morally acceptable to turn the track on the one worker 'without hesitation'. However, this initial experimental scenarios and research failed to make a distinction between the tram situation and others who find killing the one man immoral. Using deliberate examples, such as differentiating between those that avoid injury and bring aid, she illustrated that the principle behind the effect is insignificant for such comparisons. Dennett (1984) argued that Foot used intuitive and speculative arguments to assist her interpretations (Bauman et al., 2014).

To further understand the trolley problem and moral utilitarian decisions, Thomson (1976, 1985) heavily modified the original scenario, analysed by Foot (1967). Thomson closely examined the idea that people are, to some extent governed by their obligation to avoid killing someone to save someone's life. This refers to positive and negative moral duties (Rawls, 1971, 1999). Following on from this, Thomson created the bystander at the switch version of the trolley problem.

Participants are presented with a switch, which can divert the trolley from the track. Thomson's trolley problem scenarios attracted the interest of a number of scholars who created a variety of different scenarios to examine the moral dilemma, in which subtle differences in variables seem to change the individual's decision (e.g., Unger, 1996; Bauman et al., 2014). Accordingly, the trolley problem has been developed to help philosophers probing moral doctrine in an unconventional, yet accessible experimental scenario. It has received attention from critics about its use in philosophy (e.g., Hare, 1981; Pincoffs, 1986; Singer, 1999). However, its main purpose is to point out and test the limitations of human rationality and cognition (in contrast to expected normatively grounded assumptions), using abstract moral scenarios for psychological research (Bauman et al., 2014).

Surprisingly, the results revealed that respondents seem to think that it is not acceptable to push the stranger, but it is admissible to flip the switch. Both of these conditions seem to be normatively equivalent - saving five lives for the price of one. The big question (still up to these days) psychologists are asking is, why do people feel that it is appropriate to divert the train but not to push a stranger, and how can we understand the underlying psychological factors that allow us to make judgements about moral dilemmas? (Nichols & Mallon, 2006).

1.4. Dual-process theory of moral utilitarian behaviour

In the past decade the research interest has increased, leading to the development of the dual or two-system theories in decision-making (e.g. Epstein, Lipson, Holstein & Huh, 1992; Evans, 2003, 2006; Kahneman & Fredrick, 2002; Slovic, Finucane, Peters, & MacGregor, 2002a, 2002b; Smith & DeCoster, 2000; Strack& Deutsch, 2004). For example, a two-system model has been developed by economists (e.g., Fudenberg & Levine, 2006), which focused on giving a sufficient

explanation for inconsistencies, including human biases related to loss aversion (people feel losses more than normatively equivalent gains). Moreover, most of the theoretical accounts in psychology and economics (supported by experimental evidence) indicate the presence of two qualitatively different mental systems involved in every decision-making mechanism and behaviour. The two systems have different theoretical terms and standards from author to author. For example, rational versus experiential (Epstein et al., 1992), rule-based versus associative (Sloman, 1996), noetic versus experiential (Strack & Deutsch, 2004), deliberative versus affective (Loewenstein & O'Donoghue, 2004) – or as they are more popularly known System 1 versus System 2 (Evans, 2003; Kahneman & Fredrick, 2002; Keren & Schul, 2009). These researchers do not only use different names for each of the two systems, they also use different terms to define their meaning and psychological underlying characteristics. The most frequently used terms are two-system, dual-mode, and dual-process theories. What these theories have in common is that there are two different processing modes available at any given time for activation, and employed in particular behaviours.

Accordingly, psychologists have argued and discussed for years that there are differences between intuition and reasoning thoughts. These differences have been appealed in efforts to form apparently conflicting results in judgement studies under uncertainty (Kahneman & Frederick, 2002; Sloman, 1996, 2002; Stanovich, 1999; Stanovich & West, 2002). Stanovich and West (2000) have labelled these two cognitive processes system 1 and system 2; the psychological processes assumed under system 1 are emotionally charged most of the time, they are usually fast, automatic, and effortless. Unsurprisingly, they are hard to control or adjust as they are ruled by habit. On the other hand, the processes of system 2 are controlled

consciously; they are slower, serial, and effortful (Kahneman, 2003).

Philosophers, economists and psychologists have yet to produce a theory to account for psychological and normative factors underlying moral utilitarian behaviour. Empirical methods have provided new insights into how moral utilitarian behaviour can be understood and assessed. Joshua Greene recently made an important contribution to the analysis of the footbridge scenario. He suggested that when people were asked to make judgements about a 'personal' action (i.e. pushing the stranger), it showed increased brain activity in areas associated with, as opposed to relatively 'impersonal' action (i.e. diverting the train with a switch). Greene (Greene 2005; Greene & Haidt, 2002) argued that there is a set of psychological criteria in moral decision-making that could be defined as personal/impersonal violations.

It is a personal moral violation if: firstly, it causes serious harm to the body; secondly, if it is directed towards a particular person or group of persons; thirdly, the harm caused does not lead to the deflection of an existing threat onto a different party. It is impersonal if it does not meet all the three criteria above, and an example would be the 'trolley problem' by Thomson, as it involves a deflection of an existing threat - i.e. no agency/direct involvement, it merely 'edits' the situation with no 'authority'- (Greene 2005; Greene & Haidt, 2002).

This distinction shows an important asymmetry in lay intuitions about moral dilemmas. However, how can we define 'moral violation'? Does it mean 'transgression'? If 'transgression' is a measure of judgement for what is deemed acceptable, then diverting the train in the bystander case does not seem to be, in the slightest, an action of transgression. Accordingly, existing empirical evidence suggests that participants considered diverting the trolley to be permissible (Greene et al., 2001; Hauser, Cushman, Young, Jin & Mikhail, 2007; Mikhail, 2000).

The footbridge scenario can be explained as follows:

The 'personal' involvement hypothesis can be summarised as: "If an act is manifestly personal, then it is judged impermissible". It is a potential explanation for a permissible or impermissible action, such as pushing a stranger off the bridge, which is clearly personal. Greene et al. (2001) strongly support this hypothesis as it suggests an emotional engagement in peoples' decision-making behaviour, of what they consider to be an impermissible or acceptable judgement (Nichols & Mallon, 2006).

Researchers have found empirical evidence that supports the personal involvement hypothesis (e.g., Greene et al., 2001). However, despite the growing support, there are a number of issues surrounding this hypothesis. For instance, some acts that are clearly personal and emotional, such as self-defence and punishment (e.g., spanking your own child) are considered permissible. In addition, cultural understanding of what is judged to be permissible is barely taken into account by psychologists in their research. In some indigenous communities such as the Yanomamo, it is permissible for men to beat their wives (Chagnon, 1992) and male circumcision is regarded as a personal matter according to an informal survey (Nichols & Mallon, 2006).

For a long time, theories of moral psychology largely ignored the role of cognitive reasoning in reference to moral judgement; instead the research focused predominantly on the role of emotion and affective intuition in moral behaviour. Typically, two research questions are the focus in moral psychology: "Why do we care about what others do, even if what they do does not affect us?*"* and "How can we decide whether what they have done is right or wrong?". The answers to these questions have changed over time. For a long time, psychologists debated the issue of

whether moral judgements could be considered to be an outcome of emotional and non-rational processes, such as Freudian internalisation and behaviourist reinforcement, or reasoning and 'higher' cognition, such as Piaget's and Kohlberg's post-conventional reasoning. Recent studies showed the importance of both emotions and reasoning, particularly the process of automatic emotions, which was shown to be influential. Lawrence Kohlberg (1969) is considered to be responsible for the initial development in this debate. He continued Jean Piaget's earlier work (Trevino, 1992) by developing a six-stage model of the development of moral reasoning. Kohlberg (1969) argued that 'morals' develop through a role-taking experience or by evaluating a problem from several different perspectives, which improves moral reasoning that informs moral judgements. In his work, Kohlberg focuses on moral reasoning and ignores the role and influences of morally related emotional activations, which recent moral psychology research takes into account.

By distinguishing the effects of moral versus non-moral dilemmas/scenarios, Moll, Oliveira-Souza, Bramai and Grafman (2002) examined moral cognition. In contrast, Greene et al. (2001) drew a difference within the moral area between 'personal' and 'impersonal' moral judgements, and used functional magnetic resonance imaging (fMRI) to scan subjects when responding to several personal moral, impersonal moral and non-moral dilemma scenarios. They found that the areas associated with social and emotional processing, the medial frontal gyrus, the posterior cingulate gyrus and the bilateral STS (originally labelled 'angular gyrus') became more active when responding to personal moral dilemmas, compared to impersonal and non-moral dilemmas. In comparison, the areas associated with working memory, the dorsolateral prefrontal and parietal areas, became more active in reference to impersonal and non-moral dilemmas, as compared to personal dilemmas.

To link the fMRI data to behaviour, Greene et al. (2001) analysed the subjects' response times and found that participants were slow to respond appropriately but quick to respond inappropriately to personal violations. No differences were found in participants' responses in terms of appropriate responses to impersonal moral and non-moral judgements. They explained the differences in participants' responses to the two dilemmas as caused by having to overcome their responses to negative emotions when the participants reacted with appropriate responses to personal moral violations.

The original 'moral' fMRI study published by Greene et al. (2001) has offered neuroscience support of the moral dual process theory. The study found that in the "footbridge" personal context (body push off the bridge) the brain areas corresponding to emotion processing were more active, whereas in the "trolley" impersonal context (switching a mechanism) the working memory and reasoning were more active. This dissociation between emotional and rational activations has been pointed out in lesion studies (Boes, Grafft, Joshi, Chuang, Nopoulos, & Anderson, 2011; Koenigs, Young, Adolphs, Tranel, Cushman, Hauser, & Damasio, 2007). People with damaged ventromedial prefrontal cortex, which normally leads to antisocial behaviour and moral decision-making deficiencies (Boes et al., 2011), show more utilitarian behaviour in trolley problem dilemmas (Koenigs et al., 2007). According to Greene (2007) rational and reasoning processes control decision-making behaviour when either, the emotional information from the context is eliminated or there are damages to brain areas, which reduce the accessibility to emotional inferences. Crucially, in support to the dual-process theory, experimental results revealed that participants in personal dilemmas showed longer response time when they chose the utilitarian option, compared to those who chose the deontological

option (e.g., Greene et al, 2008). However, the dual-process moral utility theory is often criticised for not being able to account for motivational aspects in human social behaviour (Sun, 2012); it is plausible that emotional, rational, and motivational activations are related to the brain areas in the limbic system and brain stem (Moll & de Oliveira-Souza, 2007)

While moral development theories have argued for cognitive controlled processes (Kohlberg, 1969), Greene et al., (2001) and Haidt (2001) argued for the role of emotions in moral decision-making and offered the moral judgement dual-process theory, which indicates that both intuitive emotional responses and controlled cognitive responses play essential and, in some circumstances, competing roles. This theory connects (i) controlled cognition with utilitarian moral judgement (consequentialist) by endorsing the 'the greatest good for the greatest number of people' utilitarian arguments (Mill, 1861, 1998), and (ii) emotional responses with deontological judgements, which endorse the rights or duties (Kant, 1785, 1959; Greene, 2014). Accordingly, neuro-imaging moral judgement studies with healthy adults and individuals exhibiting aberrant moral behaviour confirmed the influence of activated emotions on moral behaviour (Young & Koenigs, 2007; Moll, de Oliveira-Souza, Eslinger, Bramati, Mourão-Miranda, Andreiuolo & Pessoa, 2002).

According to Greene et al. (2001) and Haidt (2001) moral reasoning can play a significant role in making impersonal and personal moral judgements that involve rational considerations and conflicts of emotional intuitions. To test the role of emotional/automatic versus controlled cognitive processes in moral judgements, for a better understanding of the differences between both dilemmas, Greene et al. (2001) tested their dual-process theory using fMRI and response time (RT) data. They proposed that people choose a deontological rejection of actions in the footbridge

dilemma as a result of automatic negative emotional responses. By contrast, people who use utilitarian thinking agree on harmful actions as a result of controlled cognitive processes. The researchers presented two sets of moral dilemmas: personal moral dilemmas, similar to the footbridge scenario and impersonal moral dilemmas similar to the trolley scenario. They called the dilemmas based on the trolley scenario 'moral impersonal dilemmas', whereas they referred to the dilemmas based on the footbridge scenario as 'moral personal dilemmas'.

Greene et al. (2001) defined the meaning of personal moral dilemmas as moral violations that meet some criteria such as:, actions causing serious physical harm, and orientated towards a specific person or a group of people, and finally the harm was not the result of a deflection of an existing risk onto a different party. These criteria might be thought of in terms of "I hurt you," where *hurt* refers to the most primitive kind of harmful violation, *you* makes certain that the victim is clearly denoted as an individual and *I* imprisons the agency thought, which necessitates the action springing directly from the agent's will. Any dilemmas not meeting the three criteria are impersonal moral dilemmas.

Greene et al. (2001) provided the most widely accepted conclusion that offers an explanation for the difference between the trolley and the footbridge dilemmas. Their experiments do not claim that judgements are morally right or wrong. However, they showed that two types of dilemmas (personal and impersonal) differ systematically in the extent, to which they activate brain regions related to emotions. They hypothesised that the thought of pushing someone to his or her death is more emotionally salient than turning a switch that causes similar results, but in a different way, which is what changes a person's judgement. Greene et al. (2001) hypothesised that brain areas associated with emotions will be more active during tasks of

'personal' moral dilemmas than in reference to 'impersonal' moral dilemmas, and they proposed longer response times for 'appropriate' responses to 'personal' moral dilemmas attributable to the interference of an automatic emotional response with utilitarian reasoning. In summary, the trolley dilemma involves inflicting harm from a distance and has less emotional activation, and therefore utilitarian decisions are enhanced. In contrast, the footbridge dilemma involves personally inflicting harm, and therefore the emotional activation interferes with the cognitive rational system making respondents less likely to push the man off the bridge (Greene, 2009).

Furthermore, the universal moral grammar account proposed by Mikhail (2007) departs from the dual-process model of moral judgements by suggesting that intuitions are clearly linked to emotions. However, the critical issue in the theory of moral cognition is to identify and understand the underlying appraisal system these intuitions require, by taking into account psychological (cognitive), linguistic, and normative philosophical arguments. For example, it is plausible that human judges use in their moral judgements a set of moral heuristics (mental moral short-cuts) that are cognitively economical, and often lead to paradoxical and inconsistent moral judgements in politics and law (Sunstein, 2005). It is also plausible that these psychological heuristics are sensitive to contextual semantic and visual presentations of moral tasks. The theory of moral cognition (Greene et al., 2001, 2004; Haidt, 2007; Sunstein, 2005) is also criticised for using doctrinally marginal moral tasks and emotional language references to family members and friends in personal dilemmas to weaken direct cognitive processing, as well as for vague definitions and judgement task questions on what is an 'appropriate action' (Mikhail, 2005, 2007; Borg et al., 2006). In addition, there are methodological issues with the empirical research on moral cognition, which I address in this dissertation. For example, used stimuli and

insufficient textual descriptions of moral dilemmas (e.g., Greene et al. (2001), which damage the accessibility to moral utility and lead to judgemental biases.

1.5. Moral utilitarian decisions: normative and psychological factors influencing moral choice

One of the most prominent theories of judgement and decision-making is the expected utility theory (EUT; von Neumann & Morgenstern, 1947) – a normative decision-making model based on axiomatic rules and rational behaviour expectations. The theory predicts that people make decisions about risky and uncertain options by comparing the expected utility of each option and selecting the option with highest utility. The expected values of each option are computationally derived and then a trade-off decision-making mechanism facilitates the behavioural action. Therefore, the central aim of the decision-making agent is to maximise the expected utility by selecting the option with best utility (Mongin, 1997). The normative prediction of expected utility theory is that when an agent who makes the decision facing two prospects (e.g., sure and uncertain), they must select the option with the highest utility.

Accordingly, several axioms underlying the EUT (von Neumann & Morgenstern, 1947) are directly relevant to the theoretical and empirical research in moral cognition. For example, the transitivity axiom requires consistency of decision preferences if decision option 'A' has better expected value, than decision option 'B', and the expected value of 'B' is higher than the expected value of C'; then it simply follows that normatively the expected value of 'A' is better than the expected value of 'C'. The relationship is 'transitive' because the last statement follows from the first two. Moreover, the dominance axiom states that when a decision option is superior in at least one decision attribute (property), and equal in all others (across

alternative options), then it must be the option with the best utility and respectively the rational option to select. Another normative axiomatic rule, relevant to moral cognitive theories of choice, is the descriptive invariance axiom.

Based on these normative decision expectations, a rational decision-maker should be able to make an informed rational decision (based on expected values) 'trade-off, by always selecting the option with the highest expected value, in order to maximise utility and minimising decision disutility. Any violation of these normative (and expected) axiomatic and decision rules will lead to irrational (non utilitarian) behaviour and respective biased choices.

Accordingly, this dissertation attempts to build on and explore further the complexity of human moral decision-making and solve parts of the moral utilitarian puzzle by offering psychological insights, arguments and experimental findings as to why respondents violate normative rational expectations in their choices. The research reported in this dissertation will provide a full contextual account and facilitate accessibility to utilitarian normative logic of moral dilemmas by eliminating decision uncertainty in moral choice. Both, the comparisons between the 'personal' (footbridge) and 'impersonal' (trolley) dilemmas illustrate different issues for analysis from utilitarian point of view. For instance, Borg et al. (2006) have noted that the moral dilemma scenarios that have been used, often relate to family members or individuals with a close connection. Therefore, the language employed evokes emotional response (which is independent from the utilitarian problem) and is likely to affect the individual's response. Recent results (Costa et al., 2014; Keysar, Hayakawa, & An, 2012) revealed that using a foreign language in moral decision-making evokes more rational behaviour by reducing emotional activations. Costa et al. (2014) have collected data from the United States, Spain, Korea, France and Israel;

overall participants selected the utilitarian option (to save five by killing one) only when the moral dilemmas were presented in a foreign (non-native) language. They argued that the increased psychological distance of using a non-native language induced utilitarianism and respectively more rational behavior. In this dissertation, in order to control this possible effect, all experiments were conducted with native English speakers.

A further criticism of empirical findings supporting moral cognition theory, which brought the attention of scholars,, is offered by McGuire, Langdon, Coltheart and Mackenzie (2009). They argued that the behavioural distinctions between 'personal' and impersonal' type of moral dilemmas (indicating that moral reasoning is motivated by dissociable neural systems) is not general, and it is due to specific moral dilemmas offered in the experiments (within personal and impersonal moral scenarios). Hence, there is a high contextual task dependence, and thus these moral dilemmas cannot be used as a general method and applied to other moral dilemma tasks. These findings have sparked further research, and scholars (including McGuire et al., 2009) have shown that stricter, more controlled stimuli are required to fully appreciate the psychological processing underlying moral decision-making (Lotto, Manfrinati, & Sarlo, 2013). Further methodological concerns (Lotto et al., 2013) suggest that the use of fMRI and event-related potential methods require specific procedures, through which repetition of stimuli in a defined mode is necessary. Accordingly, these repetitions can cause a behavioural learning effect and bias respondents' choices. For example, according to Aquinas (1952), when evaluating many moral dilemmas and making decisions the respondents are more willing to accept the death of a fewer number of people, in order to save greater number of people. In the experiments conducted in this dissertation, this concern is addressed

and explored by investigating moral decision-making employing independent and repeated measures designs.

When considering all of the theoretical and methodological issues outlined above, there were several factors and questions of major significance accounted for and explored in this dissertation project: (i) possible contextual effects caused by insufficient and partial moral descriptions (task textual description and visualisation of moral dilemmas) leading to framing biases (limited accessibility to moral utilitarian context), (ii) all participants in the experimental studies are English native speakers, (iii) repeated and independent measures designs were employed to account for possible behavioural effects – single versus multiple moral choice and (iv) potential behavioural differences (moral choice and moral judgements) in the pattern of utilitarian rationality are explored.

The experiments in this dissertation, explore participants judgements, and choices they have to make in response to morally sensitive utilitarian scenarios, taking into account the influence of personal and impersonal involvements, accessibility to contextual and available decision information (and caused potential uncertainty), content of utility, type of task (choice and judgements) and utilitarian ratios used in the experiments on decision rationality. Furthermore, there is evidence that some moral scenarios are more emotionally silent than others (Greene et al., 2001, 2004; Lotto, Manfrinati, & Sarlo, 2013). Accordingly, in order to overcome potential biases caused by differences in moral utilitarian statements, significance and relevance, in this dissertation project I will explore the influence of cognitive factors within the most prominent and widely used moral scenarios (the trolley and footbridge dilemmas).

1.5.1. Moral judgements, moral choices and the influence of utility ratios on moral

rationality

Experimental settings, usually in hypothetical contexts, such as having to make a life or death decision with competing variables (Greene et al., 2001; Valdesolo & DeSteno, 2006) often require a prior assessment of the outcome. Many factors influence decision-making, and they have been identified by scholars from various academic disciplines. For instance, participant's response to different options for saving more people or friends, even humans and non-humans (Petrinovich, O'Neill, & Jorgensen, 1993; O'Neill & Petrinovich, 1998; Nichols & Mallon, 2006), or the difference between action and omission (Cushman et al., 2006) and the distinction between harm as a mean and harm as a side effect (Borg et al., 2006; Bartels, 2008; Tassy, Oullier, Mancini, & Wicker, 2013).

In numerous studies, a range of questions such as "Is it acceptable to […]?" to "Would you do… in order to…?" were presented to participants to test ethical dilemmas. According to Monin, Pizarro and Beer, (2007), psychological processes may be affected by different sets of questions, which are likely to rely on distinct neural underpinnings (Borg et al., 2006). It is important to make a note of the difference between choices and judgements, with both relying on a normative and more common sense perspective (Manstead, 2000). Choices, as Sood and Forehand (2005) suggested, mean projecting potential consequences relevant to oneself using an egocentric perspective (the decision agent is related to the self), whereas judging implies an allocentric evaluation (the decision agent is independent from the self) of a situation (Firth & de Vignemont, 2005). The difference between the two perspectives egocentric and allocentric has been researched extensively, and evidence was presented in a number of studies. For example, Nadelhoffer and Feltz (2008) looked into the differences and found that participants responded differently when

asked to create what they called 'actor-observer bias'. This was supported by Berthoz, Grezes, Armony, Passingham, and Dolan, (2006), when they found activity in different brain regions for moral transgressions when comparing their own intuitions to others. Further experiments were conducted with psychiatric patients suffering from brain lesions, which support these findings (Cima, Tonnaer, & Hauser, 2010Glenn, Raine, & Schug, 2009; Glenn, Raine, Schug, Young, & Hauser, 2009; Eslinger & Damasio, 1985; Tassy, Oullier, Cermolacce, & Wicker 2009). The evidence shows that people evaluate their own moral standards and that of others quite differently (dissociated patterns), and therefore the distinction between moral choices and judgements is of essence and worth further exploration (Firth & de Vignemont, 2005; Tassy et al., 2013).

The difference between moral judgement and moral choice has been of interest to scholars. In this dissertation, I use an empirical and systematic approach to explore the impact of different contexts on moral utilitarian choice and whether choice and moral judgement of moral actions differ. It was hypothesised that moral judgement and moral choice may rely on different cognitive processes (Tassy et al., 2012; 2013). For example, in one experiment Tassy et al. (2013) found that closeness (relationship) with the utilitarian moral target (victim) had less influence on judgement ("Is it acceptable to…?" Yes and No) than on choice of action ("Would you…?" Yes and No). It is worth nothing that these types of questions are not really capturing the difference between choice and judgements, as both of them are expressed on a binary choice scale (Yes/No). Moreover, it is also plausible, that the pattern of moral utilitarian behaviour will not be influenced by the task (judgement or choice) when cognitive moral biases are eliminated (e.g., providing a full description and access to moral utility). This is an empirical question, which will be explored

further in this dissertation.

Participants' response under judgement and choice conditions shows that they were able to make appropriate decisions in the non-moral dilemma situation. There are two observations that can be deducted from the moral dilemma cases. In the first observation, responses to judgement and choice of action seem to be separate, and one is more utilitarian than the other. The results seem to indicate that participants acted in an immoral way, which was supported by a recent study by Kurzban, Descioli and Fein, (2012) and another study that found a weak correlation between judgement and action of choice (Blasi, 1980). The second observation refers to the number of lives sacrificed, suggesting that the higher the number of lives saved, the more likely it is that participants become utilitarian in both, choice of action and judgement. Previous research has provided evidence for this observation (O'Neill & Petrinovich, 1998; Shenhav & Greene, 2010), which suggests that participants' decisions are affected by a cost-benefit analysis ("expected moral value"). However, it is quite clear that utilitarian response is higher for choice of action than judgement, suggesting more emotional influence. Choosing to save a large number of people comes with a greater reward. Shenhay and Greene (2010) proposed a potential explanation that choice of action may involve more selfish decisions (also Tassy et al., 2013).

Another study that used victims closely related to the participants showed that, their response was less utilitarian for both judgement and choice as shown in previous studies (O'Neill & Petrinovich, 1998). It was, however, significantly stronger in choice than judgement decision-making condition. Although higher affective proximity led to higher response for choice, its consequence is that the opposite is true for closer proximity. A possible explanation for this could be that affection leads to a decisive choice due to its close and strong sense of personal consequence (Thomas,

Croft, & Tranel, 2011). Sood and Forehand (2005) suggested that judgements rely on impersonal evaluations and have no personal consequences, which is not the same with action choices (see also Tassy et al., 2013).

As Greene et al. (2001) suggested that judgement becomes less utilitarian than action of choice due to the contextualization of information emotionally. However, if personal consequences were taken into consideration, judgement would not be influenced by emotions. (Tassy et al., 2012). A study suggested that different variables in the context of moral evaluation influence abstract judgement and hypothetical choice. This provides empirical evidence that evaluating moral judgements depends on different mechanisms for both, choice and judgement as reported by (Tassy et al., 2012). This could potentially lead to a better understanding of the differences between judgements and choices that affect our social decisions, and most importantly the ones related to life and death. The variation between choices and judgements may prove useful in exploring moral cognition for pathologies (Tassy et al., 2013).

Another research question, which should be taken into consideration by moral cognition theorists, and not currently well embedded in theoretical and empirical moral research, is about the utility ratios used in the tasks with moral dilemmas. Theorists have argued that with the 'footbridge' task the victims are paid more attention compared to the trolley dilemma, and because of that, participants are more sensitive to the distinction in victims number in the footbridge compared to the trolley (e.g., Nakamura, 2012). For example, it is plausible that the attention of decision makers is gated by the intervention required, causing respondents to neglect other potential victims involved in the moral scenarios - the intervention myopia hypothesis (e.g., Waldmann & Dieterich, 2007). This hypothesis gives a novel interpretation of

the footbridge and trolley dilemmas and the underlying psychological mechanisms facilitating moral choice, by exploring the qualitative differences between the dilemmas. The 'trolley' is considered to be an intervening agent, and the 'victim' in the footbridge dilemma is considered to be intervening potential patient. Moreover, reported studies (e.g., Waldmann & Dieterich, 2007) revealed that moral evaluations depend on the causally generated utilitarian consequences; respondents are more likely to be utilitarian in their choice if the experimental intervention was targeted at the agent rather than a patient.

Accordingly, based on these findings several intriguing research questions can be offered. Judgement and decision-making theorists (Slovic, Griffin, & Tversky, 1990; Tversky & Koheler, 1994; Tversky, Sattath, & Slovic, 1988; also see Fischer & Hawkins, 1993) have argued that the decision attributes will be psychologically represented with more decision weight and impact, if the attributes are perceived with more attention. Therefore, it follows that people will be more sensitive and judge differently changes in the utilitarian decision ratios within the footbridge dilemma, comparing to the trolley dilemma (as the victims are paid more attention). This prediction is supported empirically (Nakamura, 2012; 2013); the number of victims (the utilitarian ratio saved versus sacrificed lives) could be easily influenced by human moral reasoning processes. The results have shown that the effect of the experimental manipulation (the number of potential victims) is larger in the footbridge dilemma than in the trolley dilemma. The authors argued that this novel finding reflects utilitarian thinking, even personal (footbridge) type of dilemmas (Nakamura, 2012; 2013). However, further research is necessary, in order to explore the true nature of moral choice by controlling for possible decision and cognitive biases. Accordingly, it is plausible that the utilitarian decision-making can be

enhanced (independent from utilitarian ratios) if the utilitarian properties are accessible to the decision-makers (making it possible to follow and apply rational rules) and the decision context is debiased.

1.5.2. The influence of psychological rules and decision content of moral utility on moral decision-making

Deontological moral rules following traditional rule-based accounts assume that behavioural actions are permissible, as long as they do not violate the moral rule (Kant, 1785, 1959; Ross, 1930). According to Kant (1785; 1959) morality in actions integrates not only agents' duties to others, but to the agent as well. Specifically, we should distinguish between 'perfect' and 'imperfect' duties to 'himself' and 'others'. Rules specifying perfect duties to others account for actions that are clearly immoral (one such example is stealing). Moreover, individual 'perfect' duties towards 'himself' should prevent taking action that would compromise internal values and utilities (e.g., smoking and drinking behaviours). In contrast, Kant pointed out that 'imperfect' duties do not rely on specific or exact actions; for example, individual 'imperfect' duties towards 'others' and 'himself' can promote happiness, but do not prescribe which are the appropriate actions to achieve this end (e.g., happiness).

Surprisingly, even some utilitarian moral philosophers accept that an action is wrong if it is violating moral rules. In contrast to utilitarian moral account, theorists (e.g. Brandt, 1985) have argued that it is morally wrong to violate rules justified by consequences of actions (e.g., Brandt, 1985). For example, an action is classified as morally wrong if it is violating a moral 'local' rule that is utilised by the decision-maker. In other words, there is a possibility to implement psychological moral rules in the moral utilitarian norm, based on local knowledge and rules. People could be utilitarian in their judgements and decisions according to their subjective knowledge

of rules and respective internal psychological rationalisations (e.g., Turiel, Killen & Helwig 1987). This rule-utilitarian based approach provides explanations for personal acts as it gives a psychological interpretation, which suggests that if an action is perceived as an impermissible, it violates the moral rule set by the decision-maker himself (Nichols & Mallon, 2006). Moreover, there are normative judgements that add to this philosophical understanding. It can be argued, that what individuals consider to be a conventional violation of moral rules depends on knowledge of the local rule (e.g., Turiel et al., 1987). For example, cross-cultural differences in moral reasoning can be explained by moral local rules - tipping in western countries is considered normal, acceptable and expected, but not in many Asian countries. This therefore indicates that there is an independent and psychologically driven normative mechanism underlying the use of rules (e.g., Nichols & Mallon, 2006).

The question that remains unanswered however is: why is it acceptable, in the trolley scenario, to choose one over five, when compared to the footbridge scenario? The traditional rule-base accounts provide an answer that suggests individual actions are explained by rules that are either permitted or forbidden. For example, a rule such as "Do not kill people" may not lead to one individual killing another, but that individual may act in a way that brings death; unintended by foreseen side effect. However, what can be considered as moral or immoral rule? This is a question that prominent scholars continue to debate with no real consensus (Foot, 1967; Quinn, 1989; Thomson, 1976; Nichols & Mallon, 2006).

In spite of the possible explanations the moral rule accounts provide, there are potential complications with characterising rules, as to what is acceptable and what is not. There is no clear, independent or unique answer to how that asymmetry can be explained by a generic rule. This approach does not look into specific psychological

factors and moral decision contexts and contents. Experimental results revealed a psychological asymmetry in lay intuitions about moral dilemmas (Nichols & Mallon, 2006). Respondents considered as a permissible act diverting a train (and killing one innocent person instead of five), but considered as impermissible to push a stranger in front of a train to save five innocents. This reinforces the idea that people are not absolute deontologists. The experiments took into account 'weak impermissibility', and 'all-in impermissibility'; the former refers to an action that violated a rule and the latter refers to an action that is wrong, all things considered (Nichols & Mallon, 2006). What is notable about the results is that, people appreciate the difference between weak and all-in impermissibility. However, this result contradicts views in moral ethics (e.g., absolute deontology); if an action violates a moral rule (when a rule is broken), it is wrong to go ahead with that action (e.g., Fried, 1978). In other words, if moral rules are accepted and applied, there must be no distinction between weak and all-in impermissibility.

Accordingly, and in contrast to Greene et al. (2001), Nichols and Mallon (2006) argued that there are two distinguishable psychological mechanisms involved in moral decision-making: (i) a mechanism that reveals respondents' capacity to minimise negative decision outcomes and (ii) a mechanism that reveals the use of rules, which forbid certain actions. Crucially, the authors argued (Nichols & Mallon, 2006) that the 'rules' cannot be integrated under the capacity mechanism (when respondents consider how to minimise the bad outcomes). Furthermore, Nichols and Mallon (2006) proposed that human judgements with all-in impermissibility type of scenarios involve three psychological factors: representation of rules, cost and benefits evaluation and emotional activations, which makes the goal of unified utilitarian explanations of moral judgements unachievable (given possible interactions

of diverse psychological factors and use of psychological mechanisms).

However, in this dissertation I argue that that it is plausible for human decision-makers to achieve utilitarian performance (driven by a maximisation strategy) based on consistent use of utilitarian mechanisms, if the influence of psychological and contextual factors is well understood. For example, improving accessibility to available utilitarian information (which is often unavailable in philosophy and psychological experiments), and therefore minimising psychological uncertainty may lead to better utilitarian decisions. Before exploring this possibility, we should acknowledge that theorists in moral psychology and philosophy paid very little attention to the potential influence of utilitarian content. Specifically, whether the type of 'utility' involved in the decision-making scenarios matter and influence moral decision-making mechanisms. It is an interesting (and unexplored in moral decision-making) question, motivated by recent research results (Kusev, van Schaik, Ayton, Dent & Chater, 2009; Kusev & van Schaik, 2011) that reveal the content of utility of decision-making scenarios has influence on the respondents pattern of preferences. The nature and experience with the decision-making content (and utility) determine our preferences; it matters whether we consider decisions about hypothetical monetary gambles or insurance monetary decisions, as different decision contents will evoke different cognitive associations, evaluations of subjective values and memory/experience.

Accordingly, and unlike psychologists and philosophers, researchers in economics offer a very particular (non-psychological) prediction about the potential influence of utilitarian contents. The content nature of Utility in stake should not influence decision actions and the goal to maximise expected values in (e.g., von Neumann & Morgenstern, 1947); as long as there is a potential to maximise the utility

(and its expected values), the type of decision utility content should not matter. So does it matter whether we consider human life (the most valuable utility) or nonhuman and inanimate objects? Psychologists have argued (Barrett & Johnson, 2003; Guthrie, 1993; Bassili, 1976; Berry, Misovich, Kean & Baron, 1992; Michoette, 1963; Scholl & Tremoulet, 2000) that people have the ability to detect intentional 'agents' in the environment (agents with beliefs and desires) and to attribute psychological (humanlike) properties to inanimate objects. The cognitive ability to detect agency in the environment is fundamental for human beings (recognising threats and survival opportunities), and therefore the cognition mechanisms involved in detecting agencies are very sensitive and easy to be activated. Registering an object as an agent is independent from its biology, and accordingly, attributing human properties and values to an object is possible and does not require a biological agency (humans or animals).

However, neuroimaging studies (Mitchell, Macrae & Banaji, 2005) provided evidence that there is a specific pattern of neural activation (dorsal regions of the medial prefrontal cortex) when it comes to forming 'human impressions' (with human agency). The results revealed that activation in the dorsal regions of the medial prefrontal cortex was more apparent when respondents considered human agency impressions than inanimate objects impressions; indicating that social cognitive factors associated with human agency rely on different neural mechanisms than those with non-human agency (Mitchell et al., 2005). It is an intriguing research question to test the above assumptions, and measure whether the utilitarian moral behavior is affected by utilitarian content (type of utility involved). It is plausible that the utilitarian moral rules are deeply ingrained in human cognitive system and overrule activations and responses of non-utilitarian nature. This dissertation will offer an

empirical insight into this possibility by measuring moral behaviour with human and non-human (animals and inanimate objects) utilitarian content.

Philosophers (e.g., Introna, 2014), argued that the type of utility is determined by the similarity of kinds involved in utilitarian consideration. Indeed, it is argued that human agents order, categorise, compare and value (inappropriately) most things similar to us (humans) and we value least utilitarian contents dissimilar to us (e.g., inanimate beings). This is because non-human beings are 'less valuable' (in these orders and comparisons) and therefore not a significant part of the human deontological or utilitarian moral mechanisms (Introna, 2014). However, comparative psychology studies (e.g., Azrin, Hutchinson, & Sallery, 1964) demonstrated that aggressive behaviour (elicitation of attacking behaviour of squirrel monkeys) towards animate and inanimate objects is possible; revealing rather more general behavioural mechanism towards the 'environment' than any specific objects – animate or inanimate (and their similarity to us).

Furthermore, in the review of existing theoretical and experimental findings in the dissertation I have explored the current views in psychology and philosophy, as to why human judges consider as 'unacceptable' the action of harming directly a person, even when this action maximises utility. Recent experimental evidence revealed (Millar, Turri, & Friedman, 2014) that the same behavioural (non-utilitarian) pattern emerged when participants considered utility content with inanimate objects that they owned. Specifically, when the respondents considered dilemmas with saving five inanimate objects by destroying one, this action was judged as unacceptable when the action involved violating another person ownership rights, but not if they owned the object (Millar et al., 2014). It is crucial to explore this effect further (beyond ownership) and identify other, and more universal, psychological factors underlying

moral choice and agency. I see the accessibility to available utilitarian information and content of utility as an opportunity to further explore the nature of human moral utilitarian behaviour.

1.5.3. The effect of availability of information in human decision-making

There are many research attempts in psychology to account for behavioural and psychological strategies and the associated errors and biases. Decision-making researchers explored the existence of mental heuristics - a set of psychological rules people tend to use (e.g., Simon, 1990; Tversky & Kahneman, 1973; Tversky & Kahneman, 1974.). These psychological rules, often described as mental shortcuts, could be applied successfully to most of our every day decisions, but also could lead to deviations from normative expectations (e.g., expected utility theory and logic). Accordingly, a number of studies have focused upon 'availability' heuristic (e.g., Tversky & Kahneman, 1973), which accounts for the easiness with which psychological representations come to mind when needed - an on-going psychological 'ease' strategy in the memory assessment (Kubovy, 1977). More recently, Kahneman (2003) clarified that availability depends on accessibility to information; specifically, it is necessary to assess and take into account accessibility in moral judgements "…in which frequencies or probabilities are judged by the ease with which instances come to mind." (pp. 701; Kahneman, 2003).

Kahneman argued that physical (e.g., size, loudness, distance and brightness) and some psychological (similarity, causal propensity, surprisingness, affective valence and mood) properties (Kahneman & Frederick, 2002; Tversky & Kahneman, 1983; Kahneman & Varey, 1990; Michotte, 1963; Kahneman, Ritov, & Schkade, 1999; Slovic, Finucane, Peters, & MacGregor, 2002; Zajonc, 1980; Schwarz & Clore, 1983) are automatically (with no effort) registered by the perceptual systems.

Kahneman referred to these attributes as 'natural assessments' (Kahneman, 2003; Tversky & Kahneman, 1983). Furthermore, Kahneman (2003) also argued that (i) accessibility to information is a natural assessment and (ii) accessibility is driven by the characteristics of the stimuli (events) - e.g., stimulus salience and the cognitive mechanisms needed to facilitate accessibility – such as selective attention, memory, specific training, and associative activations (e.g., Kusev et al., 2009). However, some accessed properties (e.g., information available in the context as with moral utilitarian scenarios) will require deliberative psychological processing – e.g., where the utilitarian decisions are driven by maximisation (effortful) strategies, leading to maximised expected values.

Decision theorists have observed that the quality of utilitarian decisions can also be critically influenced by external (e.g., contextual) factors that are beyond the decision-makers control (Kusev et al., 2009, 2011, Kusev, van Schaik, & Aldrovandi, 2012). For example, accessibility of information in memory (Kusev, 2009), context (Kusev et al., 2009, 2012) and parallel emotional activations - priming (Kusev, Tsaneva-Atanasova, van Schaik, & Chater, 2012) influence people's risky preferences and decision-making rationality. Specifically, decision rationality varies as a function of the accessibility of events in memory and context (Kusev et al., 2009); accessibility (Kahneman, 2003; Koriat, 1993; Kusev et al., 2009; Tulving & Pearlstone, 1966) predicts that respondents' judgements are informed by "…the amount and intensity of the information accessed in the course of a particular task" (pp. 1495, Kusev et al., 2009).

1.5.4. Availability and uncertainty in moral decision-making

It is well established in psychology that access to available utilitarian information is not an easy or effortless task for human agents (Savage, 1954). The

subjective expected utility theory (Savage, 1954) proposed psychological and behavioural strategies that increase the accessibility to available (contextual) information and subjective representations of utility in support of rational (normative) decision-making. Furthermore, in a normative utilitarian fashion, Savage (1954) 'sure-thing' normative principle of choice/judgement assumes that sure decision outcomes (regardless of actual/preferred selection) should not influence human preferences and rationality. However, under conditions of uncertainty individuals often violate this normative expectation, as a result of an incorrect or partial assessment of the decision options leading to irrational behaviour (Kahneman & Tversky, 1979; Tversky & Khaneman, 1992; Kusev et al., 2009; Vlaev & Chater, 2006). For example, (i) the 'framing effect' (Tversky & Kahneman, 1981), where partially available contextual information framed as loss or gain, leads to paradoxical reverse in preferences and irrational behaviour and (ii) the decision cooperation strategies ('prisoner's dilemma game'; e.g., Vlaev & Chater, 2006), depends on knowledge about the opponent cooperation willingness.

It is also well established by decision scientists (e.g., Tversky & Kahneman, 1986) that decision uncertainty shifts preferences to risk averse behaviour. People tend to be willing to take actions when the decision prospect appears more certain, and in contrast they are more risk averse for decision prospects with high level of uncertainty (Tversky & Kahneman, 1981; Tversky & Kahneman, 1986) – a certainty effect. Research in psychology suggests that the decision-making under uncertainty (both with normative and descriptive expectations) is often consequentialist due to the fact that the agent takes into consideration the probable effect of decision actions in the decision maximisation (Shafir & Tversky, 1992). Nevertheless, as I explored, decisions are not always made in a consequentialist manner (e.g. the violation of sure

thing principle). Here, I will provide another example to illustrate the issue regarding the influence of certainty about utilitarian outcomes on decision behaviour. An individual may choose to purchase an item upon receiving good results in their exam. If the exam outcome is negative, they may choose to return the item and if they have passed the exam, they may choose to keep the item. However, they may choose to wait with the purchase until after they receive the results (Shafir & Tversky, 1992).

It is plausible that some moral decision scenarios (e.g., the trolley dilemma) evoke more psychological certainty than others (e.g., footbridge dilemma) by providing more 'certainties' over the actions and their consequences. For example, in the trolley dilemma there is a 'switching mechanism', which 'takes care' reliably of the actions and their utilitarian outcomes. In contrast, with the footbridge dilemma there are all sorts of 'uncertainties' and possibilities resulting from 'personal involvement/action' not accounted for by the moral scenarios, and leaving space for speculations/interpretations and vagueness regarding the utilitarian outcomes (as a result of actions).

Furthermore, providing partial utilitarian information (as in all previously conducted moral studies; e.g., Greene et al., 2001) in both, moral trolley and footbridge scenarios (and the judgement question focusing on one of the possibilities) enhances decision uncertainty and framing effects (e.g., Tversky & Kahneman, 1981), which might be the reason for the observed pattern of irrational utilitarian behaviour with moral decision-making scenarios. Accordingly, when one is supposed to follow decision criteria (normative logic), there is a possibility of interference and influence from conflicting and partial descriptions, leading to ambiguity and uncertainty. This might be due to a number of psychological factors: contextual accessibility to the utilitarian information: vagueness, that is typically prevalent in the moral utilitarian

descriptions, choice (selection) or judgement (evaluation) strategies and tasks; content of moral utility (human lives or inanimate objects) and utility ratios employed in moral scenarios.

According to Christensen, Flexas, Calabrese, Gut and Gomila, (2014) the emotional involvement in moral judgement could be present because of the uncontrolled variations in the dilemma formulations, instead of the difference between personal and impersonal factors. No doubt that Greene et al, (2001) initial set of moral dilemmas has provided valuable information to the moral judgement field; however, conceptual and formulation errors continued unchallenged (Christensen & Gomila, 2012). Christensen et al. (2014) proposed future studies to use only the subset of the initial dilemmas by Greene et al. (2001), and to further validate this initial set of moral scenarios (Christensen et al., 2014).

The way the decision question is formulated can bias the decision-makers too. It has been established empirically, that the formulation of the judgement questions influences participants' moral decision (O'Hara et al., 2010); for example, using 'wrong', 'inappropriate', 'forbidden', and 'blameworthy' in the moral judgement question. The results revealed that participants judge moral transgressions more severely when the words 'wrong' or 'inappropriate' are used, than when the words 'forbidden' or 'blameworthy'… Another study by (Borg et al., 2006) discovered an effect of using the question 'Would you... ?' on behaviour (response time) with moral scenarios compared to non-moral scenarios (less decision time with moral scenarios). Whereas using the question 'Is it wrong to...?' did not show any differences in response time between moral and non-moral scenarios. This finding showed that these questions are processed psychologically differently from each other. Furthermore, research by Feldman Hall, Mobbs, Evans, Hiscox, Navrady and Dalgleish (2012)

revealed that providing more available contextual information to the participants leads to more internal coherence between what they said they would do (willingness) and what they actually did (actions) (Christensen et al., 2014).

Could uncertainty be the reason for the difference between the trolley and the footbridge dilemma? It is plausible that uncertainty (levels of certainty) is the psychological link between the differences (normative rationality and behaviour) in the moral descriptions and the utility of the outcome. If the level of uncertainty is high the normative utilitarian (and expected) behaviour will be impaired, and in contrast, if the uncertainty level is low the utility moral actions will be enhanced and visible to the decision-makers. Not providing explicit contextual account for moral actions and their consequences may evoke speculations about actions and consequences of moral actions, such as: 'If you push someone, it might make things worse by killing all six people', 'If the person is only injured, he/she may escape and there will be one injured and five killed', If a fight broke out, pushing one might cause seven people to be killed (including you) and given that no full contextual moral account for all possible outcomes is provided, you might think that it is possible to save 'all six people involved'. Therefore, by controlling the level of uncertainty (providing full textual or visual accounts for the actions and consequences of actions) the utilitarian task would be clearer and there might not be any difference between the trolley and footbridge dilemmas.

Furthermore, according to Huettel, Song, and Mccarthy (2005) uncertainty results in unpredictable behaviours. Uncertainty is, undoubtedly, an important factor in our decision-making processing mechanism, and it is of great interest to many researchers in the behavioural and neuroimaging fields. In fact, a significant effect was evident in fMRI during a maze navigation task (Yoshida & Ishii, 2006). It was

also evident that uncertainty is linked to emotional and pathological disorders (Holaway, Heimberg, & Coles, 2006; Boelen & Reijntjes, 2009;Mushtaq, Bland & Schaefer, 2011). Moreover, experimental results revealed that people are able to make effective decisions about the future in uncertain situations, if they are offered relevant and accessible decision information (Volz, Schubotz, & Von Cramon 2003; Hsu, Bhatt, Adolphs, Tranel, & Camerer, 2005; Yu & Dayan, 2005; Kording & Wolpert, 2006; Yoshida & Ishii, 2006; Behrens, Woolrich, Walton, & Rushworth, 2007).

Moreover, studies have revealed that the accuracy of behavioural forecasting (Bertelson & Boons, 1960; Scheffers & Coles, 2000) is associated with accessibility (and associate uncertainty) to previous experiences and context in a normative way (Behrens et al., 2007). The role of context is crucial as it leads to expected uncertainty and unexpected uncertainty (Mushtaq et al., 2011), moderated by levels of accessibility and experience. It is important to note that the brain activations with expected and unexpected uncertainties are not distinctive (Mushtaq, Bland & Schaefer, 2011).

Uncertainty seems to have a vital influence on some cognitive functions, particularly monitoring. Monitoring refers to "…a set of processes that evaluate the need to implement or adjust top-down control, and this process is often defined within the scope of the specific monitoring of the outcomes of on going behaviour." (pp. 6, Mushtaq et al., 2011), (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Kerns, Cohen, MacDonald, Cho, Stenger, & Carter, 2004; Yeung & Cohen, 2006; Brown, 2009; Mushtaq et al., 2011). The research evidence suggests that top-down control may be associated with uncertainty as the areas activated in the brain are the prefrontal cortex, ACC and areas in the parietal lobe; these areas are associated with higher cognitive (monitoring) functions. Uncertainty seems to share some features

with the monitoring system, as they both use top-down control to explain signals. This suggests that there are potential links between the two psychological processes (Mushtaq et al., 2011).

Monitoring and uncertainty have been examined using complex dynamic control (CDC) scenarios, which are virtual, realistic scenarios. An example is a fire fight scenario, where individuals solve virtually the problem. A study that looked into CDC found that participants' attention was focused on monitoring the outcomes of the decisions (Osman, 2010). Similar findings were reported by researchers employing traffic-control tasks (Metzger & Parasuraman, 2006). Furthermore, individuals with psychopathological disorders experience issues with decision-making tasks involving uncertainty (Ladouceur, Gosselin, & Dugas2000). Studies have suggested that intolerance of uncertainty (IOU) is linked to a number of disorders, including general anxiety disorder, eating disorders, schizophrenia, and obsessive-compulsive disorder (OCD) (Andrews & Borkovec, 1988; Konstantellou & Reynolds, 2010; Dudley, Li, Kobor, Kippin, & Bredy, 2011; Steketee, Frost, & Cohen, 1998). IOU can be defined as "a tendency to react negatively on an emotional, cognitive, and behavioural level to uncertain situations and events" (p. 143; Heimberg, Turk, & Mennin, 2004). Psychopathological studies about IOU show that disorders such as schizophrenia and OCD are linked with cognitive control. A number of studies have shown that IOU correlates with lower performance in cognitive control tasks, and that individuals with disorders are unable to perform well in uncertain situations (e.g., Broome, Johns, Valli, Woolley, Tabraham, Brett, Valmaggia, Peters, Garety, & Mcguire, 2007; Mushtaq et al., 2011).

The research presented by Mushtaq et al. (201l) has provided a wealth of evidence on the connection between uncertainty and cognitive control. Brain studies

on uncertainty have revealed that the neural network is linked with cognitive control namely, lateral PFC (the prefrontal cortex), parietal and the ACC (the anterior cingulate cortex). These three areas are activated in decision-making tasks, as well as in cognitive tasks; it can be concluded that there is a significant connection between uncertainty and monitoring. Importantly, uncertain decision environments seem to have influence on monitoring (Mushtaq et al., 2011).

1.6. Summary of chapter 1 and outline of experimental chapters 2, 3, and 4

This dissertation thesis aims to systematically investigate whether the differences in moral decision-making behaviour and rationality are caused by lack of accessibility to contextual information. Moreover, I argue that the reason for irrational moral behaviour is fuelled by decision uncertainty associated with lack of accessibility to contextual information. This assumption is in contrast to the dual process moral utility theory, which predicts that irrational behaviour is caused by the simultaneous activation (and interference) of cognitive and emotional systems. Accordingly, in this dissertation research, I will also explore empirically the influence of utility ratios employed in the moral decision-making scenarios, decision-making uncertainty (eliminated uncertainty by textual and visual utility presentations), moral uncertainty with choice and judgements scenarios, as well as utilitarian content involved in the moral scenarios (e.g., human life and inanimate objects).

In order to fully assess whether decision uncertainty explains moral utilitarian behaviour, a series of theoretical issues are explored and methodological improvements offered within each experimental chapter. An overview of these issues is offered in Chapter 1, and the relevant research questions will be empirically explored in each of the following four experimental chapters. Accordingly, nine experiments are presented, and each of them addresses different but related theoretical

questions. For example in Chapter 2, I investigate the psychological uncertainty under Greene et al. choice scenarios (2001), as well as employ a novel choice method (visualising moral actions and their consequences), in order to improve utilitarian accessibility and to eliminate decision uncertainty. I also used novel descriptions of utilitarian moral scenarios (e.g., Kusev, van Schaik, Alzahrani, Lonigro, & Purser, 2016) where there is a precise contextual account for utilitarian values and corresponding consequences of utilitarian actions. In Chapter 3, I explore further the assumption of decision uncertainty and accessibility of information with judgement tasks (not choice). It is anticipated that uncertainty operates across choice and judgements tasks with similar pattern of behavioural preferences and choice rationality. In Chapter 4, I test the influence of utility ratios and content of utility (e.g., human life and inanimate objects) on decision rationality. Finally, in Chapter 5, all findings are summarised, interpreted and discussed in the context of moral utilitarian theories of decision-making. In addition, I propose further research on the role of uncertainty in judgement and decision-making.

Chapter 2:

Moral utilitarian choice: Exploration of Psychological Uncertainty and Development of new Methodological Approach to the Study of Moral Decision-making.

2.1. Introduction

Utilitarianism assumes maximisation, for example, the action with the greatest total benefit for all people is what we can consider to be morally correct and acceptable (Sinclair, Knight, & Clari, 2001). However, from a psychological point of view, the definition of a utilitarian judgement is accepting harmful actions that benefit the greater good (Greene, 2007) for the greater number of people (Moll & de Oliveira-Souza, 2007). According to Greene et al. (2001) personal moral scenarios invite emotional activations (which interfere with cognitive controlled processing) inducing non-utilitarian (irrational) behaviour. Moreover, Greene et al. (2001) found that participants rational choices with personal moral dilemmas (footbridge) took them more time than the decisions with impersonal moral situation (trolley dilemma); this is because personal moral dilemmas are more emotional and salient compared to the dilemmas with impersonal engagement. The dual-process moral utility (Greene et al., 2001; 2008) theory suggests that characteristically deontological judgements (e.g., killing any man, in order to save others is wrong) are specially supported by automatic emotional responses. They argued that the emotional activations result in support of the deontological judgements, and in contrast the controlled cognitive processing results in utilitarian judgements (Amit & Greene, 2012; Greene et al., 2004; Paxton, Ungar, & Greene, 2012).

As reported in Chapter one, Greene and colleagues (2001, 2008) have proposed a dual process theory of moral judgement, predicting brain moral subsystems and different activations for (i) emotional and deontological judgements (e.g., no personal actions, sacrificing five and saving one) and (ii) rational and utilitarian judgements (e.g., personal actions and saving five at the expense of one). Making a utilitarian (rational) choice with moral personal dilemmas causes higher activations in the right

inferior parietal lobes and anterior dorsolateral prefrontal cortex (cognitive processing areas), than respondents making non-utilitarian choices. Moreover, behavioural empirical results by Greene et al. (2008) showed further support for these predictions. Greene et al. (2008) reported evidence that when cognitive control processes are interfered by cognitive load manipulations (concurrent digit search task) respondents made less rational (non-utilitarian) decisions. The results also have shown that under increased cognitive load manipulation, response time for making a rational choice with moral scenarios increased, but had no effect on decision time with non-utilitarian (irrational) choice. Furthermore, the ventromedial prefrontal cortex (VMPC) appeared to be a neural substrate for the influence of emotion (non-utilitarian and irrational system) on moral behaviour. There is evidence that the VMPC is particularly important for making rational moral judgements with morally sensitive scenarios (emotionally aversive acts), as opposed to other non-moral scenarios (Koenigs et al., 2007). It was found that patients with VMPC lesions judging highly emotional moral scenarios were predominantly utilitarian (rational) in their judgement.

However, empirical research has shown that some emotions (e.g. anger) are positively associated with utilitarian judgements and that others are dissociated from utilitarian judgements – guilt and shame (Choe & Min, 2011; Valdesolo & DeSteno, 2006; Wheatley & Haidt 2005). Moreover, Valdesolo and DeSteno (2006) argued that induced positive feelings at the time of judgement reduced the perceived negativity of moral violations, which respectively increase utilitarian decision-making. These results reveal the complexity of the issue and the need for further research.

Arguably, there are two types of uncertain situations; situations that can be characterised as risky (e.g. gambling, where chance of winning can be computationally established) and situations that can be characterised as ambiguous

(e.g. the chance of a terrorist attack, where probability is based on conflicting/uncertain evidence). Therefore, the utilitarian (maximised) decisions can be a function of type of task and respective level of available information (description and probabilities of the outcomes) (Hsu et al. 2005). A number of studies have revealed that people respond inconsistently to different moral scenarios (e.g., in the trolley and footbridge dilemmas). For example the results by Greene et al. (2008), Greene et al. (2004), Paxton, Ungar and Greene (2012), support the predictions of the dual-process theory of moral judgements regarding automatic emotional activations (with moral 'personal' scenarios) interfering with more cognitive and rational psychological system.

In this chapter, I set out to contribute to the field of moral utilitarian decision-making by systematically investigating the role of uncertainty in moral choice. In contrast to the widely used experimental method and materials, proposed by Thomson (1985), in this chapter I explore, develop and test an alternative and new experimental method and materials to study moral utilitarian choice. My goal was to design an experimental paradigm for moral utility, which measures and explains: a) the reasons for the differences in participants' decisions in the trolley and the footbridge dilemmas, and b) the effect of uncertainty on moral choice and response time. In order to account for the previously reported differences between choices with trolley and footbridge dilemmas, three experiments tested the influence of visual presentations of moral choice, full text description of moral choice and repeated moral decision-making.

As reported by Kusev et al. (2016), experimental studies (including neuropsychological research) on moral choice did not take into account the possibility that the difference between footbridge and trolley moral dilemmas might be

independent from the level of involvement in these two dilemmas (personal or impersonal). A methodological flaw (confounding variables), which is resolved/controlled in the experiments reported in this dissertation. Specifically, these confounding variables (type of involvement and type of dilemmas) were eliminated allowing the footbridge dilemma to be impersonal (switching mechanism) and the trolley dilemma to be personal (to push the worker on the track).

Another major impediment in published moral utilitarian research is the way moral utilitarian scenarios are communicated to the respondents. Commonly these scenarios are presented textually with partial descriptions of the utilitarian alternatives (e.g., Kusev et al., 2016) and without visualisations of the moral action and consequences of the moral action. These partial text descriptions of moral scenarios do not allow access to important utilitarian information about the moral actions and consequences of moral actions.

For example, the following scenario does not account for the possibility to save the lone workman and the respective utilitarian consequences:

'A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.' (e.g., Thomson, 1985; Greene et al., 2001).

Moreover, all previously published studies on moral decision-making used moral scenarios, where the choice question accounts only for the 50% of the possible

utilitarian actions.

For example:

'Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes/No' (e.g., Thomson, 1985; Greene et al., 2001).

All these examples exemplified major methodological weaknesses in the field of moral decision-making. Accordingly, the three experiments in this chapter were expected to reveal that visual presentations of the moral actions and consequences of moral actions, supported by full text dissections of moral actions and consequences of moral actions (including questions which account for the alternatives) enhance rational/utilitarian choice by eliminating uncertainty (caused by insufficient textual and visual information).

Utilitarian (consequentialist) behaviours are judged as morally right only by virtue of their outcome (Bentham, 1970). From the utilitarian point of view, Bentham (1970) noted that is acceptable to sacrifice a small number of people's lives to save a greater number, because this results in greater utility (happiness) overall. In contrast, deontologists (e.g., Kant, 1959) have argued that it is not acceptable, because living is a fundamental right for everyone, and no one has the right to take that from anyone, regardless of any benefits that may arise from doing so. In Greene's view, the affective system is likely to be activated by 'personal' moral considerations, while the cognitive system might favour utilitarian consequences and thus rational thinking. Following Greene and colleagues, and based on the consequentialist theory of moral utilitarian judgment, in this dissertation I defined a rational choice as one that saves the lives of five workmen rather than of another single workman, thereby maximizing

the utility of the moral action that is taken and minimizing the disutility.

As Kusev et al. (2016) reported, full accessibility to utilitarian information eliminates framing effects (caused by partial utilitarian descriptions). In such scenarios, where uncertainty is reduced, decision-makers are more vividly confronted with the effect of the action and consequences of the action. Accordingly, there is a contrast between scenarios with limited utilitarian accessibility (causing psychological uncertainty) and corresponding mental simulations (compensating for reduced accessibility of moral actions and consequences), and scenarios with comprehensive information about moral actions and consequences (where moral utilitarian actions are enhanced). For example, 'situation models' (e.g., Glenberg, Meyer, & Lindem, 1987) revealed that linguistic descriptions are understood by simulating perceptual and motor aspects of those descriptions. In other words, complete descriptions of moral utilitarian scenarios may facilitate simulations by reducing uncertainty. It is also known in decision science research that uncertainty invites irrational behaviour and preferences (e.g., Kusev et al., 2016; Kusev et al., 2009; Kusev, van Schaik, & Aldrovandi, 2012; Slovic & MacPhillamy, 1974; Tversky & Kahneman, 1992).

Using full visual presentations of moral dilemmas may eliminate the uncertainty as it helps the respondents to appreciate the utilitarian outcome from their decision. According to Caruso and Gino's (2011) the mental simulation (including visual imagery) makes moral considerations more salient. It is plausible that the visual imagery presentations can eliminate the effect of the deontological moral scenario being more salient, compared to utilitarian moral (which is less salient), preferentially supporting individual rights over the greater good when the two conflict (Amit & Greene, 2012). Accordingly, three experiments will investigate the influence of full

visual presentations of moral dilemmas (pictures displaying the initial moral state, moral action, and consequences of moral actions) supported by full text descriptions of moral choice and consequences of moral choice.

2.2. Experiment 1: Explorations of moral utilitarian choice under uncertainty

In the first experiment, I investigate the influence of uncertainty in making rational utilitarian decisions. I explore the possibility that the differences in response time for personal and impersonal dilemmas (the trolley and the footbridge dilemmas) are based on cognitive reasoning, as they relate to the levels of uncertainty of moral tasks. Thinking about moral actions and consequences of moral actions creates uncertainty, which can be fuelled by insufficient decryptions of moral actions and consequences. I propose that the differences in decision-making (response) time are caused by the level of uncertainty. Accordingly, I assume that eliminating uncertainty will reduce the decision-making time for moral scenarios.

Furthermore, I offer a significant methodological improvement by eliminating the confounding variables used in moral decision-making research since Thomson (1985). The experimental designs in my studies allow the footbridge dilemma to be impersonal (switching mechanism) and the trolley dilemma to be personal (to push the worker on the track). In addition, in order to test the effect of uncertainty, the presentation of moral dilemmas used partial text descriptions (as in Thomson, 1985 and Greene colleagues, 2001) and visual description of the dilemmas. The goal of this experiment is to demonstrate that the differences in response time are caused by cognitive processing, reasoning and associated levels of uncertainty (and not their emotional valence).

2.2.1. Method

2.2.2. Participants

Participants were 181 adults (114 females, 67 males) recruited through a marketing company specialized in psychological research. Mean age was 43 years (*SD*=14.63). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

2.2.3. Experimental design and materials

The experiment was an online computer-based study; the instructions, scenarios and questions were presented to the participants online. Each participant took part in one of the experimental conditions. An independent measures design was employed in this study, 2x2x3, with independent variables 2 (type of dilemma: trolley dilemma and footbridge dilemma) x 2 (involvement: moral personal and moral impersonal) x 3 (uncertainty: text, text with a picture [presenting the action] and text with three pictures [presenting the initial state, action and consequences of the action]). There were twelve experimental conditions. The dependent variables were the choice rationality of actions, study time (reading the scenarios) and response time answering the question of appropriateness.

Participants were given short stories to read, involving moral dilemmas scenarios where the type of dilemma, involvement and uncertainty were manipulated. The experiment accounted for uncertainty by presenting descriptive and visual information about the dilemmas. For instance, in the experimental condition – 'footbridge, impersonal involvement, with text and 1 picture (behavioural action)' – participants were offered the following scenario, presentation and a question about the appropriateness of action (see Figure 1 and Appendix):

A runaway trolley is heading down the track toward five workmen who will be

killed if the trolley remains on its present course. You are on a footbridge over the track between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who is hanging on a rope painting the bridge. The only way to save the lives of the five workmen is to hit a switch, which will cause the rope to lower the stranger onto the track below, where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

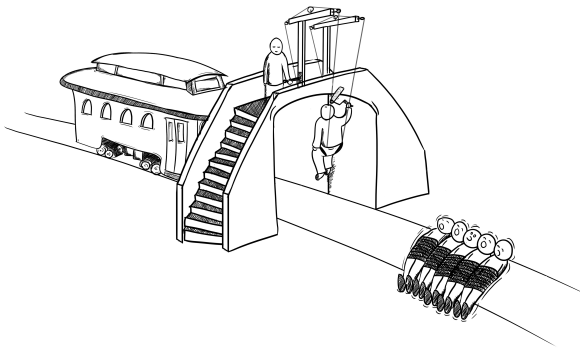


Figure 1. A visual presentation of the behavioural action with impersonal footbridge dilemma.

Participants were asked the question: 'Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?'

Yes or No.

In contrast, in the trolley moral dilemma (for example 'trolley, impersonal involvement, with text and 1 picture (behavioural action)', Figure 2; see also Appendix) participants were asked to read the following scenario:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left is a group of five railway workmen. On the track extending to the right is a single railway workman. If you do nothing the trolley will proceed to the left, causing the

deaths of the five workmen. The only way to avoid the deaths of these workmen is to hit a switch near the track that will cause the trolley to proceed to the right, causing the death of the single workman.

Similarly to the footbridge dilemma, participants were asked the question: 'Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?' Then participants had to make a choice: Yes or No.

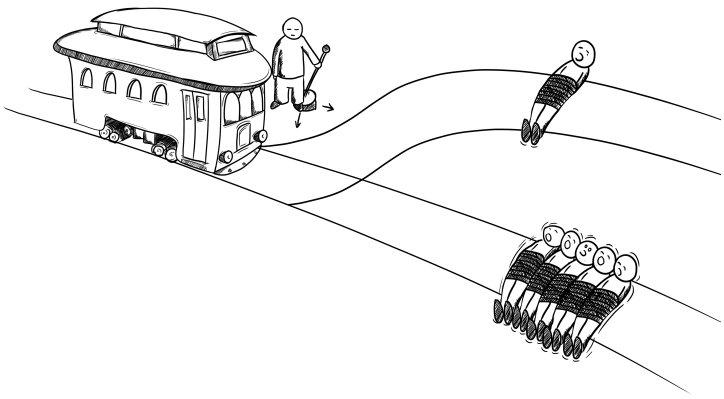


Figure 2. A visual presentation of the behavioural action with impersonal trolley dilemma.

2.2.4. Procedure

Participants took part in the experiment individually; they were assigned randomly to twelve experimental conditions. Participants had to (i) read a general description of the study and (ii) accept or decline to participate in the experiment (consent form). The respondents were instructed that the tasks are self-paced, and that they can withdraw at any given time of the study without providing a particular reason. After reading the experimental instructions and signing electronically the

consent form, participants were instructed how to progress in the experiment and how to state their choices. The experimental task required respondents to read the scenario - where the moral dilemmas (trolley, footbridge), involvement (personal and impersonal) and uncertainty (text, text + 1 picture, text + 3 pictures) were manipulated. Once participants read the moral dilemma scenario they were able to click on a 'next' button displayed on the screen (accordingly study time was recorded) and move to the moral dilemma question. Participants were presented with a moral dilemma question and asked to make a choice between two options. Accordingly, response time was recorded. At the end of the study a debrief information was displayed and 'thank you' note to the participants for their time and effort.

2.2.5. Results

Moral choice

Rational choices (choosing the option causing the death of one instead of five workers) were more commonly made when the moral involvement was impersonal. A logistic regression analysis was conducted to predict choice rationality in moral decision-making using type of dilemma, involvement and uncertainty as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between rational and irrational choices *chi square* = 40.443*, p* < .001 with *df* = 11*; N*=181). Hosmer-Lemeshow goodness-of-fit test revealed that the model prediction does not significantly differ from the observed *chi square* (8) < 0.001, *p* > .05. *Nagelkerke's* R^2 of .267 indicated a moderate relationship between predictors and prediction. Prediction success overall was 71.3% (70.5% for rational choice and 72.1% for irrational choice). The Wald criterion demonstrated that only involvement made a significant contribution to prediction (*p*=.014), *OR (EXP[B])* = 7.56, $CI_{.95}$ = [1.50;

38.15]. Therefore, the odds of a rational choice were 7.56 times larger when the involvement was moral impersonal (hitting a switch without direct contact with the person), than when it involved a moral personal act (pushing the person). Type of dilemma, uncertainty and task instructions, as well as all the two and three way interactions were not significant predictors (p>.05),

Study Time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics. A three-way analysis of variance (ANOVA) with independent variables type of dilemma (trolley and footbridge), involvement (personal and impersonal), and uncertainty (text, text with a picture [presenting the action] and text with three pictures [presenting the initial state, action and consequences of the action]) showed that only the main effect of uncertainty on study time was significant $F(2, 169) = 15.27$, $p < .001$, medium effect size ($\eta^2 = .153$). This result demonstrated that the difference between descriptions of scenarios with text (M_{Ln} =2.88; SD_{Ln} = 1.15) and description of scenarios with text and one picture (M_{Ln} =3.52; SD_{Ln} = .63) was significant ($p < .001$), as well as the difference between descriptions of scenarios with text (M_{Ln} =2.88; SD_{Ln} = 1.15) and description of scenarios with text and three pictures (M_{Ln} =3.67; SD_{Ln} = .58), ($p < .001$). Participants dedicated more time studying the scenarios with text and visual presentations of moral dilemmas, which included graphical illustrations of the initial stage, action and consequences of action. The difference between description of scenarios with text and one picture and scenarios with text and three pictures was not significant (p > .05). Moreover, the main effects of type of dilemma ($F[1, 169] = 1.09$, $p = .298$), involvement ($F[1, 169]$

= 1.71, p = .193), the two way interactions type of dilemma by involvement (F<1), type of dilemma by uncertainty (F<1), involvement by uncertainty (F< 1), the three way interaction type of dilemma by uncertainty by involvement (F<1) did not influence the amount of time participants spent studying the moral scenarios.

Response time

Similar to study time, it was tested (a three-way analysis of variance) whether independent variables type of dilemma (trolley and footbridge), involvement (personal and impersonal), and uncertainty (text, text with a picture [presenting the action] and text with three pictures [presenting the initial state, action and consequences of the action]) influence response (decision) time. Surprisingly, and in contrast to moral utility research (e.g., Greene et al., 2001), the results revealed that only the main effect of uncertainty was significant $F(2, 169) = 9.73$, $p < .001$, medium effect size ($\eta^2 = .103$). The difference in response time between moral scenarios with text only (M_{Ln} =2.56; SD_{Ln} = .74) and description of scenarios with text and one picture (M_{Ln} =2.20; SD_{Ln} = .47) was significant (p = .002), as well as the difference between descriptions of scenarios with text (M_{Ln} =2.56; SD_{Ln} = .74) and description of scenarios with text and three pictures (M_{Ln} =2.14; SD_{Ln} = .39), (p< .001). Participants took more time deciding on the decision appropriateness of moral utilitarian scenarios with textual description only. Similar to study time, the difference between description of scenarios with text and one picture and scenarios with text and three pictures was not significant (p > .05). Furthermore, type of dilemma (F<1), involvement (F<1), the two way interactions type of dilemma by involvement (F[1,169]=1.93, p=.167), type of dilemma by uncertainty (F<1), involvement by uncertainty (F< 1), and the three way interaction type of dilemma by uncertainty by involvement (F< 1) did not influence participants decision time of appropriateness.

In his paper Greene et al. (2001) claimed that 'emotional interference' produces longer response time for emotionally incongruent responses - when participants make a rational choice in response to personal moral dilemma (e.g., judging it appropriate to push the man off the footbridge in the footbridge dilemma); and less time making a rational choice when moral involvement is impersonal. Further analysis (four-way analysis of variance) tested this prediction. Independent variables were type of dilemma (trolley and footbridge), involvement (personal and impersonal), uncertainty (text, text with visual presentation of the action] and text with visual presentation of the initial state, action and consequences of the action]) and choice rationality (irrational or rational choices with maximised utility).

Accordingly, the results showed that choice rationally (making a rational or irrational choice) did not influence participants response time (F<1); only the effect of uncertainly influenced participants response time $F(2, 157)= 7.31$, p=.001, with small effect size ($\eta^2 = .085$), (see also M_{Ln} and SD_{Ln} from the three way analysis of variance). However, the main effect type of dilemma, and all the two-way, three-way and four-way interactions were not significant (p>.05). Participants took more time deciding on the decision appropriateness of moral utilitarian scenarios with textual description only.

2.3. Experiment 2: Availability, context and visualisation of moral utilitarian choice

The results of Experiment 1 revealed that respondents took less time to make a decision with full (text) description of moral utilitarian scenarios. Experiment 2 further explored the influence of uncertainty and involvement on decision-making time. Our recent research indicated that availability of decision-making information in the context predicts rational behaviour (Kusev et al., 2016). For example, in one experiment we identified that partial contextual descriptions of moral utility (as in

Greene's research) induced irrational behaviour. Notably, since Thomson's (1985) moral utilitarian scenarios, researchers used presentations of moral scenarios with reduced accessibility to utility, where only half of the utilitarian information is available in the context (accounting only for saving the five workmen at the expense of the stranger). Hence, not accounting for saving the life of the stranger at the expense of five workmen - a framing effect (Tversky & Kahneman, 1981). Moreover, the decision question used by Greene and colleagues further induce uncertainty, as it requires a decision and reasoning on only one of the two possible moral actions: " … to push the stranger on to the tracks in order to save the five workmen" (Kusev et al., 2016). Accordingly, Experiment 2 aimed to build up on this finding and further explore the possibility that uncertainty (unavailable descriptions of moral utility) influence decision rationality and decision-making time for moral choice. Specifically, this study employed new stimuli - in order to eliminate uncertainty, visual presentations of the final utilitarian outcome were supported with full textual descriptions of the moral scenarios and question (where all decision possibilities and consequences are available in the context).

2.3.1.Method

2.3.2. Participants

Participants were 303 adults (140 females, 163 males) recruited through a marketing company specialized in psychological research. Mean age was 49 years (*SD* = 13.63). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

2.3.3. Experimental design and materials.

An independent measures 2×2×2 design was employed, with independent variables type of dilemma (trolley dilemma or footbridge dilemma), involvement (moral personal or moral impersonal), and uncertainty (partial text description and question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and question). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time.

Each participant took part in one experimental condition (there are eight experimental conditions overall). Participants read short scenarios about moral-dilemmas where we manipulated the type of dilemma (trolley and footbridge), action involvement (personal and impersonal), and task instructions and questions (uncertainly). The study took into account uncertainty by manipulating and presenting utilitarian descriptive information about the moral dilemmas, by presenting partial text description and question as in Greene et al. (2001) or by full textual and visual (picture) descriptions of the final outcome, accounting for all moral behavioural actions and consequences of the moral utilitarian actions. For example, in the experimental condition 'footbridge, personal involvement, with full description of moral actions and decision consequences' participants were offered the following description of moral scenarios (Kusev et al., 2016) and choice options about the appropriateness of action (Figure 3; see also Appendix):

Moral scenario: Footbridge, personal involvement, with a full text description and visual presentation of decision consequences:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the

track, in between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who happens to be very large. The only way to save the lives of the five workmen is to push the lone workman off the bridge and onto the track below, where his large body will stop the trolley (Scene X). The lone workman will die if you do this, but the five workmen will be saved. The only way to save the life of the lone workman is not to push this workman off the bridge (Scene Y). The five workmen will die if you do this, but the lone workman will be saved.

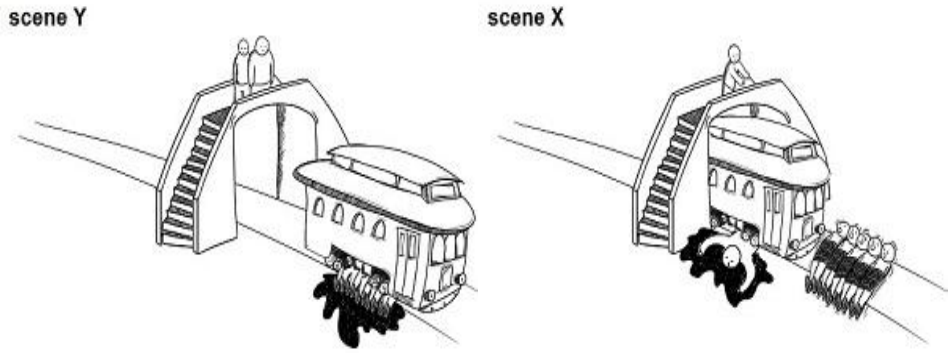


Figure 3. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman).

Question:

Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (Scene X)

Sacrifice five workmen in order to save one workman (Scene Y)

2.3.4. Procedure

The experiment was an online computer-based study. Each participant was presented with (i) general experimental instructions, (ii) a moral dilemma scenario and (iii) a moral choice question (moral utilitarian alternatives – rational or irrational). Participants had to (i) read a general description of the study and (ii) accept or decline to participate in the experiment (consent form). The respondents were instructed that the tasks are self-paced, and that they can withdraw at any given time of the study without providing a particular reason. After reading the experimental instructions, and signing electronically the consent form, participants were instructed how to progress in the experiment and how to state their choices. Once participants read the moral dilemma scenario they were able to click on a 'next' button displayed on the screen (accordingly study time was recorded) and move to the moral dilemma question. Participants were presented with a moral dilemma question and asked to make a choice between two moral utilitarian alternatives (involving rational and irrational moral action and consequences). Accordingly, response time was recorded. At the end of the study a debrief form was displayed and 'thank you' note to the participants for their time and effort.

2.3.5. Results

Moral choice

The effect of independent variables on choice was analysed. In contrast to the dual process theory of moral utilitarian decision-making (e.g., Greene, 2001), rational choices (choosing the option causing the death of one instead of five workers) were more commonly made when full moral utilitarian information 'full text plus picture of the final outcome' (eliminating uncertainty) was presented, and when participants reasoned about the appropriateness of moral actions under impersonal moral involvement (see Figure 4).

A logistic regression analysis was conducted to predict moral choice (irrational/rational) using as predictors type of dilemma, involvement, and uncertainty. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 101.119, $p < .001$ with $df = 7$). Model fit was good, Hosmer-Lemeshow *chi square* (6) < 0.001, $p > .05$. Nagelkerke's R^2 of .379 and indicated a moderately strong relationship between predictors and prediction. Prediction success overall was 76% (77% for irrational choice and 74% for rational choice). The Wald criterion demonstrated that uncertainty ($p = .001$), *OR (EXP[B])* = 5.42, $CI_{.95}$ = [1.96; 15.01] and involvement ($p = .004$), *OR (EXP[B])* = 0.17, $CI_{.95}$ = [0.05; 0.57] made significant contribution to prediction. Therefore, the odds of a rational choice were 5.42 times larger when a moral dilemma was presented with full information and visual presentation of the final moral utility outcome (eliminating uncertainty), than when it was presented with partial textual information (as in Greene et al., 2001; 2011). Furthermore, the odds of a rational choice were 0.17 times smaller when a moral dilemma was personal (pushing the person), than when it involved an impersonal act (hitting a switch). Type of dilemma, as well as all two and three-way interactions were not significant predictors ($p>.05$).

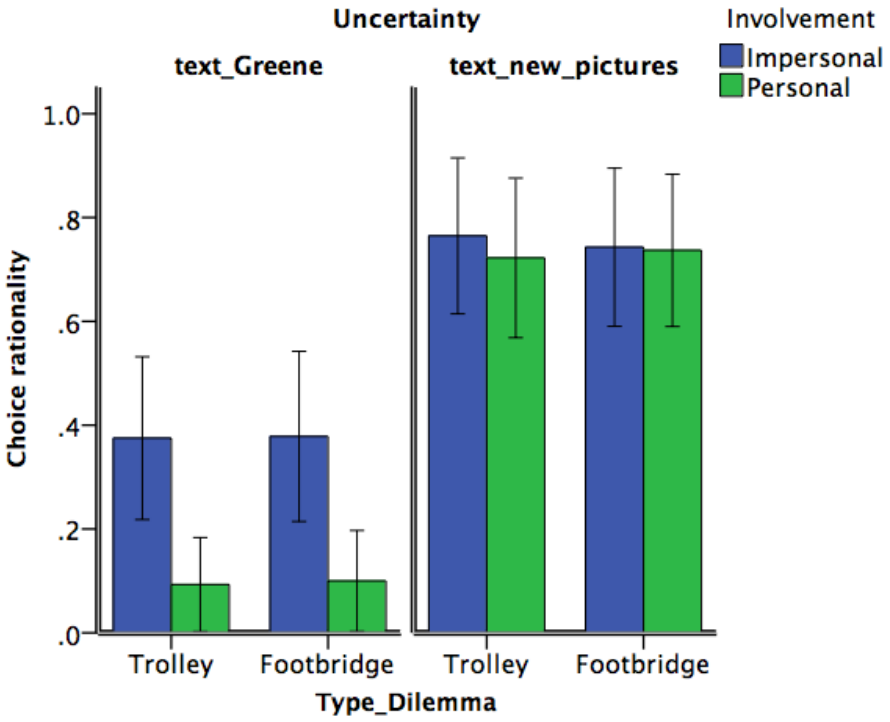


Figure 4. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means.

Study time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics. A three-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), uncertainty (partial text description and question or full text description with picture of the final outcome and question [displayed information about the consequences of the action). The results showed that the main effect of involvement on study time was significant $F(1, 295) = 7.65$, $p = .006$, with small effect size ($\eta^2 = .025$). Specifically, this result demonstrated that respondents took more time to study moral scenarios with impersonal involvement (M_{Ln} =3.49; SD_{Ln}= .62), than moral scenarios with personal involvement (M_{Ln} =3.33; SD_{Ln}= .57). The

second main effect uncertainly significantly influenced participants study time $F(1,295) = 70.11$, $p<.001$, with medium to large effect size ($\eta^2 = .192$). Respondents took more time to study (read) the moral scenarios with full utilitarian information (de-biased and full moral utility text with a picture of the final utilitarian outcome) (M_{Ln} =3.68; SD_{Ln}= .59), than the moral scenarios with partial text information (M_{Ln} =3.16; SD_{Ln}= .49). However, the main effect type of moral dilemma (trolley or footbridge) was not significant ($F<1$). The interactions type of dilemma by involvement ($F[1, 295]= 2.79$, $p = .096$), type of dilemma by uncertainty ($F[1, 295] = 1.74$, $p = .189$), involvement by uncertainty ($F< 1$) and three-way interaction type of dilemma by involvement by uncertainty($F<1$), were also not significant.

Response time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics. Three-way (ANOVA) was conducted with independent variables (type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), uncertainty (partial text description and question or full text description with picture of the final outcome) and dependent variable and choice response time. The results showed that the main effect (uncertainty) on response time was significant $F(1, 295) = 29.07$, $p < .001$, with small to medium effect size ($\eta^2 = .090$) (also see Figure 4). Specifically, this result revealed that the participants took less time to respond with full utilitarian information (improved text with a picture of final utilitarian outcome) (M_{Ln} =1.88; SD_{Ln}= .51), than in the moral scenarios with partial information (M_{Ln} =2.26; SD_{Ln}= .68). However, the main effect type of moral dilemma (trolley or footbridge) and involvement (personal or impersonal) were not significant ($F<1$). The interactions type of dilemma by

involvement (F< 1), type of dilemma by uncertainty (F[1, 295] = 1.66, p = .198), involvement by uncertainty (F< 1), and the three-way interaction type of dilemma by involvement by uncertainty (F< 1), were also not significant (also see Figure 5).

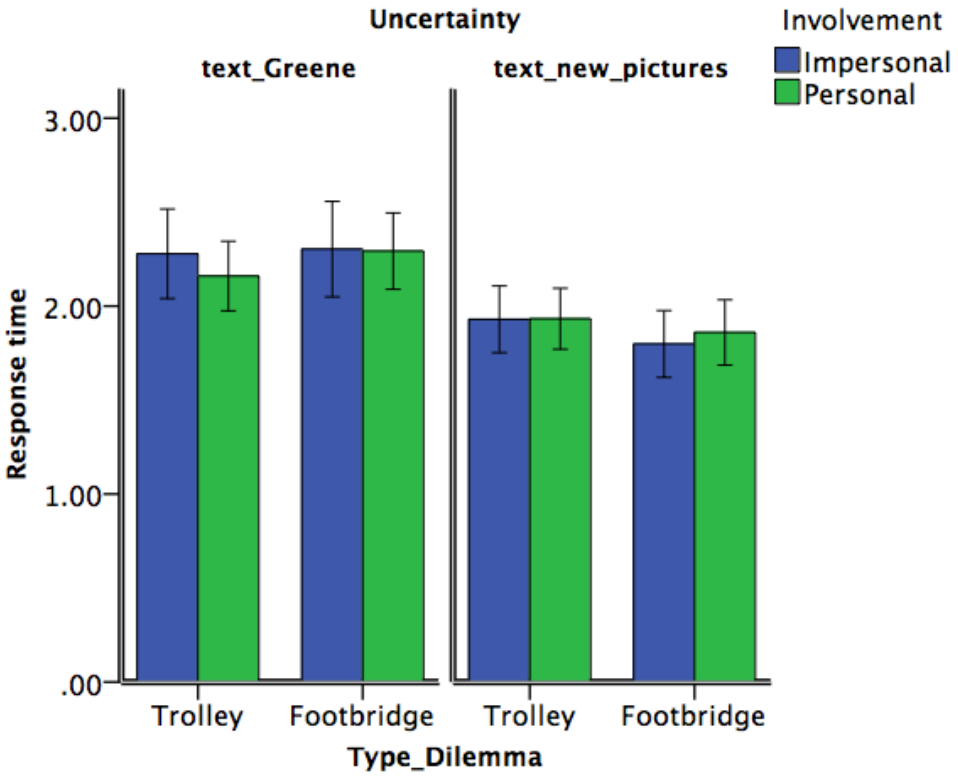


Figure 5. Mean (Ln) response time. Error bars represent 95% CI of the means.

Further analysis investigated Greene et al's. (2001) claim that 'emotional interference' produces longer response time for emotionally incongruent responses when participants make a rational choice in response to personal moral dilemma (e.g., judging it appropriate to push the man off the footbridge in the footbridge dilemma), and less time making rational choice when the moral involvement is impersonal. Four-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), uncertainty (partial text description and question or full text description with picture

of the final outcome and question [displayed information about the consequences of the action) and choice rationality (irrational or rational-maximised utility).

The results showed that the first main effect of uncertainty on response time was significant $F(1, 287) = 13.51$, $p = .001$, with small effect size ($\eta^2 = .045$). Specifically, the respondents took less time to make a choice with full utilitarian information (improved text with a picture of final utilitarian outcome) (M_{Ln} =1.88; SD_{Ln}= .51), than in the moral scenarios with partial information (M_{Ln} =2.26; SD_{Ln}= .68). The second main effect choice rationality significantly influenced participants response time $F(1,287) = 19.11$, $p<.001$, with small to medium effect size ($\eta^2 = .06$). Respondents took more time to answer the question when irrational choice was made (sacrifice five workmen in order to save one workmen) (M_{Ln} =2.32; SD_{Ln}= .66), than when rational choice was made (sacrifice one workman in order to save five workmen) (M_{Ln} =1.81; SD_{Ln}= .47). The third main effect type of moral dilemma (trolley or footbridge) $F(1,287) = 1.23$, $p=.269$ and forth main effect involvement (personal or impersonal) $F(1,287) = 3.06$, $p=.081$were not significant.

The interactions type of dilemma by involvement ($F<1$), type of dilemma by uncertainty ($F<1$), type of dilemma by choice rationality ($F< 1$), involvement by uncertainty (F [1, 287]= 2.22, $p = .138$), three-way interaction type of dilemma by involvement by uncertainty ($F< 1$), three-way interaction type of dilemma by involvement by choice rationality ($F< 1$), three-way interaction type of dilemma by uncertainty by choice rationality (F[1, 287]= 2.82, $p = .94$), and four-way interaction type of dilemma by involvement by uncertainty by choice rationality ($F< 1$) were all not significant.

Three significant interactions were found. The first significant two-way interaction was involvement by choice rationality (F [1, 287]= 11.80, $p = .001$; η^2 =

.040. The second significant two-way interaction was uncertainty by choice rationality (F [1, 287]= 29.25, p < .001; η^2 = .092). The three-way interaction involvement by uncertainty by choice rationality was also significant (F [1, 287]= 13.59, p < .001; η^2 = .045).

However, as there were significant two- and three-way interactions, simple-effect tests were conducted. The simple-effect tests showed that when partial information was presented, only the interaction between involvement and choice rationality was significant, F (1, 159) = 15.60, p < .001, η^2 = .091. Further simple effects showed that the effect of choice rationality was significant, F (1, 82) = 8.69, p =.004, η^2 = .09, when involvement was personal (and partial information was presented), with rational choices taking more time to make (M_{Ln} = 2.81; SD_{Ln}= .38) than irrational choices (M_{Ln} = 2.16; SD_{Ln} = .61). Moreover, the effect was significant, F (1, 76) = 8.05, p =.006, η^2 = .09, when involvement was impersonal, with rational choices taking less time (M_{Ln} = 1.99; SD_{Ln} = .45) than irrational choices (M_{Ln} = 2.47; SD_{Ln} = .83).

However, simple effects showed that when full moral utilitarian information was presented, (i) the effect of choice rationality was significant, F(1, 142) = 115.60, p < .001, η^2 = .461, with rational choices taking less time (M_{Ln} =1.67; SD_{Ln}=.36) than irrational choices (M_{Ln} = 2.45; SD_{Ln}=.41) (also see Figure 5); and (ii) the effect of type of dilemma F(1, 142) = 5.16, p = .025, η^2 = .037, with trolley dilemma choices taking more time (M_{Ln} = 1.93; SD_{Ln} = .49) than the footbridge dilemma choices (M_{Ln} = 1.83; SD_{Ln} = .52) (also see Figure 6). In conclusion, any emotional interference, with rational choices taking more time to make, appears as an artefact of presenting partial information and type of dilemma, and disappears when full information is presented, with rational choices taking less time.

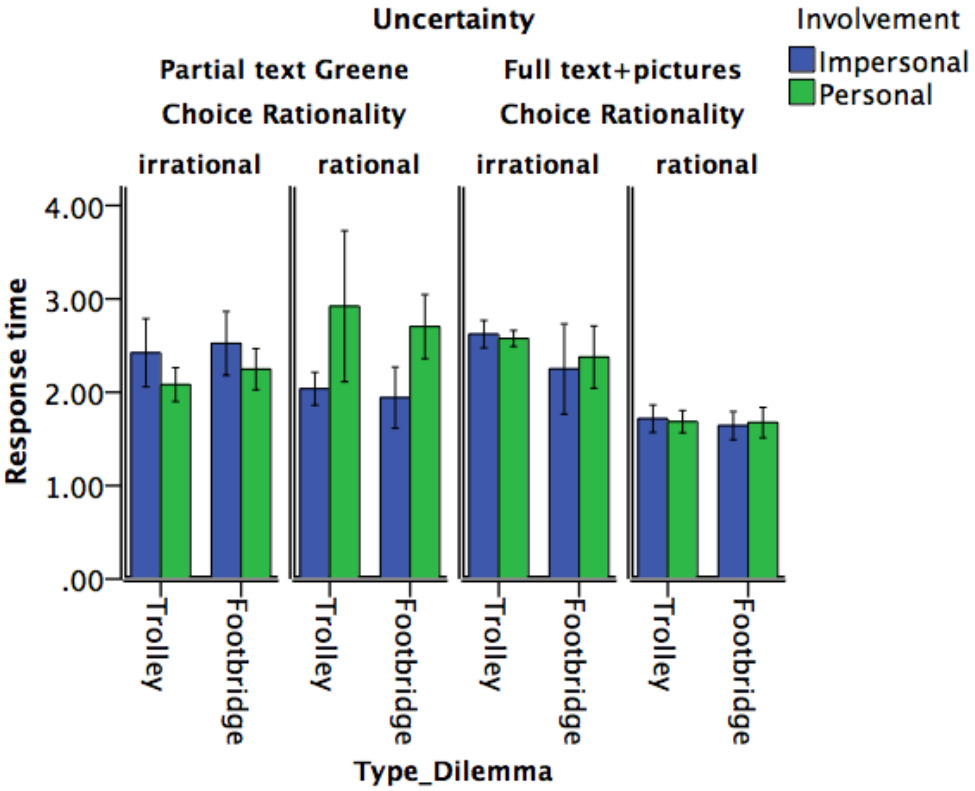


Figure 6. Mean (Ln) response time with rationality. Error bars represent 95% CI of the means.

2.4. Experiment 3: Repeated moral utilitarian choices

Experiment 2 revealed an effect of uncertainty on moral utilitarian choice and response time, using an independent measures design. Accordingly, Experiment 3 aimed to establish the robustness of the uncertainty effect and its relation to involvement and type of dilemma by replicating the results of Experiment 2, using a repeated measures design. Therefore, all participants took part in all experimental conditions.

2.4.1. Method

2.4.2. Participants

Participants were 167 adults (85 females, 82 males) recruited through a recruitment service of online survey panels. Mean age was 49 years (SD = 12.48). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

2.4.3. Experimental design and materials

A repeated measures 2×2×2 design was employed, with independent variables type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), uncertainty (partial text description and question or full text description with picture of the final outcome and question [displayed information about the consequences of the action]). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time.

Eight experimental conditions were presented to all participants. Participants read short scenarios about moral-dilemmas, where the type of dilemma (trolley and footbridge), action involvement (personal and impersonal), task instructions and questions (uncertainty) were manipulated. As in experiment 2, the study took into account uncertainty by presenting partial text description and a question as in Greene et al. (2001), or by full textual and visual (picture) descriptions of moral behavioural actions and consequences. Descriptive information about the moral dilemmas was presented in the experiment. The experimental design accounted for uncertainty by offering partial text description and a question as in Greene et al. (2001), or by full textual and visual (picture) descriptions of the final decision outcome (accounting for moral behavioural actions and consequences of the moral utilitarian actions). The

order of stimuli (e.g., horizontal presentation of pictures with moral dilemmas), description of moral dilemmas and questions were randomised.

For example, in the experimental condition 'trolley, impersonal involvement, with full text description of moral actions and decision consequences' participants were offered the following textual description of moral dilemma and choice options about the appropriateness of action (Figure 7; see also Appendix):

Moral scenario: Trolley, impersonal involvement, with a full text description and visual presentation of decision consequences:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see scene X). The only way to save the life of the lone workman is not to hit the switch near the track. The five workmen will die if you do this, but the lone workman will be saved (see scene Y).

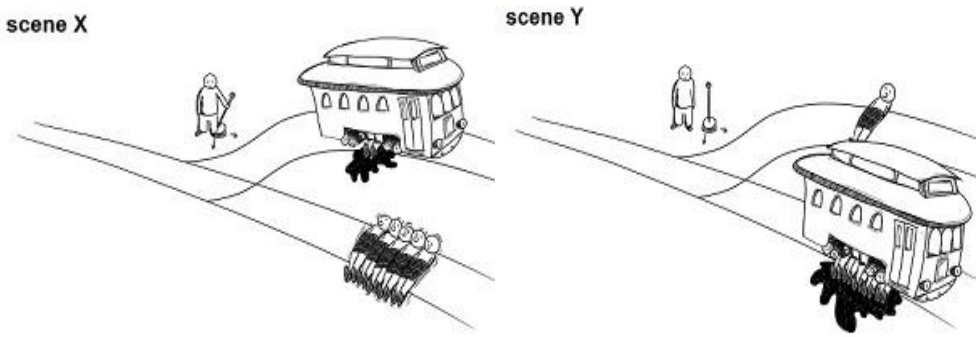


Figure 7. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman).

Question:

Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

2.4.4. Procedure

The experiment was an online computer-based study. Each participant was presented with (i) general experimental instructions, (ii) all eight moral dilemma scenarios and (iii) a moral choice question following each moral dilemma scenarios (moral utilitarian alternatives – rational or irrational). Participants had to (i) read a general description of the study and (ii) accept or decline to participate in the experiment (consent form). The respondents were instructed that the tasks are self-paced, and that they can withdraw at any given time of the study without providing a particular reason. After reading the experimental instructions, and signing electronically the consent form, participants were instructed how to progress in the experiment and how to state their choices. Once participants read the moral dilemma scenario they were able to click on a 'next' button displayed on the screen (accordingly study time was recorded) and move to the moral dilemma question. Participants were presented with a moral dilemma question and asked to make a choice between two moral utilitarian alternatives (involving rational and irrational moral action and consequences). Accordingly, response time was recorded. At the end of the study a debrief form was displayed and 'thank you' note to the participants for their time and effort.

2.4.5. Results

Moral choice

Rational choices (choosing the option causing death to one instead of five workers) were more commonly made when full moral utilitarian information (full text and a picture of the final outcome) was presented, and when an impersonal moral dilemma was presented (see also Figure 8). A logistic regression analysis was conducted to predict moral choice (irrational/rational) using as predictors type of dilemma, involvement, and uncertainty. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 477.442, $p < .001$ with $df = 7$). Nagelkerke's R^2 of .742 indicated a strong relationship between predictors and prediction. Prediction success overall was 89.2% (84% for irrational choice and 92.5% for rational choice). The Wald criterion demonstrated that uncertainty ($p < .001$) and involvement ($p < .001$) made significant contribution to prediction. The type of dilemma, as well as all two and three-way interactions were not significant predictors ($p>.05$). *EXP(B)* value indicates that when certainty is raised by one unit, the odds of making a rational choice increases by 24.84; however, when involvement is raised, the odds of making rational choice decreases by 0.15. Therefore, the odds of a rational choice were 24.84 times larger when a moral dilemma was presented with full information (eliminating uncertainty), than when it was presented with partial information. Furthermore, the odds of a rational choice were 0.15 times smaller when a moral dilemma involved a choice of a personal act (pushing the person), than when it involved an impersonal act.

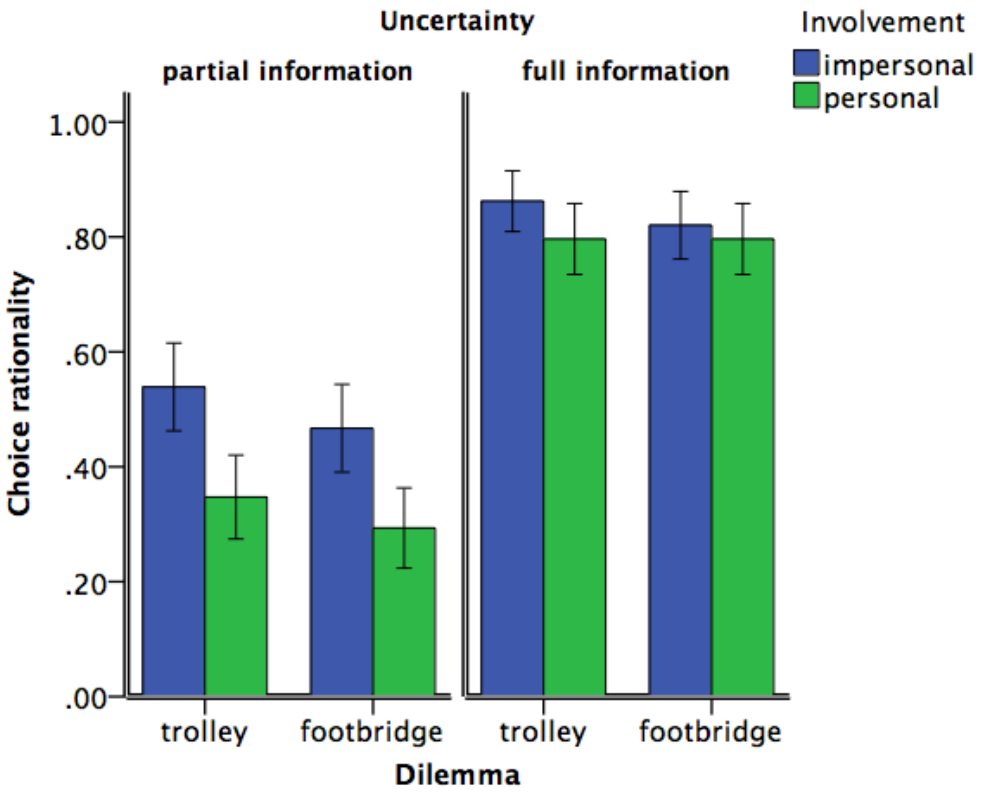


Figure 8. Choice rationality (0 = irrational; 1= rational). Error bars represent 95% CI of the means.

Study time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics. A three-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), uncertainty (partial text description and question or full text description with a picture of the final outcome and a question [displayed information about the consequences of the action). The results showed that the main effect uncertainly significantly influenced participants study time $F(1,166) = 76.64$, $p<.001$, with medium to large effect size ($\eta^2 = .316$). Respondents took more time to study

(read) the moral scenarios with full utilitarian information (improved text with a picture of final utilitarian outcome) M_{Ln} =2.27 ($CI_{.95}$ = 2.20; 2.34), than the moral scenarios with partial information M_{Ln} =1.89 ($CI_{.95}$ = 1.82; 1.95). The second main effect dilemma also significantly influenced participants study time $F(1,166) = 5.52$, p=.020 (η^2= .032). Respondents took more time to study the moral scenarios with trolley dilemma M_{Ln} =2.12 ($CI_{.95}$ = 2.06; 2.18), than the moral scenarios with footbridge dilemmas M_{Ln} =1.04 ($CI_{.95}$ = 1.98; 2.10). In contrast, the third main effect – involvement - did not influence participants study time F (1, 166) = 3.12, p = .079. .The interactions type of dilemma by involvement (F< 1), type of dilemma by uncertainty (F<1), involvement by uncertainty (F< 1) and three-way interaction type of dilemma by involvement by uncertainty (F [1, 166]= 2.93, p = .089), were also not significant.

Response time

Three-way (ANOVA) was conducted with independent variables (type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), uncertainty (partial text description and a question or full text description with a picture of the final outcome) and dependent variable response time for moral choice. The results showed that the main effect (uncertainty) on response time was significant $F(1, 166) = 170.83$, p < .001, with large effect size (η^2 = .507). Specifically, this result revealed that the participants took less time to respond with full utilitarian information (improved text with a picture of final utilitarian outcome) M_{Ln}=1.65 ($CI_{.95}$ = 1.59; 1.71), than the moral scenarios with partial information M_{Ln} =2.22; $CI_{.95}$ = 2.16; 2.28). The second main effect of involvement (F<1), as well as the third main effect type of moral dilemma (F<1) on response time, were not significant. The interactions type of dilemma by involvement

(F< 1), type of dilemma by uncertainty (F< 1), involvement by uncertainty (F[1, 166] = 1.25, p=.266), the three-way interaction type of dilemma by involvement by uncertainty $F(1, 166) = 3.42$, p = .066, were all not significant.

Similar to Experiment 2, additional statistical analysis investigated Greene et al's. (2001) prediction that 'emotional interference' produces longer response time for emotionally incongruent responses, when participants make a rational choice in response to personal moral dilemma. Because the independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), uncertainty (partial text description and a question or full text description with a picture of the final outcome and question [displayed information about the consequences of the action) and choice rationality (irrational or rational decisions) were used with repeated measures, but the latter was confounded with the first three independent variables, the data were analysed with generalised estimation equations. Analysis of the full research design showed that the main effects of uncertainty (*chi square* [1] = 93.036, p < .001) and choice rationality (*chi square* [1] = 103.909, p < .001) on response time were statistically significant (see Figure 7). Similarly, the two-way interaction choice rationality by uncertainty (*chi square* [1] = 261.962, p < .001), and the three-way interaction uncertainty by choice rationality by type of dilemma (*chi square* [1] = 8.306, p = .004) were also significant. However, none of the remaining two-, three- and four-way interactions were significant.

Because of the significant three-way interaction and a significant two-way interaction of choice rationality with uncertainty within each of the two dilemmas (footbridge: *chi square* [1] = 150.120), p < .001; trolley: *chi square* [1] = 169.935), p < .001), follow-up analysis was conducted separately for the footbridge dilemma with irrational and rational choice and trolley dilemma with rational and irrational choice.

The analysis of trolley dilemma with a rational choice made showed that, only the main effect of uncertainty (*chi square* [1] = 188.834), $p < .001$ was significant; respondents took more time to make the choice when partial information was presented (M_{Ln} = 2.31; SD_{Ln} = .60), than when full information was presented (M_{Ln} = 1.49; SD_{Ln}=.58). Similarly, when respondents made an irrational choice with trolley dilemma, only uncertainty significantly influenced response time chi square (1) = 21.818, $p < .001$, with decision with full information taking more time (M_{Ln}= 2.49; SD_{Ln}= .35) than decisions with partial information (M_{Ln}= 2.16; SD_{Ln} = .69) (see Figure 9).

A similar pattern of results was observed for choices made with footbridge dilemma. The analysis of the footbridge dilemma with rational choices made showed that, only the main effect of uncertainty was significant *chi square* (1)= 189.557, $p <$ .001; respondents took more time to make the choice when partial information was presented (M_{Ln}= 2.33; SD_{Ln}= .58) than when full information was presented (M_{Ln}= 1.47; SD_{Ln} =.60). The results also revealed a significant main effect of uncertainty on response time, when irrational choices were made *chi square* (1)= 11.471, $p < .001$; with decision with full information taking more time (M_{Ln}= 2.36; SD_{Ln} = .46) than decisions with partial information (M_{Ln}= 2.14; SD_{Ln} = .67). Similar to Experiment 2, the results revealed that any emotional interference with rational choices taking more time to make disappears, when full information is presented, with rational choices taking less time (see Figure 9).

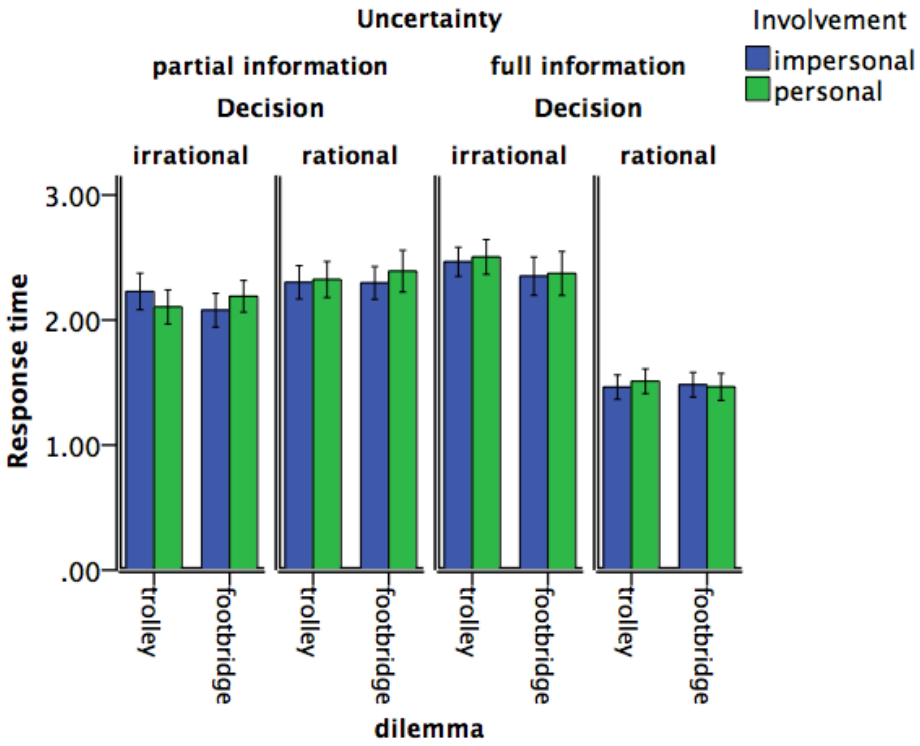


Figure 9. Mean response time (Ln) with rationality. Error bars represent 95% CI of the means.

2.5. General Discussion

The general objective of experiments 1, 2 and 3 was to explore the influence of (i) visual and text descriptions of moral scenarios, and (ii) multiple moral decisions on decision-making and rationality. Accordingly, in Experiment 1 I explored the effect of visual presentations (displaying the initial state, action and consequences of actions) of moral dilemmas (with partial text descriptions) on moral utilitarian choice and decision-making time. Unsurprisingly, the results revealed that, only the main effect of uncertainty significantly influenced respondents study time. Participants in this study invested more time studying the moral scenarios with partial text description with one picture (visual presentation of the action) and partial text description with three pictures (visual presentation of the initial decision state, action and

consequences of the action), than the scenarios with partial text only (no visual presentation). This result is intuitive, as the scenarios with visual presentations supported by partial text descriptions provided more information (visual and textual) to comprehend, and respectively required more time to assess. Surprisingly, previous research on moral decision-making (e.g. Thomson 1985; Greene and colleagues, 2001, 2007) did not collect data about study time across different moral scenarios. The results from Experiment 1 also revealed that only type of involvement (personal and impersonal) predicted rational utilitarian choice, with impersonal involvement (hitting a switch) leading to more rational choices. Crucially, and in contrast to Greene et al. (2001), the results have shown that participants took less time to make a decision with visual presentations and partial text description of moral scenarios, than with scenarios offering only partial text description of morally sensitive situations.

Furthermore, the dual-process moral utility theory (Greene et al., 2001) predicts that activated 'emotional interference' produces longer response time for emotionally incongruent responses, when participants make a rational choice in response to personal moral dilemma (e.g., a choice made to push the man off the footbridge in the footbridge dilemma in order to save five). In contrast, the results from Experiment 1 showed that choice rationality did not influence participant's decision-making time. Only uncertainty influenced participants' decision time – participants took more time deciding on the decision appropriateness of moral utilitarian scenarios with partial textual description only.

Experiment 2 further elaborated on these findings. Research on moral decision-making (since Thomson, 1985) employed moral utilitarian scenarios of moral dilemmas with reduced accessibility to utility (Kusev et al., 2016), where only half of the utilitarian information is available in the context (accounting only for saving the

five workmen at the expense of the stranger). This clearly creates a framing effect (Tversky & Kahneman, 1981) – the moral scenarios do not provide information for saving the life of the stranger at the expense of five workmen. This framing bias is further induced in the research by Greene and colleagues (e.g., 2001) by requiring a decision on only one of the two possible moral actions: " … to push the stranger on to the tracks in order to save the five workmen" (Kusev et al., 2016). Accordingly, Experiment 2 aimed to build up on this finding and to further explore the possibility that uncertainty (unavailable and limited textual descriptions of moral utility) influences decision rationality and decision-making time for moral choice. Experiment 2 employed new stimuli - visual presentations of the final utilitarian outcome (for each of the decision options), supported by full textual descriptions of the moral scenarios, consequences of moral actions and a question.

As in Experiment 1, the results from Experiments 2 revealed that participants took more time to study (read) the moral scenarios with full text descriptions of utilitarian actions and their consequences (supported by a graphical/visual display of the final utilitarian outcome), than the moral scenarios with partial text description of the moral scenario. Importantly, the results revealed the effect of uncertainty on moral choice, as well as confirmed the effect of involvement on moral choice. Specifically, participants were more likely to make a rational choice when the moral scenario used full text descriptions of the decision actions and consequences of the decisions, supported by graphical visualisation of the decision-making outcome. In addition, participants were less likely to make a rational choice if the personal moral dilemma involved a personal action (pushing the stranger). In contrast to Greene and colleagues, the results have shown that only the effect of uncertainty significantly influenced respondents' decision-making time; participants took less time to respond

with full utilitarian information, than in the moral scenarios with partial text descriptions (and no visualisation of moral decision outcomes). Follow-up analyses (exploring the prediction of dual-process moral utilitarian theory) demonstrated that, when full moral utilitarian information was presented, the effect of choice rationality on decision response time was significant; with rational choices taking less time than irrational choices.

Experiment 3 explored the robustness of these new findings by employing repeated measures design. Specifically, if the uncertainty will remain a significant predictor of decision rationality, when they take part in all experimental conditions. Similar to experiments 1 and 2, participants took more time to study the moral scenarios with full utilitarian textual and visual descriptions of actions and consequences of actions (large effect size) than the moral scenarios with partial text descriptions. Respondents also took more time to study moral scenarios with trolley dilemmas than the moral scenarios with footbridge dilemmas (small effect size). As in Experiment 2, participants were more likely to make a rational choice when the moral scenario used full text descriptions of the decision actions and consequences of the decisions, supported by graphical visualisation of the decision-making outcome. In addition, participants were less likely to make a rational choice, if the personal moral dilemma involved a personal action (pushing the stranger). Importantly, the results of Experiment 3 confirmed the findings about the influence of full utilitarian information on decision-making time. For example, and in contrast to the predictions of dual-process moral utility theory (Greene and colleagues, 2001), the results have shown that respondents took less time to make a rational choice, when full utilitarian information (textual and visual) was presented, than when partial text description of moral scenarios was presented. In addition to the reported result that respondents took

less time to make a rational choice and more time to make an irrational choice, when full utilitarian information (textual and visual) was presented, the predicted difference (by dual-process moral utility theory) in reaction time between personal (emotional activation) and impersonal moral dilemmas is not present when full utilitarian information is available. However, and again in contrast to the predictions of dual-process moral utility theory, when respondents made an irrational choice with full utilitarian information, it took them more time than decisions with partial utilitarian information.

According to the Uncertainty reduction theory (Berger & Calabrese, 1975) levels of uncertainty are positively associated with levels of information-seeking behaviour. For example, there is a positive association between information-seeking behaviour and high levels of uncertainty. Accordingly, successfully identified comprehensive information (textual or pictorial) reduces the levels of uncertainty. Furthermore, as uncertainty levels decline (e.g., available comprehensive textual or pictorial information), information seeking behaviour declines too. Moreover, recent research by Kusev et al. (2016) revealed that with full contextual information decision-makers are more vividly confronted with the effect of the action (both in personal or impersonal moral dilemmas), and associate mental simulations (or information-seeking behaviour) will not be employed for exploration of other possible outcomes of the scenario (e.g., FeldmanHall et al., 2012). In other words, limited utilitarian accessibility of moral actions and consequences results in a psychological uncertainty and corresponding mental simulations (compensating for reduced accessibility of moral actions and consequences). Similar interpretation is adopted by 'Situation models' (e.g., Glenberg, Meyer, & Lindem, 1987), where "descriptions"

are understood by simulating perceptual and motor aspects of those descriptions (Kusev et al., 2016).

Experimental results (Caruso & Gino, 2011) indicated that increased mental simulations (visual imagery) caused by insufficient/restricted visual accessibility could induce emotional reactions. However, in this dissertationn I explored Greene and colleagues' (2001) prediction that 'emotional interference' produces longer response time for emotionally incongruent responses. Recent research by Kusev et al. (2016) replicated this prediction only under conditions with insufficient contextual information. The experimental results (experiments 1, 2 and 3) revealed that when full information is available (pictorial and textual descriptions of moral scenarios and consequences of moral actions) rational choices were made faster for both personal (emotionally silent) and impersonal moral scenarios. Therefore, the results suggest that the emotional interference predicted by Greene is an artifact of presenting partial information and does not happen when full information is accessible (presented).

These results form experiments 1, 2 and 3 are novel and not predicted by the dual-process moral utility theory. The results also suggest that any emotional interference, with rational choices taking more time to make, appears as an artefact of presenting partial information about moral scenarios and question, and disappears when full information is presented, with rational choices taking less time (e.g., Kusev et al., 2016)

Chapter 3:

Moral Utilitarian Judgement: Exploration and Assessment of Psychological Uncertainty Under Moral Judgements

3.1. Introduction

Many social and business situations require a judgement (evaluation) of morally sensitive scenarios, or a choice between alternative morally sensitive scenarios. It is not uncommon to observe a discrepancy between the behavioural patterns with choice and judgement of the same utility. For example, preference reversals (e.g., Slovic & Lichtenstein, 1983) can occur when individuals are faced with two alternative options - one offering a high probability of winning a modest sum of money (the P bet), and the other offering a low probability of winning a large amount of money (the $ bet). In these tasks respondents are required to make a choice between the options and to evaluate the worth of the options (judgement). A very robust finding from these tasks reveals that respondents often choose the P bet with a higher probability of winning less money, but also that they assign a larger monetary value to the $ bet. This behaviour is of interest, because it demonstrates internal psychological preference inconstancy regarding the utility of the options and selected behavioural strategies (e.g., Slovic & Lichtenstein, 1983). The preference reversals results also suggest the possibility that two independent psychological/behavioural strategies govern human judgements and decision-making. One strategy relates to 'choice' (irrational as respondents typically select the option with lower expected value) and judgment (rational as respondents assign more worth to the option with higher expected value). No previous research in moral decision-making has explored the behavioural patterns with moral choice and moral judgements, and whether the behavioural choice-judgement discrepancy will be present under moral utilitarian scenarios. Accordingly, in this dissertation I aim to explore the impact of uncertainty, involvement and type of dilemma on moral utilitarian behaviour. factors on moral utilitarian behaviour and response time for moral decisions and judgements. In Chapter 3 I investigate

specifically whether the behavioural pattern observed with moral choice (experiments 1, 2 and 3) will differ from the behavioural pattern with moral judgement (experiments 4 and 5).

Furthermore, the response time judgement data have a broader significance for research carried out in moral psychology, because of the empirical and theoretical evidence implying that controlled cognitive processes in moral judgements are limited. Similar to Greene et al. (2001; 2008), Haidt's (2001) social intuitionist model of moral judgements argued that intuitions (and not reasoning) predict moral behaviour. Moreover, the authors argued that controlled cognitive processing (reasoning) is taking place after the judgement – as a retrospective justification of human judgements. It is also plausible that the moral reasoning and decision-making strategies for judgements (passive evaluation - requiring less self reflection/justification) and choice (active behavioural engagement and selection) are shared and not comparable to those employed in task with risky choice and judgements. Therefore experiments 4 and 5 will explore whether the behavioural moral judgements patterns are influenced by the same factors, influencing moral choice.

In experiments 4 and 5 I will examine further the influence of uncertainty, involvement and type of dilemma on moral judgements. Very little research has been carried out on the contrast and similarities between moral choice and judgements, and the findings suggest that the effect of choice and judgement on moral behaviour is different (e.g., Tassy et al., 2013). For a comprehensive understanding of moral behaviour, it is important to explore these differences further. The chapter will therefore address the question if moral evaluations (judgement task) will alter the influence of uncertainty on moral behaviour. It is plausible that moral judgement and

moral choice may rely on different cognitive processes (Tassy et al., 2012, 2013). Tassy et al. (2013) found that closeness (relationship) with the utilitarian moral target (victim) had less influence on judgement ("Is it acceptable to…?" Yes and No), than on choice of action ("Would you…?" Yes and No). However, it is worth noting that these questions do not really distinguish choice from judgement, as both questions required binary (Yes/No) choice. Moreover, it is also plausible, that the pattern of moral utilitarian judgement will be not only influenced by involvement, but by uncertainty too with rational judgements taking less time (as in experiments 2 and 3). That would be the case when cognitive moral biases are eliminated – by providing a full description of moral actions and consequences of moral actions. These are empirical questions, which will be explored in experiments 4 and 5. In this chapter I focused on judgement instead of choice, by changing the moral question from binary choice options (Yes/No questions) to a judgement of appropriateness on a Likert scale from 1 to 10.

3.2. Experiment 4: Exploration of moral utilitarian judgements under uncertainty

As in Experiment 1, Experiment 4 aimed to explore the influence of uncertainty, type of involvement and task on moral utilitarian judgement and response time. In contrast to experiment 1, respondents were required to make a moral judgement (not a decision with binary options). As outlined in this chapter, this experiment will explore whether a similar behavioural pattern will emerge with judgements (as with binary Yes/No decisions). Importantly, Tassy et al. (2013) claimed that different cognitive processes underlie choice of actions and judgements of moral utility. However, their method employs moral reasoning task for choice/judgement followed by Yes/Now binary choice selection. In contrast, Experiment 4, employs a judgement of appropriateness of action question on a Likert scale (1=Appropriate to 10=

Inappropriate) and investigates the influence of three psychological factors (i) involvement, (ii) type of dilemma and (iii) uncertainty (partial text and partial text with full visual description of actions and consequences of actions) on utilitarian rationality, study and response time. All these factors were not controlled/accounted by Tassy et al. (2013).

3.2.1. Method

3.2.2. Participants

Participants were 180 adults (94 females, 86 males) recruited through a recruitment service of online survey panels. Mean age was 43 years (SD = 14.07). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

3.2.3. Experimental design and materials.

An independent measures 2×2×3 design was employed, with independent variables type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), and uncertainty (text, text with a picture [illustrating the action]), or text with three pictures [illustrating initial state, action, and consequences of the action]). The dependent variables were the judgement of appropriateness of action (using a 10-point scale with end-points 'appropriate' and 'inappropriate'), study time (reading the scenarios), and judgement time.

There were twelve experimental conditions. Participants were given short stories to read, involving moral-dilemmas scenarios where the type of dilemma, action involvement, task instructions and uncertainty were manipulated. The experiment accounted for uncertainty by presenting descriptive and visual information

about the dilemmas: (1) by text only, (2) by text with one picture, showing the behavioural action or (3) by text with three pictures, showing the initial state, the behavioural action and consequences of the action. For example in the experimental condition 'footbridge, impersonal involvement, text with one picture (visualisation of behavioural action)' participants were offered the following scenario, presentation and question about the appropriateness of action (Figure 10; also see Appendix):

Moral scenario: Footbridge, impersonal involvement, with text and 1 picture (behavioural action):

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the track between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who is hanging on a rope painting the bridge. The only way to save the lives of the five workmen is to hit a switch, which will cause the rope to lower the stranger onto the track below, where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

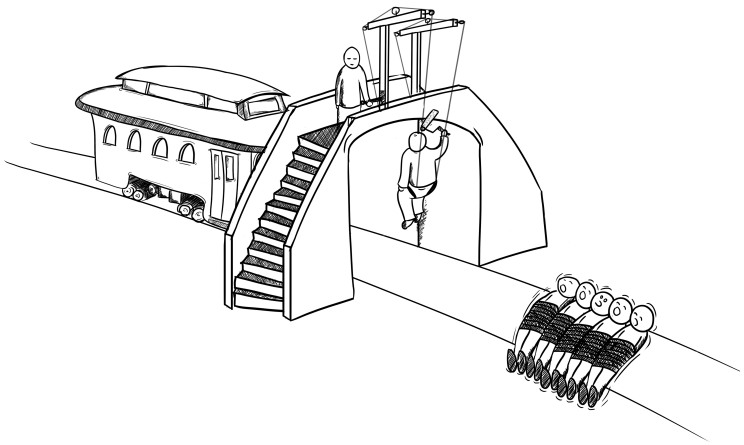


Figure 10. A visual presentation of the behavioural action with impersonal

footbridge dilemma.

Participants were asked the question: 'Is it appropriate for you to sacrifice one workman in order to save five workmen?'. They had to judge on a Likert scale from 1 (appropriate) to 10 (inappropriate).



3.2.4. Procedure

Instructions, a scenario and a question were presented in an online computer-based experiment. Participants were required to read the instructions and one moral-dilemma scenario. Then (after clicking the 'next' button) they had to judge the appropriateness (using a 10-point scale with end-points 'appropriate' and 'inappropriate') of taking action. As in experiments 1 to 3, the moral scenario was visible to the participants during the judgement of appropriateness of action. The time participants spent on reading and judging the scenario was recorded.

3.2.5. Results

Judgement of appropriateness

Judgement of inappropriateness declined linearly with eliminating uncertainty, with mean (*SD*) 7.32 (1.91) for text, 5.20 (2.14) for text with one picture, and 3.85 (2.18) for text with three pictures. 2×2×3 ANOVA showed that the effect of uncertainty was significant, $F(2, 168) = 45.22$, $p < .001$, with large effect size $\eta^2 = .350$, as was the linear trend of uncertainty, $p < .001$. The results revealed that respondents judged as more appropriate moral utility scenarios (with saving five and sacrificing one), when visual presentations of moral actions and consequences of moral actions were displayed. The results also showed that the second main effect

(involvement) influenced participants judgements of appropriateness $F(1, 168) = 5.62$, $p = .019$, with small effect size $\eta^2 = .032$. Specifically, impersonal moral utilitarian scenarios were judged as more appropriate (M= 5.10; SD=2.34) than utilitarian moral scenarios with personal involvement (M= 5.81; SD=2.64), see also Figure 11. However, the main effect of type of dilemma did not influence participants judgements of appropriateness F (1, 168) = 1.58, p = .210, as well as the two-way interactions type of dilemma by involvement $F(1, 168) = 3.71$, p = .056, type of dilemma by uncertainty (F<1), involvement by uncertainty F (2, 168) = 2.36, p = .093, and the three-way interaction type of dilemma by involvement by uncertainty $F(2, 168) = 2.54$, p = .093.

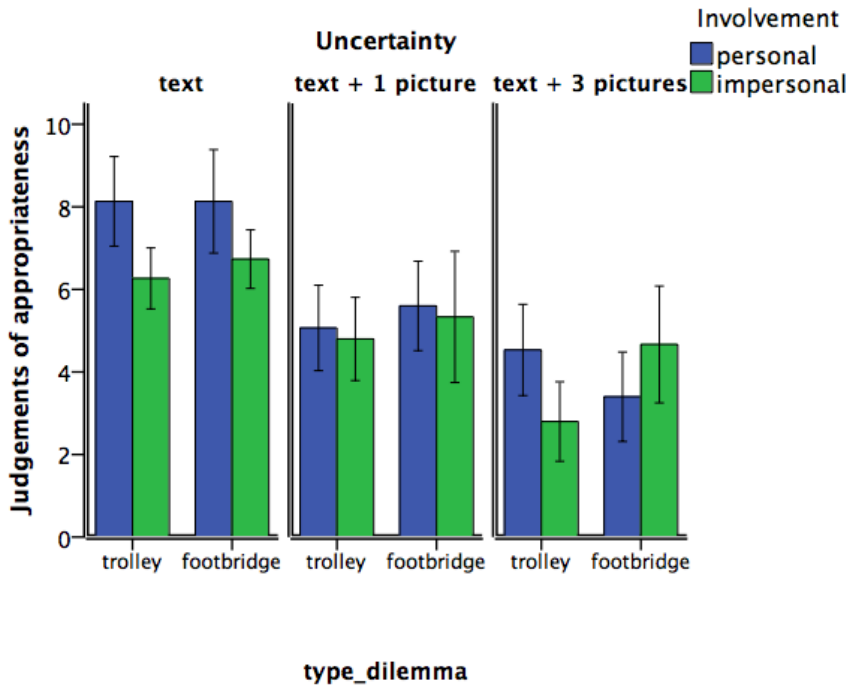


Figure 11. Judgements of appropriateness (0= appropriate; 10= inappropriate). Error bars represent 95% CI of the means.

Study time

Study time decreased linearly with uncertainty, with mean (*SD*) 17.59 seconds(s) (17.99) for text, 45.99 s (40.95) for text with one picture, and 48.60 s (35.04) for text with three pictures. 2×2×3 analysis of variance (ANOVA) showed that the effect of uncertainty was significant, $F(2, 168) = 16.54$ $p < .001$, $\eta^2 = .165$. The results revealed that respondents spent more time reading and studying moral scenarios with text and one picture (p< .001) and text with three pictures (p<. 001), than moral scenarios with text only. However, the main effect of type of dilemma ($F<1$), involvement $F(1, 168) = 2.09$, $p = .150$ did not influence participants study time as well as the two-way interactions type of dilemma by involvement ($F<1$), type of dilemma by uncertainty $F(2, 168) = 2.10$, $p = .126$, involvement by uncertainty ($F<1$), and the three-way interaction type of dilemma by involvement by uncertainty ($F<1$).

Response time

The positively skewed distribution of response (judgement) time was improved by a logarithmic transformation for an inferential statistical analysis. Three-way analysis of variance was conducted. The results showed that the main effect (uncertainty) on judgement time was significant $F(2, 168) = 35.85$, $p < .001$, with large effect size ($\eta^2 = .299$). Specifically, this result revealed that the participants took less time to make a judgement for moral scenarios with textual description and three pictures (illustrating initial state, action, and consequences of the action) (M_{Ln} =2.09; SD_{Ln} =.36), than moral scenarios with textual description only (M_{Ln}=2.69; SD_{Ln} =.43), $p.<.001$. Similarly, the difference in judgement time between moral scenarios with textual description and one pictures (illustrating the action) (M_{Ln}=2.28; SD_{Ln} =.39) was less than that in moral scenarios with textual description only (M_{Ln}=2.69; SD_{Ln} =.43), $p.<.001$. Importantly, the difference in judgement time

between moral scenarios with text and three pictures (M_{Ln}=2.09; SD_{Ln} =.36) and text with one picture (M_{Ln}=2.28; SD_{Ln} =.39) was also significant p=.038. In contrast, the main effects of type of dilemma (F<1), involvement (F<1), as well as the two-way interactions type of dilemma by involvement (F<1), type of dilemma by uncertainty (F<1), involvement by uncertainty (F<1), and the three-way interaction type of dilemma by involvement by uncertainty $F(2, 168) = 1.22$, $p = .299$ were not significant (see also Figure 12).

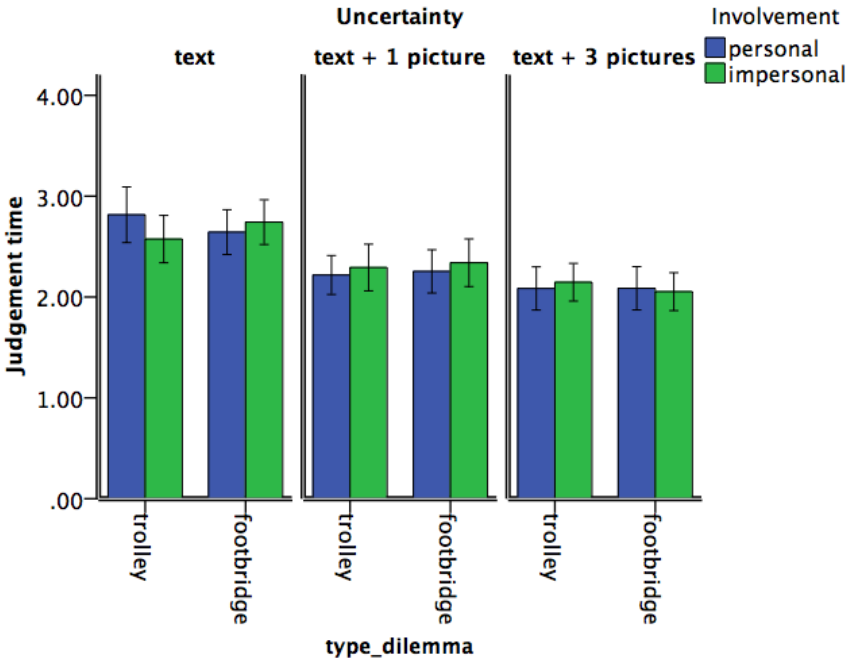


Figure 12. Mean judgement time (Ln). Error bars represent 95% CI of the means.

Similar to the choice experiments from Chapter 2, additional analysis tested Greene et al's. (2001; 2008) prediction that rational choices (in this experiment judgements) in scenarios with moral personal involvement take more decision time, than rational choices with moral impersonal involvement. According to the dual process moral utility account 'emotional interference' produces longer response time for emotionally incongruent responses, when participants make a rational choice in

response to personal moral dilemma. Accordingly, four-way analysis of variance (ANOVA) was conducted; independent variables were type of dilemma (trolley and footbridge), involvement (personal and impersonal), uncertainty (text, text with visual presentation of the action], text with visual presentation of the initial state, action and consequences of the action]) and judgement of appropriateness of action.

In contrast to the dual-process moral utility theory (Greene and colleagues), the results showed that judging appropriateness of actions did not influence participants judgement (response) time (F<1); only the effect of uncertainly influenced participants response time $F(2, 101)= 11.30$, $p<.001$, $\eta^2 = .183$. Respondents took more time to judge the appropriateness of moral scenarios with textual description only (M_{Ln}=2.67; $CI_{.95}$ =2.53; 2.80) than (i) moral scenarios with textual description and one pictures (illustrating the action) (M_{Ln}=2.25; $CI_{.95}$ =2.12; 2.38) $p<.001$ and (ii) moral scenarios with textual description and three pictures (illustrating initial state, action consequences of moral utilitarian action) (M_{Ln}=2.12; $CI_{.95}$ =1.98; 2.25) $p<.001$. The difference in judgement time between moral scenarios with text and three pictures and text with one picture was not significant $p=.456$. However, the main effect type of dilemma, involvement and all the two-way, three-way and four-way interactions were not significant ($p>.05$). Participants took more time judging the appropriateness of moral utilitarian scenarios with textual description only.

3.3. Experiment 5: Availability, context and visualisation of moral utilitarian judgements

The results from experiment 4 revealed that visual presentations of utilitarian actions and consequences of actions induced the appropriateness of moral judgements. As in experiments 2 and 3, Experiment 5 employed new set of stimuli - in order to eliminate uncertainty, visual presentations of the final utilitarian outcome

were supported with full textual descriptions of the moral scenarios and a question (where all decision possibilities and consequences are available in the context). Moreover, in order to establish a behavioural rationality measure based on judgements of appropriateness of actions and also to eliminate uncertainty, in this study respondents were required to make two judgements of appropriateness. The first question required participants to judge the appropriateness of sacrificing one workman in order to save five workmen, and the second question required a judgement of appropriateness of sacrificing five workmen in order to save one workman (using a 10-point scale with counterbalanced end-points 'appropriate' and 'inappropriate').

3.3.1. Method

3.3.2. Participants

Participants were 292 adults (173 females, 119 males) recruited through a recruitment service of online survey panels. Mean age was 46 years (*SD* = 15.29). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

3.3.3. Experimental design and materials

An independent measures 2×2×2 design was employed, with independent variables type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), and uncertainty (partial text description and a question or full text description with a picture of the final outcome [displayed information about the consequences of the action] and a question). The dependent variables were the judgement of appropriateness of action – two judgement questions: 'Is it appropriate for you to sacrifice one workman in order to save five

workmen' and 'Is it appropriate for you to sacrifice five workmen in order to save one workman' (using a 10-point scale with counterbalanced end-points 'appropriate' and 'inappropriate'), study time (reading the scenarios) and judgement time (the average time of judging moral rational and irrational options). In order to account for judgement rationality (and for comparison purposes with the choice experiments) the dependent variable judgement of appropriateness was coded binary (0=irrational; 1=rational). Particularly, if the appropriateness judgement score of the question 'Is it appropriate for you to sacrifice one workman in order to save five workmen' was equal or higher, than the score of the question 'Is it appropriate for you to sacrifice five workmen in order to save one workman' the respondent judgement was categorised as irrational (= 0). Respectively, if the appropriateness judgement score of the question 'Is it appropriate for you to sacrifice one workman in order to save five workmen' was lower than the score of the question 'Is it appropriate for you to sacrifice five workmen in order to save one workman' the respondent judgement was categorised as rational (=1).

There were eight experimental conditions. Participants read short scenarios about moral-dilemmas, where the type of dilemma (trolley and footbridge), action involvement (personal and impersonal), task instructions and questions (uncertainty) were manipulated. Descriptive information about the moral dilemmas were presented in the experiment accounted for uncertainty by presenting partial text description and a question as in Greene et al. (2001) or by full textual and visual (picture) descriptions of the final outcome, accounting for all possible moral behavioural actions and consequences of the moral utilitarian actions. Materials and stimuli were the same as in Experiment 2 and 3. However, the task was different – two judgement questions.

The order of stimuli (horizontal presentation of pictures with moral dilemmas), description of moral dilemmas and questions were randomised.

For example in the experimental condition 'footbridge, impersonal involvement, with full text and visual displayed information about the consequences of the action' participants were offered the following scenario, presentation and a question about the appropriateness of action.

Moral scenario: Footbridge, impersonal involvement, with a full text description and visual presentation of decision consequences:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge. The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see scene X). The only way to save the life of the lone workman is not to hit the switch. The five workmen will die if you do this, but the lone workman will be saved (see scene Y).' (also see Figure 13).

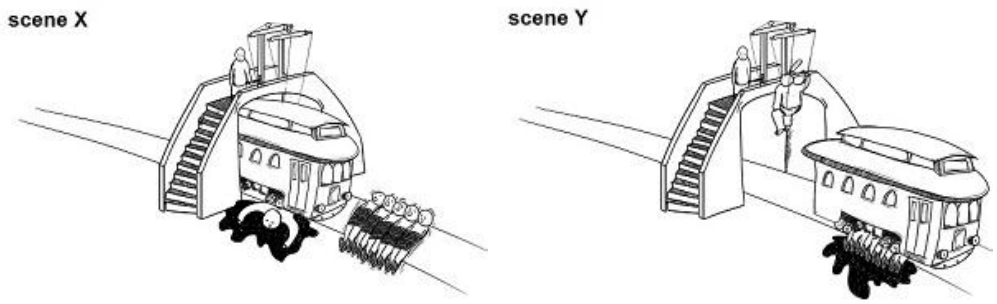


Figure 13. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save five workmen; Scene Y = sacrifice five workmen in order to save one workman).

Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Participants had to judge on a scale from 1 (appropriate) to 10 (inappropriate):

Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

3.3.4. Procedure

Instructions, a scenario and a question were presented in an online computer-based experiment. Participants were required to read the instructions and one moral-dilemma scenario. Then (after clicking the 'next' button) they had to judge the

appropriateness (using a 10-point scale with end-points 'appropriate' and 'inappropriate') of taking action. Each appropriateness judgement question was displayed on a separate screen. As in experiments 1 to 4, the moral scenarios were visible to the participants during the judgement of appropriateness of action. The time participants spent on reading and judging the scenario was recorded.

3.3.5. Results

Judgement of appropriateness (rational judgements)

Rational judgements (judging the option 'causing death to one instead of five workers' as more appropriate than the option 'causing death to five instead of one workers') were more commonly made when full moral utilitarian information (full text and a picture of the final outcome) (see also Figure 14). A logistic regression analysis was conducted to predict moral judgement (irrational/rational) using as predictors type of dilemma, involvement, and uncertainty. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational judgements (*chi square* = 67.103, $p < .001$, $df = 7$). Model fit was good, Hosmer-Lemeshow *chi square* (6) < 0.001, $p > .05$. Nagelkerke's R^2 of .274 indicated a moderately strong relationship between predictors and prediction. Prediction success overall was 72.9% (75.4% for irrational choice and 70.9% for rational choice). The Wald criterion demonstrated that only uncertainty ($p < .001$), *OR (EXP[B])* = 9.42, $CI_{.95}$ = [3.17; 27.95] made significant contribution to prediction. Therefore, the odds of a rational judgement were 9.42 times larger, when a moral dilemma was presented with full information and a visual presentation of the final moral utility outcome (eliminating uncertainty), than when it was presented with partial textual information (as in Greene et al., 2001, 2008). Furthermore, involvement, type of dilemma, as well as all two and

three-way interactions were not significant predictors (p>.05).

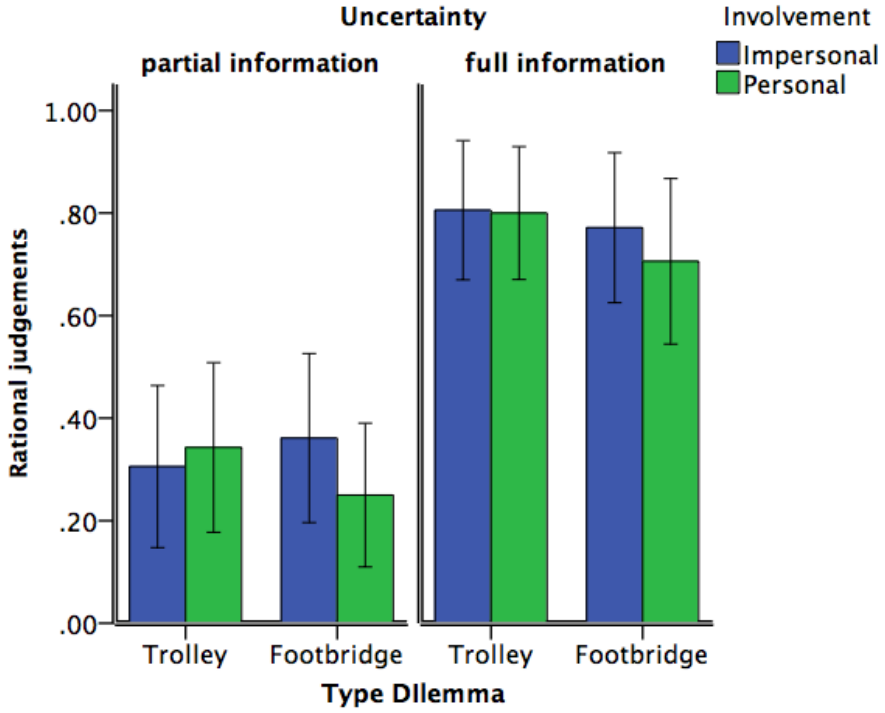


Figure 14. Rational judgements (0 = irrational; 1 = rational). Error bars represent 95% CI of the means.

Study time

The positively skewed distribution of study time was improved by a logarithmic transformation for inferential statistical analysis. 2×2×2 analysis of variance (ANOVA) showed that the effect of uncertainty on study time was significant, $F(1, 284) = 72.72$ $p < .001$, $\eta^2 = .204$. The results revealed that respondents spent more time reading and studying moral scenarios with full text and displayed presentation of moral consequences (M_{Ln}=3.69; SD_{Ln} =.45), than with partial text description of moral dilemmas (M_{Ln}=3.23; SD_{Ln} =.50). However, the main effect of type of

dilemma $F(1, 284) = 3.05$, $p = .082$, involvement ($F<1$) did not influence participants' study time, as well as the two-way interactions type of dilemma by involvement $F(1, 284) = 2.06$, $p = .152$, type of dilemma by uncertainty ($F<1$), involvement by uncertainty $F(1, 284) = 2.04$, $p = .154$, and the three-way interaction type of dilemma by involvement by uncertainty ($F<1$).

Response time

Three-way analysis of variance was conducted. The results showed that the main effect (uncertainty) on judgement time was significant $F(1, 284) = 30.27$, $p < .001$, $\eta^2 = .096$. Specifically, this result revealed that the participants took less time to make a judgement for moral scenarios with full text description and displayed/visualised information about the consequences of the action (M=13.89; SD=4.64), than moral scenarios with partial textual description only (as in Greene et al., 2001, 2008) (M=17.00; SD=4.93). However, the main effects of type of dilemma ($F<1$), involvement ($F<1$), as well as the two-way interactions type of dilemma by involvement $F(1, 284) = 1.36$, $p < .245$, type of dilemma by uncertainty ($F<1$), involvement by uncertainty $F(1, 284) = 2.18$, $p < .141$, and the three-way interaction type of dilemma by involvement by uncertainty $F(1, 248) = 1.29$, $p = .256$ were not significant (see also Figure 15).

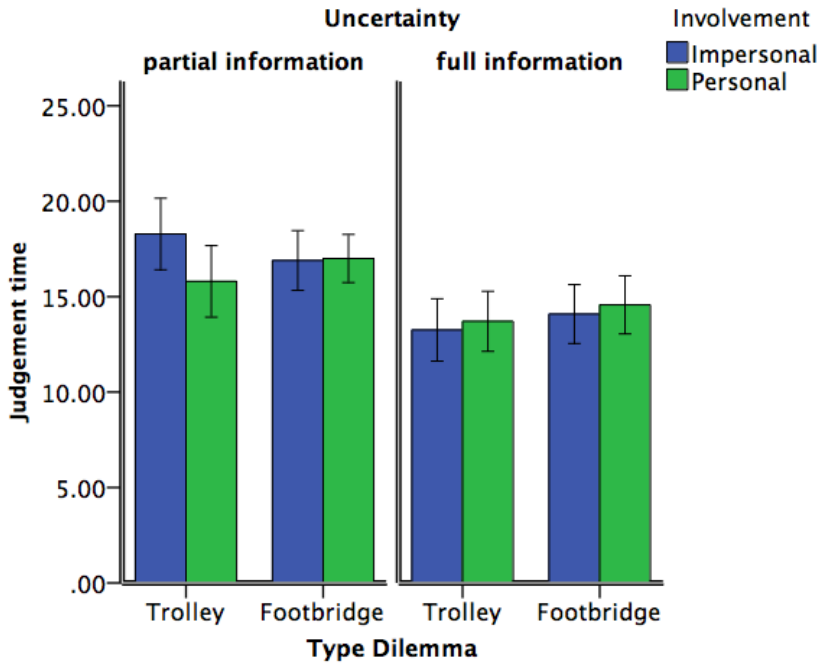


Figure 15. Mean judgement time. Error bars represent 95% CI of the means.

Similar to the experiments 1, 2, 3 and 4, additional analysis tested Greene et al's. (2001; 2008) prediction that making a rational choice (in this experiment judgements) in scenarios with moral personal involvement takes more time than making a rational choice with moral impersonal involvement. Four-way analysis of variance (ANOVA) was conducted; independent variables were type of dilemma (trolley and footbridge), involvement (personal and impersonal), uncertainty (partial text description and full text description with visual presentation of the consequences of moral action) and choice rationality (irrational or rational judgements).

Similar to the results from experiments 1, 2, 3, and 4, and in contrast to the dual process moral utility theory (Greene et al., 2008), the results showed that judging appropriateness (rational or irrational) of actions did not influence participants judgement (response) time $F(1, 276)= 1.56$, $p=.212$; only the effect of uncertainly influenced participants response time $F(1, 276)= 30.59$, $p<.001$, $\eta^2 = .100$.

Respondents took more time to judge the appropriateness of moral scenarios with textual description only (M=16.99; $CI_{.95}$ =16.15; 17.84), than moral scenarios with full text description and displayed/visualised information about the consequences of the action (M=13.43; $CI_{.95}$ =12.49; 14.37). However, the main effect type of dilemma, involvement and all the two-way, three-way and four-way interactions were not significant (p>.05). Participants took more time judging the appropriateness of moral utilitarian scenarios with partial textual description only.

3.4. General discussion

Tassy et al. (2013) claimed that different cognitive processes underlie choice of actions and judgements of moral utility. Accordingly, experiments 4 and 5 aimed to explore the moral behavioural pattern in judgements, and whether the moral effects established with choice will be present with judgements too. As in Experiment 1, Experiment 4 explored the influence of uncertainty (partial text descriptions and partial text descriptions supported by visualisation of moral actions and consequences of moral actions), type of involvement and task on moral utilitarian judgement and response time. However, in contrast to Experiment 1, the task required respondents to make a moral judgement (not a decision with binary options). Moreover, the experimental method in Experiment 5 (similar to the choice experiments 2 and 3) employed new set of stimuli - visual presentations of the final utilitarian outcome were supported by full textual descriptions of the moral scenarios and two judgement questions (judging the appropriateness of both moral alternatives).

Similar to Experiment 1, the results from experiment 4 revealed that respondents took more time reading and studying moral utilitarian scenarios with partial text and one picture and partial text with three pictures than moral scenarios with partial text only. In addition, and in contrast to recent findings (Amit & Greene,

2012) that moral utilitarian judgements could be induced by visual interferences, the results from experiment 4 (and 5) revealed that moral visual support (and not interference) induced utilitarian judgements. Respondents judged as more appropriate saving five workmen and sacrificing one workman when: (i) the moral partial text scenarios were supported by visual presentations of actions and consequences of the actions (large effect size), and (ii) the moral scenarios were impersonal (small effect size). Moreover, in contrast to the dual-process moral utility theory predictions, the results have shown that participants took less time to judge the appropriateness of actions with scenarios using visual presentations (and partial text descriptions) of the moral dilemmas than with scenarios using partial text descriptions of the moral scenario.

Similar to the results from Experiment 4, participants in Experiment 5 spent more time reading and studying moral scenarios with full text and visual presentation of the moral consequences of the actions, than with partial textual description of the moral dilemmas. In contrast to Amit and Greene (2012), when the moral dilemmas were presented with full text descriptions supported by visual presentations of the consequences of moral actions, moral judgements were more rational than those moral scenarios, offering partial text descriptions only. Consistent with the results from experiments 1, 2, 3, and 4, in Experiment 5 participants took less time to make a judgement for moral scenarios with full text description supported by a visual presentation of the consequences of action, than moral scenarios with partial textual description only (as the scenarios used by Greene et al., 2001, 2008).

In contrast to Tassy et al. (2013), the overall pattern of results in experiments 4 and 5 (moral judgements) was similar and consistent to the moral utilitarian pattern with choice (experiments 1, 2 and 3). Experimental manipulations of uncertainty did

influence respondents' utilitarian rationality, study and response time. Most importantly (and in contrast to Amit & Greene, 2012), participants were more rational in their judgements when the utilitarian information was presented with visual and textual descriptions, than when presented with partial textual descriptions only. It is also important to note that similar to the results from experiments 1, 2 and 3, participants in experiments 4 and 5 spent more time to study the moral scenarios and less time to judge moral scenarios with visual and textual descriptions. In addition, (and in contrast to Experiment 1), uncertainty (in Experiment 4) significantly influenced judgements for moral scenarios. Respondents judged as more appropriate to sacrifice one workman in order to save five workmen, even with partial text descriptions supported by full visual presentations of actions and consequences of actions (than the scenarios with partial text descriptions only).

Chapter 4:

Moral Utilitarian Values: Utility ratios, Content of Utility, Uncertainty and Moral Decision-making

4.1. Introduction

According to John Taurek's seminal work (Taurek, 1977), when judging and choosing between morally sensitive alternatives (moral trade-offs), the number of people involved should not matter, as each individual should receive an equal chance of survival – the so called 'equal greatest chance' principle (Taurek, 1977). This deontological proposal was debated (and criticised) over many years, and alternative consequentialist principles were proposed such as, numbers do matter ('save the greatest number' principle; e.g., Bradley, 2009; Raz, 2003). Importantly, there were proposals arguing for a non-consequentialist 'duty' to save the greater number in conflicting settings (Kamm, 1998; Scanlon, 1998). This non-consequentialist duty principle proposed by Kamm (1998) and Scanlon (1998) is certainly not related to an aggregated value or a calculation of the overall good. They specifically argued that two moral principles underlie the interpretation of equality: (i) the life of each potential agent is equal and (ii) that equal, but opposing claims from agents should be balanced against each other; by doing so, the side with the greater number will be left unbalanced and therefore selected. However, Wasserman and Strudler (2003; Hsieh, Strudler & Wasserman, 2006) argued that this assumption is not very clear, and that a full argument for non-consequentialist utilitarianism is yet to be developed. Moreover, Bradley (2009) rejected the assumptions of 'Equal greatest chance' and argued for 'save the greatest number'. The author claimed that these two strategies have fundamental differences in their final goal, and concluded that they are practically non-comparable – one is about what the agent should do at 'the end' (save the greatest number) and the second is about how the agent should decide in the end – flip a coin (equal greatest chance).

Moreover, Taurek's argument implies that, if we have two groups of people

under risk, and we can save only one of the groups - we should toss a coin, even if the groups are approximately the same size or one of the groups is times bigger than the other (Lawlor, 2006). However, if we assume that 'saving the greatest number' is the only reason for selecting utilitarian strategies, the difference between moral dilemmas with saving 1 vs 2 and saving 1 vs 5 should not affect respondents' decision strategy and utilitarian rationality. This assumption is somewhat implausible, and experiments 6 and 7 will empirically explore and test it.

Furthermore, Lawlor (2006) proposed that there are two moral values incorporated in moral utilitarian reasoning (the second is not accounted by Taurek, 1977): (i) the equal greatest chance (tossing a coin for saving one person or another) and (ii) 'saving the greatest number' driven by weighting the odds favouring the larger group (taking into account the difference in size of the larger group). In other words, that moral dilemmas can be seen as moral lotteries, which implies that each moral dilemma is weighted differently based on the number of agents involved (e.g., 1 vs 2 or 1 vs 5), and this is not irrational. Surprisingly, very little psychological research attempted to contribute in these debates, and test empirically these assumptions. Nakamura (2012, 2013) argued that increasing the number of victims 'does matter' only when participants are faced with footbridge dilemmas (personal involvement), which was interpreted as deontological thinking. However, in experiments 6 and 7, I will explore the possibility that the utilitarian weight of the moral dilemmas (associated with the utility ratio/trade-offs), as well as moral uncertainty (partial and full descriptions of utilitarian information - the moral scenarios) predict decision rationality across personal and impersonal moral dilemmas. It is plausible that utilitarian rationality will be reduced with saving 1 versus 2 moral dilemmas (compared to saving 1 versus 5). However, I expect induced

decision rationality, when full utilitarian information is available to the respondents. Furthermore, experiments 6 and 7 (similar to experiments 1 to 5) will control for confounding variables – type of dilemma (footbridge and trolley) and type of involvement (personal and impersonal).

Empirical and theoretical parallels between theories of economic decisions and moral utilitarianism have been made, suggesting that moral decision-making employs the same mechanisms and processes as nonmoral/economic decision-making. For example, the computation of probability and money leads to expected values and respective reward activations; similar computational and reward mechanisms are assumed to underlie and determine the utilitarian moral values (Greene, Nystrom, Engell, Darley & Cohen, 2004; Knoch, Pascual-Leone, Meyer, Treyer & Fehr, 2006; Koenigs & Tranel, 2007; Koenigs, Young, Adolphs, Tranel, Cushman, Hauser & Damasio, 2007). Further support for utilitarian 'common' decision mechanism (underlying moral and nonmoral decision-making) comes from Tobler, Kalis and Kalenscher (2008). The authors argued that the activation in the dorsolateral prefrontal cortex is common for utilitarian (rational) decisions in both, moral and nonmoral (e.g., risk taking) decision-making tasks. Similarly, the activations in the ventromedial prefrontal cortex (caused by emotional vividness) are common when respondents make non-utilitarian (irrational) decisions for both, moral and nonmoral decision-making tasks. Importantly, Tobler et al. (2008) suggested that the moral utilitarian reward (cost-benefit) signals and system are similar to those of any other utilitarian reward signals. Moreover, empirical psychological and neuroscience research revealed that brain prefrontal reward regions facilitate the computations and processing of (i) economic utility signals and (ii) moral utility signals (Greene et al., 2004; Knoch et al., 2006; Koenigs & Tranel, 2007; Koenigs et al., 2007).

However, Tobler and colleagues (2008) argued that the basic components of the utility signals will be computed in the prefrontal cortex and striatum in the same way for economic (nonmoral), and moral utilitarian processing/tasks, but the latter may invite additional computations in the insula and cingulate cortex. Accordingly it is plausible that the utilitarian rationality is stimulated by reward related activations (by weighting the odds favouring the larger group and taking into account the difference in size of the larger group). Moral reward activations could enhance further utilitarian maximisation not only by 'saving the greatest number', but also by 'saving the greatest number with 'high' utility ratio' (saving 1 vs 5), in comparison to a task with 'low' utility ratio (saving 1 vs 2). Experiments 6 and 7 will explore this possibility.

The potential influences on moral decision-making rationality are not limited to the effects of utility ratio and uncertainty. It is plausible that the decision-making utilitarian content has a major role too. According to the normative decision-making theory (e.g., von Neumann & Morgenstern, 1947), the utilitarian decision content (e.g., money, health, human life, inanimate objects) should not influence the way decision-making information is processed and evaluated, and most importantly, should not influence the utilitarian maximisation strategy of rational decision agents. This argument is clear, however, it is possible that the specifics (characteristics) of a particular utilitarian content considered in utilitarian moral choice, influence the response in moral tasks. Human decision agents adapt to perform trade-offs with different utilitarian properties. The experience with type of utility trade-offs could determine moral utilitarian behaviour, and account for differences in psychological processing and behaviour of decision-making agents. Therefore, the experience with particular utilitarian trade-offs will determine whether something can be considered (as plausible) for utilitarian trade-offs or not. For example, it is unlikely that decision

agents consider (and engage in) a trade-off with human lives (something they cannot do and never did before) in the same way, as a trade-off with utility they can buy/sell and exchange (e.g., inanimate objects - 'TVs'). More evidence (in addition to the neuropsychological findings) for universal moral code/sense (independent from cross-cultural differences) comes from social-cognition research (Banerjee, Huebner, & Hauser, 2010). The authors found that gender, education, political views, and religion do not predict moral behavior (9000 participants) for unfamiliar scenarios (hypothetical and new), and claimed that humans share a universal moral sense, which dominates the variation of cross-cultural differences (Banerjee et al., 2010). Accordingly, I argue that the type (content) of utility has implications for utilitarian decision rationality, and experiments 8 and 9 will explore this assumption.

Experimental research explored the influence of ownership on acceptability of utilitarian actions; specifically, the idea that ownership rights (on inanimate objects) is taken into account in moral evaluations (Millar, Turri, & Friedman, 2014). In two studies Millar et al. (2014) found that violating the ownership rights (destroying objects owned by another person) is perceived as less morally acceptable, than destroying objects owned by the respondents. These results are important and interesting, as they revealed that utilitarian behaviour did not depend on involvement (personal and impersonal) and that utilitarian behaviour can be decreased, even without causing physical harm to humans (destroying inanimate objects owned by another person). However, these experiments did not test directly the influence of content of utility; the potential contrast between utility trade-offs with living stimuli and utility trade-offs with inanimate objects. Moreover, philosophers (e.g., Introna, 2014) argued that moral ordering and separating (in categories) of moral values, systems and utilities (e.g., humans and inanimate objects) is not acceptable, as we

should not extend our moral human subjective consideration to inanimate objects in the same way, as for inanimate objects – things should be assessed in their own terms and not judged by value systems developed in humanistic terms (Introna, 2014). Introna (2014) also argued that type of utility is determined by the similarity of kinds, involved in utilitarian consideration. Indeed, it is argued that utilitarian human agents order, categorise, compare and value (inappropriately) most things similar to us (humans), and we value least utilitarian contents dissimilar to us (e.g., inanimate beings). This is because in utilitarian human terms, non-human beings are 'less valuable' (in these orders and comparisons), and therefore not a significant part of the human deontological or utilitarian moral mechanisms (Introna, 2014).

Accordingly, experiments 8 and 9 will explore these possibilities empirically. It is plausible that utilitarian trade-off experience (acceptable utility for trade-off versus utility not acceptable for trade-off) shapes (psychologically) the moral values, categories, and utilitarian behaviour. For example, moral utilitarian evaluations of 'dissimilar to us stimuli' – e.g. 'TVs' (with previous trade-off experience, hence acceptable trade-offs) could induce the utilitarian decision rationality of human agents. Moreover, Topolski, Weaver, Martin and McCoy (2013) offered somewhat related empirical evidence for the influence of content on utilitarian trade-offs. In one experiment they measured moral judgements – a choice between saving a human life and an animal life. Surprisingly, Topolski et al. (2013) found that respondents were more willing to save the life of their own animal above a human life, than someone else's animal above a human life. They interpreted this result as psychological kin effect. However, this result can be seen as utility 'ownership' effect – the things we own can be perceived as more valuable - an endowment effect (e.g., Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984). Nevertheless, we can own things

only if we can buy and possess them, and some types of utility cannot be obtained and owned (e.g., human life).

4.2. Experiment 6: Moral utility ratios

This experiment is designed to explore the influence of utility ratios (number of workers involved in moral scenarios) on moral choice. In all of the conducted experiments so far, the utility trade-offs involved a choice between sacrificing one workman or sacrificing five workmen. Accordingly, this experiment aimed to investigate whether changing the utility trade-off to sacrificing one workman versus sacrificing two workmen will influence moral choice, the decision-making time, and will further reduce respondents' decision-making rationality.

4.2.1. Method

4.2.2. Participants

Participants were 166 adults (84 females, 82 males) recruited through a recruitment service of online survey panels. Mean age was 51 years (SD = 14.45). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

4.2.3. Experimental design and materials

The experiment employed a repeated measures 2×2×2 design, with independent variables type of dilemma (trolley dilemma and footbridge dilemma), action involvement (moral personal and moral impersonal), and utility ratios (saving 1 versus 2 and saving 1 versus 5 workers). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time.

Accordingly, eight experimental conditions were presented to all participants in the experiment. Participants read short scenarios about moral dilemmas, where the type of dilemma (trolley and footbridge), action involvement (personal and impersonal), and moral utility ratios (number of workers) were manipulated. All scenarios were using Greene's partial textual descriptions of the moral scenarios. The order of experimental scenarios, was randomised.

For example, in the experimental condition 'trolley impersonal scenario' participants were offered the following textual description of moral dilemma and a Yes/No choice option (see also Appendix):

Moral scenario: Trolley, impersonal involvement (one versus two workmen):

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. On the track extending to the left are two railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the two workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the two workmen?

Yes/No

4.2.4. Procedure

The experiment was an online computer-based study. Each participant was provided with the general instructions regarding the experiment and how to state their choices, followed by the consent form where they can accept or decline to participate

in the experiment. Participants were presented with eight moral dilemma scenarios (displayed one at a time). Each moral scenario was followed by a question (representing a choice between rational or irrational option). As in all experiments reported in this dissertation, the moral scenarios were visible to the participants during the decision-making. Response and study time were recorded throughout the experiment, and at the end a debrief form about the experiment was displayed.

4.2.5. Results

Moral choice

A logistic regression analysis was conducted to predict moral choice (irrational/rational) using as predictors type of dilemma, involvement, and utility ratio. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 684.100, $p < .001$ with $df = 7$). Nagelkerke's R^2 of .591 indicated a moderately strong relationship between predictors and prediction. Prediction success overall was 86.1% (93% for irrational choice and 63.8% for rational choice). The Wald criterion demonstrated that only utility ratio ($p = .005$), *OR (EXP[B])* = 2.64, $CI_{.95}$ = [1.35; 5.17] made a significant contribution to prediction. Type of dilemma, involvement, as well as all two and three-way interactions were not significant predictors ($p>.05$). *EXP(B)* value indicates that the odds of a rational choice were 2.64 times larger when the moral dilemma was about a trade-off between saving 1 versus 5 workers, than when the moral dilemma involved a trade-off between saving 1 versus 2 workers.

Study time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics (for both, dependent variables study and response time). A three-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), and utility ratio (saving 1 versus 2 and saving 1 versus 5 workers). The dependent variable was study time (how much time the respondents spent on studying the scenarios).

The results showed that the main effects type of dilemma ($F< 1$), involvement ($F< 1$) and utility ratios (F [1, 165]= 2.13, p = .146) did not influence significantly participants study time. Similarly, the interactions type of dilemma by involvement (F [1, 165]= 3.19, p = .076), type of dilemma by utility ratio ($F< 1$), involvement by utility ratio ($F< 1$) and the three-way interaction type of dilemma by involvement by utility ratio (F [1, 165]= 3.48, p = .064), were also all not significant.

Response time

Three-way (ANOVA) was conducted with independent variables (type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), and utility ratio (saving 1 versus 2 and saving 1 versus 5 workers). The dependent variable was response time for moral choice.

The results showed that the main effects type of dilemma ($F< 1$), involvement ($F< 1$) and utility ratio (F [1, 165]= 2.28, p = .133) did not influence significantly participants' response time. Moreover, the interactions type of dilemma by involvement (F [1, 165]= 2.70, p = .102), type of dilemma by utility ratio ($F< 1$), involvement by utility ratio ($F< 1$), and the three-way interaction type of dilemma by involvement by utility ratio (F [1, 165]= 3.43, p = .066) were also all not significant.

As in all previous experiments, additional statistical analyses were conducted, testing Greene and colleagues (2001) prediction about 'emotional interference'. Because the independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), utility ratio (saving 1 versus 2 and saving 1 versus 5 workers) and choice rationality (irrational or rational decisions) were used with repeated measures, but the latter was confounded with the first three independent variables, the data were analysed with generalised estimation equations. Analysis of the full research design showed that none of the main effects utility ratio (*chi square* [1] = .219, p =.640), type of dilemma (*chi square* [1] = 1.793, p =.181), involvement (*chi square* [1] = .718, p =.397), choice rationality (*chi square* [1] = 3.369, p =.066) were statistically not significant. Similarly, the two-, three-, and four-way interactions were all not significant (p>.05).

4.3. Experiment 7: Moral utility ratios and uncertainty

Experiment 7 further explored the influence of uncertainty (with partial text description and full text description with a visual presentation of the decision consequences of moral scenarios) on moral choice and rationality. Uncertainty was explored in the context of trade-offs with two different utility ratios: (i) sacrificing one workman versus sacrificing two workmen and (ii) sacrificing one workman versus sacrificing five workmen. In addition, type of dilemma and involvement were manipulated, in order to investigate their influence on moral choice rationality, reading time and the decision-making time.

4.3.1. Method

4.3.2. Participants

Participants were 160 adults (107 females, 53 males) recruited through a

recruitment service of online survey panels. Mean age was 51 years (SD = 13.30). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

4.3.3. Experimental design and materials

A repeated measures 2×2×2x2 design was employed, with independent variables type of dilemma (trolley dilemma and footbridge dilemma), action involvement (moral personal and moral impersonal), utility ratios (saving 1 versus 2 and saving 1 versus 5) and uncertainty (partial text description and question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and a question). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time.

Sixteen experimental conditions were presented to all participants. Short moral-dilemmas scenarios were presented to the participants. The order of stimuli (horizontal presentation of pictures with moral dilemmas), description of moral dilemmas and questions were randomised. For example, in the experimental condition 'trolley personal scenario with full description of moral actions and consequences' participants were offered the following textual description of moral dilemma and choice options about the appropriateness of action (Figure 16; see also Appendix):

Moral scenario: Trolley, personal involvement (one versus two workmen), with a full text description and visual presentation of decision consequences:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the two workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved (see scene X). The only way to save the life of the lone workman is not to push this workman. The two workmen will die if you do this, but the lone workman will be saved (see scene Y).

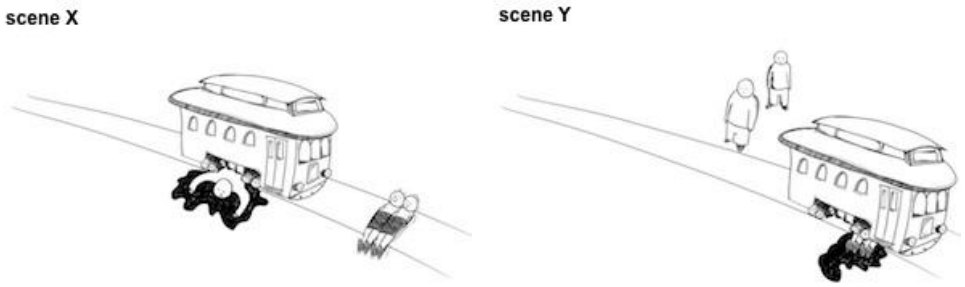


Figure 16. A visual presentation of decision consequences (Scene X = sacrifice one workman in order to save two workmen; Scene Y = sacrifice two workmen in order to save one workman).

Choose the option which is more appropriate for you:

Sacrifice one workman in order to save two workmen (scene X)

Sacrifice two workmen in order to save one workman (scene Y)

4.3.4. Procedure

As in Experiment 6, Experiment 7 was conducted as an online computer based study. General instructions, information about the experiment and a consent form were provided to the participants. Participants were presented with sixteen moral

dilemma scenarios (displayed one at a time). Each moral scenario was followed by a question (representing a choice between rational or irrational option). As in all experiments reported in this dissertation, the moral scenarios were visible to the participants during the decision-making. Response and study time were recorded throughout the experiment, and at the end a debrief form about the experiment was displayed.

4.3.5. Results

Moral choice

Rational choices were more commonly made when full moral utilitarian information (full text and a picture of the final outcome) was presented, and when the moral scenarios involved a decision trade-off between saving 1 versus 5 workers (see also Figure 17). A logistic regression analysis was conducted to predict moral choice (irrational/rational) using as predictors type of dilemma, involvement, utility ratio and uncertainty. Model fit was good; a test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 1790.260, $p < .001$ with $df = 13$). Nagelkerke's R^2 of .671 indicated a moderately strong relationship between predictors and prediction. Prediction success overall was 86.6% (86.4% for irrational choice and 86.7% for rational choice). The Wald criterion demonstrated that uncertainty ($p<.001$), *OR (EXP[B])* = 7.67, $CI_{.95}$ = [4.44; 13.27], utility ratio ($p<.001$), *OR (EXP[B])* = 3.43, $CI_{.95}$ = [1.95; 6.04] and involvement ($p=.001$), *OR (EXP[B])* = 0.35, $CI_{.95}$ = [0.19; 0.635] made significant contributions to prediction. Type of dilemma, as well as all two-, three-, and four-way interactions were not significant predictors ($p>.05$).

Therefore, the odds of a rational choice were 7.67 times larger when a moral dilemma was presented with full text and visual presentation of the final moral utility outcome (eliminating uncertainty), than when it was presented with partial textual information. Similarly, the odds of a rational choice were 3.43 times larger when the moral dilemma was about a trade-off between saving 1 versus 5 workers, than when the moral dilemma involved a trade-off between saving 1 versus 2 workers. In contrast, the odds of a rational choice were 0.35 times smaller when a moral dilemma was personal (pushing the person), than when it involved an impersonal act (hitting a switch).

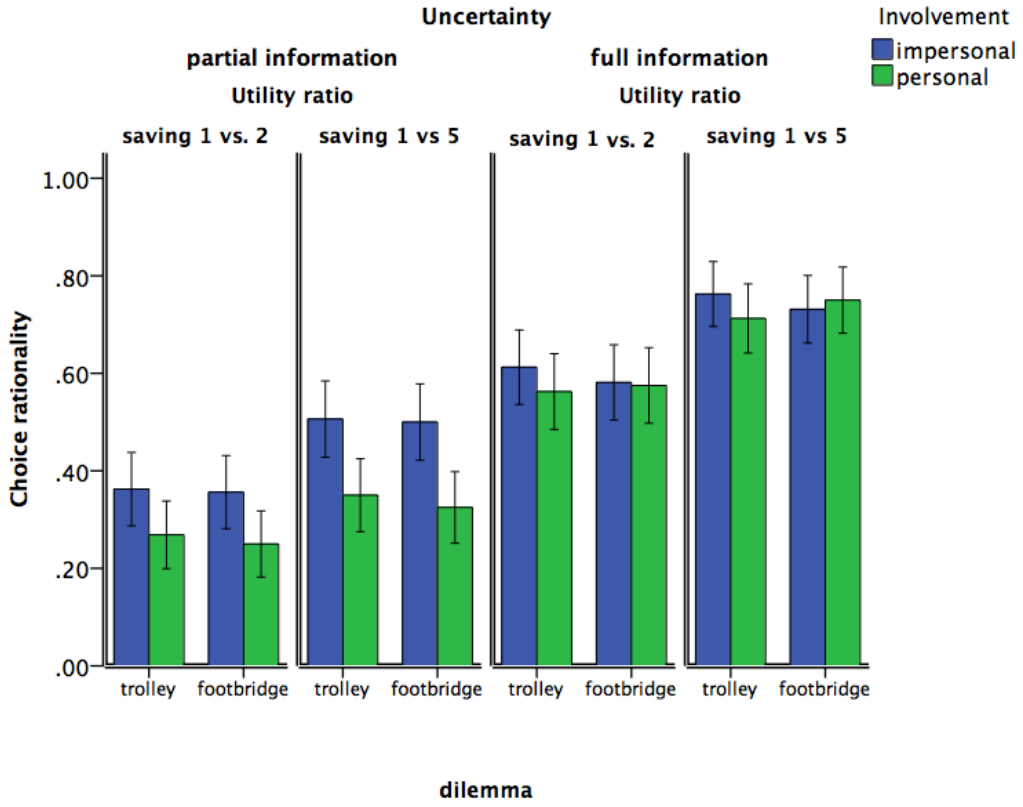


Figure 17. Choice rationality (0=irrational; 1=rational). Error bars represent 95% CI of the means.

Study time

A four-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (personal or impersonal), utility ratio (saving 1 versus 2 or saving 1 versus 5 workers) and uncertainty (partial text description and question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and question). The dependent variable was study time (how much time the respondents spent on reading the scenarios).

The results showed that the main effect of uncertainly significantly influenced participants study time $F(1,159) = 52.36$, $p<.001$, with small to medium effect size ($\eta^2 = .020$). Respondents took more time to study (read) the moral scenarios with full utilitarian information (full text with a picture of final utilitarian outcome) $M=10.36$ ($CI_{.95} = 9.81; 10.91$), than the moral scenarios with partial information $M=7.48$ ($CI_{.95} = 6.93; 8.03$). However the main effects of utility ratio (F [1, 159]= 1.51, $p = .220$), type of dilemma ($F< 1$), involvement ($F< 1$) and all of the two-, three- and four-way interactions were not significant ($F< 1$).

Response time

Four-way (ANOVA) was conducted with independent variables (type of dilemma (trolley dilemma or footbridge dilemma), action involvement (moral personal or moral impersonal), utility ratio (saving 1 versus 2 and saving 1 versus 5 workers) and uncertainty (partial text description and a question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and question). The dependent variable was response time for moral choice.

The results showed that only the main effects of uncertainty (F [1, 159]= 44.87, p< .001, η^2 = .017) and involvement (F [1, 159]= 8.08, p = .005, η^2 = .003) significantly influenced participants' decision-making time. However, the main effects type of dilemma (F< 1), utility ratio (F< 1), as well as all two-, three, and four-way interactions (p>.05) did not influence respondents' decision-making time.

These results confirmed (as reported in my previous experiments) that respondents took more time to make a decision about moral scenarios with partial information M=6.99 ($CI_{.95}$ = 6.68; 7.30), than in the moral scenarios with full text and visual presentation of the decision final outcome M=5.49 ($CI_{.95}$ = 5.18; 5.80). The results also revealed that respondents took more time to decide with impersonal moral dilemmas M=6.56 ($CI_{.95}$ = 6.25; 6.87), than with personal moral dilemmas M=5.92 ($CI_{.95}$ = 5.61; 6.23).

In order to account for the prediction that a rational moral choice takes more time than irrational choice (e.g., Greene and colleagues, 2001), additional statistical analyses were conducted, including decision-making rationality (irrational or rational decisions) as an independent variable. Analysis of the full research design showed that only the main effects of uncertainty (*chi square* [1] = 29.741, p < .001), involvement (*chi square* [1] = 7.700, p = .006), and choice rationality (*chi square* [1] = 4.754, p = .029) on response time were statistically significant (also see Figure 18). Moreover, the two-way interactions uncertainty by involvement (*chi square* [1] = 11.709, p = .001), uncertainty by choice rationality (*chi square* [1] = 118.429, p < .001), utility ratio by involvement (*chi square* [1] = 9.919, p = .002), and involvement by choice rationality (*chi square* [1] = 15.635, p < .001) were significant. Similarly, and the three-way interactions uncertainty by utility ratio by involvement (*chi square* [1] = 4.839, p = .028), uncertainty by involvement by choice rationality (*chi square*

[1] = 10.382, p = .001), involvement by type of dilemma by choice rationality (*chi square* [1] = 5.302, p = .021), and the four-way interactions uncertainty by utility ratio by type of dilemma by choice rationality (*chi square* [1] = 7.982, p = .005), uncertainty by involvement by type of dilemma by choice rationality (*chi square* [1] = 7.959, p = .005) were also significant. However, none of the remaining two-, three-four-, five-way interactions were significant.

Because of the significant four-way interactions, follow-up analyses were conducted separately for saving 1 versus 2 workers moral dilemmas with irrational and rational choices, and for saving 1 versus 5 workers moral dilemmas with irrational and rational choices. The analysis of saving 1 versus 2 workers dilemma with irrational choice made showed that, only the main effect of uncertainty (*chi square* [1] = 9.262), p = .002 was significant; respondents took more time to make an irrational choice when full information was presented (M= 6.69; $CI_{.95}$ = 6.27; 7.11), than when partial information was presented (M = 5.72; $CI_{.95}$ = 5.19; 6.25). When respondents made a rational choice with saving 1 versus 2 workers dilemma, uncertainty (*chi square* [1] = 58.287, p < .001) and involvement (*chi square* [1] = 22.664, p < .001) significantly influenced decision-making response time. These results revealed (in contrast to an irrational choice) that a rational decision with full information took less time (M = 4.83; $CI_{.95}$ = 4.45; 5.21) than a rational decision with partial information (M = 9.07; $CI_{.95}$ = 7.93; 10.21) (see Figure 18). In addition, making a rational choice with impersonal involvement took more decision-making time (M = 8.31; $CI_{.95}$ = 5.79; 6.76) than a rational choice with personal involvement (M = 5.59; $CI_{.95}$ = 4.88; 6.31).

The analysis of saving 1 versus 5 workers dilemma with irrational choice made, revealed a similar pattern of results. The analysis of the 1 versus 5 workers dilemma

with irrational choices made, showed that only the main effect of uncertainty was significant *chi square* (1)= 16.053, $p < .001$; respondents took more time to make the choice when full information was presented ($M = 7.21$; $CI_{.95} = 6.40; 8.03$), than when partial information was presented ($M = 5.45$; $CI_{.95} = 4.91; 5.99$). When respondents made a rational choice with saving 1 versus 5 workers dilemma, only uncertainty significantly influenced decision-making response time (*chi square* [1] = 52.774, $p < .001$). These results revealed (in contrast to an irrational choice) that a rational decision with full information took less time ($M = 4.72$; $CI_{.95} = 4.31; 5.14$) than a rational decision with partial information ($M = 9.18$; $CI_{.95} = 7.94; 10.42$) (see Figure 18).

None of the remaining interactions were significant. Consistent to the findings reported so far in this dissertation, the results from Experiment 7 revealed that uncertainty influences decision-making time, with rational choices taking less time to make, when full information is available (text and visual presentation of the moral utilitarian outcome). In contrast, when an irrational choice is made participants took more time, with full moral utilitarian information than with partial moral utilitarian information.

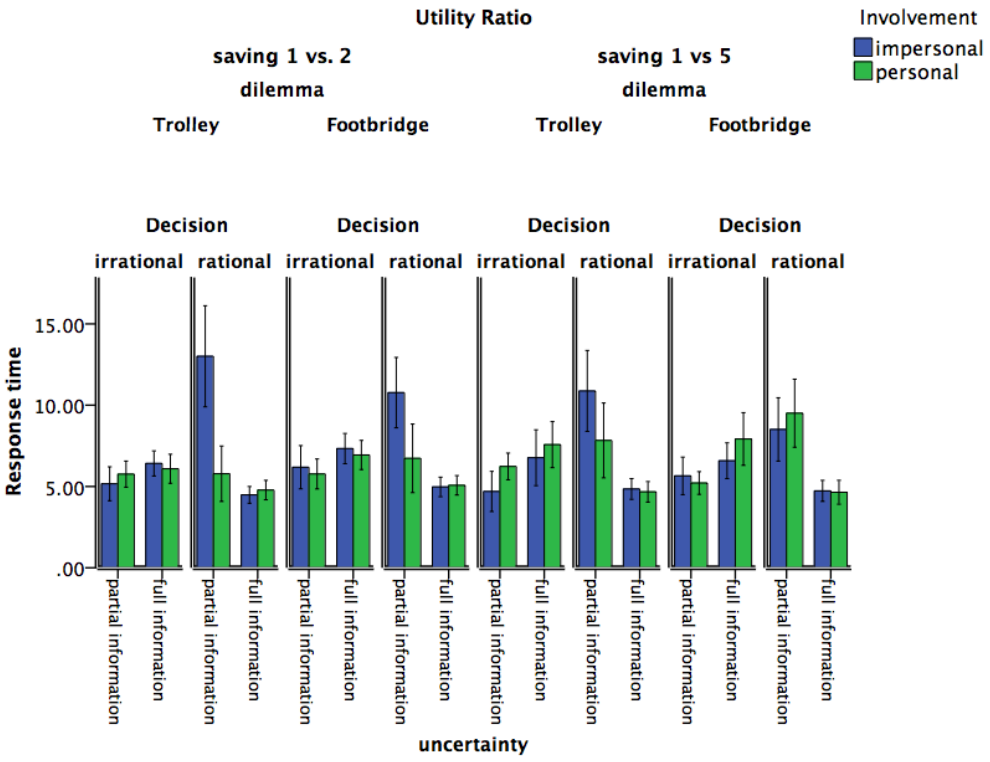


Figure 18. Mean response time with rationality. Error bars represent 95% CI of the means.

4.4. Experiment 8: Content of moral utility

From normative decision-making stand (e.g., von Neumann & Morgenstern, 1947) the utilitarian decision content (e.g., money, health, human life, inanimate objects) should not influence the way decision-making information is processed and evaluated, and most importantly, should not influence the utilitarian maximisation strategy of rational decision agents. In contrast, philosophers (e.g., Introna, 2014) argued that moral theories (deontological and consequentialist) treat moral utility in utilitarian 'human' terms. Utilitarian human agents order, categorise, compare and value (inappropriately) most things similar to us (humans). However, recent research revealed (Millar et al., 2014) an irrational moral behaviour (decision-making), even when the stimuli were inanimate objects. Moreover, Topolski et al. (2013) found that

respondents were more willing to save the life of their own animal over a human life of a stranger - a psychological kin effect. However, as I argued in Chapter 4, these effects can be seen as utility 'ownership' (e.g., Knetsch & Sinden, 1984). We can only own 'things' available for trade-offs (or experienced in trade-offs) and some types of utility cannot be obtained and owned (e.g., human life). Experiment 8, will further explore the influence of content of utility (e.g., human life and inanimate objects) on decision-making rationality. The experiment is based on Greene and colleagues' (2001, 2008) moral scenarios (partial text description), and includes manipulation of type of dilemma and involvement.

4.4.1. Method

4.4.2. Participants

Participants were 184 adults (111 females, 73 males) recruited through a recruitment service of online survey panels. Mean age was 47 years (SD = 15.45). They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

4.4.3. Experimental design and materials

A repeated measures 2×2×3 design was employed, with independent variables type of dilemma (trolley dilemma and footbridge dilemma), action involvement (moral personal and moral impersonal), and content of utility (humans, animals 'cats' and inanimate objects 'TVs'). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time.

Twelve experimental conditions were presented to all participants. Participants read short scenarios about moral dilemmas, where the type of dilemma (trolley and

footbridge), action involvement (personal and impersonal), and content of moral utility (humans, animals 'cats' and inanimate objects 'TVs') were manipulated. The order of stimuli (moral scenarios) and questions were randomised.

For example, in the experimental condition 'footbridge, impersonal involvement with 'cats' moral scenario' participants were offered the following textual description of moral dilemma and a Yes/No choice option (see also Appendix):

Moral scenario: Footbridge, impersonal involvement with 'cats'

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in a transparent cage who is hanging on a rope that help move the cats to the other side.

The only way to save the lives of the five cats is to hit a switch, causing the rope to lower the single cat onto the track below, where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five cats?

Yes

No

4.4.4. Procedure

As experiments 1 to 7, Experiment 8 was an online computer based study. General instructions, information about the experiment and a consent form were

provided to the participants. Participants were instructed that they are free to withdraw from the experiment at any time during the study. Participants were presented with twelve moral dilemma scenarios (displayed one at a time). Each moral scenario was followed by a question (representing a choice between rational or irrational option). The moral scenarios were visible to the participants during the decision-making task. Response and study time were recorded throughout the experiment.

4.4.5. Results

Moral choice

Rational choices were more commonly made when the moral scenarios involved nonhuman stimuli (animals and inanimate objects) and impersonal involvement, (see also Figure 19). A logistic regression analysis was conducted to predict moral choice (irrational/rational), using as predictors type of dilemma, involvement, and content of utility. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 1377.957, $p < .001$ with $df = 7$). Nagelkerke's R^2 of .620 indicated a moderately strong relationship between predictors and prediction. Prediction success overall was 84.6% (82.6% for irrational choice and 86.5% for rational choice). The Wald criterion demonstrated that only content of utility ($p < .001$), *OR (EXP[B])* = 14.63, $CI_{.95}$ = [7.86; 27.23] and involvement ($p < .001$), *OR (EXP[B])* = 0.28, $CI_{.95}$ = [0.15; 0.50] made significant contributions to prediction. The type of dilemma, as well as all two- and three-way interactions, were not significant predictors ($p>.05$). *EXP(B)* value indicates that the odds of a rational choice were 14.63 times larger, when the moral dilemma involved inanimate objects, than when the moral dilemma involved animals and human.

Moreover, when the moral dilemmas involved personal involvement (pushing) the odds of a rational choice were 0.28 times smaller, than when the dilemma involved an impersonal act (hitting a switch).

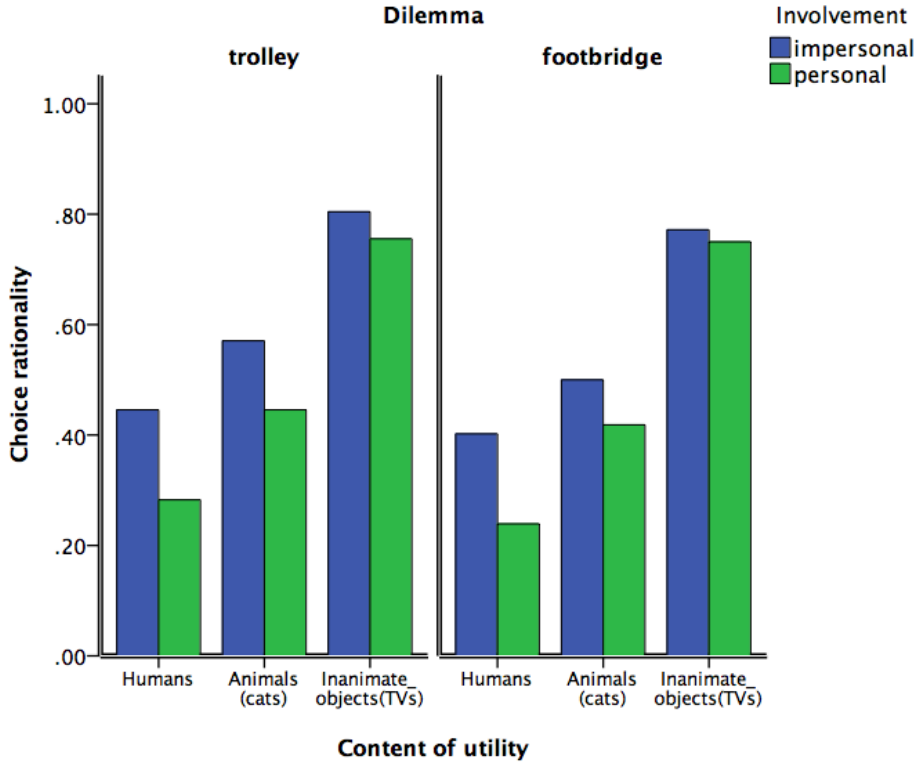


Figure 19. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means.

Study time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics (for both, dependent variables study and response time). A three-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (moral personal and moral impersonal), and content of utility (humans, animals 'cats' and inanimate objects 'TVs'). The

dependent variable was study time (how much time the respondents spent on studying the scenarios).

The results showed that only the main effect of content of utility significantly influenced participants' study time (F [1, 183]= 7.24, p = .001, η^2 = .007). A pairwise comparison test with Bonferroni correction demonstrated that participants took less time studying moral scenarios involving humans (M_{Ln}=1.67; $CI_{.95}$ = 1.62; 1.73), than studying moral scenarios with inanimate objects (M_{Ln}=1.78; $CI_{.95}$ = 1.72; 1.84), p=.030. Similarly, studying moral scenarios with animals took less time (M_{Ln}=1.62; $CI_{.95}$ = 1.57; 1.68) than studying moral scenarios with inanimate objects (M_{Ln}=1.78; $CI_{.95}$ = 1.72; 1.84), p=.001. However, the main effects type of dilemma (F [1, 183]= 1.88, p = .170), and involvement (F< 1), as well as the two-, and three-way interactions (p>.05) did not influence significantly participants' study time.

Response time

Three-way (ANOVA) was conducted with independent variables type of dilemma (trolley and footbridge), involvement (moral personal and moral impersonal), and content of utility (humans, animals 'cats' and inanimate objects 'TVs'). The dependent variable was response time for moral choice.

The results showed that the main effect content of utility significantly influenced respondents' decision-making time (F [1, 183]= 7.05, p = .001, η^2 = .006). A pairwise comparison test with Bonferroni correction demonstrated that participants took less time to make a decision for moral scenarios involving humans (M_{Ln}=1.19; $CI_{.95}$ = 1.13; 1.26) than for moral scenarios with inanimate objects (M_{Ln}=1.33; $CI_{.95}$ = 1.27; 1.40), p=.011. Similarly, decision response time for moral scenarios with animals was less (M_{Ln}=1.16; $CI_{.95}$ = 1.10; 1.23), than for the moral scenarios with inanimate objects (M_{Ln}=1.33; $CI_{.95}$ = 1.27; 1.40), p=.001. However, the main effects

type of dilemma (F [1, 183]= 2.18, p = .140), and involvement (F< 1), as well as the two-, and three-way interactions (p>.05) did not influence significantly participants' decision-making time.

Conducted further statistical analyses (generalised estimation equations), including choice rationality as an independent variable, confirmed the effect of content of utility on decision-making time (*chi square* [2] = 8.724, p =.013). Moreover, choice rationality also influenced decision response time (*chi square* [1] = 3.990, p =.046), with irrational choices taking less time (M_{Ln}=1.17; $CI_{.95}$ = 1.06; 1.29) than rational decisions (M_{Ln}=1.30; $CI_{.95}$ = 1.21; 1.40). However, none of the remaining main effects, two-, three- and four-way interactions were significant (p>.05).

4.5. Experiment 9: Content of moral utility and uncertainty

Experiment 9, further explored the influence of content of utility (e.g., human life and inanimate objects) on decision-making rationality. However, decision uncertainty (with partial text description, and full text description with a visual presentation of the decision consequences of moral scenarios) was included and expected to influence choice rationality in the context of decision trade-offs with humans and inanimate objects. Moreover, as in all previous experiments, the factors type of dilemma and involvement were included too.

4.5.1. Method

4.5.2. Participants

Participants were 203 adults (117 females, 86 males) recruited through a recruitment service of online survey panels. Mean age was 46 years (SD = 13.85).

They took part individually and received a payment of £1. All participants were treated in accordance with the ethical standards of the BPS.

4.5.3. Experimental design and materials

A repeated measures 2×2×3x2 design was employed, with independent variables type of dilemma (trolley dilemma and footbridge dilemma), action involvement (moral personal and moral impersonal), content of utility (humans, animals 'cats' and inanimate objects 'TVs') and uncertainty (partial text description and a question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and a question). The dependent variables were the choice of appropriateness of action (making a rational [maximised utility] or irrational choice), study time (reading the scenarios), and choice response time. Twenty-four experimental conditions were presented to all participants. The order of stimuli (horizontal presentation of pictures with moral dilemmas), description of moral dilemmas and questions were randomised.

For example, in the experimental condition 'trolley personal inanimate objects 'TVs' scenario, with full description of moral actions and consequences' participants were offered the following textual description of moral dilemma and choice options about the appropriateness of action (Figure 20; see also Appendix):

Moral scenario: Trolley, personal involvement (inanimate objects - TVs), with a full text description and visual presentation of decision consequences:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. One TV just happens to be left

by the workers who are moving the furniture to the other side near track, and you are there.

The only way to save the five TVs is to push the single TV so that it falls onto the track, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved (see scene X). The only way to save the single TV is not to push this TV. The five TVs will be destroyed if you do this, but the single TV will be saved (see scene Y).

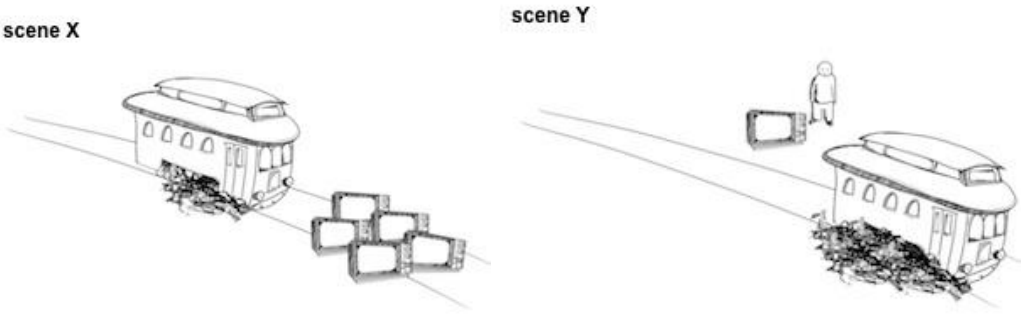


Figure 20. A visual presentation of decision consequences (Scene X = sacrifice one TV in order to save five TVs; Scene Y = sacrifice five TVs in order to save one TV).

Choose the option which is more appropriate for you:

Sacrifice one TV in order to save five TVs (scene X)

Sacrifice five TVs in order to save one TV (scene Y)

4.5.4. Procedure

As the experimental method employed in Experiment 8, Experiment 9 was a computer based online study. Information about the experiment, a consent form, and task instructions were provided to the participants. Participants were presented with

twenty-four moral dilemma scenarios (displayed one at a time). Each moral scenario was followed by a question (rational or irrational decision). The moral scenarios were visible to the participants during the decision-making task. Response and study time were recorded throughout the experiment.

4.5.5. Results

Moral choice

Rational choices were more commonly made when the moral scenarios provided full text description and visualisation of the decision consequence (see also Figure 21). A logistic regression analysis was conducted to predict moral choice (irrational/rational), using as predictors type of dilemma, involvement, content of utility and uncertainty. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between irrational and rational choices (*chi square* = 2035.361, $p < .001$ with *df* = 13). Nagelkerke's R^2 of .500 indicated a moderate relationship between predictors and prediction. Prediction success overall was 83.6% (57.8% for irrational choice and 93.1% for rational choice).

The Wald criterion demonstrated that only uncertainty ($p < .001$), *OR (EXP[B])* = 6.57, $CI_{.95}$ = [4.29; 10.07], content of utility ($p < .001$), *OR (EXP[B])* = 11.73, $CI_{.95}$ = [7.04; 19.53] and involvement (p=.001), *OR (EXP[B])* = 0.48, $CI_{.95}$ = [0.31; 0.74] made significant contributions to prediction. Moreover, the two-way interactions content of utility by uncertainty (p= .002), *OR (EXP[B])* = 0.37, $CI_{.95}$ = [0.19; 0.69] and involvement by uncertainty(p= .015), *OR (EXP[B])* = 1.92, $CI_{.95}$ = [1.13; 3.26] were also significant. None of the remaining main effect of type of dilemma, two-, three- and four way interactions were significant (p>.05). Because of the significant

two-way interactions follow-up analyses were conducted separately for content of utility with humans, animals and inanimate objects.

When the moral content involved humans (*chi square* = 963.482, $p < .001$, *df* = 7; Nagelkerke's $R^2 = .608$ with prediction success of 82.5% [79.8% for irrational choice and 84.1% for rational choice]), the Wald criterion demonstrated that only uncertainty ($p < .001$), *OR (EXP[B])* = 7.80, $CI_{.95}$ = [4.50; 14.22] and involvement (p=.003), *OR (EXP[B])* = 0.44, $CI_{.95}$ = [0.26; 0.76] made significant contributions to prediction. *EXP(B)* value indicates that the odds of a rational choice were 7.80 times larger when the moral dilemma provided full text description and visualisation of the choice outcome, than when the moral dilemma involved partial text description of moral choice. Moreover, when the moral dilemmas involved personal involvement (pushing), the odds of a rational choice were 0.44 times smaller than when the dilemma involved an impersonal act (hitting a switch), (see Figure 21).

When the moral content involved animals (cats) (*chi square* = 1274.568, $p < .001$, *df* = 7; Nagelkerke's $R^2 = .784$ with prediction success of 91.6% [81.6% for irrational choice and 95.5% for rational choice]) the Wald criterion demonstrated that only uncertainty ($p < .001$), *OR (EXP[B])* = 13.50, $CI_{.95}$ = [4.98; 36.58] and involvement ($p < .001$), *OR (EXP[B])* = 0.13, $CI_{.95}$ = [0.06; 0.28] made significant contributions to prediction. *EXP(B)* value indicates that the odds of a rational choice were 13.50 times larger when the moral dilemma provided full text description and visualisation of the choice outcome, than when the moral dilemma involved partial text description of moral choice. Moreover, when the moral dilemmas involved personal involvement (pushing), the odds of a rational choice were 0.13 times smaller than when the dilemma involved an impersonal act (hitting a switch), (see Figure 21).

When the moral content involved inanimate objects (TVs) (*chi square* =

799.693, $p < .001$, $df = 7$; Nagelkerke's $R^2 = .694$ with prediction success of 93.4% [66.1% for irrational choice and 98% for rational choice]) the Wald criterion demonstrated that only uncertainty ($p = .008$), *OR (EXP[B])* = 3.46, $CI_{.95}$ = [1.38; 8.69] and involvement ($p = .049$), *OR (EXP[B])* = 0.45, $CI_{.95}$ = [0.21; 0.99] made significant contributions to prediction. *EXP(B)* value indicates that the odds of a rational choice were 3.46 times larger when the moral dilemma provided full text description and visualisation of the choice outcome, than when the moral dilemma involved partial text description of moral choice. Moreover, when the moral dilemmas involved personal involvement (pushing), the odds of a rational choice were 0.45 times smaller than when the dilemma involved an impersonal act (hitting a switch), (see Figure 21).

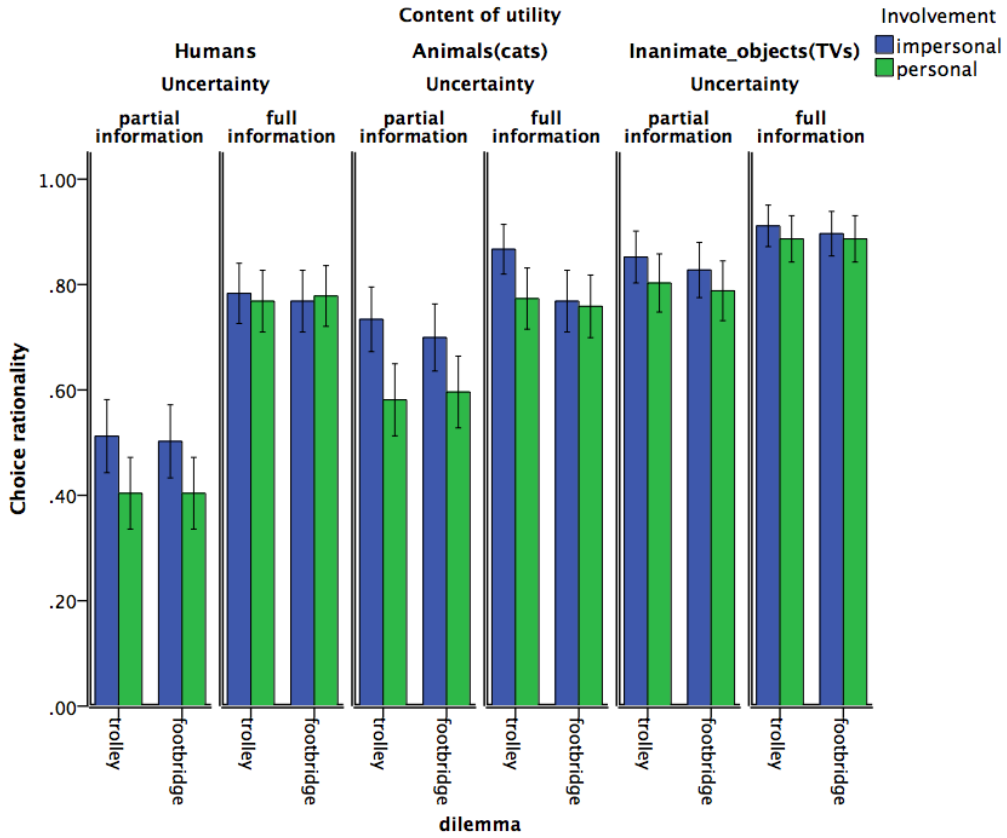


Figure 21. Choice rationality (0= irrational; 1= rational). Error bars represent 95% CI of the means.

Study time

The frequency distributions of study and response time were positively skewed, and this was considerably improved by logarithmic transformation for all inferential statistics (for both dependent variables study and response time). A four-way analysis of variance (ANOVA) was conducted with independent variables type of dilemma (trolley or footbridge), involvement (moral personal and moral impersonal), content of utility (humans, animals 'cats' and inanimate objects 'TVs') and uncertainty (partial text description and a question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and question). The dependent variable was study time.

The results showed that the main effect of content of utility significantly influenced participants study time (F[1, 202]= 16.62, p < .001, η^2 = .007). A pairwise comparison test with Bonferroni correction demonstrated that participants took less time studying moral scenarios involving humans (M_{Ln}=2.01; $CI_{.95}$ = 1.97; 2.04), than studying moral scenarios with inanimate objects (M_{Ln}=2.14; $CI_{.95}$ = 2.11; 2.18), p<.001. Similarly, studying moral scenarios with animals took less time (M_{Ln}=2.03; $CI_{.95}$ = 1.99; 2.07) than studying moral scenarios with inanimate objects (M_{Ln}=2.14; $CI_{.95}$ = 2.11; 2.18), p<.001. The results also revealed that the main effect of uncertainty influenced participants study time (F[1, 202]= 85.67, p < .001, η^2 = .017); it took participants less time studying moral scenarios with partial information (M_{Ln}=1.96; $CI_{.95}$ = 1.93; 1.99), than studying moral scenarios with full text description of moral scenarios and visualisations of choice consequences (M_{Ln}=2.15; $CI_{.95}$ = 2.13; 2.18). However, the main effects type of dilemma (F< 1), and involvement (F [1, 202]= 2.31, p = .129), as well as the two-, three- and four-way interactions did not influence significantly participants' study time (p>.05).

Response time

Four-way (ANOVA) was conducted with independent variables type of dilemma (trolley and footbridge), involvement (moral personal and moral impersonal), content of utility (humans, animals 'cats' and inanimate objects 'TVs') and uncertainty (partial text description and a question or full text description with visual presentation of the final moral utility outcome [displayed information about the consequences of the action] and question). The dependent variable was response time for moral choice.

The results showed a significant main effect of uncertainty on decision-making time (F[1, 202]= 50.01, p < .001, η^2 = .010). The respondents took more time to make

a decision about moral scenarios with partial information (M_{Ln}=1.74; $CI_{.95}$ = 1.71; 1.77) than in the moral scenarios with full text and visual presentation of the decision final outcome *M*=1.59 ($CI_{.95}$ = 1.56; 1.62). Moreover, content of utility also significantly influenced respondents' decision-making time (*F*[1, 202]= 4.54, *p* = .011, η^2 = .002). A pairwise comparison test with Bonferroni correction demonstrated that participants took less time to make a decision for moral scenarios involving humans (M_{Ln}=1.63; $CI_{.95}$ = 1.59; 1.67), than for moral scenarios with inanimate objects (M_{Ln}=1.71; $CI_{.95}$ = 1.67; 1.74), *p*=.009. However, the main effects type of dilemma (*F*< 1) and involvement (*F*< 1), as well as the two-, three- and four-way interactions did not influence significantly participants' decision-making time (p>.05).

Conducted further statistical analyses (generalised estimation equations), including choice rationality as an independent variable, confirmed the effect of content of utility on decision-making time (*chi square* [2] = 11.192, *p* =.004) and uncertainty (*chi square* [2] = 19.885, *p* <.001). The results also revealed an effect of choice rationality on decision response time (*chi square* [1] = 5.895, *p* =.015).

Moreover, the two-way interactions uncertainty by decision rationality (*chi square* [1] = 457.114, *p* <.001), content of utility by involvement (*chi square* [2] = 9.637, *p* =.008), content of utility by decision rationality (*chi square* [2] = 11.334, *p* =.003), type of dilemma by decision rationality (*chi square* [1] = 3.841, *p* =.050), the three-way interactions uncertainty by content of utility by decision rationality (*chi square* [2] = 61.510, *p* <.001), content of utility by involvement by decision rationality (*chi square* [2] = 10.411, *p* =.005), and the four-way interaction uncertainty by content of utility by involvement by decision rationality (*chi square* [2]

= 11.290, p =.004) were also significant. None of the remaining main effects, two-, three-, four-, five-way interactions were significant (p>.05).

Because of the significant two-, three-, and four-way interactions follow-up analyses were conducted separately for content of utility with humans, animals and inanimate objects with rational and irrational decisions.

When respondents made an irrational choice with moral dilemmas involving humans only, uncertainty significantly influenced decision-making response time (*chi square* [1] = 370.294, p < .001). Specifically, respondents took less time to make an irrational choice with partial information (M_{Ln}=1.28; $CI_{.95}$ = 1.21; 1.35), than with full text descriptions and visualisation of choice consequences (M_{Ln}=2.28; $CI_{.95}$ = 2.20; 2.37). Moreover, when respondents made a rational choice with moral dilemmas involving humans only, uncertainty significantly influenced decision-making response time (*chi square* [1] = 223.303, p < .001). In particular, respondents took less time to make a rational choice with full text information and visualisation (M_{Ln}=1.38; $CI_{.95}$ = 1.33; 1.43), than with partial text descriptions (M_{Ln}=2.15; $CI_{.95}$ = 2.06; 2.23).

When respondents made an irrational choice with moral dilemmas involving animals (cats), uncertainty significantly influenced decision-making response time (*chi square* [1] = 54.281, p < .001). Specifically, respondents took less time to make an irrational choice with partial information (M_{Ln}=1.40; $CI_{.95}$ = 1.29; 1.51), than with full text descriptions and visualisation of choice consequences (M_{Ln}=1.98; $CI_{.95}$ = 1.81; 2.16). Moreover, when respondents made a rational choice with moral dilemmas involving animals (cats), uncertainty significantly influenced decision-making response time (*chi square* [1] = 94.013, p < .001). In particular, respondents took less time to make a rational choice with full text information and visualisation (M_{Ln}=1.44;

$CI_{.95}$ = 1.38; 1.51), than with partial text descriptions (M_{Ln}=1.94; $CI_{.95}$ = 1.87; 2.01). The results also revealed that when respondents made an irrational choice with dilemmas involving animals (cats), the main effect of involvement was also significant (*chi square* [1] = 54.281, $p < .001$). Respondents took less time to make an irrational choice with impersonal moral dilemmas (M_{Ln}=1.59; $CI_{.95}$ = 1.42; 1.75), than with personal moral dilemmas (M_{Ln}=1.80; $CI_{.95}$ = 1.67; 1.92).

When respondents made an irrational choice with moral dilemmas involving inanimate objects (TVs), uncertainty significantly influenced decision-making response time (*chi square* [1] = 32.407, $p < .001$). Specifically, respondents took less time to make an irrational choice with partial information (M_{Ln}=1.60; $CI_{.95}$ = 1.43; 1.76), than with full text descriptions and visualisation of choice consequences (M_{Ln}=2.30; $CI_{.95}$ = 2.10; 2.50). Moreover, when respondents made a rational choice with moral dilemmas involving inanimate objects (TVs) uncertainty significantly influenced decision-making response time (*chi square* [1] = 54.007, $p < .001$). In particular, respondents took less time to make a rational choice with full text descriptions and visualisation of choice consequences (M_{Ln}=1.54; $CI_{.95}$ = 1.48; 1.61), than with partial text descriptions (M_{Ln}=1.84; $CI_{.95}$ = 1.77; 1.91). The results also revealed that when respondents made an irrational choice with dilemmas involving inanimate objects (TVs), the main effect of involvement was also significant (*chi square* [1] = 32.2407, $p < .001$). Respondents took less time to make an irrational choice with personal moral dilemmas (M_{Ln}=1.83; $CI_{.95}$ = 1.66; 2.00), than with impersonal moral dilemmas (M_{Ln}=2.07; $CI_{.95}$ = 1.89; 2.24). The remaining main effects and interactions were all not significant (p>.05).

4.6. General discussion

Experiments 6 and 7 were designed to explore the influence of utility ratios (number of workers involved in moral scenarios) on moral trade-offs (utilitarian choice rationality). Specifically, I aimed to investigate whether changing the utility trade-off to sacrificing one workman versus sacrificing two workmen will influence moral choice, the decision-making time, and further reduce respondents' decision-making rationality. Moreover, Experiment 7 incorporated manipulations of uncertainty (with partial text description taken from Greene, 2001, and full text description with a visual presentation of the decision consequences of moral scenarios) and its influence on moral choice and rationality. As in all experiments in this dissertation, type of dilemma and involvement were controlled (as all previously published research failed to control for these confounding variables), and their influence on moral choice rationality, reading time and the decision-making time measured.

According to Taurek's (Taurek, 1977) proposal, a choice between morally sensitive scenarios should not be influenced by the number of victims, involved in the scenarios (applying the principle of 'equal greatest chance' of survival). Taurek's argument implies that in situations, where we can save only a group of people (from two groups of people with equal, similar or different sizes) - we should toss a coin (e.g., Lawlor, 2006). In contrast, normative decision-making theory (e.g., von Neumann & Morgenstern, 1947) is concerned with utility maximisation; in moral utilitarian terms, saving the greatest number of people should be the prior rational strategy, underlying any moral choice (ends over means). Similarly, Bradley (2009) argued for utility maximisation as a prevailing moral logic, and rejected the assumption that the 'equal greatest chance' is directly comparable to 'save the

greatest number'.

Experiments 6 and 7 tested the assumption that saving the greatest number is not the only utilitarian reason employed by human agents in moral choice. The difference between moral dilemmas with saving 1vs 2 and saving 1 vs 5 could influence respondents' utilitarian rationality. This idea is motivated by Lawlor's (2006) assumption that in 'saving the greatest number', weighting of the odds favouring the larger group (and the difference in size of the larger group) should be taken into account too. This implies that each moral dilemma is weighted differently based on the number of agents involved (e.g., 1 vs 2 or 1 vs 5), and this is not irrational. Accordingly, reward activations could enhance further utilitarian maximisation by 'saving the greatest number with 'high' utility ratio'; saving 1 vs 5 can be seen as more morally rewarding than saving 1 vs 2. Experiments 6 and 7 also explored whether the effect of uncertainty (established in experiments 1 to 5) will be present and independent from the effect of utility ratio.

The results from Experiment 6 revealed that the type of dilemma, involvement and utility ratios (main effects and interactions) did not influence significantly participants study time. However, and as I predicted, a logistic regression analysis has shown that only utility ratio predicts moral rational (irrational) choice – respondents were more likely to make a rational choice about a moral dilemma with a trade-off between saving 1 vs 5, than when the moral dilemma involved a trade-off between saving 1 versus 2 workers. Moreover, the results revealed that none of the main effects - utility ratio, type of dilemma, involvement, and choice rationality (and their interactions) influences response time for moral choice.

Similar to the experiments 2 to 5, respondents in Experiment 7 took more time to study moral scenarios with full utilitarian information (full text description with a

visualisation of decision consequences). Importantly, and as predicted, rational choices were more commonly made when full moral utilitarian information (full text description with a visualisation of decision consequences) was presented, and when the moral scenarios involved a decision trade-off between saving 1 versus 5 workers (than with a trade-off between saving 1 vs 2). The results also revealed that the odds of a rational choice were smaller when a moral dilemma was personal (pushing the person), than when it involved an impersonal act (hitting a switch). Finally, the results from Experiment 7 have shown that uncertainty influences respondents' decision-making time - respondents took more time to make a decision about moral scenarios with partial information, than with full utilitarian information. Moreover, respondents took less time to make a rational choice (saving 1 vs 2 and saving 1 vs 5) with full utilitarian information (text descriptions and visualisation of decision consequences), than a rational decision with partial information (moral scenarios taken from Greene, 2001). Overall, and in contrast to Taurek (1977),, the results from experiments 6 and 7 confirmed that numbers do matter (beyond expected utility maximisation), and that facilitating full utilitarian descriptions of moral utility reduced irrationality. In accordance with Lawlor's (2006) philosophical proposal, I found that increased number of victims induced moral rational behaviour. It is possible that reward activations enhanced utilitarian maximisation saving 1 vs 5 (and hence more rational) can be seen as more morally rewarding than saving 1 vs 2. These findings are of a particular importance to any normative theory of decision-making, attempting to use psychological factors (underlying moral utilitarian behaviour) for explaining maximisation goals and behaviour.

In order to investigate more potential factors contributing in the maximisation of utilitarian behaviour, experiments 8 and 9 focused on utilitarian content and

uncertainty. In contrast to normative decision theory (see Introna, 2014), I have hypothesised that moral utilitarian content (in addition to utility ratios) might influence the utilitarian maximisation strategies and behaviour. Particularly, that trade-off experience with utility determines rationality in moral choice - a trade-off task with human lives (no experience) is different from a trade-off task with inanimate objects (TVs). Moreover, things we could involve in trade-offs are things we can also posses, and it is well established in decision-making research that things we own can be perceived as more valuable - an endowment effect (e.g., Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984; Millar et al., 2014; Topolski et al., 2013). Accordingly, things we can possess (come with utilitarian trade-off experience) are associated with more rational utilitarian behaviour, than things we cannot (e.g., human life).

Experiment 8 revealed that only content of utility significantly influenced participants study time - participants took less time studying moral scenarios involving humans than studying moral scenarios with inanimate objects. Moreover, as I predicted, rational choices were more commonly made when the moral scenarios involved nonhuman stimuli (animals and inanimate objects) and impersonal involvement. Furthermore, the results have shown that content of utility significantly influenced respondents decision-making time - participants took less time to make a decision for moral scenarios with content of utility humans than for moral scenarios with content of utility inanimate objects. Moral decisions with content of utility animals took less time than moral decisions with content of utility inanimate objects. These results revealed that respondents invested more cognitive effort and demonstrated more utilitarian rationality for trade-offs with nonhuman content of utility - things they have some trade-offs experience with and can maximise

accordingly.

These findings were supported by the results from Experiment 9, where uncertainly was also included in the experimental design. In Experiment 9, respondents took less time to study moral scenarios with humans, than more scenarios with inanimate objects. Moreover, it took participants less time studying moral scenarios with partial information, than studying moral scenarios with full text description of moral scenarios and visualisations of choice consequences. Moral rational choices were more commonly made for (i) scenarios with full text description and a visualisation of the decision consequence, (ii) content of utility 'inanimate objects' and 'animals' than 'humans'. The effect of uncertainty (induced rationality for scenarios with full utilitarian descriptions and a visualisation of decision consequences) was significant and influenced moral utilitarian choice for trade-offs with all three contents of utility (humans, animals and inanimate objects). In addition, the respondents took more time to make a decision for (i) moral scenarios with partial information, than in the moral scenarios with full text and a visual presentation of the decision final outcome, (ii) moral scenarios with inanimate objects, than for moral scenarios involving humans. Importantly, when respondents made a rational choice with moral dilemmas involving all three contents of utility (humans, animals and inanimate object), they took less time to decide with full utilitarian descriptions than with partial text descriptions only. In contrast, when the utilitarian decisions were irrational, it took participants less time to make a decision with partial text description than with full utilitarian text descriptions and visualisation of decision consequences.

In other words, utilitarian accessibility (eliminated uncertainty by full text descriptions and visualisation of decision consequences) was only beneficial (in terms of response time effort) to the rational decision-makers. Moreover, as in Experiment

8, the results from Experiment 9 have shown that trade-off utilitarian rationality is induced by the nonhuman content of utility (utility with trade-off experience). As I argued, things we could psychologically process in trade-offs are things we can also own (e.g., Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984; Millar et al., 2014; Topolski et al., 2013). Accordingly, things we can possess (content of utility, we have more utilitarian trade-off experience with) are more appropriate stimuli for measuring human rational utilitarian behavior, than things we cannot possess (e.g., human life). Together, the empirical findings from experiments 6, 7, 8 and 9 are novel and not previously explored, and have the potential to contribute to further theoretical developments of both, normative and psychological moral decision-making.

Chapter 5: Conclusion and Future Work

5.1. Discussion and Summary of Main Findings

The dual-process moral utility theory, proposed to account for the differences in moral choice (rationality) and response time for moral choices (e.g., Bartels, 2008; Cushman et al., 2006; Greene, 2007; Greene, et al., 2001; Haidt, 2001; Pizarro & Bloom, 2003; Young & Koenigs, 2007; Evans & Stanovich, 2013), suggest that two psychological subsystems are involved in moral utilitarian behaviour. One is assumed to be automatic (activated emotions), and the second to be deliberative, controlled and effortful (cognitive). These two psychological functions are supposed to interfere with each other when respondents evaluate morally sensitive scenarios with personal involvement. Moreover, these subsystems are expected to account for rational and irrational behaviour – with activated 'emotional interference' leading to irrational behaviour. Further support for this theory comes form empirical results (e.g., Greene et al., 2001), suggesting that even if respondents are able to make a rational choice (with activated 'emotional interference' caused by personal involvement – e.g., 'to push the stranger'), respondents needed more time to make this rational decision, than making a rational choice for moral scenarios without 'emotional interference; (e.g., with impersonal involvement – 'to hit a switch').

In nine experiments I aimed to establish (and argued for) that a generic utilitarian cognitive factor – 'uncertainty' (based on accessibility to utilitarian information, regulating levels of uncertainty) accommodates behavioural choice-differences in moral decision rationality. As the experimental results confirmed, this factor has an independent influence (beyond the type of dilemma and involvement – previously confounded in experimental research) on moral utilitarian behaviour. An

increased accessibility to utilitarian information decreased psychological uncertainty, inducing rational moral utilitarian behaviour across the experiments. Moreover, in contrast to the dual-process utilitarian theory, when making a rational choice respondents took less time with scenarios offering full utilitarian accessibility (facilitated by full text description of the scenarios and moral choice questions and supported by visualisation of decision consequences), than with scenarios offering partial textual descriptions of moral utilitarian information (as with all moral experimental studies published since Thomson, 1985). This finding is important, as it offers methodological improvements to the study of moral decision-making, and reveals issues with the dual-process moral utilitarian theory predictions and psychological mechanisms. It is plausible that the emotional activations predicted by the dual-process moral theory are in fact a degree of uncertainty, invited by limited utilitarian information.

Furthermore, the results revealed no difference (as predicted by previous research, e.g., Tassy et al., 2013) in the behavioural patterns between choice and judgments. Moreover, uncertainty significantly predicted moral choice and moral judgements – additional evidence of the generalisability of uncertainty, as a major factor that should be taken into account in future research.

This dissertation research discovered additional, and not previously considered psychological factors influencing moral utilitarian behaviour. Specifically, in their effort to maximise utility, respondents took into account the utility ratio in the moral trade-offs; in addition to the eliminated uncertainty (caused by insufficient utilitarian information), the increased number of victims induced further respondents' moral rational behaviour. This result can be attributed to enhanced reward activations for utilitarian moral dilemmas offering 'saving of more victims'. I also found that content

of utility is a psychological factor predicting moral utilitarian behaviour. I argued that different utilities are treated differently in utilitarian trade-offs based on the experience making a trade-off with the utility. Things we could psychologically process in trade-offs are things we can also own or have previously owned (e.g., Kahneman, Knetsch, & Thaler, 1990; Knetsch & Sinden, 1984; Millar et al., 2014; Topolski et al., 2013). The results confirmed that the trade-off utilitarian rationality is induced by the nonhuman content of utility (utility with trade-off experience). The results from nine experiments are novel and have the potential to contribute to further theoretical developments of both, normative and psychological moral decision-making.

5.2. Limitations

Although this dissertation has reached its aims, it still has some limitation. One major limitation, impossible to overcome completely, is that the moral scenarios employed (content of utility human life) are hypothetical and unrealistic. Bauman, McGraw, Bartels and Warren (2014) argued that imaginary moral scenarios involving humans do not predict how people will behave in the real world; however, they do give us knowledge about the psychological factors and processing in moral decision-making. A possible solution, which future research should consider, is developing simulated virtual reality platforms offering visual realistic presentations of morally sensitive scenarios, and opportunity for decision-making actions. However, the increased realism of these virtual reality experiments may not have a major influence on behaviour, as the participants will be still aware of the simulated environment. Another possibility, which future research should consider is the development of field experimental moral methods. This method will prevent the initial knowledge, that the moral dilemmas are hypothetical to influence the behaviour of the participants.

However, as the scenarios involve sacrificing human lives and the field methods involve random participations in real-world settings, without a consent for participation obtained in advance, the ethical approval for such experiments will prove to be difficult and very complex (involving local authorities).

The experimental methods in this dissertation followed closely the method employed in testing dual process moral utility theory. In their research Greene and colleagues did not measure explicitly subjectively perceived degree of emotions. Similarly, in this dissertation the subjective degree of perceived emotions and uncertainty were not measured. Moreover, behavioural decision theorists (e.g., Stewart et al., 2006; Kusev et al., 2011) argued that decision-makers do not have absolute access to psychological variables (absolute or self-assessed variables and representations). Specifically, recent research by Kusev et al. (unpublished) revealed dissociation between behavioural risk preferences (experimental method) and self-assessed risk preferences (based on questions).

5.3. Future Directions and Applications

In addition to the possibilities offered in the above section, a future research should employ fMRI method to investigate whether there is an overlap (brain regions) between emotions and uncertainty. This is an opportunity for researchers concerned with development of theories of emotions and emotion regulation strategies. A long history of research explored the influence of emotions in decision-making and their neural foundations (Damasio, 2005; Panksepp, 1998; Zajonc, 1980). Theories of emotion-decision processes offered two different classifications of emotions, based on immediate (affective states at the time of the decision) and anticipated (emotions people expect to feel) emotions (Loewenstein & Lerner, 2003; Loewenstein, 2000; Loomes & Sugden, 1982). It is plausible, that psychological uncertainty shares similar

neural mechanisms as immediate emotions. Moreover, I also plan to continue my research in the field of moral decision-making, and conduct follow up experiments. I am currently contributing to a research grant application with my supervisor Dr Kusev, investigating the influence of altruism, ownership and uncertainty on moral utilitarian choice. For example, whether the respondents would value more the life of an altruistic human stranger (who risked their life, in order to save patients on several occasions), than the life of a utilitarian stranger (who successfully saved the lives of the greatest number of patients on several occasions).

Experimental evidence suggests that people employ regulation strategies designed to alter their emotional reactions. One of the most influential approaches in the study of emotion and emotion regulation (ER) is the process model of emotions (Gross, 1998; 2002). The model and associate regulation strategies account for all the actions that people take in order to control the experience of emotions. Accordingly, future research should also explore the psychological mechanisms of uncertainty regulations, as well as the similarity/differences between emotion and uncertainty regulation strategies.

Normative choice models suggest that agent behaviour should aim to maximise utility (Von Neumann & Morgenstern, 1947). In contrast, human decision-makers are shown to divert from maximising utility due to the influences from decision context and content (Hertwig et al., 2004; Kahneman & Tversky, 1979; Kusev et al., 2009). Accordingly, the research findings and knowledge from this dissertation have practical applications too. It is envisaged that the knowledge about moral decision uncertainty, content of utility (decision paradigms) and utility ratios involved in moral trade-offs is beneficial to human resources departments (health and safety procedures) and expert training programmes. For example, in the development of training

interventions for emergency and special security units, as well as law enforcement agencies – the ability to search (and appreciate) relevant utilitarian information (and be aware of the issues with partial utilitarian information) could prove crucial. Moreover, in order to promote a fair business environment and debias human decision-making, stakeholders must ensure and facilitate available and accessible decision-making information sufficient to facilitate an informed choice.

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Appendix – Tasks and stimuli used in the experiments

Experimental materials used in experiment 1

1) Moral scenarios with text only (taken from Greene, 2001):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls on to the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and on to the tracks below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman on to the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

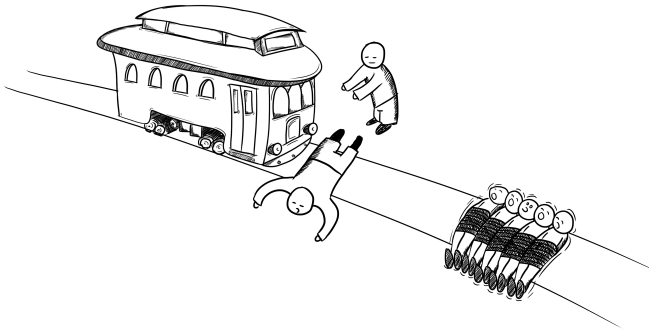
Yes

No

2) Moral scenarios with text (taken from Greene, 2001) and a picture of the behavioural action:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls on to the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.



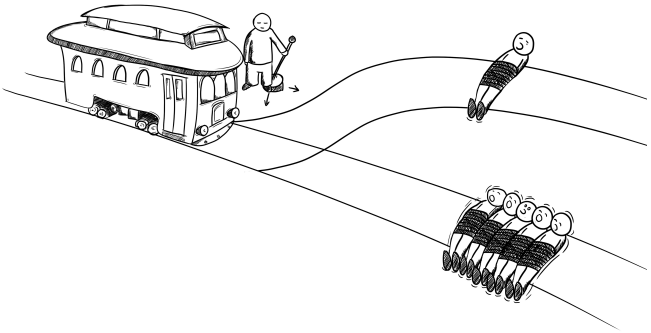
Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.



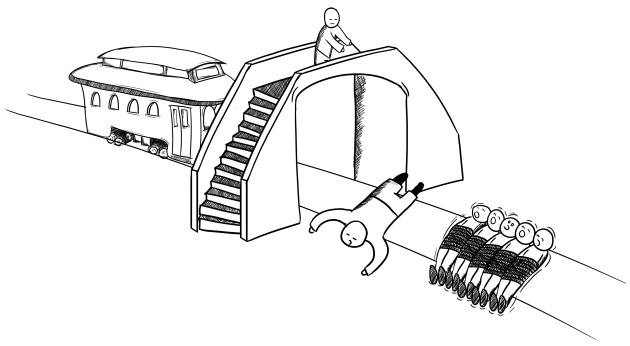
Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.



Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

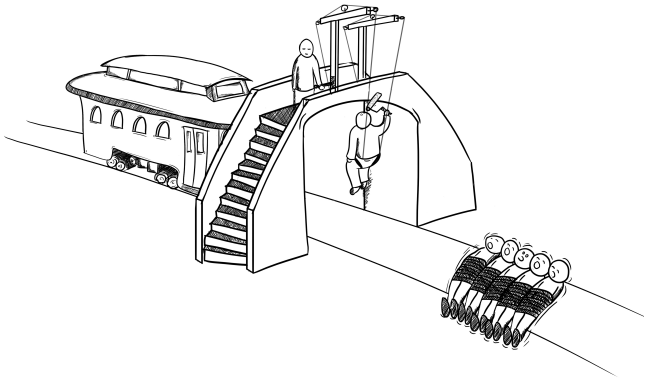
No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the

tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.



Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

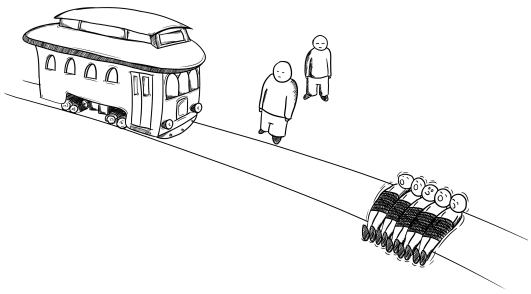
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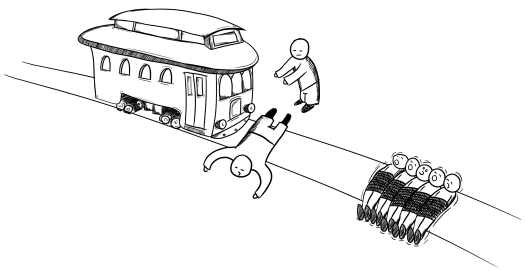
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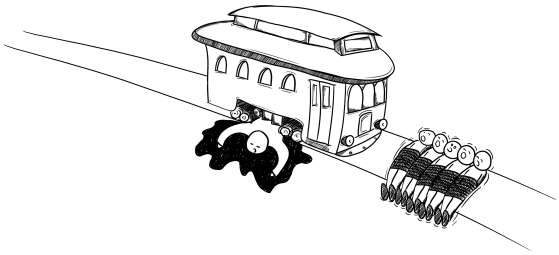
3) Moral scenarios with text (taken from Greene, 2001) and three pictures (illustrating the initial state, behavioural action and consequences of the action):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.







Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

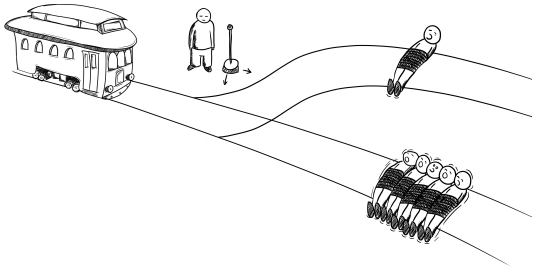
Yes

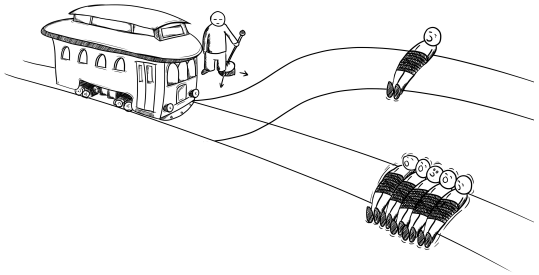
No

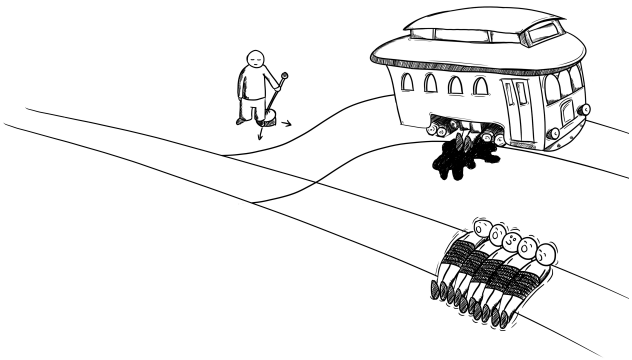
Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large

body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.







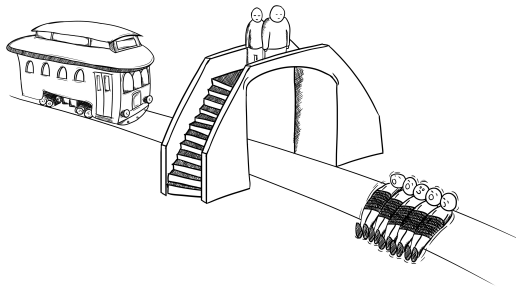
Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

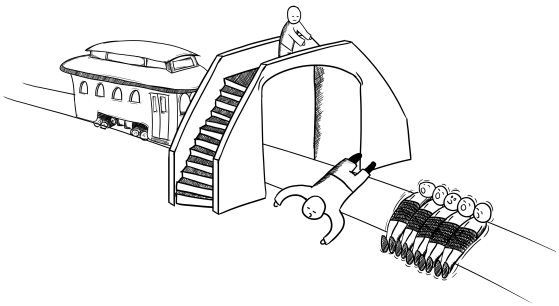
Yes

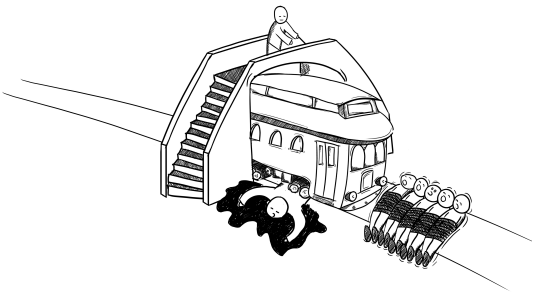
No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the tracks below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.







Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

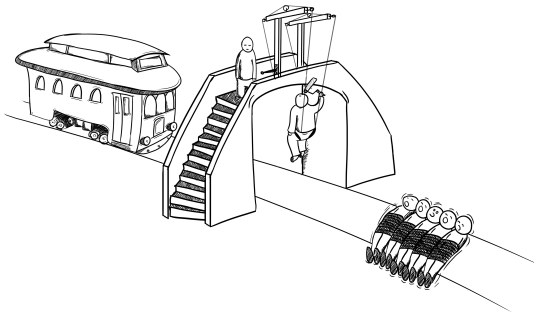
No

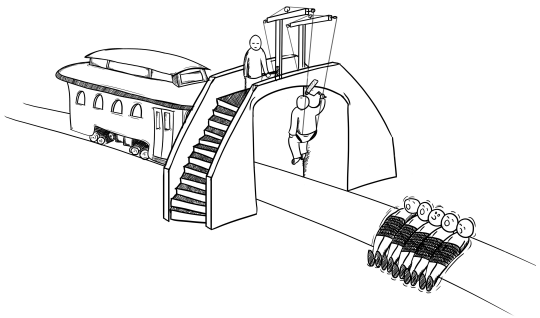
Footbridge, impersonal involvement:

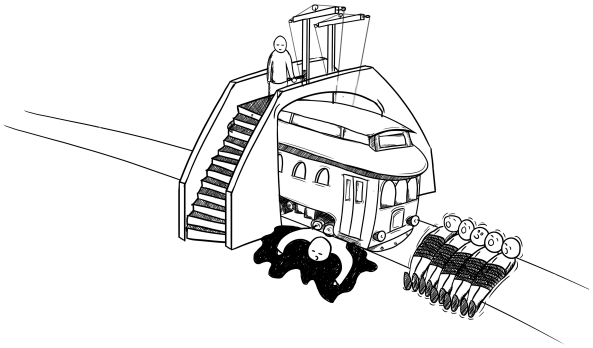
A runaway trolley is heading down the track toward five workmen who will be

killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.







Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Experimental materials used in experiment 2 and 3

1) Moral scenarios with partial text description (taken from Greene, 2001):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman.

The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

2) Moral scenarios with full text description and visual presentation of decision consequences:

Trolley, personal involvement:

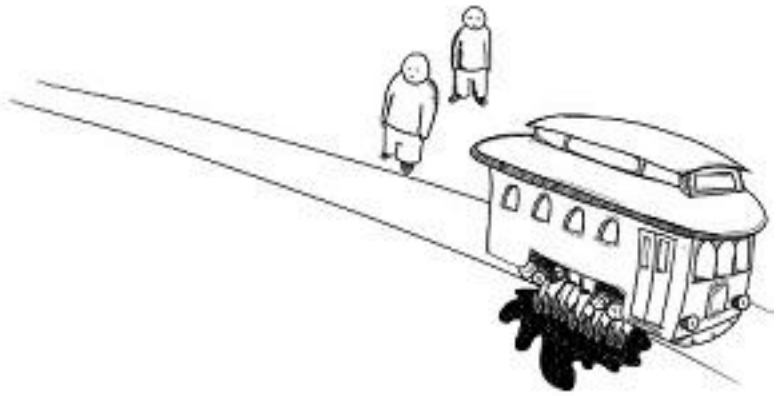
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

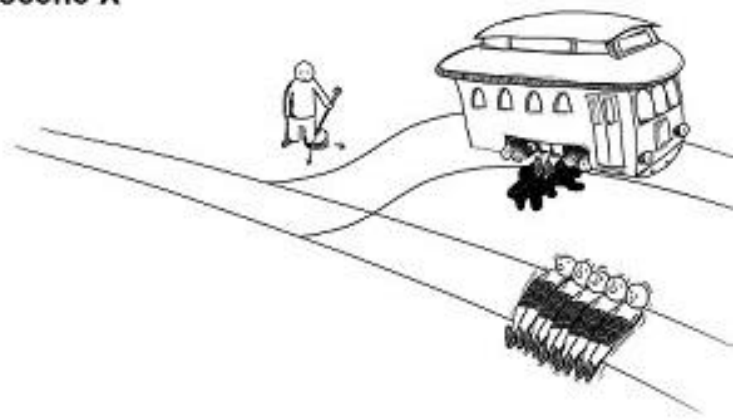
Sacrifice five workmen in order to save one workman (scene Y)

Trolley, impersonal involvement:

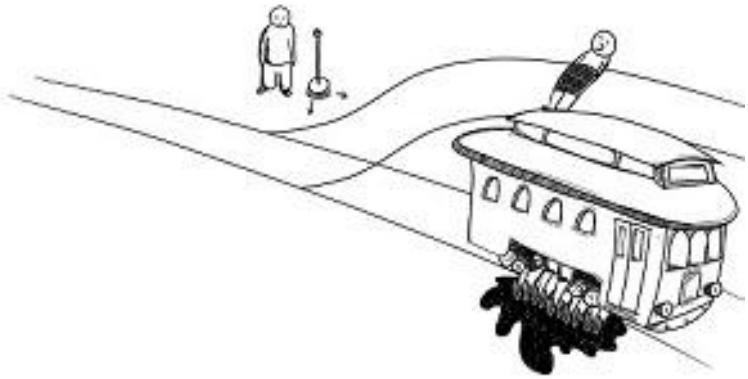
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to hit the switch near the track. The five workmen will die if you do

this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

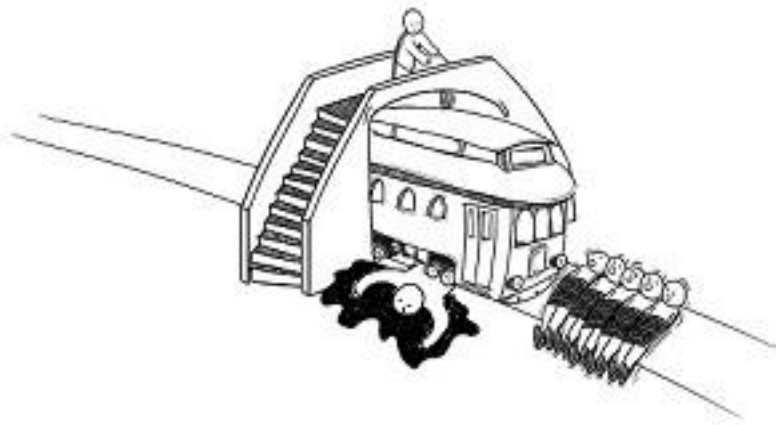
Sacrifice five workmen in order to save one workman (scene Y)

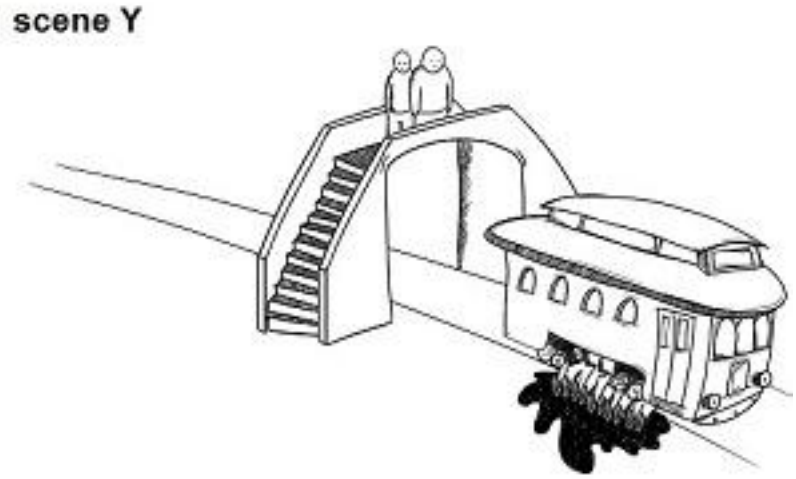
Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who happens to be very large.

The only way to save the lives of the five workmen is to push the lone workman off the bridge and onto the track below where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman off the bridge. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X





Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

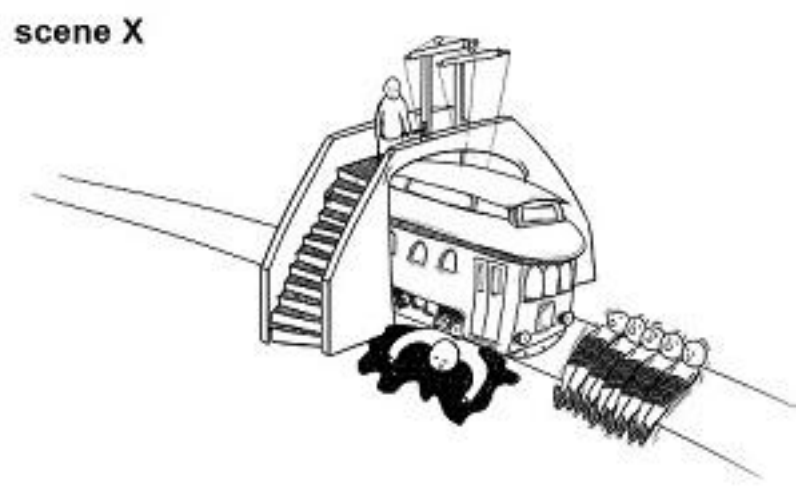
Sacrifice five workmen in order to save one workman (scene Y)

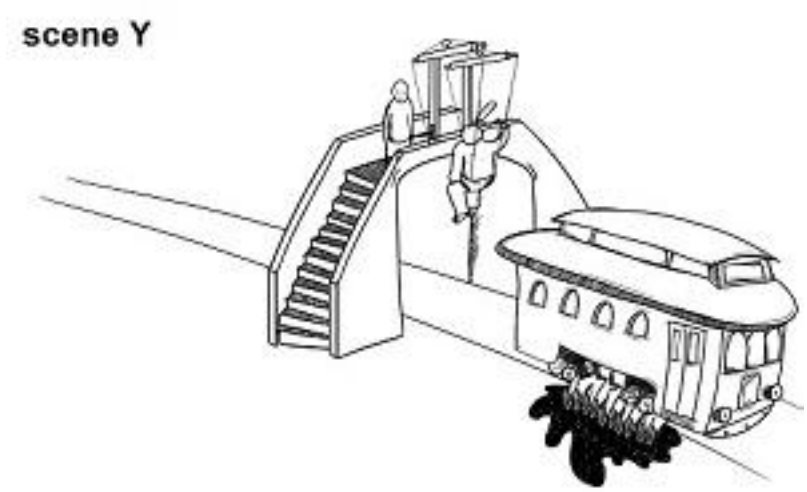
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to

hit the switch. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).





Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

Experimental materials used in experiment 4

1) Moral scenarios with text only (taken from Greene, 2001):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman.

The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

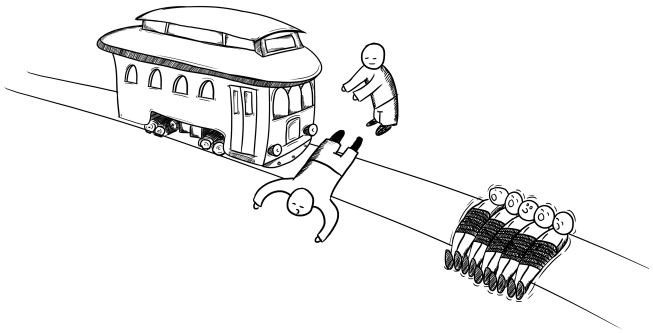
Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

2) Moral scenarios with text (taken from Greene, 2001) and a picture illustrating the behaviour action:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

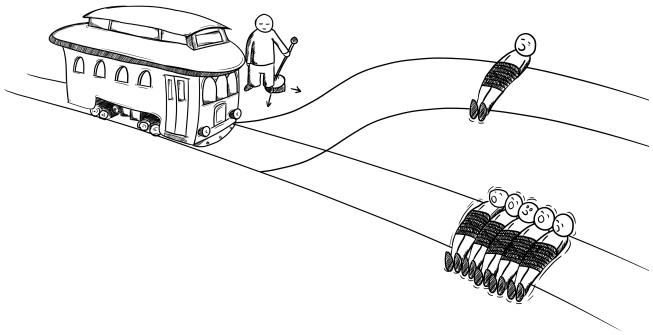


Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

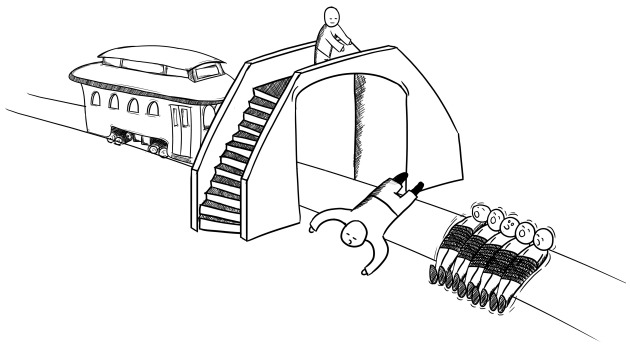


Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.



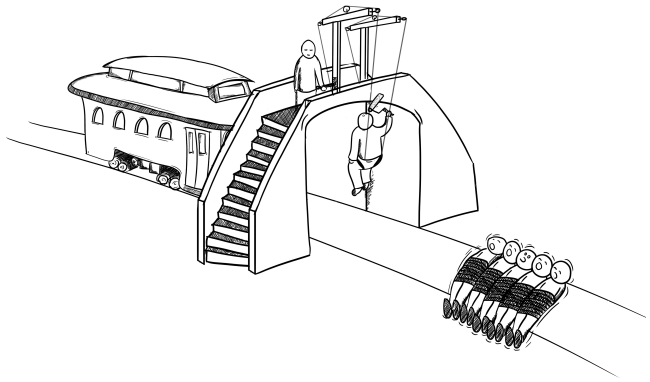
Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.



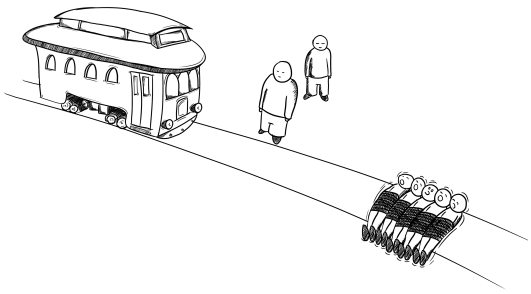
Is it appropriate for you to sacrifice one workman in order to save five workmen?

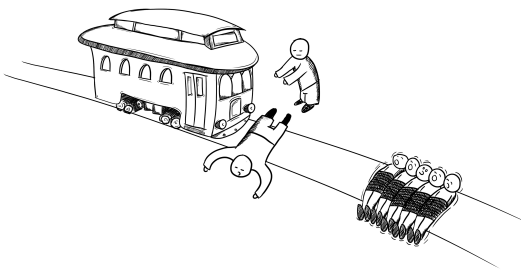
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

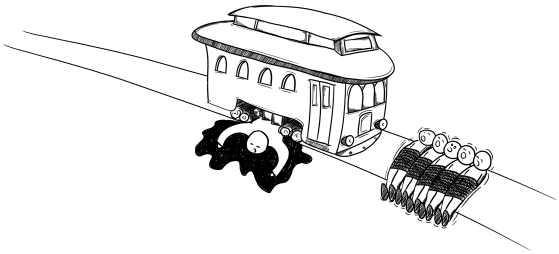
3) Moral scenarios with text (taken from Greene, 2001) with three pictures (illustrating the initial state, behavioural action and consequences of the action):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.





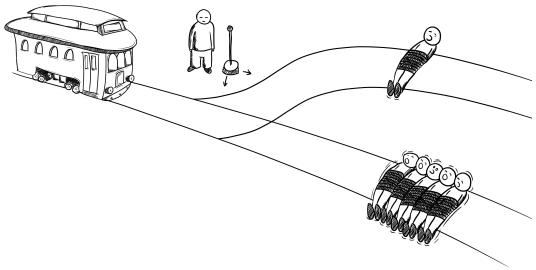


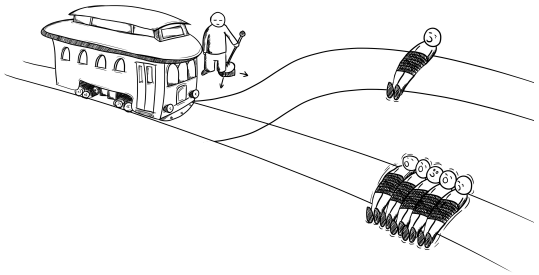
Is it appropriate for you to sacrifice one workman in order to save five workmen?

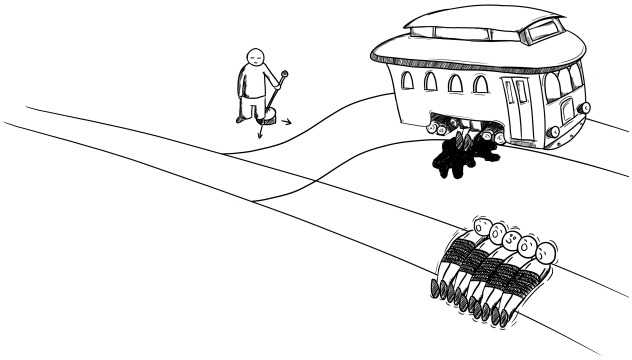
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.







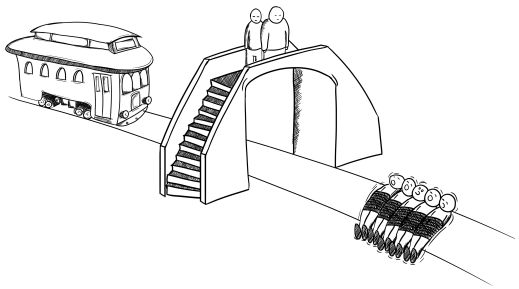
Is it appropriate for you to sacrifice one workman in order to save five workmen?

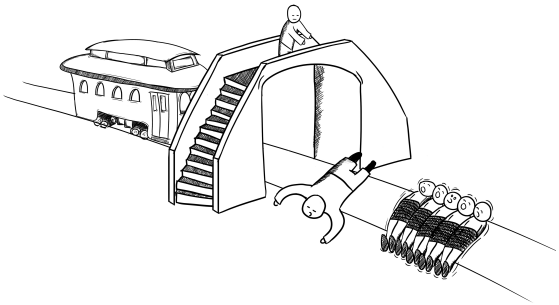
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

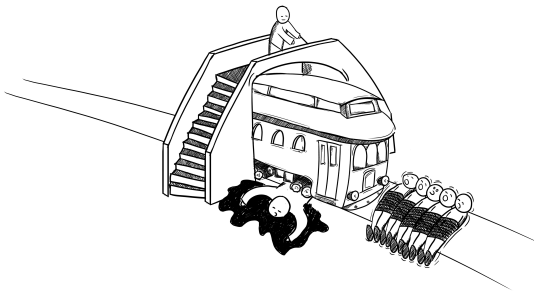
Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large.

The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.







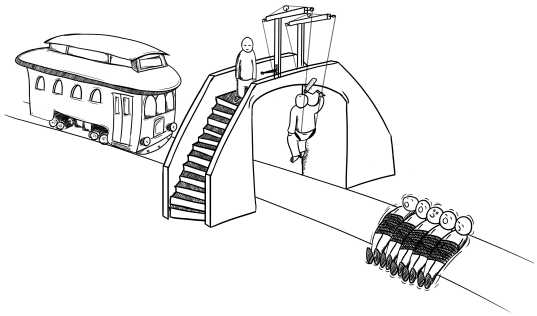
Is it appropriate for you to sacrifice one workman in order to save five workmen?

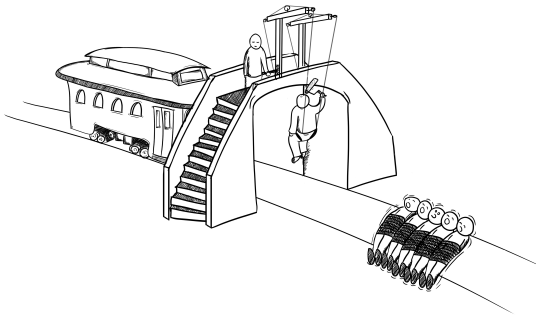
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

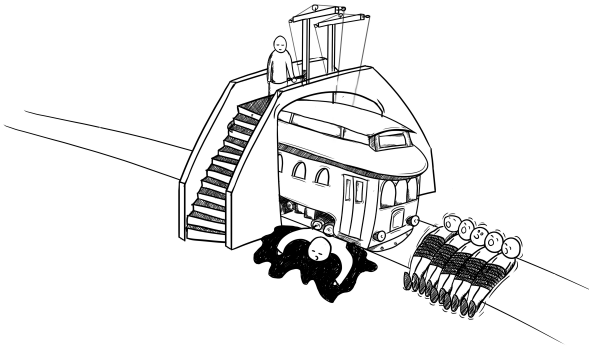
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.







Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Experimental materials used in experiment 5

1) Moral scenarios with partial text description (taken from Greene, 2001):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.



Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large

body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to sacrifice one workman in order to save five workmen?



2) Moral scenarios with full text description and visual presentation of decision consequences:

Trolley, personal involvement:

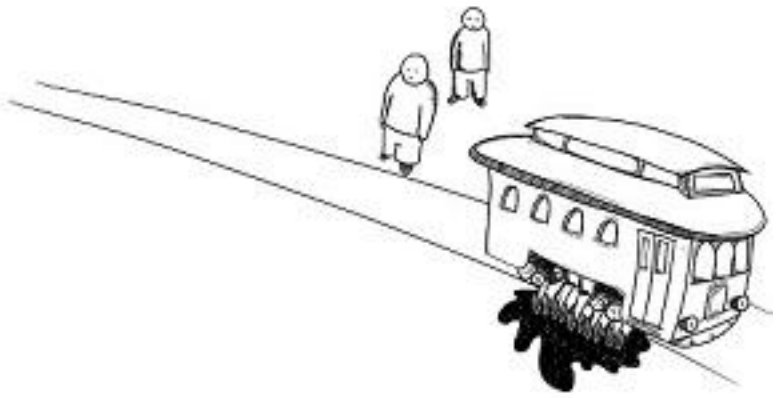
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

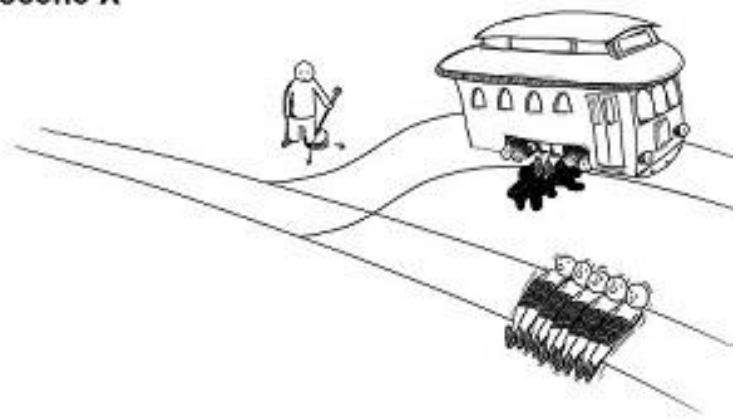
Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

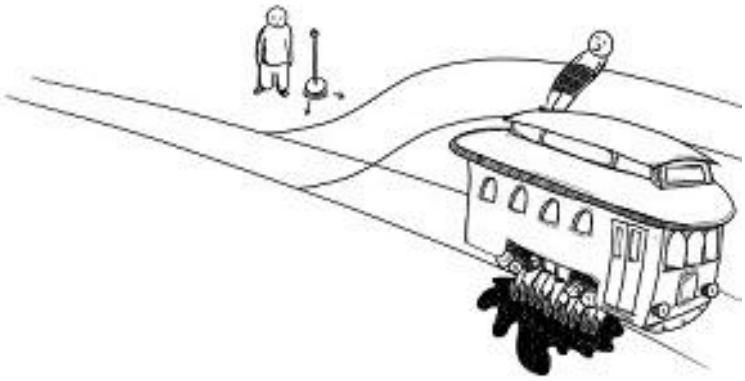
Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to hit the switch near the track. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

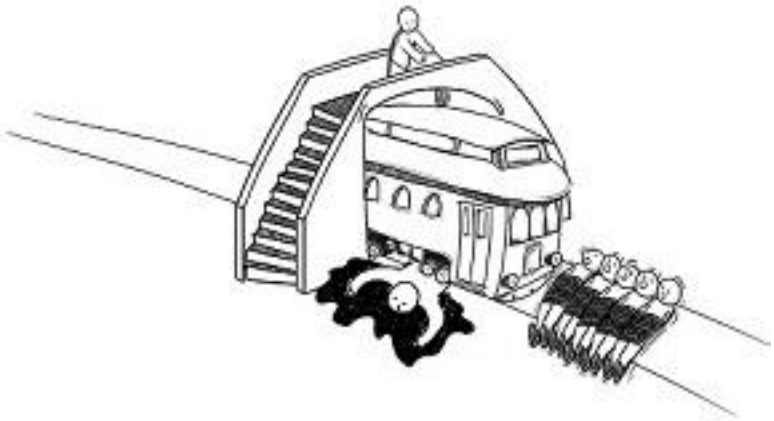
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, personal involvement:

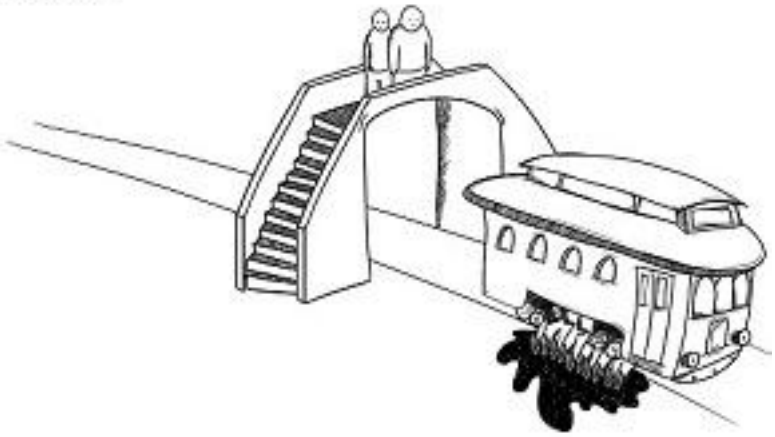
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who happens to be very large.

The only way to save the lives of the five workmen is to push the lone workman off the bridge and onto the track below where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman off the bridge. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

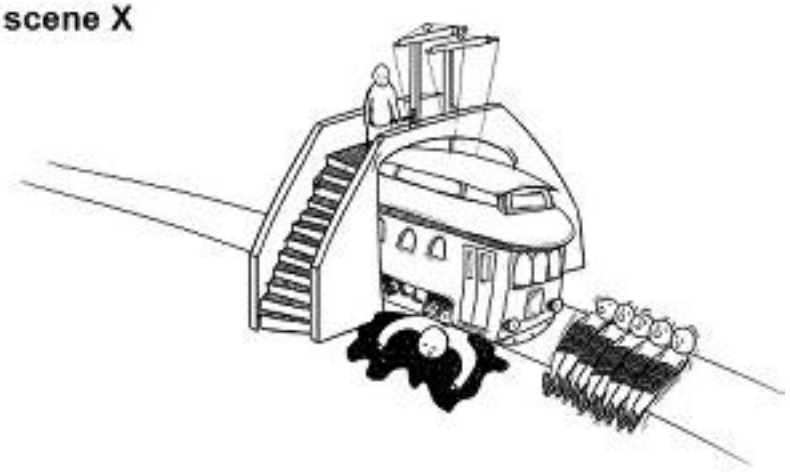
Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Footbridge, impersonal involvement:

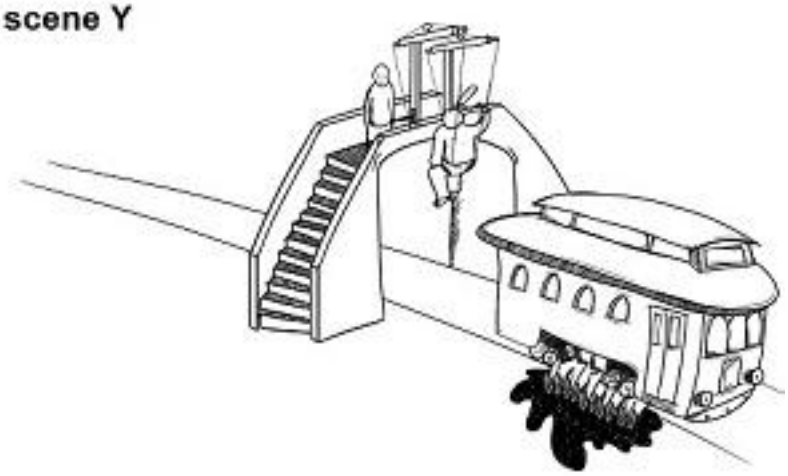
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to hit the switch. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Judge the appropriateness of the following alternatives:

Is it appropriate for you to sacrifice five workmen in order to save one workman (scene Y)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Is it appropriate for you to sacrifice one workman in order to save five workmen (scene X)?

Appropriate ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ Inappropriate

Experimental materials used in experiment 6

1) Moral scenarios with text (taken from Greene, 2001), one versus five workmen:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are

five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

2) Moral scenarios with text (taken from Greene, 2001), one versus two workmen:

Trolley, personal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the two workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the two workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. On the track extending to the left are two railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the two workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the two workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the two workmen. Next to you on this footbridge is a stranger who happens to be very large.

The only way to save the lives of the two workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the two workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the two workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the two workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the two workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the two workmen?

Yes

No

Experimental materials used in experiment 7

1) Moral scenarios with partial text description (taken from Greene, 2001) with one versus five workmen:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are

five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the tracks below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

2) Moral scenarios with full text description and visual presentation of decision consequences with one versus five workmen:

Trolley, personal involvement:

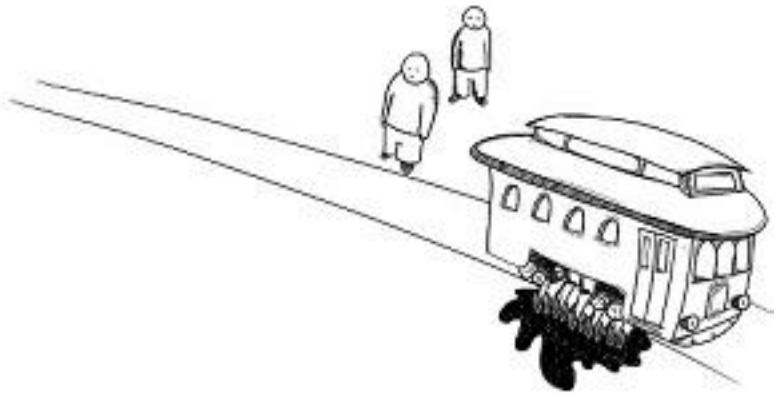
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

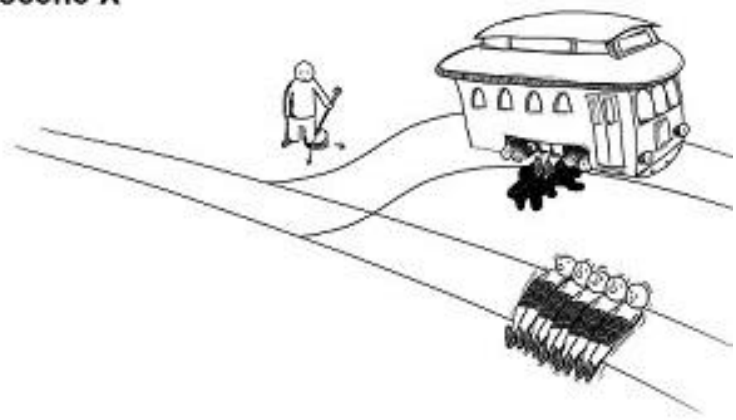
Sacrifice five workmen in order to save one workman (scene Y)

Trolley impersonal involvement:

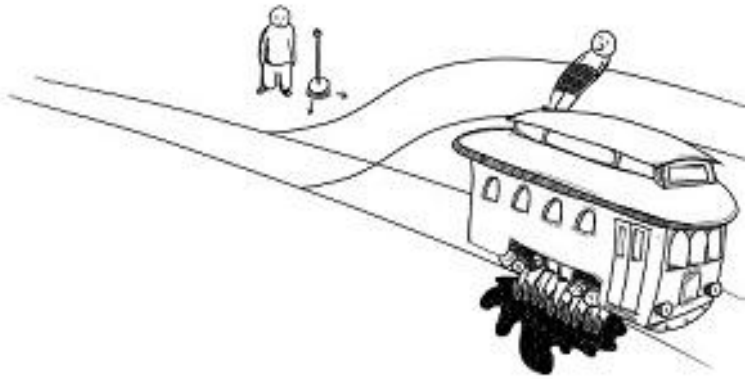
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to hit the switch near the track. The five workmen will die if you do

this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

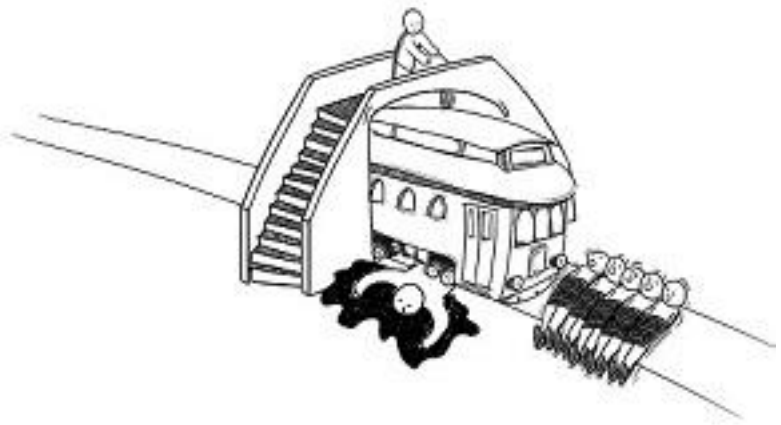
Sacrifice five workmen in order to save one workman (scene Y)

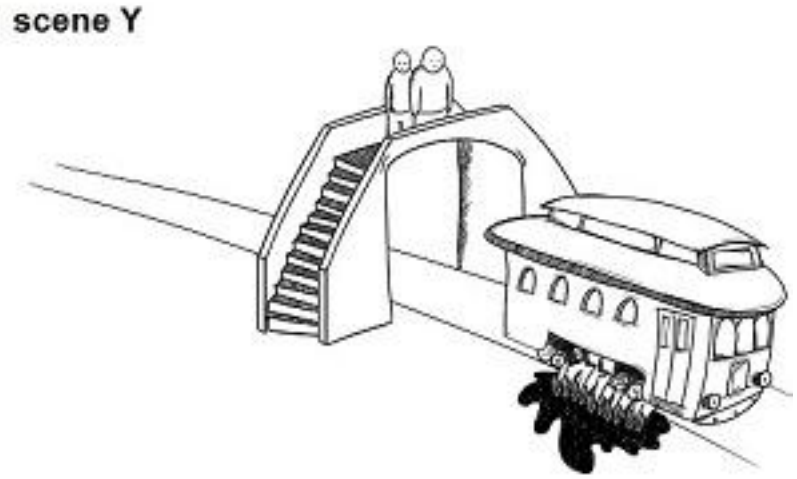
Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who happens to be very large.

The only way to save the lives of the five workmen is to push the lone workman off the bridge and onto the track below where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman off the bridge. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X





Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

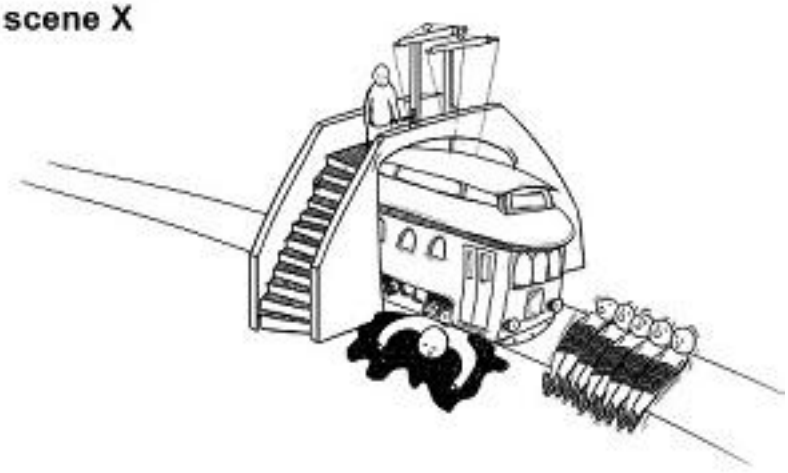
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

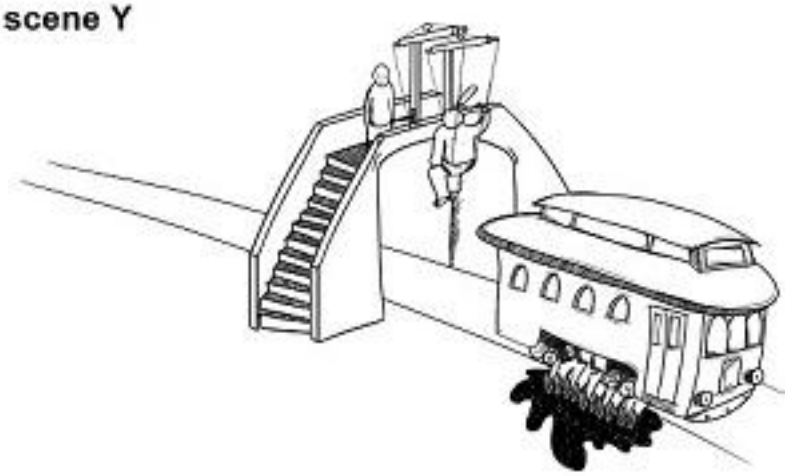
The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to

hit the switch. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

3) Moral scenarios with partial text description (taken from Greene, 2001) with one versus two workmen:

Trolley, personal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the two workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the two workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. On the track extending to the left are

two railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the two workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the two workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the two workmen. Next to you on this footbridge is a stranger who happens to be very large.

The only way to save the lives of the two workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the two workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the two workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the two workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the two workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the two workmen?

Yes

No

4) Moral scenarios with full text description and visual presentation of decision consequences with one versus two workmen

Trolley, personal involvement:

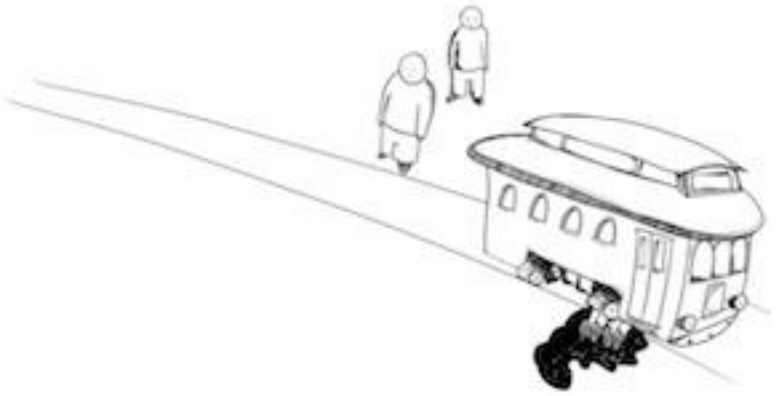
A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the two workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman. The two workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save two workmen (scene X)

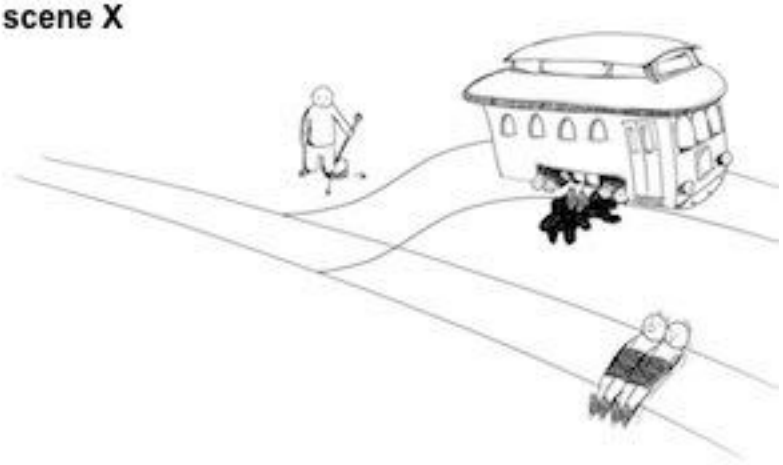
Sacrifice two workmen in order to save one workman (scene Y)

Trolley, impersonal involvement:

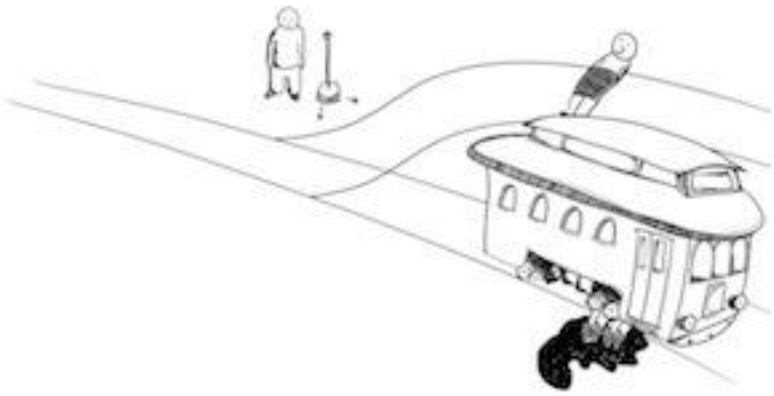
A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the two workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved (see **scene X**). The only way to save the life of the lone

workman is not to hit the switch near the track. The two workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save two workmen (scene X)

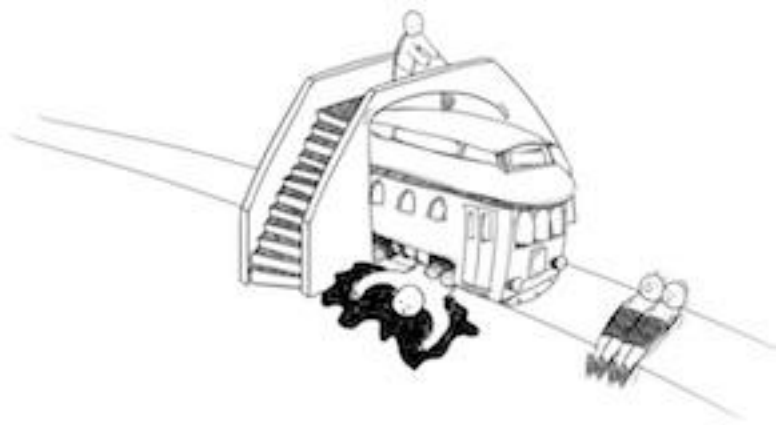
Sacrifice two workmen in order to save one workman (scene Y)

Footbridge, personal involvement:

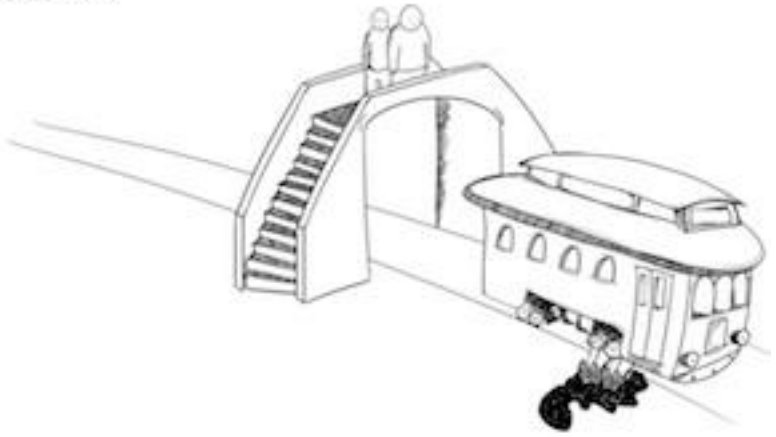
A runaway trolley is heading down the track toward two workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the two workmen. Next to you on this footbridge is a lone workman who happens to be very large.

The only way to save the lives of the two workmen is to push the lone workman off the bridge and onto the track below where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman off the bridge. The two workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



Scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save two workmen (scene X)

Sacrifice two workmen in order to save one workman (scene Y)

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward two workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the

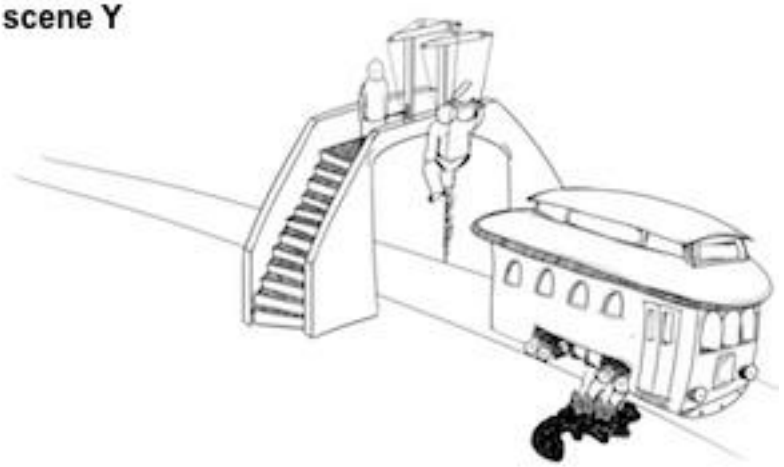
tracks between the approaching trolley and the two workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the two workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the two workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to hit the switch. The two workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save two workmen (scene X)

Sacrifice two workmen in order to save one workman (scene Y)

Experimental materials used in experiment 8

1) Moral scenarios with partial text description (taken from Greene, 2001) with humans:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are

five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the tracks below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

2) Moral scenarios with partial text description (taken from Greene, 2001) with animals (cats):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. A single cat in a transparent cage just happens to be near the track where you are standing. The only way to save the lives of the five cats is to push the single cat so that it falls onto the track, where the transparent cage will stop the trolley. The single cat will die if you do this, but the five cats will be saved.

Is it appropriate for you to push the cat on to the tracks in order to save the five other cats?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. On the track extending to the left are five cats. On the track extending to the right is a single cat. The only way to save the lives of the five cats is to hit a switch near the track that will

cause the trolley to proceed to the right, where the single cat in a transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five cats?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in in a transparent cage who happens to be there.

The only way to save the lives of the five cats is to push this single cat off the bridge and onto the track below where the in transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to push the single cat on to the track in order to save the other five cats?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in transparent cage who is hanging on a rope that help move the cats to the other side.

The only way to save the lives of the five cats is to hit a switch, causing the rope to lower the single cat onto the track below, where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five cats?

Yes

No

3) Moral scenarios with partial text description (taken from Greene, 2001) with inanimate objects (TVs):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. One TV just happens to be left by the workers who are moving furniture to the other side near the track, and you are there. The only way to save the five TVs is to push the single TV onto the track, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to push the single TV on to the tracks in order to save the other five TVs from being destroyed?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. On the track extending to the left are five TVs. On the track extending to the right is a single TV. The only way to save the five TVs is to hit a switch near the track that will cause the trolley to proceed to the right, where the single TV will stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to hit the switch in order to avoid the five TVs of being destroyed?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV, which happens to be left by the workers who are moving furniture to the other side near the track. The only way to save the five TVs is to push this one TV off the bridge and onto the tracks below where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to push the single TV on to the tracks in order to save the other five TVs?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV which is hanging on a rope that help move the TVs to the other side.

The only way to save the five TVs is to hit a switch, causing the rope to lower the single TV onto the track below, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to hit the switch in order to avoid the five TVs of being destroyed?

Yes

No

Experimental materials used in experiment 9

1) Moral scenarios with partial text description (taken from Greene, 2001) with humans:

Trolley, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there. The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are

five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five workmen. Next to you on this footbridge is a stranger who happens to be very large. The only way to save the lives of the five workmen is to push this stranger off the bridge and onto the track below where his large body will stop the trolley. The stranger will die if you do this, but the five workmen will be saved.

Is it appropriate for you to push the stranger on to the tracks in order to save the five workmen?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five workmen?

Yes

No

2) Moral scenarios with full text description and visual presentation of decision consequences with humans:

Trolley, personal involvement:

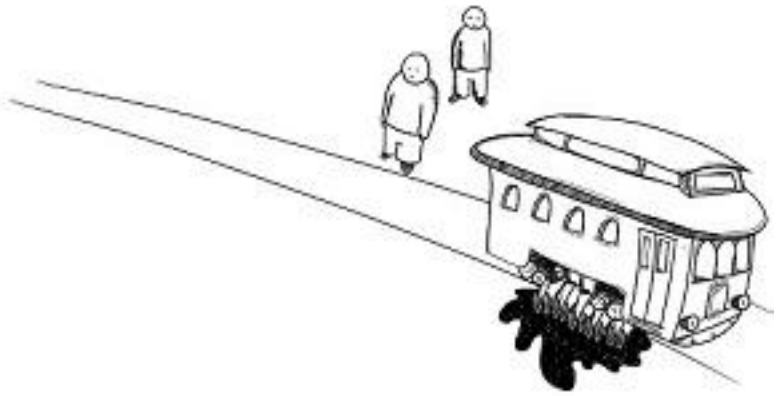
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. A lone workman just happens to be standing near the track, and you are there.

The only way to save the lives of the five workmen is to push the lone workman so that he falls onto the track, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

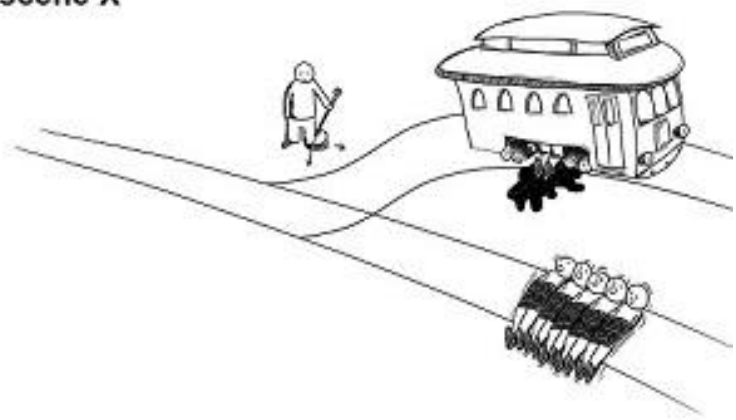
Sacrifice five workmen in order to save one workman (scene Y)

Trolley, impersonal involvement:

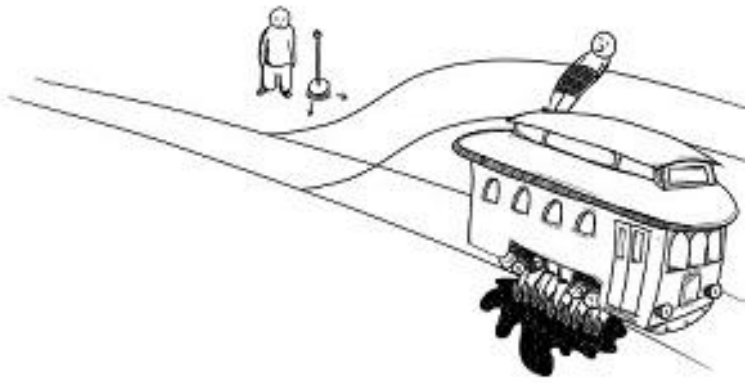
A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. On the track extending to the left are five railway workmen. On the track extending to the right is a lone railway workman. The only way to save the lives of the five workmen is to hit a switch near the track that will cause the trolley to proceed to the right, where the lone workman's large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone

workman is not to hit the switch near the track. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

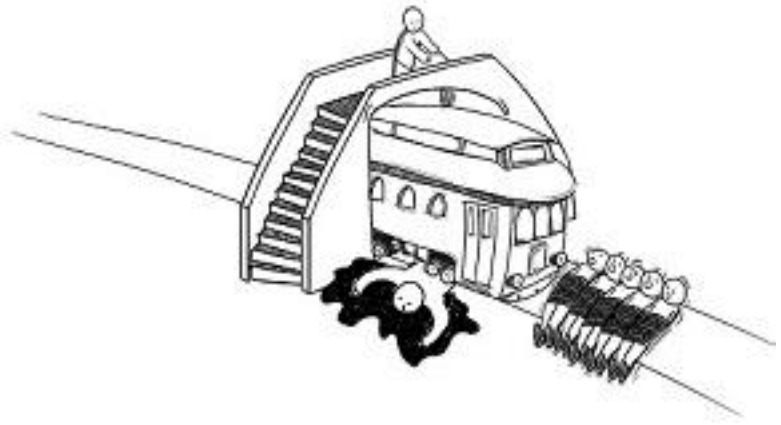
Sacrifice five workmen in order to save one workman (scene Y)

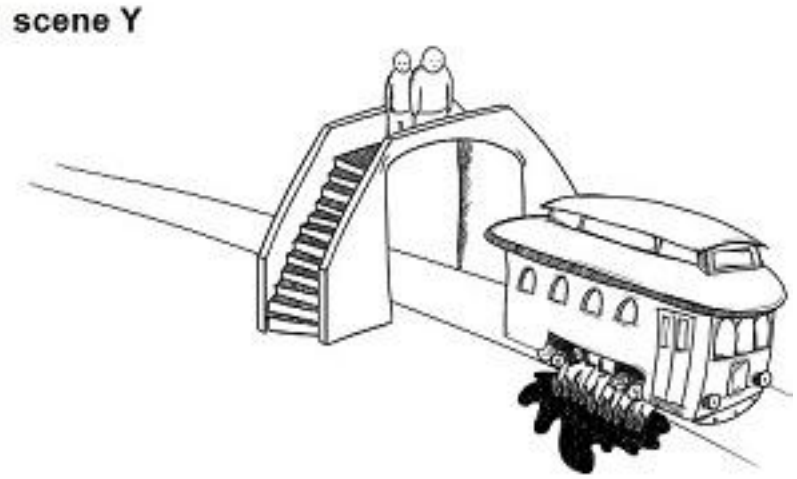
Footbridge, personal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who happens to be very large.

The only way to save the lives of the five workmen is to push the lone workman off the bridge and onto the track below where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to push this workman off the bridge. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X





Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

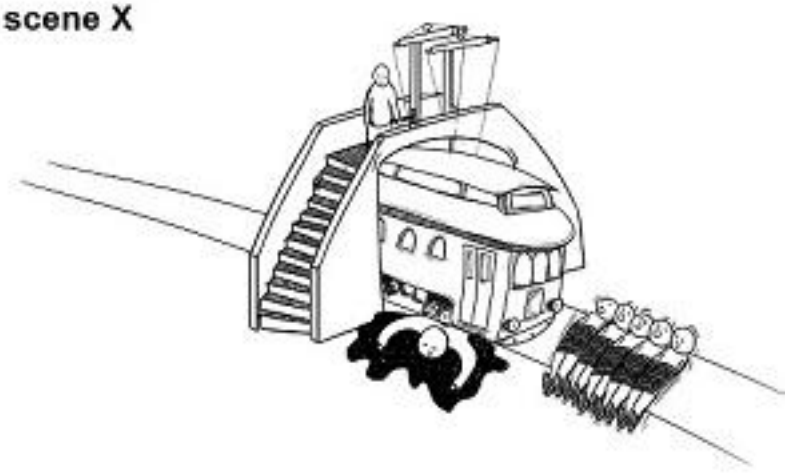
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five workmen who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five workmen. Next to you on this footbridge is a lone workman who is hanging on a rope, painting the bridge.

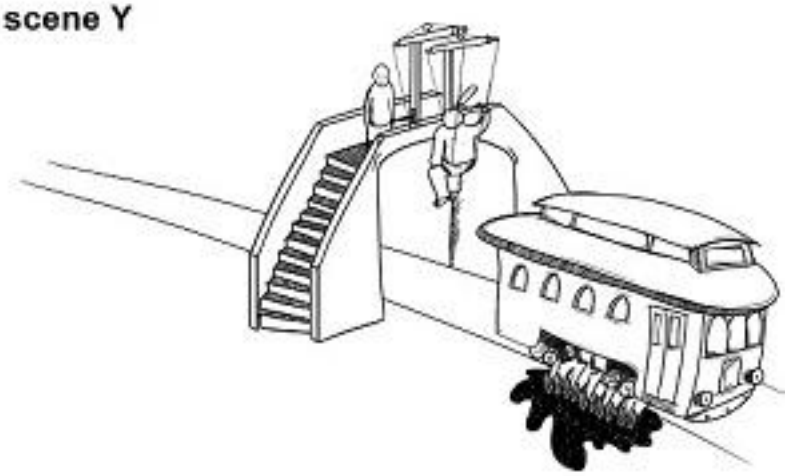
The only way to save the lives of the five workmen is to hit a switch, causing the rope to lower the lone workman onto the track below, where his large body will stop the trolley. The lone workman will die if you do this, but the five workmen will be saved (see **scene X**). The only way to save the life of the lone workman is not to

hit the switch. The five workmen will die if you do this, but the lone workman will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one workman in order to save five workmen (scene X)

Sacrifice five workmen in order to save one workman (scene Y)

3) Moral scenarios with partial text description (taken from Greene, 2001) with animals (cats):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. A single cat in a transparent cage just happens to be near the track where you are standing. The only way to save the lives of the five cats is to push the single cat, so that it falls onto the track, where the transparent cage will stop the trolley. The single cat will die if you do this, but the five cats will be saved.

Is it appropriate for you to push the cat on to the tracks in order to save the five other cats?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. On the track extending to the left are five cats. On the track extending to the right is a single cat. The only way to save the lives of the five cats is to hit a switch near the track that will

cause the trolley to proceed to the right, where the single cat in transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five cats?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in in transparent cage who happens to be there.

The only way to save the lives of the five cats is to push this single cat off the bridge and onto the track below where the in transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to push the single cat on to the tracks in order to save the other five cats?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in a transparent cage who is hanging on a rope that help move the cats to the other side.

The only way to save the lives of the five cats is to hit a switch, causing the rope to lower the single cat onto the track below, where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved.

Is it appropriate for you to hit the switch in order to avoid the deaths of the five cats?

Yes

No

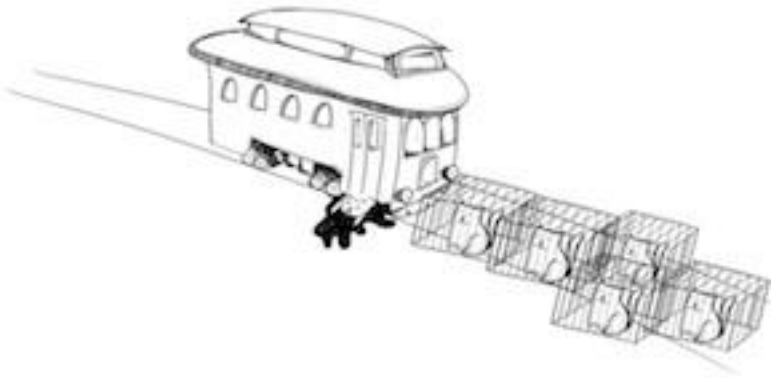
4) Moral scenarios with full text description and visual presentation of decision consequences with animals (cats):

Trolley, personal involvement:

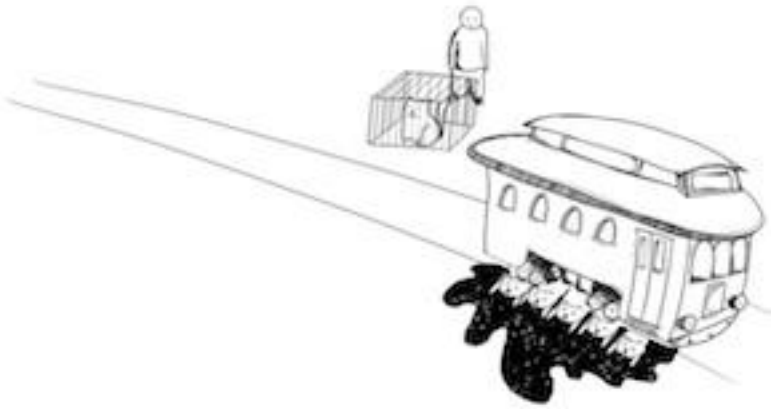
A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. A single cat just happens to be in transparent cage near the track, and you are there.

The only way to save the lives of the five cats is to push the single cat so that it falls onto the track, where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved (see **scene X**). The only way to save the life of the single cat is not to push this cat. The five cats will die if you do this, but the single cat will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one cat in order to save five cats (scene X)

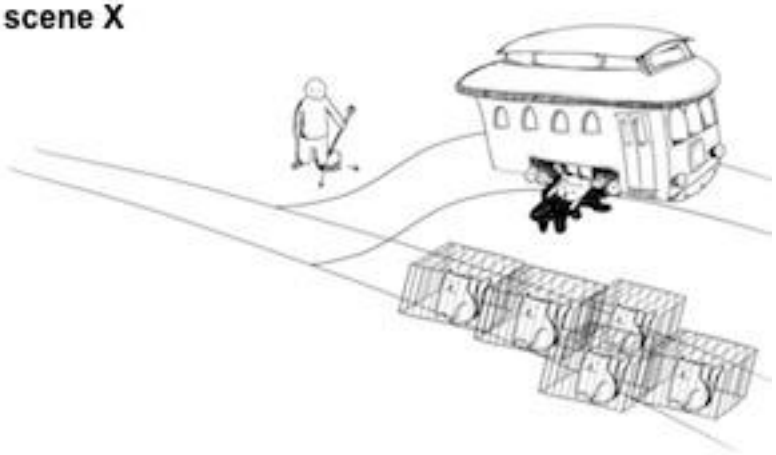
Sacrifice five cats in order to save one cat (scene Y)

Trolley, impersonal involvement:

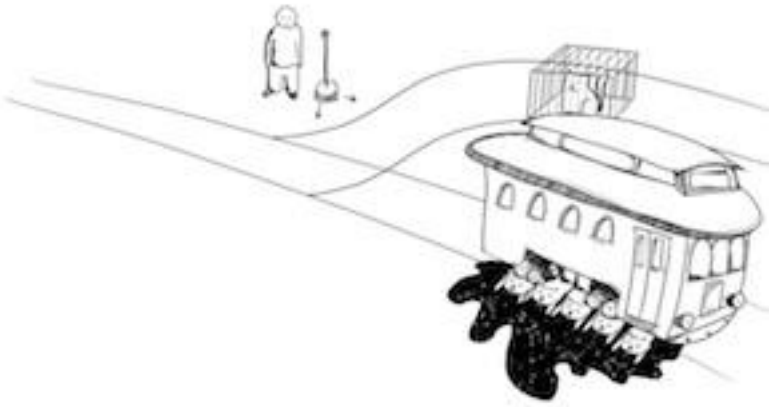
A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. On the track extending to the left are five cats. On the track extending to the right is a single cat. The only way to save the lives of the five cats is to hit a switch near the track that will cause the trolley to proceed to the right, where the single cat's transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved (see **scene X**). The only way to save the life of the single cat is not to hit the

switch near the track. The five cats will die if you do this, but the single cat will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one cat in order to save five cats (scene X)

Sacrifice five cats in order to save one cat (scene Y)

Footbridge, personal involvement:

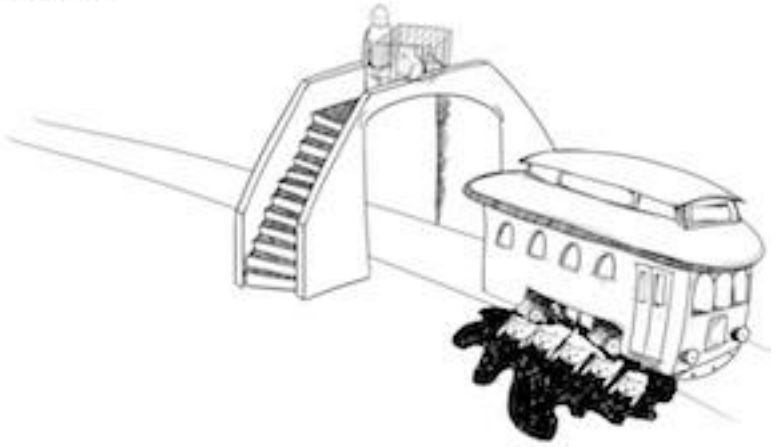
A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in a transparent cage.

The only way to save the lives of the five cats is to push the single cat off the bridge and onto the track below where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved (see **scene X**). The only way to save the life of the single cat is not to push this cat off the bridge. The five cats will die if you do this, but the single cat will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one cat in order to save five cats (scene X)

Sacrifice five cats in order to save one cat (scene Y)

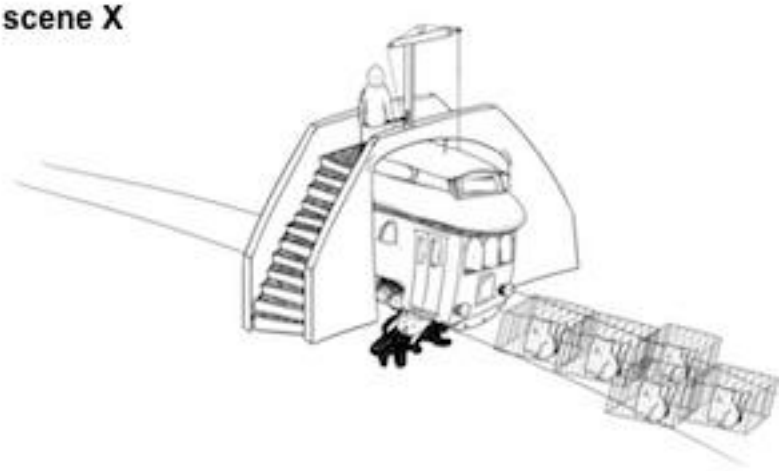
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five cats in transparent cages who will be killed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five cats. Next to you on this footbridge is a single cat in a transparent cage who is hanging on a rope that help move the cats to other side.

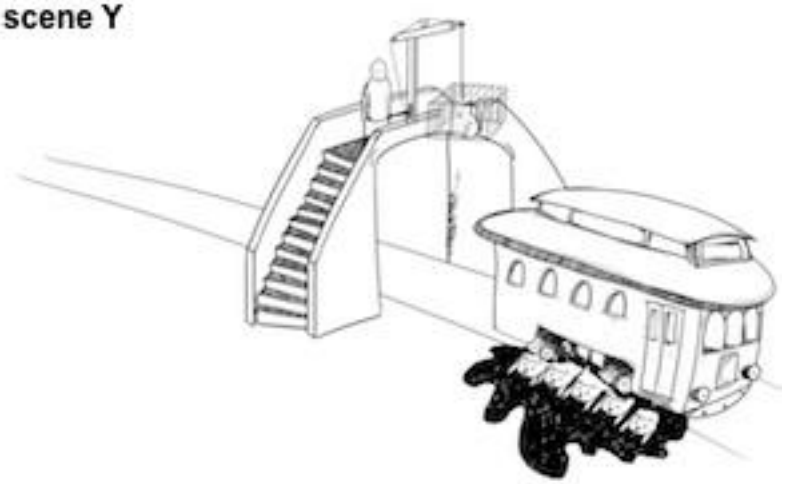
The only way to save the lives of the five cats is to hit a switch, causing the rope to lower the single cat onto the track below, where the transparent cage will stop the trolley. The single cat will die if you do this, but the other five cats will be saved (see **scene X**). The only way to save the life of the single cat is not to hit the switch. The

five cats will die if you do this, but the single cat will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one cat in order to save five cats (scene X)

Sacrifice five cats in order to save one cat (scene Y)

5) Moral scenarios with partial text description (taken from Greene, 2001) with inanimate objects (TVs):

Trolley, personal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. One TV just happens to be left by the workers who are moving furniture to the other side near the track, and you are there. The only way to save the five TVs is to push the single TV onto the track, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to push the single TV on to the tracks in order to save the other five TVs from being destroyed?

Yes

No

Trolley, impersonal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. On the track extending to the left are five TVs. On the track extending to the right is a single TV. The only way to save the five TV is to hit a switch near the track that will cause the trolley to proceed to the right, where the single TV will stop the trolley. The single TV will be destroyed if you do this, but the other five TV will be saved.

Is it appropriate for you to hit the switch in order to avoid the five TVs of being destroyed?

Yes

No

Footbridge, personal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley proceeds on its present course. You are on a footbridge over the tracks, in between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV, which happens to be left by the workers who are moving furniture to the other side near the track. The only way to save the five TVs is to push this one TV off the bridge and onto the track below where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to push the single TV on to the tracks in order to save the other five TVs?

Yes

No

Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV which is hanging on a rope that help move the TVs to the other side.

The only way to save the five TVs is to hit a switch, causing the rope to lower the single TV onto the track below, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved.

Is it appropriate for you to hit the switch in order to avoid the five TVs of being destroyed?

Yes

No

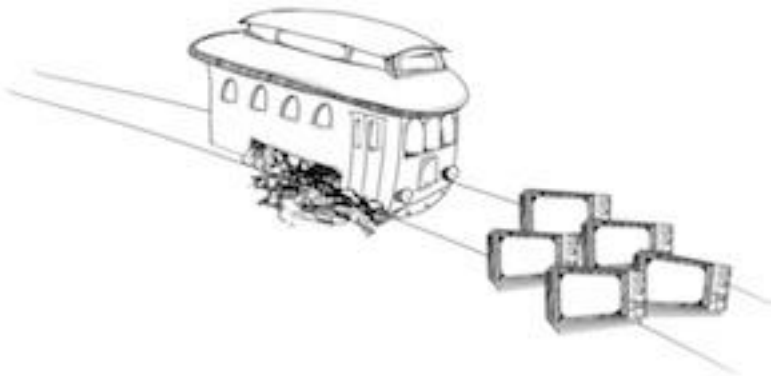
6) Moral scenarios with full text description and visual presentation of decision consequences with inanimate objects (TVs):

Trolley, personal involvement:

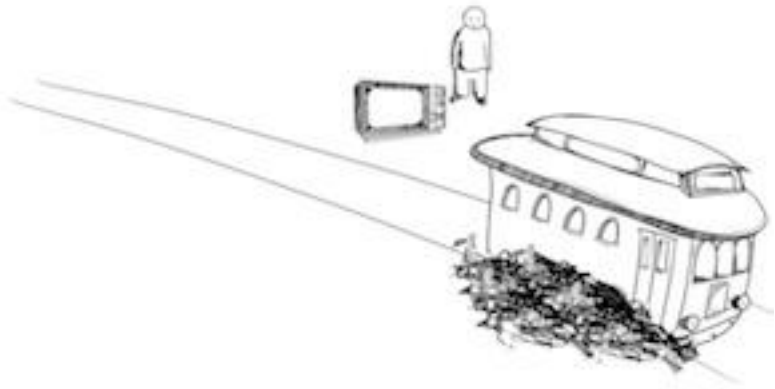
A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. One TV just happens to be left by the workers who are moving the furniture to the other side near track, and you are there.

The only way to save the five TVs is to push the single TV so that it falls onto the track, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved (see **scene X**). The only way to save the single TV is not to push this TV. The five TVs will be destroyed if you do this, but the single TV will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one TV in order to save five TVs (scene X)

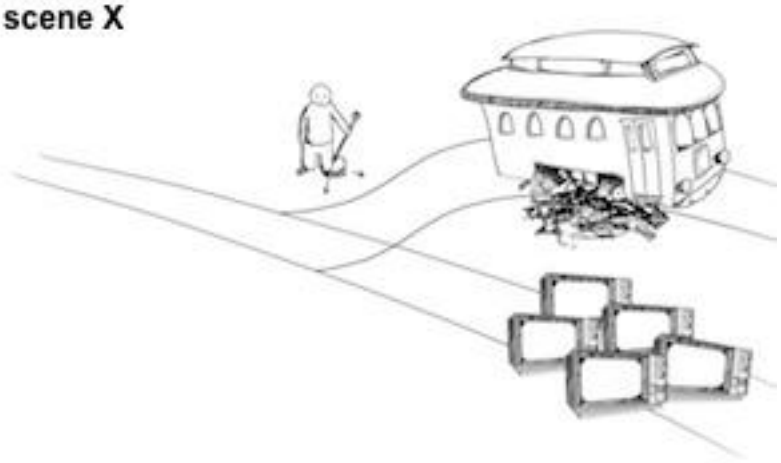
Sacrifice five TVs in order to save one TV (scene Y)

Trolley, impersonal involvement:

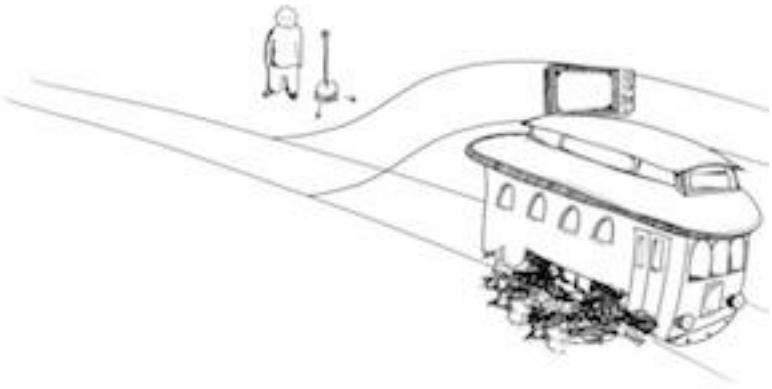
A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. On the track extending to the left are five TVs. On the track extending to the right is a single TV. The only way to save the five TVs is to hit a switch near the track that will cause the trolley to proceed to the right, where the single TV will stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved (see **scene X**). The only way to save the single TV is not to hit the switch near the track. The five TVs will be

destroyed if you do this, but the single TV will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one TV in order to save five TVs (scene X)

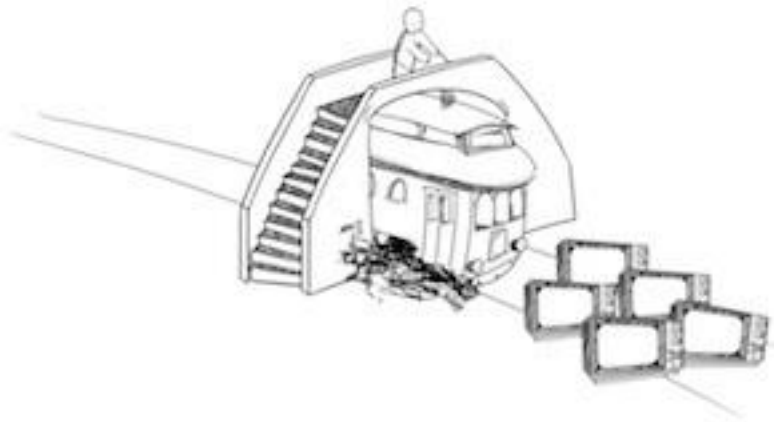
Sacrifice five TVs in order to save one TV (scene Y)

Footbridge, personal involvement:

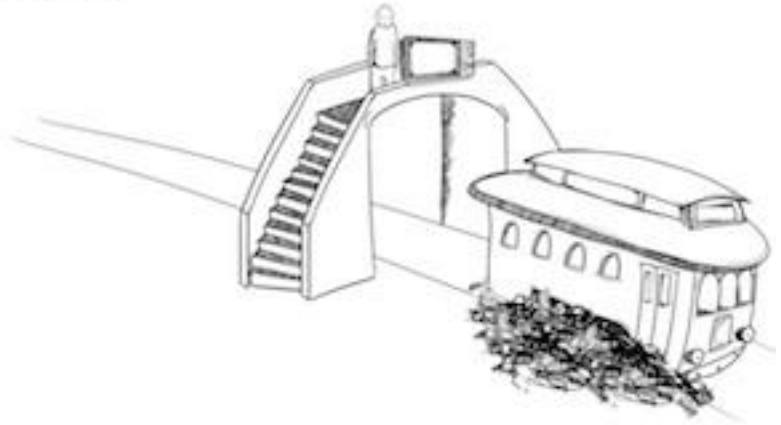
A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley proceeds on its present course. You are on a footbridge over the track, in between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV, which happens to be left by the workers who are moving furniture.

The only way to save the five TVs is to push the single TV off the bridge and onto the track below where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved (see **scene X**). The only way to save the single TV is not to push this TV off the bridge. The five TVs will be destroyed if you do this, but the single TV will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one TV in order to save five TVs (scene X)

Sacrifice five TVs in order to save one TV (scene Y)

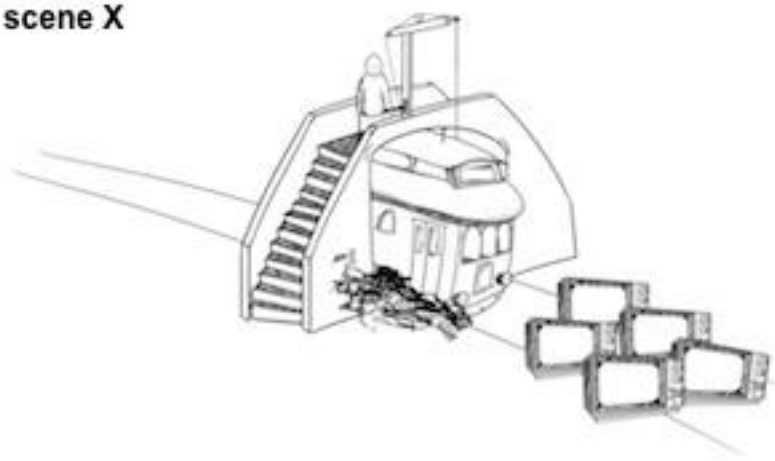
Footbridge, impersonal involvement:

A runaway trolley is heading down the track toward five TVs, which will be destroyed if the trolley remains on its present course. You are on a footbridge over the tracks between the approaching trolley and the five TVs. Next to you on this footbridge is a single TV which is hanging on a rope that help move the TVs to the other side.

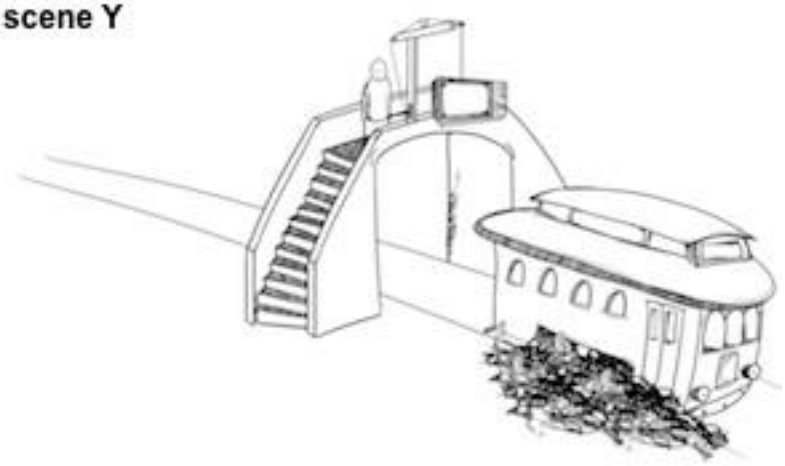
The only way to save the five TVs is to hit a switch, causing the rope to lower the single TV onto the track below, where it will collide with and stop the trolley. The single TV will be destroyed if you do this, but the other five TVs will be saved (see

scene X). The only way to save the single TV is not to hit the switch. The five TVs will be destroyed if you do this, but the single TV will be saved (see **scene Y**).

scene X



scene Y



Choose the option which is more appropriate for you:

Sacrifice one TV in order to save five TVs (scene X)

Sacrifice five TVs in order to save one TV (scene Y)