

How time, peer pressure, cognitive load, and emotional attachment influences affect people's decisions of moral dilemmas within Virtual Environments

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2 Abstract

Many studies which have attempted to research peoples moral decision-making process have been conducted in a hypothetical setting which recreates the famous “Trolley dilemma”. Recreating such problem in real life to study peoples moral decision-making process is unethical and dangerous due to the nature of the “Trolley dilemma”. Because of this real-life influence which could influence people’s decisions and would be present in real life presentations of the dilemma are left unstudied. The purpose of this study is to conduct research through design and develop a virtual reality experience called Embodied Trolley (VR) which would invoke people’s decision-making process. By recreating a virtual “Trolley dilemma” the project aims to simulate pressures present in real life in hopes to discover how they may influence people’s decision-making process in a virtual environment. Using thematic analysis, the study analysed participants reflections and opinions during Embodied Trolley (VR) experience which provided an insight to which simulated influences had affected participants choices most. It was found that the most significant influences which affect people’s decision during virtual “Trolley dilemma” recreations were **emotional attachment, social peer pressure and number of victims saved during the dilemmas**. This study provides extensive insight to how people consider these influences before they decide when faced with a dilemma in a virtual environment.

3 Introduction

For longest of times many philosophers such as Socrates, Plato, Aristotle, Jeremy Bentham, and Immanuel Kant provided society with several ethics philosophies which dictate how one should live a virtuous and moral life. While the mentioned theorist cultivated their ideas on morality and ethics quite some time away from ours, some even as far as two thousand years ago, the ideas proposed by them have left strong foundations which influence many people's moral decision making till this day.

According to Gordon [8] there are two main morality theories which people apply today, these are Deontology proposed by Immanuel Kant and Utilitarianism suggested by Jeremy Bentham. Both theories of Utilitarianism and Deontology have been explored within hypothetical moral dilemma scenarios of the “Trolley” and “Fat Man” problem. Nevertheless, most research of peoples' choices within moral dilemmas like the “Trolley Problem” are purely hypothetical since recreating such problem in real life has significant amount of danger present for all the persons participating in such recreations. This means influences which would be present within real-life presentations of moral dilemmas and could affect the Utilitarianism and Deontology approaches to “The Trolley” and “The Fat man” problems are not accounted for in the hypothetical scenarios. To study possible effects to people's decision-making process posed by influences of real-life circumstances research through design will carried out during this study. A virtual reality experience called Embodied Trolley (VR) will be developed which will recreate “The trolley problem” and several of its unstudied variations within an immersive virtual environment. To replicate real-life circumstances in a virtual world this experience will attempt to simulate four variables of **time pressure, cognitive load, emotional attachment, and social peer pressure**. The study will then gather participants to play and discuss the Embodied Trolley (VR) experience. Following this the project will carry out thematic analysis on participants discussions through which it aims to investigate the possible effects of real-life circumstances to Utilitarianism and Deontology like approaches when solving difficult moral dilemmas.

4 Literature review introduction

Within this literature review there will be research analysed and synthesized which discusses the origins of the “Trolley Problem” dilemma and its variations which will be recreated in this project. There will also be papers examined which did related research on the “Trolley” dilemma in virtual reality (VR). The literature review will display surveys of “Trolley problem” choices which will be used as base datasets for comparing the VR recreations to the ones that only have been explored on paper. Finally, journals discussing how to create immersive virtual environments and characters will be examined to understand how to recreate the dilemmas in a realistic way for future participants of the project testing.

4.1 Trolley Problem Origins

Before exploring the “Trolley problem” and its variations within virtual environments it is important to understand why it was created. The research where “The Trolley problem” appears for the first time was written by Foot [5] and goes by the name of “The Problem of Abortion and the Doctrine of the Double Effect”. During this thesis the researcher tries to explore a doctrine proposed by the Catholic church called “The Double Effect” which is often used to justify abortion cases by Catholics where an unborn child possess a risk to its mother’s life. In more detail, “The Double Effect” principle justifies an action that could cause foreseen but inadvertent consequences such as death to someone if this action intended a good effect. This displays that the “Double doctrine” is not only applicable to abortion cases but also in other situations as well. For example Foot [5] explains that the doctrine is often brought up in War and civilian death situations. If there is a targeted base for bombing in a civilian populated area the doctrine sometimes is used to justify the unforeseen civilian deaths since the target was the base and not the civilians. However, the doctrine has a second rule which states that the foreseen bad effect should not be used as means to reach the good effect. To display how this rule reflects on the doctrine Foot [5] created two dilemmas. One is infamous “The Trolley Problem” where there are two train tracks. On one of the tracks there are five workers that are unaware of a trolley with no breaks heading their way. On the other track there is only a single worker. You as a trolley driver can divert the trolley towards a single worker saving the other five workers. In contrast to the “Trolley Problem” the second dilemma

which is proposed by Foot [5] is the “Transplant Problem”. In this dilemma there is a doctor with five dying patients all in urgent need of transplants. Another healthy patient arrives to the doctor’s clinic with a minor injury. This give the doctor a choice to murder the healthy patient and use him for transplants to save the other five dying patients. When reflecting on the “Double Effect” doctrine during “The Trolley Dilemma” Foot [5] says its okay to sacrifice one person to save the other five since the single worker death is unintended consequences of the good effect. Nevertheless, in the “Transplant problem” [5] states that it would be immoral for the doctor to kill a healthy patient so he could save the other five dying patients. This is because the doctor would have to do the bad effect of killing someone first to reach the good effect which directly violates the second rule of the doctrine. This provides an interesting insight to the “Trolley” and “Transplant” dilemmas because according to Sokol [19] people tend choose the same responses as Foot [5] suggests in her research for both dilemmas. This displays that the reasoning proposed by the “Double effect” doctrine may have large influence on people’s moral decision making in the modern day when solving hypothetical dilemmas. By delving deeper into reasons why people prefer these outcomes it would be possible to better understand what unexpected real-life consequences may affect on people decision making within immersive virtual recreations of moral dilemmas.

4.2 First variation of the “Trolley Problem”

After the previous Foots [5] paper another researcher by the name of Thomson [22] took interest in the difference of choices when solving “The Trolley” and “Transplant” dilemmas. However, within her “The Trolley Problem” paper Thomson [22] proposes a different ethical problem to represent “Transplant” dilemma. This dilemma is “The Fat Man Problem” during which five people are trapped on a single track. There is a trolley heading towards five victims with no breaks. A bystander is on a bridge above the tracks and sees another man on the same bridge who is large enough to stop the trolley if pushed on to the tracks. Should the bystander push the fat man on the tracks to save the other five people? Thomson [22] argued that pushing the large man of the bridge is immoral because the action of toppling him off a bridge directly violates his rights. When reflecting on the original “trolley problem” Thomson [22] argued that the action of pulling the leaver is not infringing on anyone’s rights hence saving five workers instead of one is

moral. Even though Thomson has recently changed her reasoning about the original “Trolley Problem”, the distinction in her original paper between the two dilemmas is important to the project because it displays the importance of an action one may have to take when solving moral dilemmas. By studying the statistics of Sokol [19] research one can recognise that many people tend to choose to save the large man instead of the five workers as Thomson [22] suggested in her work. While this doesn’t display that people tend to use the reasoning proposed by the researcher when solving the dilemma, the overwhelming response of people choosing not to kill the “fat man” does correlate to a possible moral influence actions that may or may not violate some ones rights. By implementing actions which directly violate rights of fictional characters within virtual recreations of ethical dilemmas it would be possible to study if these actions will have a profound effect on people’s decision making when solving difficult moral problems.

4.3 Deontology and Utilitarianism in moral dilemmas

A concept which frequently comes up when exploring the “Trolley” dilemmas is the Deontology and Utilitarianism practical ethics. “What makes moral dilemma judgments ‘utilitarian’ or ‘deontological’?” is research conducted by Gawronski and Beer [7] which examines the discussed Foot [5] and Thomson [22] approaches to the “trolley problem” and how the two mentioned forms of ethics may affect ones decision making during difficult dilemmas. Before delving into ethical dilemmas Gawronski and Beer [7] in their article explain what is important for utilitarian’s and deontologists when making moral decisions. When a utilitarian is solving a moral dilemma, he will try to identify and choose the action which will result in most overall well-being. This displays that Utilitarian’s are more likely to be sensitive to the outcome of the dilemma rather than to the action one must take to reach the desired outcome. On the other hand, Deontologists are more concerned with the moral norms of an action rather than the outcome it produces. This means that a deontologist during a dilemma will choose the action which is right under rules that are considered as the norm within his social structure.

After describing both approaches of practical ethics Gawronski and Beer [7] explains how Utilitarianism and Deontology represents different choices during the “Trolley” and “Fat Man” dilemmas. For example, to not push the large man of the bridge during the “Fat man” dilemma or to not turn the switch during the “Trolley” problem is the deontological approach because the

action of not killing is a moral rule for a modern deontologist. On the other hand, letting five people live instead of one during the “Trolley problem” or pushing the large man of a bridge during the “Fat man” problem is Utilitarian because saving five people is a greater outcome than saving one which is what Utilitarianism stands for. Both outcomes are chosen when solving dilemmas however some approaches are more favored in certain dilemmas than others. For example, according to Di Nucci [15] most people choose the Utilitarian outcome of the original “Trolley” problem however during the “Fat Man” variation people most often choose the Deontology approach.

Nonetheless Gawronski and Beer [7] argue that while it is possible to identify which approach to dilemmas is Utilitarian or Deontological it is difficult to recognize if people choices are truly inspired by the two ethical theories during the dilemmas. For example, during the “Trolley” dilemma the person may be willing to sacrifices the one worker even if no lives are saved or a person might not push a large man of a bridge during the “Fat man” because they have a general preference for inaction. This shows that prescribing ethics of Utilitarianism or Deontology to some one’s response during dilemmas may be unjustified. The researchers believe this ambiguity arises from the lack of experimentation with critical determinants of both ethical theories. However Gawronski and Beer [7] display several studies that have done so. One of such studies was caried out by Trémolière and Bonnefon [24] where he used different “kill-save” ratios in dilemmas with additional effects of cognitive load and time pressure. It was found that people were more likely to choose the utilitarian response under high cognitive load and time pressure as seen in (Figure 1).

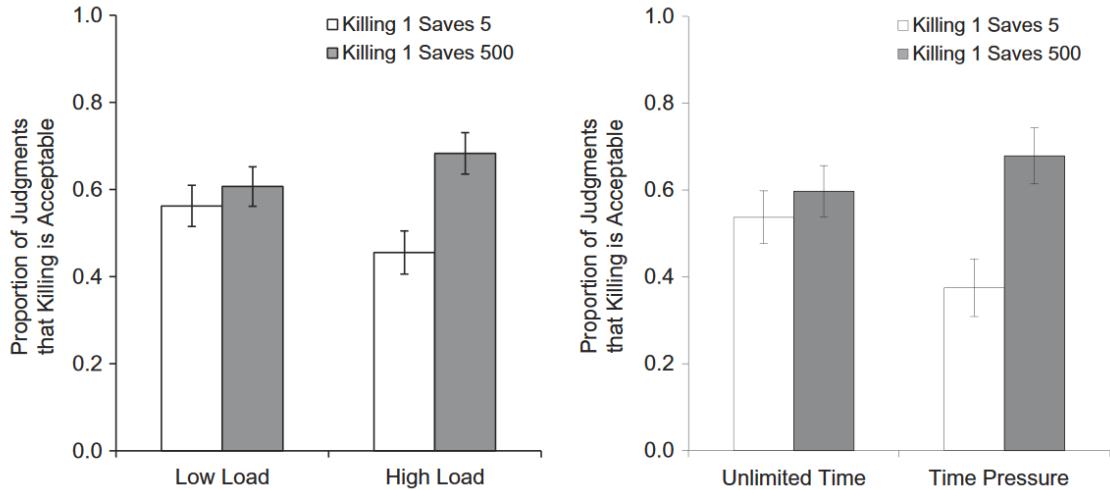


Figure 1. The results suggest that participants' judgments are sensitive to outcomes under cognitive load and time pressure, but not under control conditions with no load and no time pressure. From research of Gawronski and Beer. [7]

By exploring the research of Gawronski and Beer [7] it seems that it may be unsuitable to use Utilitarian and Deontology ethics as an explanation for people choices during difficult dilemmas such as the “Trolley Problem”. Nevertheless Gawronski and Beer [7] and Trémolière and Bonnefon [24] work also proves that manipulating critical determinants of Utilitarian or Deontology outcomes during virtual recreations of dilemmas have an impact on people decisions. This leaves an interesting notion the project could study where different virtual recreations of the “Trolley” dilemma are manipulating determinants of Utilitarian or Deontology outcomes by adding various pressures experienced in real life. For example, what if the Utilitarian who tries to solve the original trolley problem finds out that the single person on one of the tracks is his best friend, would he still choose a single person's death instead of five? What if a Deontologist finds out during the “Fat Man” problem that one of the five people on the track is his son, would he still choose not to push the large man of the bridge? What if a person knows that his actions are watched during the dilemma? Will the peer pressure be strong enough for him to push the large man on the tracks and save five the workers?

4.4 Preferred outcomes of the “Trolley problem”

To have a reference to what outcomes people mostly choose during both “The Trolley” and “The Fat Man” problem three large scale surveys were found which at times had asked over three thousand people about their choices during these dilemmas. These are Sokol [19], Di Nucci [15] surveys. After analysing all surveys it was found that most people preferred to save 5 victims in the original “Trolley problem” and not to sacrifice the large man in “The Fat Man dilemma”. Below you can see all three survey results summarised by Hendricks [10] in (Figure 2).

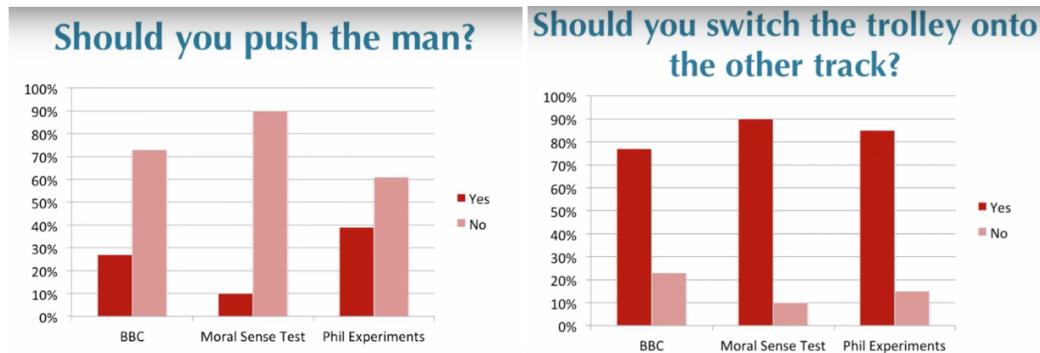


Figure 2. is displaying the comparison summed up by Hendricks (2015) between free surveys that gathered information about peoples preferred choice during “The Trolley” and “Fat Man” hypothetical dilemmas. [10]

This displays that people have similar choices during the hypothetical “Trolley” dilemma and its variations. With this information the project can recreate dilemmas with various simulated pressures that are more directed to sway the popular choices of the specific dilemmas. Additionally, these findings will serve as consistent dataset when comparing the projects data after the virtual reality experiments with each survey’s hypothetical dilemma statistics.

4.5 Thematic analysis and people reflections

Because this is a research through design study it was important have a method which would help to understand people’s thoughts and opinions on any design utilised through the study. To find one of such methods a study conducted by Flintham [4] was examined. By developing “The Corrupt Kitchen” virtual reality experience the researcher was able to observe

which decisions within a chaotic virtual restaurant kitchen are prioritised by participants when a time limit is present during the experience. Additional pressures were implemented such as verbal cues from customer characters, hygiene state of the kitchen getting worse over time, and the appearance of restaurant inspector. To analyse how these pressures affected people's choices during the experience Flintham [4] allowed participant to reflect on their choices at the end of the game by showing them the results of their actions and then conducted a semi-structured interview for each participant to reflect on the experience of the game. To study the qualitative data from the interviews the researcher used thematic analysis to see what themes were common between all participants. The common themes were interpreted by the researcher and used as an insight to participants decision making process during the experience. After analysing the works of Flintham [4] it was decided that the use of thematic analysis method was the most appropriate method to study decision-making process during the Embodied Trolley (VR) experience.

4.6 People emotional arousal during moral dilemmas

When researching information about the "Trolley problem" for the project it was important to see if there was any work done which had recreated the "Trolley problem" using virtual reality technology. Two of such works have been found. "Virtual Morality: Emotion and Action in a Simulated Three-Dimensional "Trolley Problem"" is one of such research's written by Navarrete, McDonald and L Mott [14]. This study tries to explore people's emotions when making action during the original "Trolley Problem" within a virtual reality world. During their analysis researchers tried to see how many people would choose the Utilitarian outcome when placed with in a Virtually Reality simulated level of the "Trolley" dilemma. Additionally, they analysed how strongly their emotions would be affected by their choice. They did this by recreating the "Trolley Problem" with the use of nVisor SX VR headset and made two versions of the dilemma, one where participants had to pull the switch to save five people and one where they had to pull the switch if they wanted to save one person. They observed participants emotion arousal using electrodes and found that people felt highest emotion when their desired outcome required action. Additionally, they found that over 90 percent of people mostly choose the utilitarian outcome of the dilemma while being in the Virtual environment.

This is useful information for the project because it can be used to recreate virtual dilemmas where participants emotions are more likely to be heightened. By creating virtual dilemmas where the popular hypothetical outcome requires action the project could examine if a person heightened emotional state will have impact on his decision-making process. The aspect of heightened emotional state during virtual dilemmas could also be further explored by adding various pressure effects such as cognitive load, time pressure or social pressure. By doing so it would be possible to examine if heightened emotions during virtual “Trolley” dilemmas will have a significant impact on people’s decisions. (Figure 3) displays the results of emotional arousal and people choices during virtual recreations of the dilemmas.

Figure 3. the results of Navarrete, McDonald and L Mott, 2011 research[14].

Descriptive Statistics for Autonomic Arousal by Phase, Trial, and Condition

Phase	Trial	Condition					
		Action			Omission		
		<i>M</i>	<i>SD</i>	<i>N</i>	<i>M</i>	<i>SD</i>	<i>N</i>
Habituation	1	0.16	0.64	159	0.08	0.61	131
	2	-0.11	0.55	142	-0.06	0.54	145
	3	-0.13	0.61	150	-0.17	0.54	141
	4	-0.16	0.64	127	-0.10	0.54	163
Experimental	1	0.21	0.69	147	0.00	0.63	146
	1	0.55	0.69	153	0.46	0.65	139
Postexperimental	2	0.34	0.63	143	0.29	0.61	146
	3	0.21	0.63	137	0.27	0.74	148

*Table 2
Count for Utilitarian Outcomes by Phase, Trial, and Condition*

Phase	Trial	Condition					
		Action		Omission		Yes	No
		Yes	No	Yes	No		
Experimental	1	133	14	129	17		
	1	140	12	124	14		
Postexperimental	2	134	8	139	7		
	3	123	14	136	11		

Note. The yes/no columns refer to counts of participants choosing a utilitarian outcome (yes) versus not (no).

4.7 Virtual Reality immersion and “The Trolley Problem”

Another recent research which recreated “Trolley Problem” in VR was conducted by Smith [18] and is called “Ethical Behaviour and Moral Decision

Making within Virtual Worlds". This research aimed to test if the immersion of Virtual Reality would affect people's decision making when dealing with the different versions of "The Trolley Problem". To test this the researcher recreated the original and other additional versions of "The Trolley" and "The Fat Man" problem. For example, one of his versions took the original "Trolley problem" approach but instead of having the typical victim arrangement on each track the researcher decided to have equal amounts of males on one track and females on the other. Another variation included similar arrangement but this time humans where pitted against animals.

Another interesting aspect of Smith [18] research was his use of Linds' Moral Competence Test (MCT) and Moral Foundations Questionnaire (MFQ). As described by the researcher MCT assesses moral competence by presenting participants with two moral dilemmas where the decision is already made. People are then giving six arguments that support the outcomes of the stories and six that don't. The participants then rate the arguments from -4 to 4 points which is then collected to a single value called "C-score". Smith [18] used MCT to asses' participants moral competency both before his experiments and after.

The Moral Foundations Questionnaire (MFQ) as explained by Smith [18] is another measure which was initially designed to discuss virtues that are used for exploration of various cultures morality. The questioner helps to gain an insight to a person's individual moral foundations and their moral decision-making process. Before starting the experiments in his research Smith [18] used the MFQ to gain insight to his participants moral foundations.

After the study it was found that immersion of VR could impact individual's moral decision making but the extent varied from person to person. It was also found that during "The Fat Man" problem females were more likely to utilise the Deontological outcome (saving the fat man instead of five people) than males. During the variations where humans were pitted against animals almost everyone showed preference for saving humans rather than animals.

Additionally, the writer added that the preferred Utilitarian outcome to "The Trolley Problem" and common Deontology outcome to the "Fat Man" problem didn't change much from the hypothetical studies of the scenarios. These outcomes were noticed regardless of the victim's gender in both original and other variations. The researcher explains that this could be due to a moral disengagement which makes people aware that the dilemma situation

isn't real and is just simulated. This is worth thinking about when designing virtual recreations of the moral dilemmas for the project because people might engage with them in a non-realistic sense due to moral disengagement.

By examining the results of Smith [18] study it is unclear how much impact immersion of VR world can have on the decision making of people. This paper displays that immersion of VR alone might not be enough to impact people's decision-making process. However, this research also displays several tools such as MFQ or MCT which could be used in the project to gather quantifiable data about people's moral decision making if adapted correctly.

4.8 Moral Disengagement in Virtual Worlds

After analyzing Smiths [18] research it was clear that moral disengagement may be a factor that could strongly influence the project experiment results. To understand how to control or at least minimize moral disengagement within virtual environments "It's Okay to Shoot a Character: Moral Disengagement in Violent Video Games" research by Hartmann and Vorderer [9] was analysed. Within their study researchers tried to see what makes virtual violence enjoyable rather than aversive by letting people kill various characters in two types of first-person shooter video games. The first game didn't have a story, the participants of the test where thrust into the game world without knowing why some characters were killing other civilian characters. In the second game the participants where familiarized with the situation of the game and where told about the intentions of the bad characters. Participants got to play both games and their actions where recorded during each play. During their research Hartmann and Vorderer [9] observed that the participants felt more guilt when the characters were human and had no immoral bad doing according to the game. Additionally, they found that participants less familiar with the games generally felt more guilt and negative effects which points to weaker influence of Moral disengagement. When the participants were familiarized to the premise of the game level and why some characters where attacking civilian characters, they felt less guilty when killing the bad characters of the game. This means if the project recreations of the trolley dilemma are less predictable and the premise of the dilemmas is explained minimally, participants choices during the tests may be more influenced by the real-life pressures and the project test results may be more accurate.

4.9 Moral development

Since the people who most likely are going to be tested in the project are going to be young or mature adults it is important to understand how moral choices may be made at different ages. Lawrence Kohlberg according to McLeod [13] was a well known psychologist and had interest in developmental psychology and moral development. One of his achievements was the development of “Heinz dilemma” which aided his discovery of 6 different stages of moral development. There are two specific moral stages of interest for this project discovered by Kohlberg. These are stage four and five. According to McLeod [13] people at stage four try to uphold social group values and law. Additionally, people at this stage are mostly teenagers and young adults. People who are at stage five are aware that rules and law exists for good purposes, but they also understand that laws are imperfect and sometimes they go against good interest of individuals. According to McLeod [13] stage five is mostly observed in middle aged adults. This research is important to the project because it shows that specific age groups may have a more unified or separate choices during the recreated virtual dilemmas. For example, older adults age group may have more varied responses to the virtual representations of dilemmas due to them knowing that laws are not always perfect. A more unified response may be observed in young adults age group because according to McLeod [13] people at stage four who mostly are young adults tend to uphold their social group values. The unified response of young adults might be even more amplified if a multiplayer is implemented to the experiments of the project because young adults may be more prone to societal peer pressure than older adults.

5 Virtual Reality Experience Design

To study how people make moral decisions and how their decisions are influenced by various factors a virtual environment was needed which would provoke people's decision-making process. After analysing the work of Foot [5] the frequent occurrence of her developed "Trolley Dilemma" in modern research of normative ethics was an important factor which led to the decision of recreating the "Trolley Dilemma" within a virtual environment. By analysing the works of Smith [18] and Navarrete, McDonald and L Mott, [14] the idea of recreating the "Trolley Dilemma" within a virtual environment was reinforced since both of the studies had recreated the "Trolley Dilemma" using virtual reality technology to study if immersion and action within the virtual environment would influence people's decision-making process. By creating a VR version of this problem and gathering a level of responses from people about the experience we make a continuation to research of the "Trolley Dilemma" as suggested by Thomson [22].

The Embodied Trolley (VR) is a multiplayer, room-scale, virtual reality experience which recreates the "Trolley Dilemma" and its several other variations. Within the experience the players get to choose the outcome of each variation of the dilemma and get to see the consequences of their choices. After each variation players get to see information about each other's choices which includes how many times a choice was made, the outcome of their final choice and the time of their final choice.

To play the experience, two participants need to use the Oculus Quest 2 headset with an internet connection. Once the experience is running the participants appear in a "Training" level. In this level the participants learn how to interact with common objects within the experience such as levers, keypads and picking up objects. Once the two players are ready both need to pull a "Player Ready" lever which starts the main part of the experience. After doing so both players get transported to the "Discussion" level of the experience. Here both players will be able to see each other's avatars for the first time and activate a video by using a "Start Video" lever. Once the video is activated a "Villain" character appears on a screen within the level. This character explains to players that they were chosen and kidnaped to be a part of his "Trolley Dilemma" tests and continues to explain the first variation in which participants will be involved. After the video ends the participants are given a five second countdown after which the first variation (Original Trolley Dilemma) is loaded. When the level is loaded each partic-

ipant finds themselves in a valley on a platform between two train tracks. On first track there are five generic “stick-man” characters that are having a dance party and are unaware of a train engine heading their way. On the second track there is a single “Stick-man” character also unaware of the train. Here participant can make a choice to divert the train engine to the second track with the use of a lever. This will save the five “stick-man” characters but will kill the single “stick-man”. Otherwise, the participants can choose to do nothing and let five “stick-man” characters perish. Once the train reaches the track intersection participants are no longer allowed to use the lever. Depending on which track the train engine is heading the according “stick-man” character/s will start screaming and running from the engine until eventually they get hit resulting in a low-poly blood explosion. After participants get to see the consequence they are thrusted back into the same “Discussion” level only this time they can see the details about each other’s choices and are encouraged to discuss them. When they are ready, they can continue to the following variation by pulling the same “Start Video” lever.

5.1 Graphics of the experience

When developing the Embodied Trolley (VR), graphics of the experience were thought to be a large factor influencing the immersion of the game. According to Pesko [16] game visuals are one of the main things that pull people into the game world. This means if graphics of the game are randomly chosen the immersion of the experience would be week and participants may be more affected by moral disengagement making the results of the study less credible.

Martin [12] and Flintham [4] explains that for graphics to be immersive they don’t need to be photorealistic. The researchers add that there are many video games that have unique or animated style graphics that are more immersive than games with “Realistic” graphics. The important thing to watch out for are inconsistencies between graphics and glitches such as two objects clipping one another. According to the researchers such things tend to snap back players to reality quicker as they notice strange phenomena happening within the game.

Finally, there is also the argument of graphics being too gruesome. The aim of this study is to allow people to explore the dilemma and photorealistic graphics might have to strong of an impact on people mentally. To have graphics which are not too spine-chilling an example was taken from older

stick man fighting games such as Landfall West [27]. By following such approach stick man like graphics will help to create a virtual environment which can recreate violence and still be palatable.

Due to this reasoning, it was decided that the experience will use low-polygon mesh models and pastel colours. Since low-polygon models are low in detail and there are many of them, they are easy to match with each other which makes the overall aesthetic of the experience consistent. Additionally, low-polygon models will provide faster performance to the experience on VR systems such as Oculus 2. Pastel colours will be used to create a unique look for the game which will provide a professional finish to the experience (Figure 4).

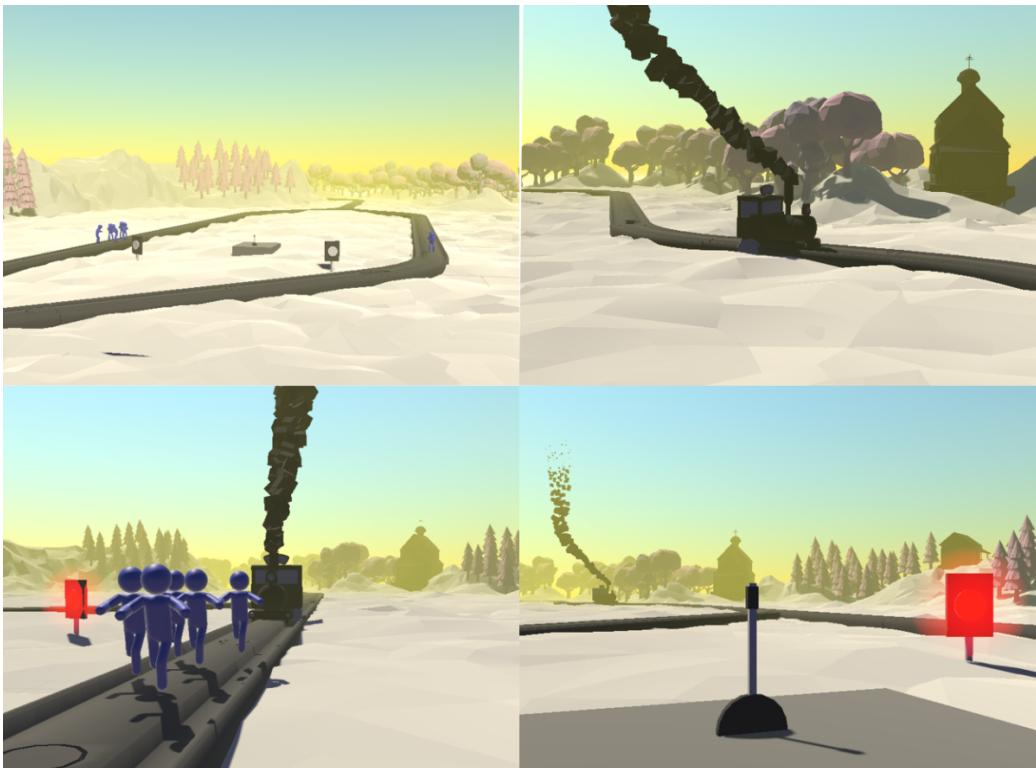


Figure 4. Shows the overall graphical design of the experience.

5.2 Characters

There are several characters in the experience that play important roles and could have impact on people's immersion of the experience.

The first type of characters participants will encounter are victim characters. These characters are represented by “Stick-Man” models which were chosen to fit the low-polygon graphics of the game (Figure 5).

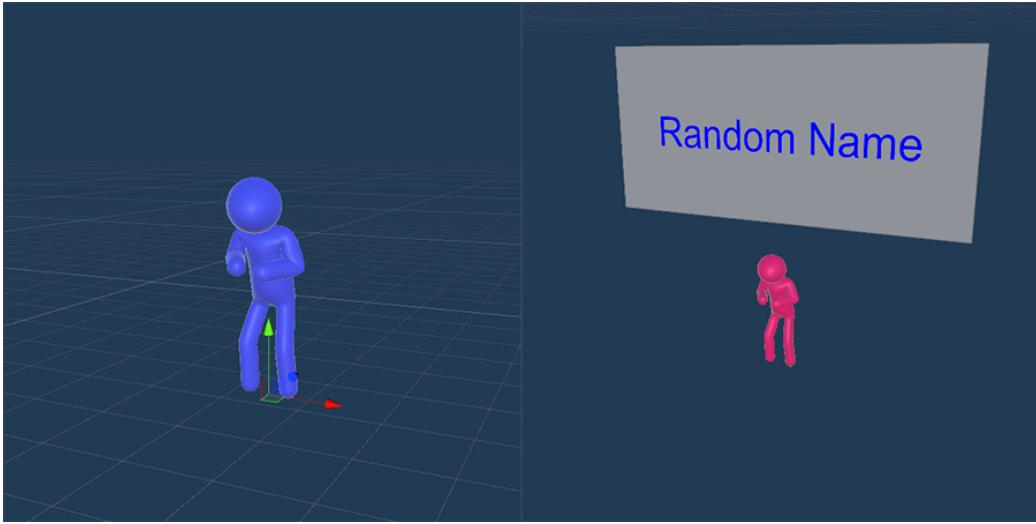


Figure 5. Shows “Stick-Man” victims. The unknown victim is on the left and the “Loved One” is on the right.

There are two versions of the victim characters. The first version represents an “Unknown” victim and is coloured blue. The second version represents a participant “Loved One” and is in colour pink. There is also a panel floating above the “Loved One” victim which displays “Your Loved One” text to participants (Figure 5). Initially there was an idea to ask the participants for several names of people they care about in real life. These names would have been displayed on the panels of the “Loved One” character during the experience. By doing so it was thought to create a stronger emotional attachment to the character, however this would have created ethical barriers for the study which would be difficult to overcome in a short amount of time. Because of this reasoning it was thought to be more practical to not ask for such information from participants. Additionally, it was thought that by asking such question participants may understand what will happen in the experience. By having panels which display “Your Loved One” message on the top of the character the study hopes that the participants will mentally envision their loved person in the place of this character.

Another victim character which appears only once during the experience is the “Large Man” victim (Figure 6). This character is exclusively used in

in the “Fat Man Dilemma” where the character can be pushed off a platform to stop a train and save five people. The large size of the model was chosen to convey the possibility of the “Large Man’s” body being able to stop the incoming train. This character is in colour blue since like the “Unknown” victims it has no relation to the participants.



Figure 6. Shows “Large Man” victim on the platform during the ”Fat Man” variation.

The final character which participants encounter is the “Villain” (Figure 7). According to Martin [12] strong characters with good writing and voice

acting can have a strong positive impact on player immersion during the game. Using professional voice acting and distorted web camera videos the “Villain” character was created to explain the premise and each dilemma of the experience. This character only appears in video form during the “Discussion” level once participants activate the “Start Video” lever. To enhance immersion through voice acting a professional voice actor by the name of Trev Neo was engaged to help the lines and record the voice of “Villain” character.

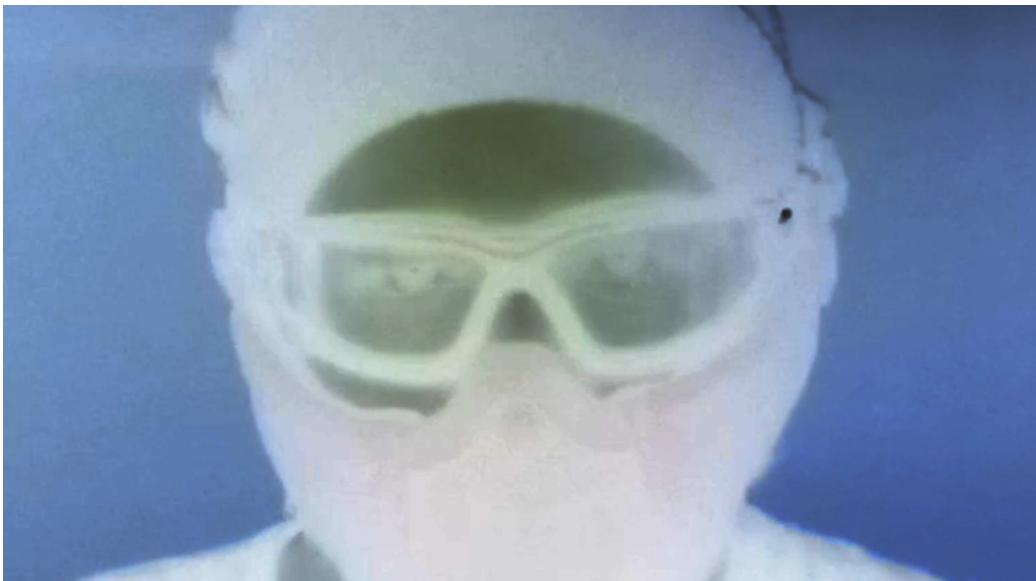


Figure 7. Shows “Villain” character of the experience.

5.3 Discussion level

The discussion level was designed after analysing Flinthams [4] work. It was thought to be important to allow participants of the study have a debrief level in which could think, reflect, and then discuss their decisions made in each variation of the “Trolley dilemma”. These discussions could then be recorded and used as qualitative data providing insight to people’s decision-making process. To encourage participants to have discussions the level has two objects which are “Discussion board” and “Outcome board” (Figure 8).



Figure 8. Shows “Outcome board” on the left and the “Discussion board” on the right which participants can use to discuss during the “Discussion” level.

The “Outcome Board” displays three attributes made in the previous variation. First one is time it took to make their final choice. The second one is how many times the train was redirected. The last attribute showed the outcome of the variation. The “Discussion board” displayed three questions which participants could use to drive discussions between each other (Table 1). The final object in the level is the “Start Lever” which participants use to get instructions about the following variation and then progress to it.

1. What was your decision? Do you think your decision is justified? If so, what justification would you give? Do you agree with the other participants decision?
2. What factor/factors had impacted your decision, which of these factors had the strongest impact?
3. Would you change your choice during this variation if anything was different? If so, please tell how the situation would have to be different for you to change your mind.

Table 1. This shows the questions on the “Discussion Board” object within the “Discussion” Level.

5.4 Experience Variations

Earlier research which has recreated the “Trolley dilemma” in virtual reality had developed several variations of it to study how people choose when different factors of the dilemma are changed. For example, Smith [18] study has created variations of the “Trolley” and “Fat Man” dilemma where different genders and numbers of characters are used. By doing so he was able to find if people had a preference to a specific gender and number of victims when making a choice during virtual recreations of the dilemmas.

Fallowing such example, it was decided that to study how people make decisions under different influences several variations of the “Trolley Dilemma” needed to be created. In this part of the paper each of the chosen and developed variations for the Embodied Trolley (VR) experience will be described. The explanations will include the influences and pressures each specific variation attempted to simulate. Also, the reasoning behind the order of each variation within the experience will be explained.

It is important to note that there aren’t many studies which recreated the “Trolley dilemma” with a multiplayer capability. To do so the variations developed for the experience will allow two players to play the experience simultaneously. This will enhance the discussions aspect of the experience and will display how interactions between two people may influence people’s decision-making process.

5.4.1 “Original Trolley” Variation

The first recreation which is loaded for the participants to play in the experience is the Thomson [22] developed variant on the original “Trolley Dilemma” created by Foot [5] (Figure 9). Since all other variations of the “Trolley dilemma” stem from this exact variant it made sense to place this as the first variation.

During this variation there are two tracks. On the first track there are five unknown victims which are going to be hit by the train if nothing is done. The second track only has a single victim. Participants can choose to redirect the train and save the five victims by using the lever on their platform. If they choose to redirect the train this will result in the death of a single victim on the second track instead.

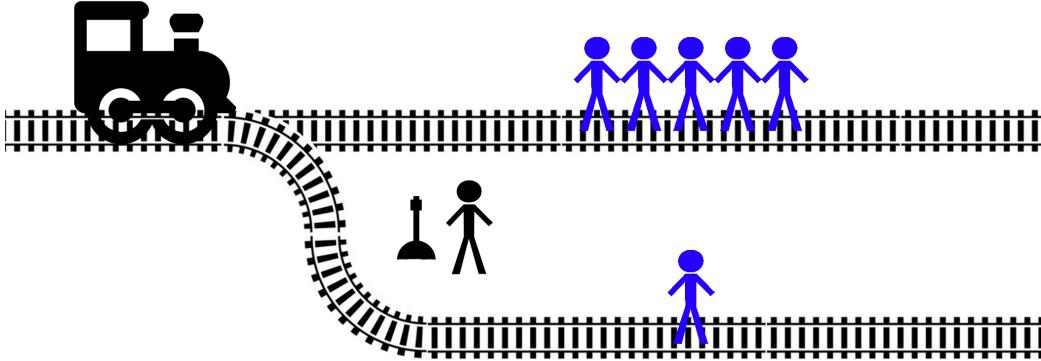


Figure 9. Shows the layout of the first variation.

This variation attempts to simulate time pressure to the participants which creates the main difference between the classical thought experiment of the “Trolley Dilemma”. Both participants get 30 seconds to make their decision. This pressure is created by the incoming train sound which gets progressively louder the closer the train is to the participant. Once the train is close enough participants will be able to see the smoke from the train coming over the hills of the valley. Finally, the participants will be able to see the train fully progressing towards the track intersection once the train enters the valley. After train crosses the intersection participants get to see the consequences of their choice.

Each participant will be playing this variation separately and won't be able to see each other. The choices will be only revealed to both participants once the variation ends and players are loaded back to the “Discussion” level.

5.4.2 “Cognitive Load” Variation

After researching the work of Trémolière and Bonnefon [24] it was noticed that significant cognitive load during difficult problems can have impact on people's moral decision making. According to Trémolière and Bonnefon [24] findings if a significant cognitive load and time pressure is applied during a dilemma people are more likely to choose the Utilitarian response of the

problem. To try and replicate the researcher's findings and understand the reasoning behind such choices it was decided that the second variation of the experience should include a cognitive load influence.

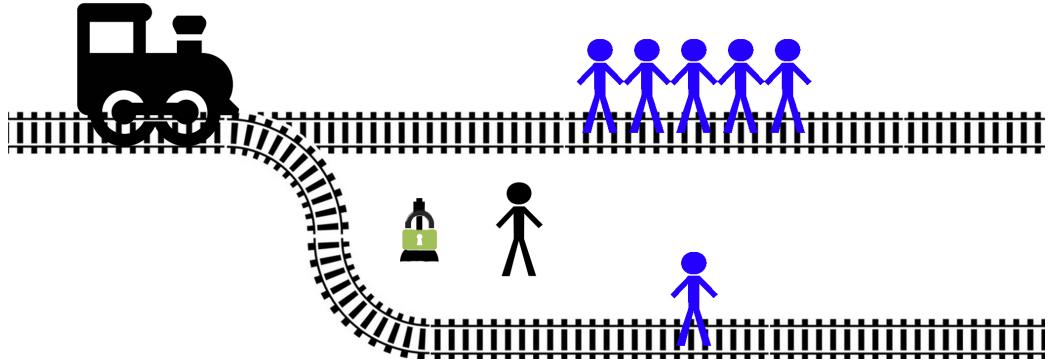


Figure 10. Shows the layout of the second variation.

This variation doesn't differ from the layout of the original "Trolley dilemma" (Figure 10). This was deliberately chosen to see if the participants will react differently to the same dilemma when a cognitive load is applied. To create the cognitive load this time the lever which can redirect the train is encased in a cage. To open the cage and use the lever participants need to solve a maths problem displayed on a board standing next to them (Figure 11). The participants can enter the answer of the problem into a keypad standing next to the cage (Figure 11). If the answer is correct the cage will break, and participants will be able to use the lever if the train still hasn't reached the track intersection.

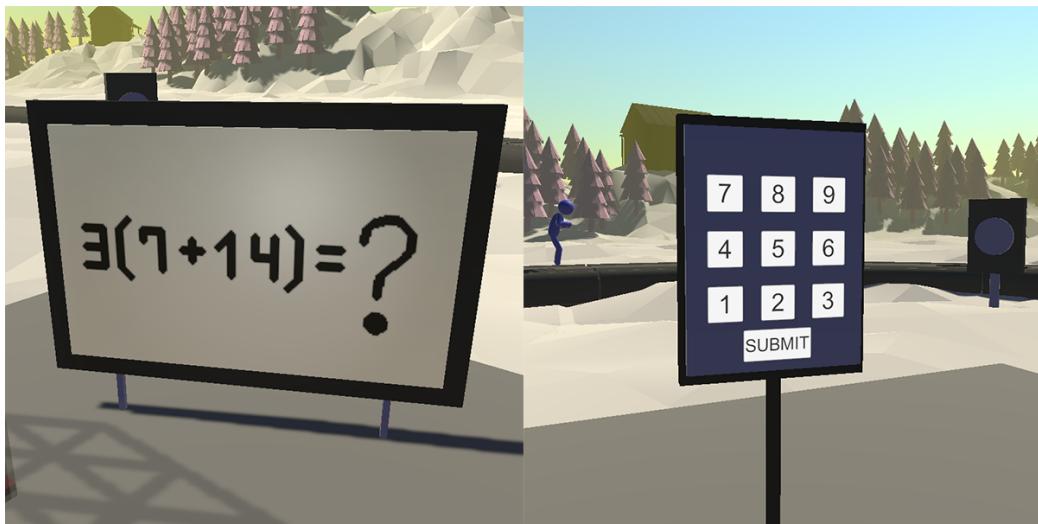


Figure 11. Shows the cognitive load math problem on the left and keypad which is used for the answer of the problem on the right.

5.4.3 “Fat Man” Variation

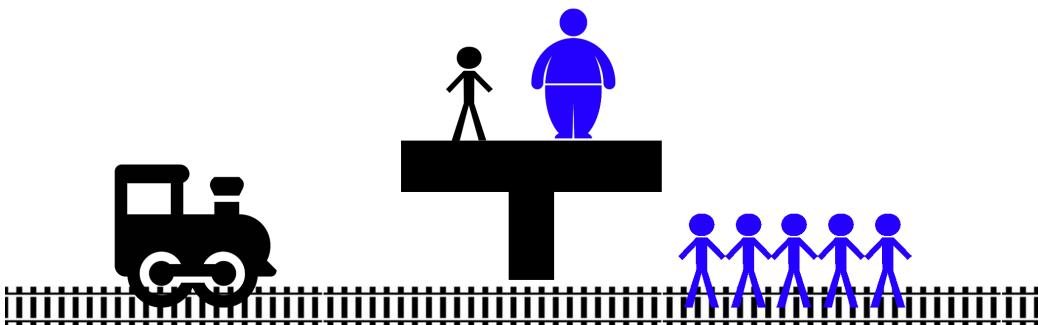


Figure 12. Shows the layout of the first variation.

The third variation which was recreated within the experience is the “Fat Man” version of the “Trolley Dilemma” developed by Thomson [22].

During this variation there is only a single track. On this track there are five victims that are going to get hit by the train if nothing is done. The participants have a choice to push of a “Large Man” of the platform on which they are standing on. If the “Large Man” is pushed off the platform before the train hits five victims, the “Large Man” will fall to the train tracks and will stop the train (Figure 12).

Since this variant was the direct opposite to the original “Trolley” variation displaying the difference between the act of pulling the lever and killing a person to save someone, it was decided to place the recreation of this dilemma after the original and the cognitive load variations.

By recreating this dilemma, it will be possible to see if people will use similar reasoning proposed by Thomson [22] and will not sacrifice the “Large Man” character to save victims. Just like in the two first levels there will be same attempt to simulate time pressure. Each participant will be playing this variation separately and won’t be able to see each other or their choices until the variation is over.

5.4.4 “Loved One” Variation

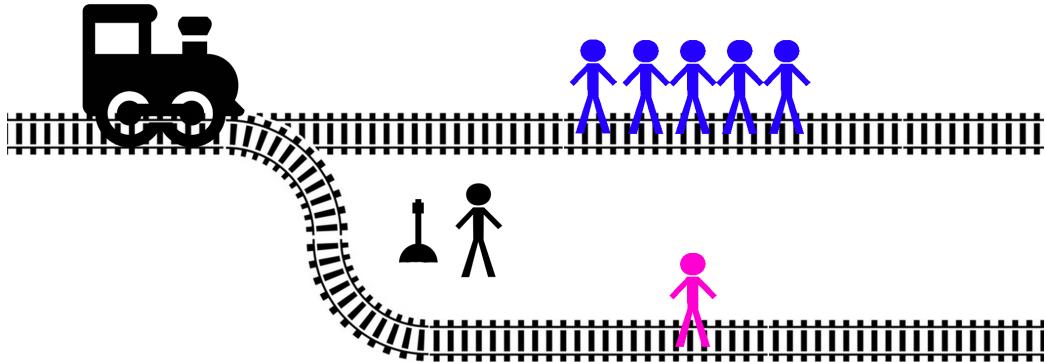


Figure 13. Shows the layout of the fourth variation.

This variation was created after studying the works of Bloom [1] about the “Trolley Dilemma” and families. This prompted the idea of seeing how

participants social connections with their loved ones might influence their choice. During this variation again, the same layout was used as in the original “Trolley Dilemma” variant. However, the way this variant differs from other variations is that during this recreation the study attempts to simulate emotional attachment influence to participants by placing a single “Loved One” character on the second track (Figure 13).

As mentioned in the Characters section of the paper “Loved One” character is coloured pink to clearly signal its significance to the participants. There is also a panel above the character which says, “Your Loved One”. This is deliberately done to attempt creating emotional attachment to these characters. By doing so it will be possible to see if participants will relate to these characters and if their decision will be different because of it. Each participant will be playing this variation separately and won’t be able to see each other or their choices until the variation is over.

5.4.5 “You May Be The Victim” Variation

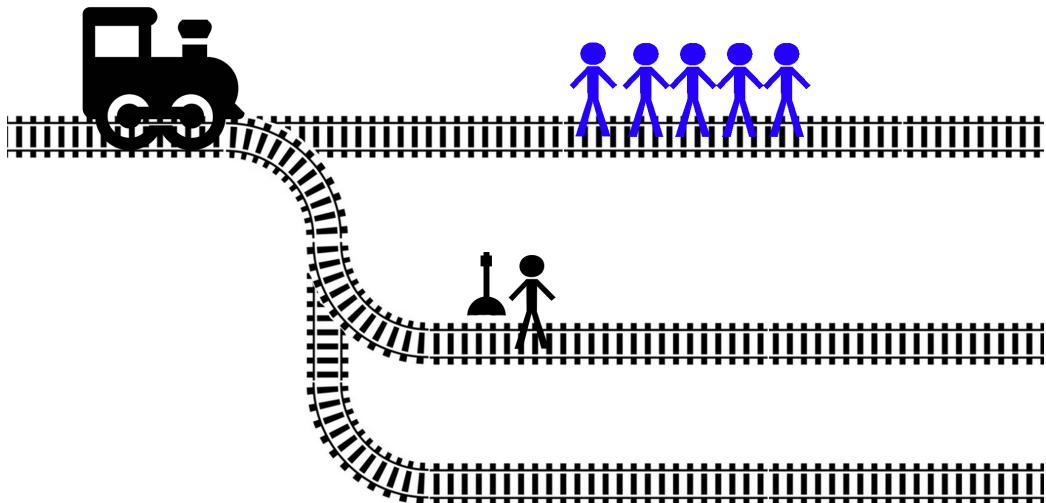


Figure 14. Shows the layout of the Fifth variation.

The fifth variation which participants play is a spinoff from the “Loved One” variation and was developed to see if participants will value their own life more over characters within the experience. In the previous variation we see if participants will have an emotional connection to the “Loved One”

victim. However, here we check if the participant will have an emotional connection to themselves. This will test if the popular idea of self-sacrifice during the “Trolley Dilemma” that was observed by Di Nucci [15] will come to fruition by participants choosing their own sacrifice during the experience.

During this variant there are three tracks. The first track where the train engine is heading has five victims on it. The second track has the participant on it. The participant is trapped within a big cage and only has access to a lever which can redirect the train. The third track is empty. Participants can make a choice to redirect the train which will save the five victims, but participants don't know if the train engine will turn to the second track, or will it turn to the third track which is empty. The level is setup so that if participants choose to take a chance and sacrifice themselves the train engine will always turn to the third track (Figure 14).

Each participant will be playing this variation separately and won't be able to see each other or their choices until the variation is over.

5.4.6 “Kick The Can” Variation

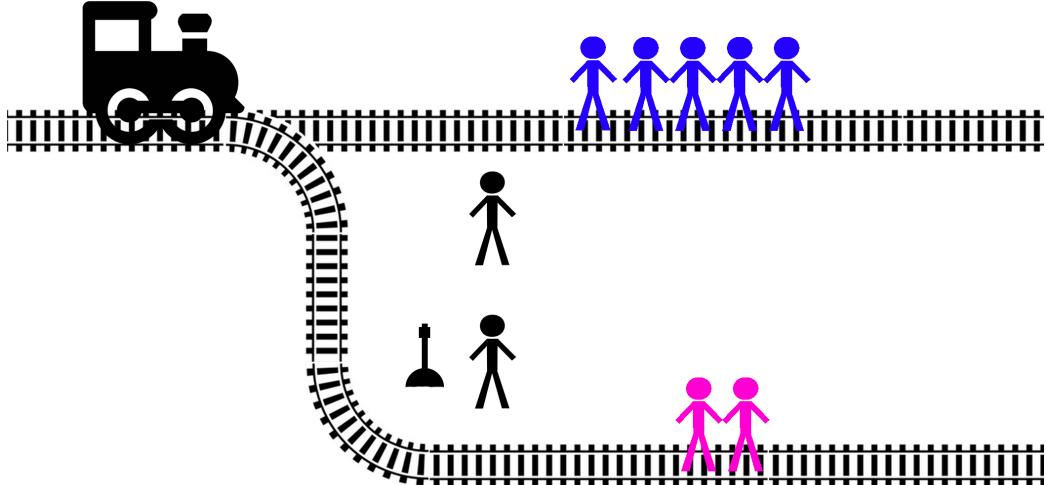


Figure 15. Shows the layout of variation six.

This is the first multiplayer variation. While participants are not explicitly told that they can communicate during the variation they can. During this variation there are two tracks. The first track where the train engine is

heading has five victims on it. The second track has a single “Loved One” character from each participant. One of the participants will be given two levers to use while the other will only be able to observe the situation (Figure 15).

The participant which has access to the levers can use the big lever to redirect the train on the second track. This will make the train hit both “Loved Ones” instead. Additionally, the participant can use a second smaller lever to pass the choice to the other participant. If the smaller lever is activated the bigger lever will get teleported to the empty platform of the observer participant.

This variant of the dilemma was designed to see if participants will let five random victims to be hit by the train engine or will they sacrifice two of their loved ones. The option of passing the choice was done to see if participants are willing to make the choice for both parties involved or if they feel unjustified to make it and will pass on the choice to the other player.

This is variation six within the experience and the first variation which involves both participants meaning that both players will be able to see each other within the level. By doing so this variant of the dilemma is attempting to simulate peer pressure by allowing both players to see each other’s actions in real time. This may reveal if the presence of another participant and communication with him will impact the other participant’s decision-making process. Additionally, there is time pressure influence simulated in the same way as in the previous dilemmas.

5.4.7 “Overturn” Variation

The seventh variation within the experience was developed to see if participants will be willing to change each other’s decision. Just like in the previous variation this one will also involve both participants meaning that peer pressure will be present in this variant. By developing a variant where one participant can overturn another’s decision the study hopes to see if participants will communicate together to make a unanimous decision or will they directly disagree and change the outcome of the dilemma. Additionally, there is time pressure influence simulated in the same way as in the previous dilemmas.

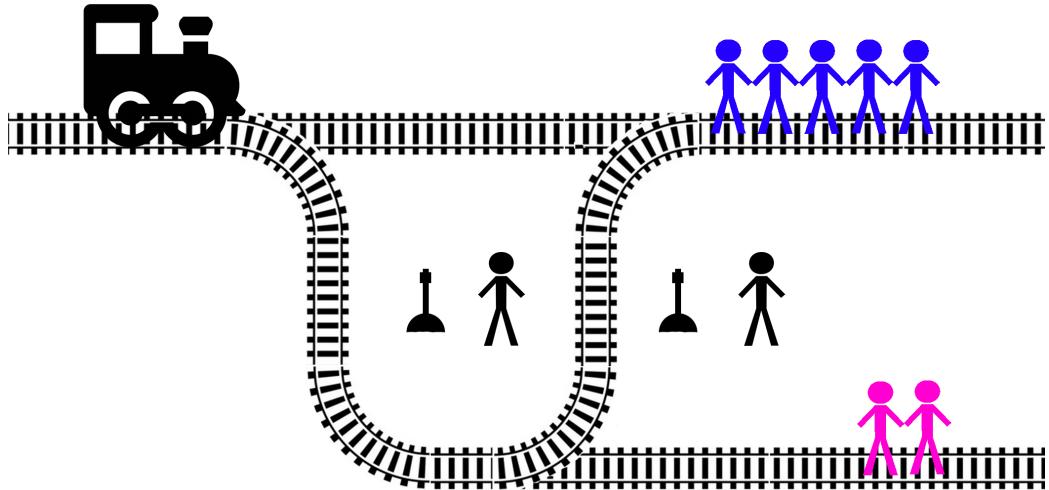


Figure 16. Shows the layout of variation seven.

During this variation there are two tracks. On the first track there are five victims and on the second track there is one “Loved One” from each participant. One of the participants will be situated closer to the interstation of the tracks where he will be able to make the first choice. The other participant will be situated further away from the intersection where he will be able to make the second choice. If participant making the first choice lets five victims die, second participant won’t be able to overturn the first decision. If participant making the first choice redirects the train engine towards two “Loved Ones”, the second participant will be able to redirect the train back to the first track to hit the five victims (Figure 16).

5.4.8 “Prisoners Dilemma” Variation

The eight variation within the experience is replicating the famous “Prisoner Dilemma” originally conceptualized by Tucker [25] and then applied to the “Trolley Problem” by Trace [23]. Just like the two previous variations this one will also attempt to simulate peer pressure. By recreating a “Trolley problem” variant which imitates the original “Prisoner Dilemma” this research will try to see if participants will be willing to cooperate for an equal outcome of the dilemma which would be best for both. Additionally,

there is time pressure influence simulated in the same way as in the previous dilemmas.

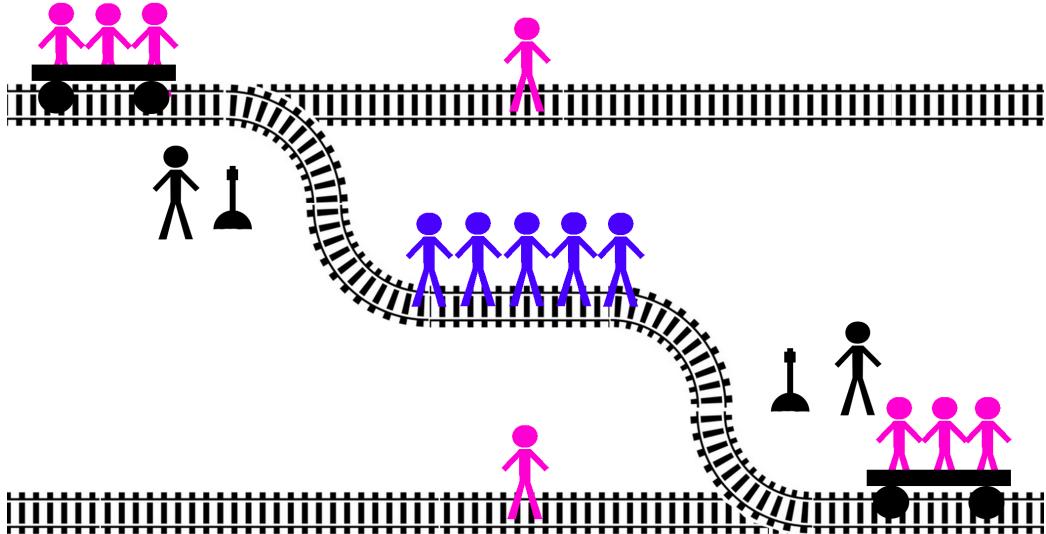


Figure 17. Shows the layout of variation eight.

During this variation there are three tracks. On the first track there is a “Loved One” of the first participant. There is also a train full of first participants “Loved Ones” heading toward the single “Loved One” on the first track. On the second track there are five random victims. On the third track the second participant is in the same situation as the first one. Both participants can choose to redirect their trains to the second track where five random victims will be hit. But if both participants choose to do so the two trains will collide killing five victims and all the “Loved Ones” onboard both trains (Figure 17).

5.4.9 “Don’t Worry I Am a Philosopher” Variation

The final variation recreated within the experience attempts to simulate peer pressure by affecting both participants directly. Within this variant of the dilemma one of the participants is given a choice between allowing the train to hit five “Unknown” victims or redirecting the train towards the avatar of their partner (Figure 18). By creating such a scenario this study will be able to see if the participant will try to communicate and sway each other’s

decisions because unlike other variants this one explicitly requires them to talk. Additionally, there is time pressure influence simulated in the same way as in the previous dilemmas.

After this variation is over it repeats itself again with participants places within the variation switched.

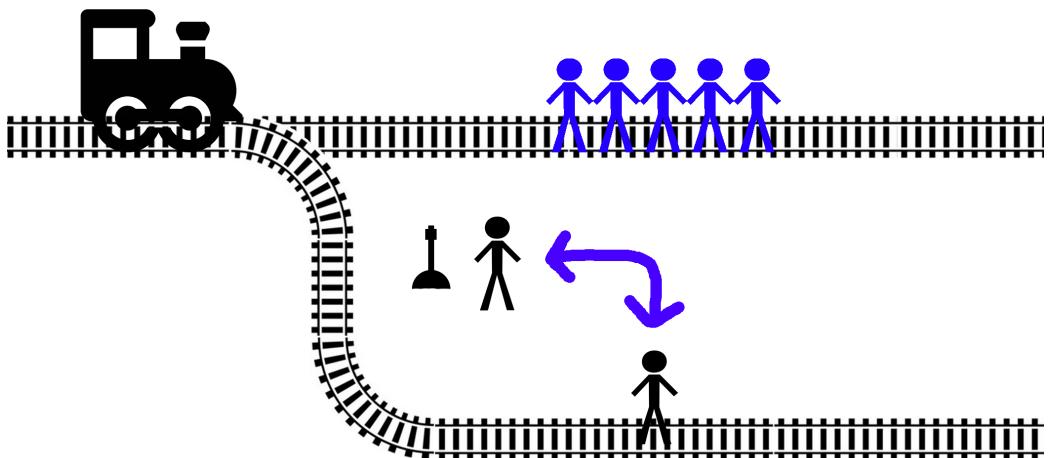


Figure 18. Shows the layout of variation nine.

6 Methodology

To study how people's decision making can be affected in virtual environments a research through design was carried out. To study people's choice processes a virtual reality experience was developed called Embodied Trolley (VR) as explained in the design section of this paper. The Embodied Trolley (VR) was then played by participants during the study and their opinions, reflections and choices on the experience were examined .

6.1 Participant Recruitment

To recruit participants for this study an email invitation was devised. This included a Google Spreadsheet link on which people wishing to participate left their email address and first name at an open time slot. Because this

study was conducted in pairs, maximum of two participants were able to sign up at each one-hour slot. Additionally, the invitation included a teaser video of the study. The video showed participants the “Villain” character of the experience explaining the premise behind the first variation of Embodied Trolley (VR). Participants were also shown few visuals of the experience like the incoming train, victim models and the virtual valley level of the experience. Finally, virtual reality hands of the player avatar being controlled were displayed to clearly indicate the VR technology aspect of the experience.

There was a total of twelve people who participated in the study (9 female; 3 male, all aged 18 or above). Most participants came from computer science and computer human interaction background. Three other participants had background in business and human resources. Finally, two of the participants had background in philosophy and social science.

Upon arriving to the study participants were provided with the Consent Form, Information Sheet and Privacy Notice documents.

6.2 First Questionnaire (Moral Foundations)

First thing participants got to do is to fill out Moral Foundations Questionnaire (MFQ). Participants were given a paper copy of the questionnaire to fill it out by themselves. The idea to use this questionnaire came from the previously discussed study of Smith [18] where it was used to find out moral foundations used by his participants when making moral decisions. For this study the MFQ was used to look for the same data. The results of the questionnaire were then used to see if the moral foundations that each participant had according to the MFQ were influential to decisions made during the Embodied Trolley (VR) experience. /par There was also a worry that MFQ may prime participant choices towards a more Utilitarian response during the experience. This will be important to keep in mind when discussing the findings of the Embodied Trolley (VR) experience.

6.3 Introduction to the Embodied Trolley (VR)

After the MFQ questionnaire two participants were brought into the room where the experience would take place. They were briefly introduced to the experience and what's going to happen throughout the study via Microsoft PowerPoint slides.

During the first few slides' participants were asked three questions. The questions were:

- Do you play video games? If so, how much?
- Have you ever used Virtual reality technology to play video games, if so, how much?
- Do you know what the “Trolley Dilemma” is?

These questions were asked to see how many participants were familiar with virtual environments, video games and the “Trolley Dilemma”. According to Hartmann and Vorderer [9] research people who are more familiar with video games and their premise usually feel less guilt when difficult decisions accrue in video games. This meant that participants who regularly play video or virtual reality games were more likely to be influenced by moral disengagement during the Embodied Trolley (VR). Additionally, people who were familiar with the “Trolley dilemma” may have realized the premise of the experience resulting in a less immersed decision making. By asking these questions the study kept track of people who may be more familiar with the virtual “Trolley Dilemma” environment and then analysed if their choices were affected by moral disengagement. After asking these questions it was found that seven participants either were average or experienced with video games. Two participants had experience with virtual reality technology. Five participants knew the base information about the “Trolley Dilemma”.

After these questions the participants were familiarised with the controls of the experience. They were told how-to pick-up objects, press buttons, and use levers within the experience. Participants were also familiarized with the room-scale boundary system of the Oculus Quest 2 headset.

Then participants were told what is going to happen once they put on the VR headset and turn on the experience. They were told about the “Training” level and how to test all the main mechanics within it.

Afterwards participants were briefed about the “Discussion” level. They were told that within this level they will be asked to reflect and together discuss their experience after each “Trolley Dilemma” variation they play. They were notified about the “Discussion Board” and the “Outcome Board” within the level and how can they use them to drive the discussion between each other.

It is important to note that at this point participants were not given any information about the “Trolley Dilemma” variations of the experience. When speaking to the participants the variations were referred to as the “Main Levels” of the experience.

6.4 Playing the Embodied Trolley (VR)

After the introduction participants were informed to put on the VR headsets and start the experience. Once in the experience, they were asked to familiarise with the mechanics of the experience by doing the tutorials in the “Tutorial” level (Figure 19).



Figure 19. Shows “Training” Level in which participants got used to mechanics of the experience.

Once both participants were ready, they were told to pull the “Player Ready” lever to start the main levels of the experience. Following this, participants were left to play the experience without any instructions unless they stated that they needed help or were unsure of the controls. If participants were hesitant to start discussions during the “Discussion” levels the investigator during the study encouraged participants to discuss their experiences with each other by reiterating through the same questions which were displayed on the “Discussion Board” within the experience.

During the experience game logs of important objects within were captured. Video and audio of the participants playing and making verbal discussions were recorded. After each participant pair finished the study the used headsets were sanitised using CleanBox CX1 UVC surface decontamination machine.

6.5 Self-Reflection Questionnaire

Once participants pairs had finished the Embodied Trolley (VR) they were given a Self-Reflection questionnaire which each participant had to fill out on their own. The questionnaire had asked participants to identify up to three factors that had affected their decision during each variation of the experience. Additionally, they were asked to reflect on the factors they wrote down by rating each factors relevancy to their decision. The scale to rate the factors was as fallow:

0 = not at all relevant

1 = not very relevant

2 = slightly relevant

3 = somewhat relevant

4 = very relevant

5 = extremely relevant

By doing this questionnaire the study aimed to observe if self-reflections of participants during the “Discussion” levels would differ from the ones expressed individually. It is important to note that within the questionnaire there was a typo regarding the “Prisoners Dilemma”. Because of this the data concerning the “Prisoners Dilemma” won’t be used in this study to avoid any false results.

6.6 Analysing the Embodied Trolley (VR)

After each participant had undergone through the experience and filled out all the questionnaires, the videos of the participants playing the Embodied

Trolley (VR) were stored and transcribed using Microsoft Teams. To understand how each participants decision-making was affected by the simulated influences during the Embodied Trolley (VR) a thematic analysis method was used to analyse the transcripts of the studies videos.

The advantage of using thematic analysis lays within its ability to find patterns within people's views, opinions, and experiences from sets of qualitative data such as interviews, discussions, and survey responses as Caulfield [3] explains. Thematic analysis achieves this by coding the words and statements in the text of a qualitative data set. These codes then are gathered into thematic nodes that represent one of the themes present within a qualitative data set. The themes can then be used as an insight to the qualitative data provided by people.

However, there is also a drawback present within the thematic analysis method. According to Braun and Clarke [2] the interpretation of a researcher when thematically analysing data can be inconsistent and, in some cases, completely misrepresent the analysed qualitative data. To avoid this Braun and Clarke [2] had developed a step-by-step guide on how to do thematic analysis (Table 2). To ensure that the study would not use the thematic analysis method in an inaccurate way the mentioned step-by-step guide was used to conduct thematic analysis in a correct manner.

Phase	Description of the process
1. Familiarizing yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.

Table 2. Show the step-by-step phases of thematic analysis developed by Braun and Clarke [2].

7 Results and Analysis

The Embodied Trolley (VR) experience and its study went well. There were two faults which occurred during the study. One of the participant pairs didn't get to finish the experience because halfway to the game one of the Oculus Quest 2 headsets ran out of battery. It was decided to not use the data from that instance to avoid inconsistencies within the results. The second fault was found within the Self-reflation questionnaire. It was noticed that the section asking about the "Prisoner's dilemma" variation was named falsely and had confused participants. To avoid mixed self-reflections from the questionnaire the data regarding "Prisoner's dilemma" won't be used from the Self-reflection questionnaire.

Players were mostly comfortable and managed to play through all the variations of the experience. There were two players needing more time and help to get use to the controls of the game. It was also noticed that while participants had intended to make a specific choice during the variations of the experience, they could not always reach their desired outcome due to their cognitive abilities. This was most prevalent in the "Cognitive load" variation where many participants failed to solve the math problem and save the five victims. This is important to consider because while participants may experience one outcome, the outcome of the dilemma may not represent the decision-making of participants. In the (Table 3) below all outcomes which were experienced by participants are displayed.

Table 3. is displaying all of the outcomes that participants experienced regardless their intention.

- Variation 1 (Original) – Killed Five:4/Killed One:6
- Variation 2 (Cognitive Load) – Killed Five:7/Killed One:3
- Variation 3 (Fat Man) – Killed Five:2/Killed Fat Man:8
- Variation 4 (Loved One) – Killed Five:8/ Killed Loved One:2
- Variation 5 (You May Be A Victim) – Killed Five:3/ Self-sacrificed:7
- Variation 6 (Kick the Can) – Killed Five:10/Killed Loved One:0
- Variation 7 (Decision Overtake) – Killed Five:9/Killed Loved One:1

- Variation 8 (Prisoner Dilemma) – Killed Five:1/Killed Single Loved One:9
- Variation 9 (Philosopher) – Killed Five:6/Killed Partner:4

Moral foundations questionnaire revealed that the sample of participants during this study primarily had two moral foundations which are Harm/Care and Fairness/Reciprocity. However, when analyzing the discussions of participants, it was found that the complied answers from MFQ were not relevant to participants decisions as they haven't brought up any values displayed by moral foundations theory just like in the mentioned study of Smith [18].

After the self-reflection questionnaires results were compiled into word clouds the same way as in Tennent [21] research, the analysis reviled that participants thoughts were genuine during discussions since the most frequent factors described in the questionnaires didn't differ much from ones expressed during discussions. However, there is also the notion of these answers being primed by the experience itself. The results of this questionnaire will be displayed for each appropriate variation during the thematic analysis section.

After conducting the thematic analysis there were three factors noticed which were most prominent to participants when choosing the outcomes of each Embodied Trolley (VR) experience variation. The first one being the **number of lives saved**, second one being **emotional attachment to victims and study partner** and the last one being **presence and communication of participants**. There were also other less frequent factors mentioned by participants such as leaving the decision up to fate and making unselfish choice. Finally, participants also expressed ideas about the experience not being real and that their decisions might be more instinctual in real life.

7.1 Thematic Analysis

To explain these findings in greater depth this chapter will expand on the recorded self-reflections and discussions of participants which occurred in the “Discussion” levels of the experience. All saturated themes which manifested during this study will be displayed under the headings of variations in which they had occurred. To differentiate between the themes there will also be subheadings displayed. There will also be a general experience heading which will explain few themes that were relevant for the overall experience.

7.1.1 First Variation themes (Original)

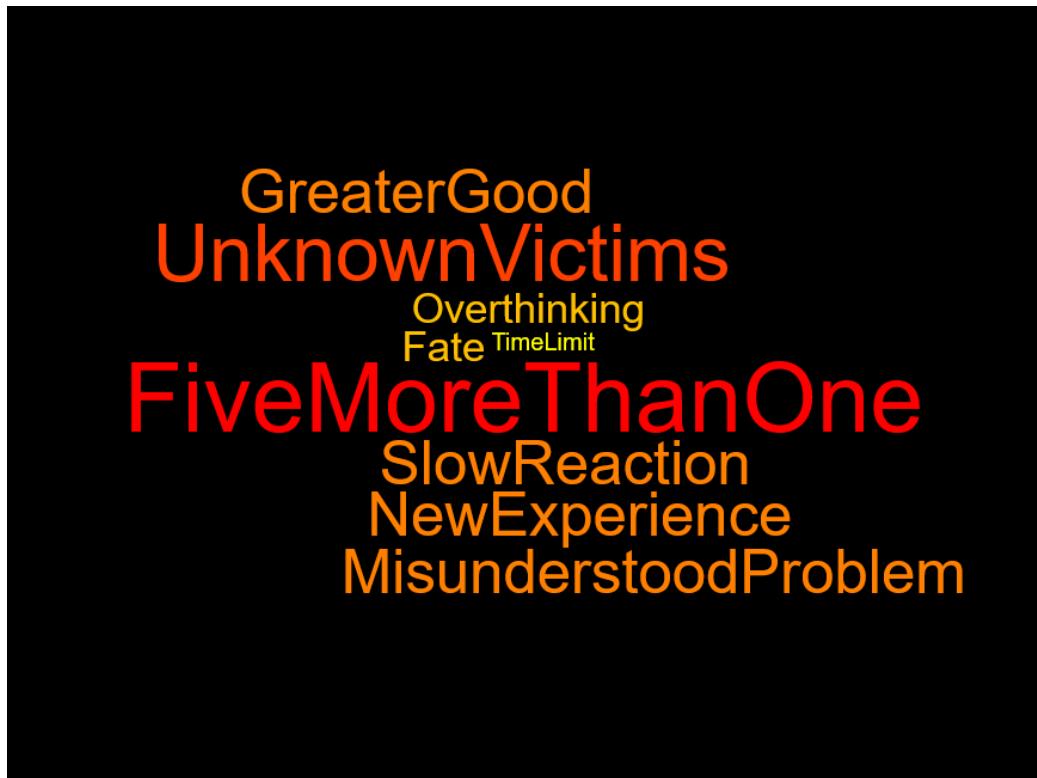


Figure 20. Word Cloud of variation one. The bigger and redder the words are the more relevant factors were during the variation.

When examining (Table 3) its noticeable that during this variation the most frequent outcome was the death of one person. Even though the outcome of five deaths wasn't far off it is important to note that there were some participants who intended to save five people and failed. For example, P6 explained "**I think I pulled the lever in the wrong direction and killed five people**". P3 expressed a similar incident, "**I killed five people by accident when I pulled the lever wrong way, but my intention was to save five people**". This shows that the number of executed outcomes is not an important variable when the aim of the study is to explore decision making process of people. As the comments show sometimes people's intentions might differ from the end outcome of a virtual dilemma which could be accidentally induced by a technical or cognitive fault.

a. Importance of more lives

The most common theme which was expressed by participants during the first and other following variations was the importance of saving more victims. This was both noticed during the discussions and from the results of the Self-Reflection questionnaire (Figure 20). It seemed that the important factor for most participants was the one which provided a greater good for the society as a hole. Most participants expressed such thoughts with direct statements. For example, P6 directly expressed the importance of victim numbers by saying “**Five lives are more important than one**”. Furthermore, P9 stated “**I chose to kill one person, because obviously to save more people**” implying that the idea of saving more victims should be common sense among people. P2 also made a similar reflection as P6 but also added that her idea came from a movie, “**I watched to many Star-Trek movies, the needs of the many outweigh the few**”. This statement gives a brief glimpse to how people’s ideas and decisions can be shaped by media which resides in a specific culture.

b. Victims background information.

Fallowing the theme of saving more lives many participants expressed that they didn’t know any background information about the victims some even stating (P7) “**For me it’s like, I don’t know any of these people, so one death is better than five**”. According to many comments, participants may have made a different decision if they knew more information about each victim. For example, P7 explained “**If I knew the five people were really bad criminals then I wouldn’t have pulled the lever obviously**”. Same idea was shared by P2 as well, “**If somebody said to me that the five victims were bad people, I would let the train run over them**”. This shows that people if given the information will prefer to sacrifice victims that had done some bad doing in a society. Another factor which participants expressed to consider was the age of the victims. For instance, P5 told “**My choice would be influenced if I knew they were children, or they were old**”. P7 also added to this point by saying “**If the comparison was between five old people and one young person I don’t know if I would had pulled the lever**” which displays an uncertain preference to save younger victims. Finally, another important background information which was relevant to the choice of participants was

the victim's relationship with his family or friends. Participants stated that if there were other people relying on the victim for survival such as family then they would consider saving that victim more so than the other people. This is evident within the comment of P3, "**I think If I knew a bit more about those people it may impact my decision. There are other factors to consider such as if other people are relying on the victim such as family**".

c. Victims Appearance and mannerism.

One of the less frequent themes which occurred during this variation was the influence of victim's appearance. It was noticed that some participants made their choice based on initial observations of the victims. P2 explained that "**The Victims looked like children who did not know any better and were just playing on the track**". Again, this displays a preference for younger victims to be saved, only this time their age was imagined by the participant purely based on the looks of the "Victim" character. On a different note, P4 mentioned "**The one person looked very scared and sad, and I was just like 'O no they know they were going to die', I didn't want to kill five people, but I felt sorry for the one by himself**". This reveals that even minor factors such as the body language of the victim and the notion of the victim being alone can make people care more about that specific victim than the other ones.

d. Involvement and omission.

Finally, the theme of involvement and omission was present within the discussion during this variation. For example, P1 decided to do nothing and let the train hit five victims. P1 explained "**If I did nothing whatever happens happens, but otherwise I am choosing someone else to go. I could actively choose for one person to die on the track, but I can also make no choice**". This was the only occurrence where a participant deliberately did nothing. However, this reveals that for some people abstaining from making a choice in a dilemma such as the "Trolley Problem" can be a morally justified choice. Nevertheless, most other participants thought that doing nothing is still making a choice because one's presence in the dilemma already counts as an involvement. Here is an extract of an exchange between two participants discussing how presence in a dilemma counts as an involuntary involvement.

P8 - The guy who died didn't volunteer to be a hero. In his life you decided to sacrifice him instead of him doing so himself.
P7 - In that case why do we have the variety to let's say give up the lives of five others? But you wouldn't, you would be just not involved.
P7 - But if you are not involved doesn't that make it worse?
P8 - I suppose yeah Just by having the lever and you being present you are involved.

7.1.2 Second Variation themes (Cognitive Load)

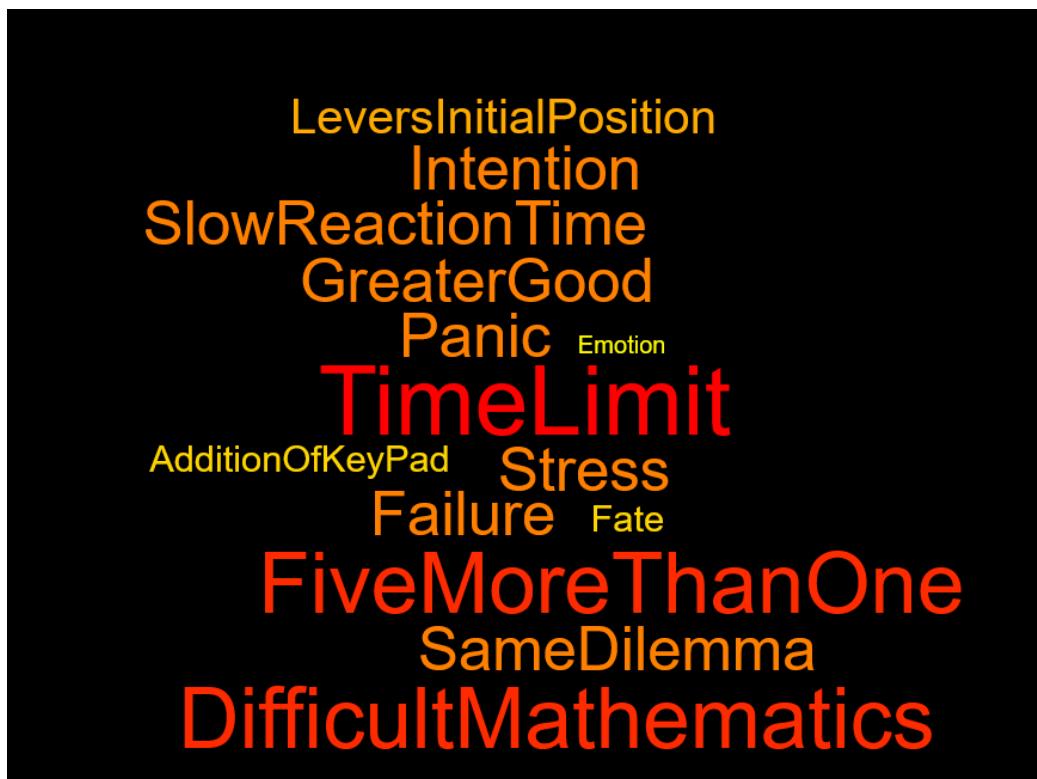


Figure 21. Word Cloud of variation two. The bigger and redder the words are the more relevant factors were during the variation.

Just like in the previous variation participants had largely expressed the same ideas. Again, participants argued that the number of saved victims was the most important factor since they didn't know any background information about the victims. For example, P6 said “**I think the same as my**

partner said previously, if I knew something about the victim or if he was a child I would choose differently”.

a. Intentions.

An interesting theme rose during this variation discussions where participants talked about whenever one's cognitive capability displays his moral expression. When looking at (Table 3) one would think that participants had contradicted them self's due to the large number of outcomes resulting in five victims' deaths unlike in the previous variation. However as previously mentioned the outcome number is not an accurate representation of people's choices during dilemmas. In this case many participants struggled with the math problem present in the variation which explains the big number of outcomes resulting in five deaths. For one instance P10 said “**I didn't get to make a decision because I wasn't good at math**”. Some participants expressed that it was difficult to count in their memory, for example P9 told “**I can't count in my head I need a piece of paper to write it down**”. Other participants directly expressed that they were either to late or slow when trying to get access to the lever (P3) “**I killed five people, but it wasn't my intention I was just to slow**”. However, at the end participants discussed that intention behind the action mattered most regardless of the outcome. It was noted that participants would not hold anything against a choosing person when the outcome was not favorable. What matters is that the person tried to reach it in the first place. For example, P8 said “**Your skill is now involved in your expression of morality. Let's say to save one was a right thing to do and you are bad at math then maybe if you don't make it in time you are not a bad person**”. P7 also added to this point by saying “**If you can't do the math, were you able to pull the lever to stop the train hitting five people? I think the intentions matters most**”.

b. Rushed decisions.

The second theme which was expressed by many participants was about the cognitive load pressure rushing people's choices. Participants explained that there was much pressure and panic during this variation. For instance, P1 said “**That one felt more panicky**”. Following this it was noticed that participants decisions were more rushed and less thought out because

of multiple layers of pressure. For example, P5 stated “**I think having the pressure like a simple math question adds another element because you are not only thinking what kind of choice you are making but you are preoccupied with the math problem which adds more pressure**”. P3 also added that even the interface used for the math answer added pressure “**There was pressure of stress to solve this math problem, the confusion with the interface and you start to panic because you know people are dying**”. This displays that even simple additional steps such as a press of another button can add significant hurdles for people to overcome when reaching for their desired outcome.

c. Cognitive Load induced choice.

Perhaps the most interesting idea captured in this part of the discussion was the idea of the choices being induced by the math problem. Many participants who saved five people in the previous variation explained that they already knew their choice since this version of the dilemma wasn’t very much different from the other one in the moral sense. This was explained by P7 who stated, “**I think having a math problem doesn’t change much, instead you are rushed towards your desired outcome more**”. Another participant even said that she wouldn’t have tried to solve the math problem if the layout of the dilemma was different (P5) “**If it was set that five people will live and one person will die and to save the one person you had to solve the math problem, you might not even want to solve the problem**”. However, an interesting change was spotted in the people who previously had intended to save the one victim. It was noticed that this time they all tried to solve the math problem regardless of their last outcome, some even succeeding in saving five people instead of one. During the discussion one of the participants explained (P1) “**I was thinking about the total now, would I have rather the death of ten or six. Before it felt what will be will be, but there is more pressure now so I could actually do this. I saw math as an actual challenge, so if could pull the lever I might as well pull it**”. This shows that by creating challenging actions which encourage people to use their skills can make people choose different choices from what they usually would consider. This is most likely due to the fact that people are focusing more on the challenge and pressure provided by the cognitive load rather than on the moral problem itself. Another participant also mentioned that

the cognitive load also makes people assume their desired outcome instead of truly thinking about it. For example, P6 explained “**It’s weird because you assume you are going to kill one person instead of five. The decision was imposed by the math problem**”. This further shows how cognitive load can change the mind set of people who are making decisions. Even the presence of a cognitive load can produce an instinct to people which makes them act towards one outcome without even thinking about the other possible result.

7.1.3 Third Variation themes (Fat Man dilemma)

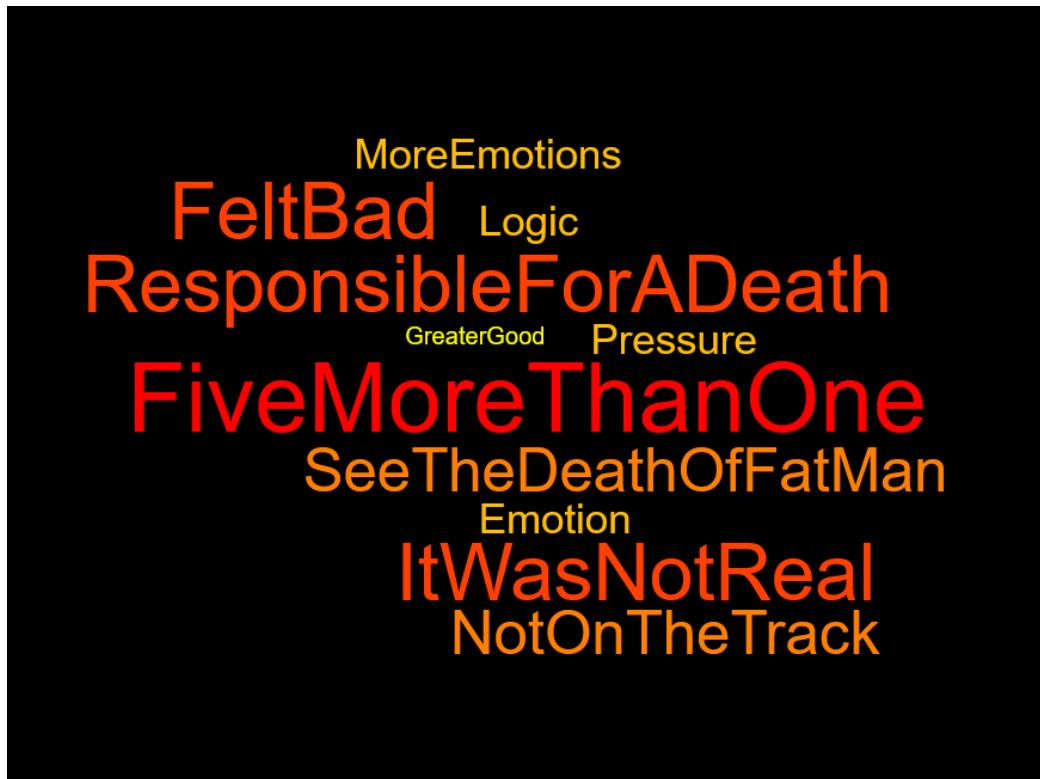


Figure 22. Word Cloud of variation three. The bigger and redder the words are the more relevant factors were during the variation.

Unlike the previous variations throughout this dilemma recreation all participants managed to reach their intended outcome. This was mainly due to the fact that participants simply had to push the “Large man” character

of the platform to reach a different outcome. When examining (table3) it's evident that most people choose to sacrifice the "Large Man".

a. Large Mans appearance meaningfulness.

When discussing the variation one of the bigger topics which participants had expressed was the "Large Man's" appearance. It was found that participants see no difference in value between the regular "Victim" and the "Large Man" characters. Many participants stated that the appearance of the large man being big or obese didn't have any influence on their decision and that this variation was still very similar to the previous ones. For example, P5 claimed "**Someone being obese or not didn't come into equation, if the other person was thin and I had to push him off to stop the train and save five people I would still have done that**". P7 also added "**For me the decision was the same as before, all I know there is one large man and five people, because he is large doesn't change my decision**". This displays that same themes of background information and number of lives being saved were strongly present within this variation as well.

b. Influence of the Pushing Action.

It was also discovered that before making the decision participants didn't consider the pushing action which was involved in the dilemma. In fact, many participants stated that they didn't see the difference between pushing a person off the platform to stop the train and using the lever to redirect the train for a different outcome. They still insisted that the more important factor was the number of lives saved in the dilemma. For instance, P3 explained "**I don't see much difference between pulling the lever and pushing the guy. So, if I use some tools to reach my decision, still the outcome is because of my decision so tools have no meaning**". Participants explained that they only started to have thoughts about the action after they made the decision. Many of them displayed more guilt after the action of pushing was committed but still, they insisted that their decision was justified due to the number of victims saved. For example, P6 said "**I feel a little bit bad right now because I did it with my own hands. Though It's not really a difference between pushing a lever and pushing a guy If the outcome is the same**". P2 also compared

this variation to the first one and have said “**I did make me think about the first test because I haven’t actually touched the single victim, but I did make the train to run him over. But in this one I would feel directly responsible for his death If I pushed him off. But then again in the first test I still was responsible for the single persons death, I only did it remotely**”. By analyzing the comments of participants, it seems that for many of them the action of pushing the large man was more of a tool to reach the intended outcome. While it did make them feel more guilty due to the direct nature of the action ultimately participants felt like they had made the right decision.

c. Large Mans Background.

Like in all previous dilemmas the theme of victim’s background came up again. Participants reiterated the same ideas such as the importance of knowing if the victim has a family or the knowledge about his age. For example, this is what P3 has said “**If I knew a bit more about him or he had other people relying on them I think it may impact my decision**”. Nevertheless, another idea came up during the discussions which implied that if participants were able to communicate with the “large man” their decisions may have been different from the popular outcome observed in this variation. Even though participants knew they could not speak with the fictional characters here is a brief discussion between two participants talking about this idea.

P8 - We could have asked him if he could jump and save them. But then again, he probably wouldn’t want to. P7 - Very few people would willingly jump. Once again, I knew nothing about the victims, so the decision was more about the numbers of people saved.

One participant even said if the “Large man” character was facing them instead of looking outwards to the train tracks or he would have had word cues which communicated pleading to the participant the decision could have been different, (P4) “**If the large man would have been facing me, or looking at me or saying, ”no please” then maybe I would have not pushed him**”. This displays that people gain information from victims not only through direct communication but also on subtle body language cues such as facial expressions which is then used in their decision-making process.

d. Moral Disengagement.

The final frequently occurring theme in this variation was moral disengagement. It is important to note that moral disengagement will be also frequently mentioned in other upcoming variations, however this is the first variation where participants had openly talked about their embodied role as a participant within the “trolley problem” and its variations. During this variation of the experience participants noted that their decisions would be way more difficult to make in real life. Participants pointed out that the victims didn't have the realistic looks of a real-life person which made it easier for them to make a choice which would be more difficult to execute in real life. For example, P8 said “**The large man didn't look very human in this virtual environment, but if it was a person with a real face than it would have been way harder to make that decision**”. People also said that in real life their decision would most likely be more instinctual than properly thought-out (P10) “**In real situation you just act on the moment and you just go with your gut**”. Participants also noticed the limited design aspect of the experience which didn't let them to communicate with the virtual characters of the dilemma. They noted that in real life people would be able to warn the victims on the track and tell them to get off before the train would manage to hit any of them (P7) “**If this was in real life it would be a way tougher decision, but at the same time you could tell the victims to get off the track**”. Finally, some participants directly acknowledged that they subconsciously understand that this is not a real experience and admitted that they can't force themselves to feel as if this was a real-life situation. For instance, P9 explained “**I think it's because you know this is a virtual experience, so it doesn't really affect my feelings so much. I think If I had to make the decision in real life this would affect my decision but now since I know this is not real, I can't force myself to feel true about this experience**”. This directly shows that it can be difficult to get realistic answers and reflections from people when studying their decision making in virtual environments. Participants will notice the non-present actions which would be present and essential in real life situations or they will often make decisions in the experience which are detached from the emotional thoughts about the problem.

7.1.4 Fourth Variation themes (Loved One)

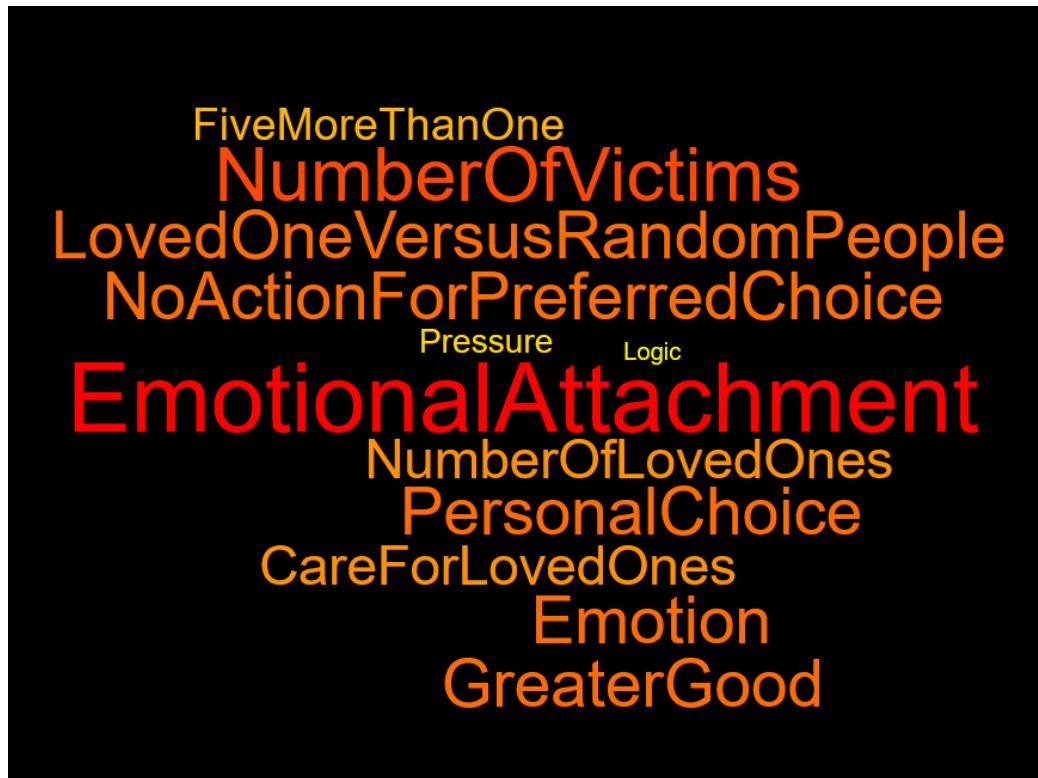


Figure 23. Word Cloud of variation four. The bigger and redder the words are the more relevant factors were during the variation.

At this point of the study participants seemed to be familiar enough with the controls of the experience. None of the participants reported that they accidentally chose the wrong choice or were not fast enough to make it. The popular choice during this variation was to save the “Loved One” character. Only two people decided to sacrifice their “Loved Ones”. The reasoning behind this sacrifice was the already mentioned theme of saving more victims. Even though two participants expressed feeling guilt after sacrificing their “Loved Ones” their justification often was described directly as the greater good for the society. For example, P7 told “**This felt horrible but at the end this was the right choice**”. P5 after doing this decision simply explained “**I felt that saving five lives was more important even if the other track had one of my family members**”.

a. Family is first.

On the other side of the dilemma the popular theme between participants was the idea of putting family always first. Most participant describe the experience as being more personal especially when there is danger present to family members. For instance, P4 told “**It felt More personal this time. I was thinking If that was my sister, I would not want anything bad happening to here ever**”. Another person directly describe that they could have an emotional attachment formed to the supposed “Loved One” because you know the person and how they are (P3) “**In the situation you know the person, you know who they are, and you have personal, emotional attachment to them**”. This displays that people care about their “loved ones” since they have more background knowledge then they would on a regular person. This leads people to make decisions according to whenever a person close to them will be directly harmed as a result.

b. Felling selfish and guilty.

The second theme which participants discussed was the feeling of guilt after saving their “Loved ones”. Some participants describe them self’s as being selfish as they choose to save their “Loved Ones” because they could not cope with the grief of losing them (P2) “**I think in a way I was being a bit Selfish, I was thinking how am I going to cope with the grief, I don’t know those people but I do know that person and he means a lot to me, I am not sure what he would have done but we can talk about it later**”. This shows that participants are willing to live with their loved one being alive even if that person didn’t agree with their decision. This was further corroborated by P7 who chose to save their “loved one” during this variation “**You don’t know if your ”loved ones” want to be saved or sacrificed. You don’t know what they would say after you save them. It could ruin your relationship**”. Regardless most participants seemed to not be dissuaded from the possible backlash of the society and their “Loved Ones” if they decided to sacrifice five random victims. For example, P8 said “**I know it was a wrong decision to not redirect the train, but I would rather save my ”Loved One” than make a morally right decision**”. Another participant said that his family will be the top priority no matter what (P10) “**My family members are at the top so you will do anything to save them, you try to save others if you can and the probably, I would try to save them if I could**”.

c. Who is the “Loved One”?

The final theme in this variation was the idea of which “Loved One” is on the track. A few participants described that their decision could have been different if they knew what “Loved One” was on the track. For one instance, P7 explains that “It doesn’t specify which ‘Loved One’ it is, it could be your mom or kid, or it could be your distant cousin”. P8 also displays similar thoughts “I think if it had specified that your ”Loved One” is child or your parents or boyfriend then it would be way much harder decision”. This shows that people may have different levels of value even for several of their “Loved Ones” which has some meaning when a person is making an important decision.

7.1.5 Fifth Variation themes (You may be the victim)



Figure 24. Word Cloud of variation five. The bigger and redder the words are the more relevant factors were during the variation.

During this variation there were two camps of participants. Ones that were willing to take the risk and sacrifice themselves to save the five people, and others who thought the chance was bigger for them to be hit by the train.

a. Unfavorable Probabilities.

People who chose to not self-sacrifice mainly expressed their thoughts about probabilities and how the probabilities were most likely low in terms of their survival. It seems that for the minority in this sample group the probability of them dying was a strong influence. Here is what P3 said about this idea “**I didn’t know the probability, I thought it will not change so I will die. Again, I didn’t know those people, so I didn’t know if they were more important than me**”. P3 also added that she didn’t feel guilty about her decision since the 5 victims were oblivious to the upcoming threat and dancing on the track. This further implies the decision being minorly influenced by the initial observations on the victim’s appearance (P3) “**I saw the five victims dancing and having a good time, so I didn’t feel as guilty**”. The idea of not knowing the background of the victims also popped up again. It was noticed that the unknown background of the victims again persuaded participants to not risk their lives and not redirect the train (P1) “**I am not risking my life for the sake of people I don’t know. I would help people, but I would not risk my life for it**”.

b. Taking the risk for greater good.

Probably the most surprising theme and at the same time the most frequent one was the willingness to take a chance of the sacrifice. It was noticed that there was a large number of participants who decided to take the chance and try to save five people by and redirecting the train on the other tracks. It seems that the possibility to save more or all people including themselves influenced their decision to redirect the train. For example, P2 expressed “**I thought It was worth the risk, I was going to close my eyes and clench my fists**”. P6 also had similar thoughts “**I felt like there was 50/50 chance to get killed, so I thought it was okay to throw myself in to the sacrifice. Not I totally rational decision, I don’t know**”. P7 added to this idea also by saying “**This has the chance of everybody surviving**”.

There was also the recurrent theme of saving more lives. Even though most participants preferred to save their “Loved Ones” it seems that in this variation participants themselves didn’t have a high self-value. When discussing the self-sacrifice choice many participants decision was influenced by the number of victims on the track (**P7**) **“For me again it’s the fact that its Five versus one”**. Some participants even mentioned that they think they would place other people in front of themselves displaying the thoughts of caring for other people more than themselves. (**P5**) **“I feel like I would put other people before me”**. It was also noticed that for some people the idea of living with guilt can also be a deciding factor when making a self-sacrifice decision. For example, P7 said **“I know it’s me but I either live with my decision for the rest of my life or I die and don’t have to care about the consequences”**. This show a similar pattern of how guilt can be one of the deciding factors in difficult dilemmas since a similar reasoning was used by some participants during the “Loved One” variation.

c. Moral disengagement.

Nevertheless, in this variation some participants again spoke about how the experience compares to real life. It seems that some participants were not completely immersed in the experience by saying (**P10**) **“But I don’t know in reality its different, I know this is trying to emulate it”**. One other participant seemed to rethink their decision since people in real life instinctively tend to save themselves first (**P9**) **“If I could choose differently, I would save my self, because in real life you tend to care for yourself first”**. Even though many participants choose to self-sacrifice during this variation such comments display that there is a reasonable chance that in real life these participants might act more instinctively and save themselves instead.

7.1.6 Sixth Variation themes (Kick the Can)

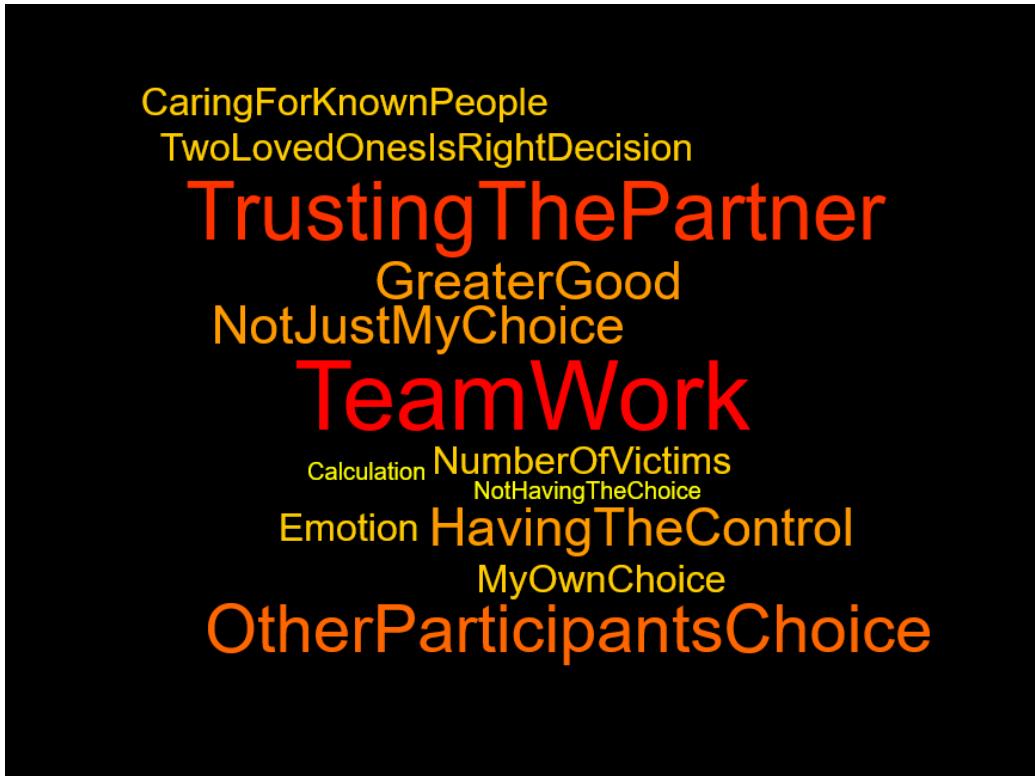


Figure 25. Word Cloud of variation six. The bigger and redder the words are the more relevant factors were during the variation.

On this variation which involves both participants directly playing the same level it is possible to notice strong differences from the single player variations. Straight away one can see by examining (Table 3) that everyone unanimously chooses to save theirs and their partners “Loved Ones”. Important to note that at this point all the participants were used to the surroundings and mechanics of the game and none of them reported any issues with struggling when reaching for a specific outcome of the dilemma.

a. Family Always First.

When participants discussed about this variation a similar theme of family being always first came up. However, this time participants acknowledged that it's not only theirs, but also other participants loved victims. It seems that this time because participants had spent some time in the experience

together a relation between the partners was developed which also had an influence towards all participants decision to save the “Loved Ones” (P3) “**For me it was again the same situation as previous one. It was somebody from my family and it was my partners sister as-well, because we collaborated this past hour, I have more personal relationship with my partner than with some random people it was more personal**”. Participants expressed that by having another person who you know involved in the decision makes it made it even more difficult to consider the possibility of saving five unknown victims. The decision is not only influenced by the participants “Loved Ones” or the unknow background of the victims but also by the bond created between the two participants. For instance, this is what P7 has said “**I was debating, yeah five is a greater number but it's not only my love one anymore but it's also someone else ”loved one” who I know, which is a lot harder to deal with then with a random or my ‘Loved One’**”.

b. Asking for permission and advice.

Secondly it was observed that upon entering the variation all participants unlike in other variations immediately had started to communicate about the decision with each other. Many participants who were given the lever first felt the need to ask the other persons opinion before deciding which displays the other participants (P5) “**I felt like I had to ask you what your opinion on it was because we could discuss it and it involved both of us**”. This displays that when other known individuals are involved in the choice of the problem most of the time the deciding person will rely on other people’s opinions to make their choice. In fact, during this experience, it was observed that the deciding person mostly acted according to what the other participant wanted. For instance, here is here is a discussion between two participants showing this exact occurrence.

P7 - Do we kill them. P8 - You asking me? P7 - It's not only my choice we need to decide quickly. P8 - I would say no but the right thing is to kill them. Do it but we can't be friends after that! P7 - Well it's your choice as well! I may have pulled the lever, but you made the choice! We are both guilty!

c. Peer pressure and social image.

Another interesting observation of peer pressure occurred during this variation. As seen in the discussion above the observing partner during the dilemma P8 has said “**Do it but we can’t be friends after that!**”. This displays a clear attempt at manipulating the deciding participant of the variation. In addition, this was not the only occurrence of this happening for example, P10 has said “**I hope you made the right decision partner, there is pressure**”. Such conversation between participants display insight to why many of the choosing participants decided to make a choice based more on the other participants wishes. One of the participants added that people can feel direct social pressure which has a big influence on people decisions. The idea of looking greedy to the society can influence people to choose differently. (P8) “**it’s really hard this one because there is a social pressure component to it, if it was only up to me, I would save my ”Loved One” but since you are also a part of this decision, I don’t want expose myself as a greedy and heartless decision maker because I want to do the right thing in front of you and other people**”. This somewhat explains why most participants had asked each other opinions on the situation. The deciding person might feel obliged to ask the other one just because he knows that its not only his stakes involved in the problem. But also, the deciding participant might not want to look like a greedy person on front of the other person.

d. Never passing the decision.

The final theme discussed during this variation was about the option of passing the decision to the other participant. During the study it was observed that none of the participants chose to pass the choice. It seemed that most preferred to rather discuss the decision and then make it themselves. When discussing why the “Passover Lever” wasn’t used participants said that they didn’t want to give a decision involving their “Loved Ones” to someone else. For one instance this is what P7 said “**If I had passed the lever the issue would be that I had stake in the result, so I had to do something about it**”. This is interesting, P7 had mainly relied on the other participants opinions to make the decision as evident in the discussion above, nevertheless this comment displays that P7 needed to feel in control when making an important decision because of the stakes involved. This could be explained by the possible guilt which could occur after passing the lever. Some participants expressed that they would not want to see the

other participant live with the consequences of the decision as evident in the discussion below.

P6 “What if we didn’t agree on the decision. P5 - Well I could have pulled a smaller lever but then I would have felt that you would need to live with the consequences, and I feel like I would rather live with them then pass them on to someone else”.

7.1.7 Seventh Variation themes (Overtake)

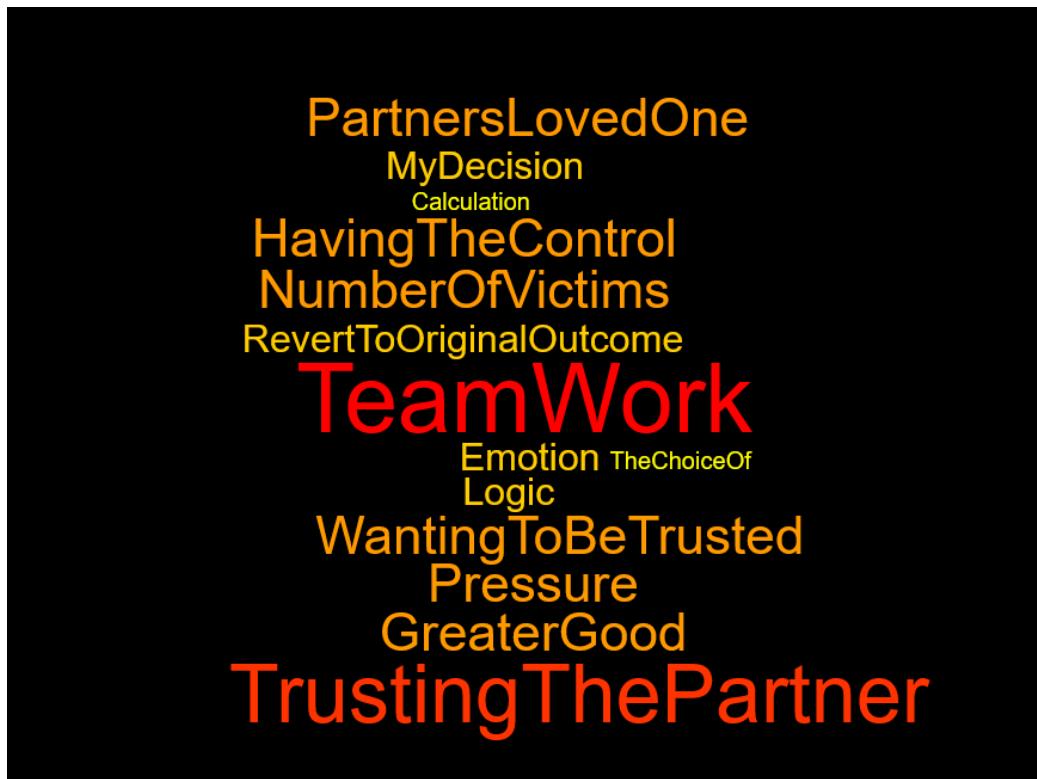


Figure 26. Word Cloud of variation seven. The bigger and redder the words are the more relevant factors were during the variation.

During this variation just like in the previous one all participants choose to save their “Loved One”. There was only one participant who redirected the train towards the “Loved One” character but then she expressed that she misunderstood the layout of the dilemma.

- a. Similarities to “Kick the can” variation.

During this variation participants didn't have many discussions unlike during other ones. Most participants expressed that this variation was the same as the previous "Kick The Can" variation. For example, P9 has said "**I think to me it was an identical situation to the previous one because I got to make the final decision**". Another participant even said that making a different choice would have been hypocritical since morally this is an identical scenario (P7) "**I would have been a bit of a hypocritical if I decided against the decision of taking out two "Loved Ones"**". For me the decision was the same as the last level". This means the same influences of communication, peer pressure and saving your partners "Loved One" were relevant here. For example, here is another dialog between two participants communicating during this scenario and asking for each other opinions on the matter.

P5 - Alright, Teamwork! what are you thinking? P6 - I am thinking the same thing as the previous scenario.

b. Trust and loyalty.

The theme which occurred during this variation was the idea of trust being gained overtime. It was noted that participants felt more familiar with each other due to the choices observed during the experience and knew what to expect from one another. By reflecting on the experience participants already agree upon a choice which was influenced by the same ideas expressed in the past variation. For one instance this is what P9 has said "**It felt like we were a team because you knew what I would choose, and I knew what you would choose**". P10 also had reiterated the same idea "**I knew what my partner would choose so I had trust in her that she will save our 'Loved Ones'**". Another participant expressed the importance of being loyal to their partner and true to their past decisions (P4) "**If I pulled the lever to hit our "loved ones" I would feel like I am betraying my partner**".

7.1.8 Eighth Variation themes (Prisoner Dilemma)

During the "Prisoners Dilemma" variation it was noticed that almost all participants made the same decision of sacrificing their single "Loved One" than rather risking the lives of their "Loved Ones" on the train and redirecting it towards the five unknown victims.

a. Importance of how many “Loved One” are saved.

A familiar theme about number of loved ones saved came up during this variation. Just like in the first few dilemmas most participants were communicating and making a choice which would result in a smallest personal cost for both without taking the risk and killing five people. In a way this resembled the first variation only this time participants worried about the amount of “Loved Ones” being killed rather than the five random victims. For instance, P3 explained **“It was calculation how many ‘Loved Ones’ are dead, it doesn’t matter if its mine or my partners ‘Loved Ones’ since we are a team”**. P1 also had similar thought to the previous comment **“We both did the same thing, in a sense we both didn’t do anything, so we saved more of our loved ones than we lost”**. Other participants also considered the five random victims as well even when they were offered the opportunity to redirect the train towards them without any other consequences.

P7 - I am not pulling the lever, you can pull the lever if you want! P8 - But that would kill five people! I am not pulling it.

b. Not trusting the partner.

There was another theme present in this variation which could explain why only one participant choose to redirect the train to the middle track with five random victims. It seemed that for many participants the possibility of the other person lying or changing their minds at the last moment was a big deterrent from the choice of redirecting the train. For example, P7 said **“It’s also the case of ‘even though I said I will do it’ but you don’t really know if I will do what I said I would. If we both have changed it at the last moment we could have lost more ‘Loved Ones’ than just two”**. Another participant expressed that they would not choose to redirect the train regardless if the other person had told them what they would do. This displays that people’s decision may be hard to influence by others when many of “Loved Ones” are involved, this is true even when the proposed outcome is supposedly better (8P) **“Here I killed my ‘Loved One’ to protect five strangers. I didn’t know what my partner would do and even if I did, I still would not risk it”**.

c. Who is the “Loved One”?

Participants also expressed that again they did not know which “Loved Ones” were on the train and on the tracks. This exhibits a possibility that participants may be more willing to take the risk to save all their “Loved Ones” if the single “Loved One” on the track had a significant value to them. For example, P7 displayed uncertainty when the significance between “Loved Ones” was discussed “**I**t’s going to be bad for me because I don’t know the relationship between my ‘loved one’ on the track and ‘Loved ones’ on the train. But at the same time, I didn’t want to take a risk all of those ‘Loved Ones’ dying on the train as-well”. Another participant had expressed this idea by stating a clear value difference between a family member and a friend (P9) “I didn’t know which ”loved Ones” these ones were. I think if the single ”loved one” was my mom and the ”Loved Ones” on the train were my friends I would have chosen to save the single ‘Loved One’”.

7.1.9 Variation Nine themes (I Am A Philosopher)

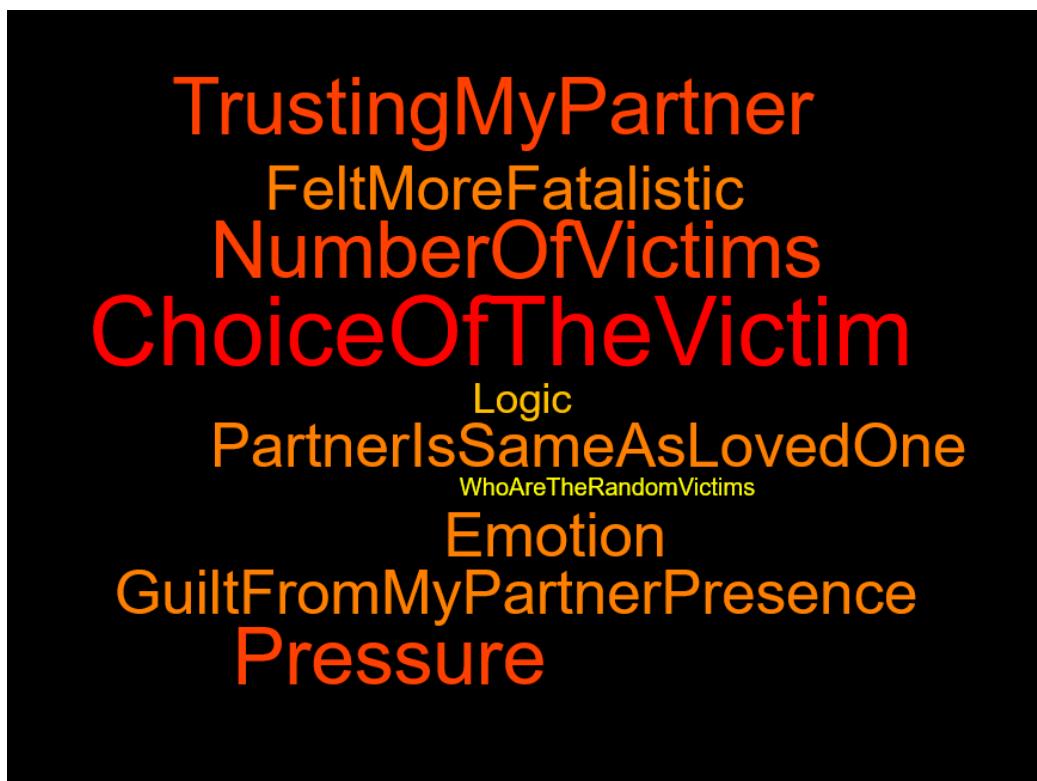


Figure 27. Word Cloud of variation nine. The bigger and redder the words are

the more relevant factors were during the variation.

The final variation the had outcomes that were more mixed. This indicates that there were quite a few less unanimous themes that were present during this variation.

a. Trust gained over time.

Perhaps the biggest observation during this was the trust each participant had for each other after the majority of the Embodied Trolley (VR) experience. Most participants expressed that they knew their partner is going to make the right choice for them regardless if it meant saving or sacrificing them. For example, P4 said “**I didn’t feel nervous or worried, I had complete trust in my partner to save me. I feel like we work well as a team**”. When participants explained how they knew which was the preferred choice of the person in the victim’s place many of them reflected on the previous choices their partner made and what they imagine their partner would want them to do, for instance P7 said “**If I knew you were there but I could not communicate with you I wouldn’t have pulled the lever because I know you personally**”. Another participant displayed a similar idea only with a reversed outcome (P8) “**I witnessed your self-sacrifice before so If I could not communicate with you, I would still sacrifice you because I would think that’s what you would want**”. Other participants who had saved their partners expressed that even knowing the real-life appearance of their partner made it hard for them to even think about their sacrifice (P10) “**I think the more you know someone even if it’s just by their face the harder it gets to save someone else instead of them**”.

b. It’s the victims’ decision.

Other people felt it was important to let the victim decide their own fate. This usually resulted in the choosing participant asking if the other participant wanted to be saved or sacrificed. Here is a discussion between two participants displaying such process.

P7 - **What decision should I make? Lever or no?** P8 - **Are you going to ask me? What If I don’t answer you? What if I will tell you no?** P7 - **Well what are you going to tell me now? That is the better question!** P8 - **Okay Do it, I will die as a hero!**

Some participants had volunteered to be sacrificed by exclaiming their wish before the variation had time to start (**P5**) “**It’s me, kill me please!**”. Many participants reported that by getting consent from the other participant it was easier for them to choose their partners sacrifice (**P7**) “**Hearing the other participant say, ‘Kill me’ helps to absorber the guilt**”. In fact, instances which involved the outcome of the partners sacrifice had been all approved by victims themselves.

c. Verbal manipulation.

Finally, it was noticed that during communication in some cases participants tried to influence the person with the choice. This was mostly done by reminding them what the victim participant has done for them before. For example, P9 said “**Remember that I chose to save you first!**”. Other participants had tried to intimidate their partners by making statements such as (**P1**) “**Don’t touch anything!**”.

7.1.10 Overall Experience themes

During the experience participants seemed to make recurrent comments which were associated with the overall mechanical design of the experience.

a. Unrealistic placement of the victims.

One of such recurring ideas was positioning of the victims during the experience. It seemed that participants really got caught up and taken out from immersion by the fact that victims were just somehow standing on the tracks without even thinking about the possibility of the incoming train. For example, P1 said “**The five victims stood on the track twice now**”. Another participant said that the victims didn’t even notice the obvious train coming towards them fast enough (**P7**) “**The people dancing didn’t even notice**”.

b. Player positions in real-life and virtual layers.

Another interesting perception which was expressed by the participants was their real-life and in game positions. During the experience “Discussion” Level participants got to be close to each other in the virtual space. However, the discussion which participants had were carried in the real-life layer by

talking directly to one another. This often-created confusion to participants, especially if their virtual avatars were facing each other but their real-life bodies were not. For example, P6 said “**It’s weird because my partner is on a different side in the game then in the room**”. Another participant added to this point (P1) “**It’s weird my partners sound is there but my partner is here on the screen**”. This displays how virtual reality experiences can create confusion and take out participants from immersion if the real-life layer is not appropriately synched with the virtual reality layer.

8 Discussion

While such studies as Smith [18] reveal what outcomes people prefer during dilemmas like the original “Trolley” or “Fat Man” problem it doesn’t show how people decide on their choice. Because of this during this study the thematic analysis method used by Flintham [4] proved to be fundamental in studying how participants reacted to different variations of the Embodied Trolley (VR) experience. Ultimately when the analysis of the discussions captured during the experience were carried out it was discovered that the most prominent factors which participants expressed to have influence on their decisions could be categorised into three points. The categories are listed below and will be now discussed as separate headings.

- Number of lives saved.
- Emotional attachment to victims and study partner.
- Presence and communication of participants.

8.1 Number of lives saved

One of the biggest factors which influenced participants decisions during the Embodied Trolley (VR) was the number of victims lives saved. It was observed that this idea had the strongest influence on participants decisions during the first few variations which didn’t involve their study partner or a character representing their loved one. This was mainly evident from participants discussions when they either clearly stated their intent or choice to save five people. They then justified their choices as being for the greater good of society which displays a utilitarian mindset amongst the participants

as described by Gawronski and Beer [7]. When discussed what would it take to change their utilitarian decisions many participants expressed that they knew nothing about the victims and if the right information was available such as victims age or if a family was relying on them then participants could have made a different decision. This displays that people attach a value to victims according to their background. If there is no information about the victims, problems like the “Trolley dilemma” becomes just calculation of which decision will save more lives.

Perhaps the most unusual use of such utilitarian mindset was observed during the “Fat Man” and “You May Be the Victim” variations. In the variation of “You May Be the Victim” a surprising number of participants decided to risk their lives to save the five victims. This is interesting because according to Taflinger [20] humans have a natural tendency towards self-preservation. Once the variation finished participants stated that they felt they would put other people in front of them and that the chance of saving everybody seemed reasonable for them. This displays that at least in the virtual environment people value themselves the same as the victims and aren’t afraid to risks their lives for them.

During the “Fat Man” variation most participants choose to sacrifice the “Large Man”. This displays a strong deviation from already existing research such as the Sokol [19] which suggest that people usually prefer to save the “Large Man”. Nevertheless, many participants during the study stated that killing the “Large Man” was the right decision because of more lives saved. Even though people showed moderate signs of guilt after pushing him off they explained that neither the appearance of the “Large Man” or the action of pushing were huge deterrents from the decision. Just like in the research of Navarrete, McDonald and L Mott [14] this displays that people do feel strong emotional difficulty when a utilitarian outcome requires a direct action of murder. However ultimately participants explained that the action only severed as a tool to reach the outcome and has no moral meaning. This displays that participants didn’t care about the “Large Man’s” right to life unlike Thomson [22] suggested that people should in her paper. It also shows that participants didn’t apply the “double effect” which was used by Foot [5] to display why utilitarian outcome is wrong on a “Fat Man” like dilemma called “Transplant”. Additionally, when speculating the reason behind people choosing to sacrifice the “Large Man” an idea of affordance influence comes up. According to Gabriella.L [6] sometimes people interact with objects simply because their attributes may invite them to do so. This could

have been also the case during “Fat Man” variation where participants could have felt invited to push of the “Large Man” because he was standing on a high platform in front of the tracks.

However, there was another theme which occurred during “Fat Man” and “You May Be the Victim” variations which might explain the unusual utilitarian decisions. During the “Fat man” variation some participants had pointed out that the “Large Man” character did not look realistic. Some participants explained that they could not tell the other five victims to get off the track while in real life they probably could. Other participants had directly acknowledged the fact they subconsciously understood the experience is not real. Additionally, during the “You May Be the Victim” variation discussions some participants said that they were uncertain if they would sacrifice themselves in real life. This means that participants could have made their choices without being immersed in the experience resulting in a choice different to one participant would make in real life.

8.2 Emotional attachment to victims and study partner

Possibly the strongest influence that had effect on participants decisions during the experience was emotional attachment expressed towards the “Loved One” character. This influence was present in every variation which involved the mentioned character and it seems that participants decisions were mostly based on how much they value the people they imagined in the place of the character. In fact, almost in every case where a “Loved One” character was present, participants had chosen to save their “Loved Ones” and expressed that they probably would not change their decision since they would rather deal with the guilt of five unknown victims dying than with a loss of a “Loved One”. Such reasoning provided by participants is most likely due to human social instinct. This is explained by Lieberman [11] who says that peoples brains experience threats to social connections almost same way as physical pain. When this notion is applied to the results of our study it is conceivable that participants may have associated such pain with the social connection loss of their imagined “Loved One”.

An interesting discovery was made during the experience regarding emotional attachment between participants. It was found that during time spent in the experience participants formed an emotional connection and

trust with each other regardless if they knew one another beforehand. This was mainly evident during the “Prisoners” and “I Am a philosopher” variations. Throughout the “Prisoners” variant most participants conveyed care for each other’s “Loved Ones”, some have even told their partners to redirect the train to the middle so they could save more of their “Loved Ones”. While this could have been simply the case of participants not wanting to risk more “Loved Ones” deaths, some participants volunteering to sacrifice their single “Loved One” so the other participant could save theirs suggest otherwise. When discussing the outcome of this variation many participants expressed that this variant was about saving bigger number of “Loved Ones”, it didn’t matter who’s “Loved Ones” it was. During the “I Am a philosopher” variation this influence seemed to be even more relevant since participants expressed having built-up trust between each other, some even stating that they felt like a team and in some case almost like a family. Some participants explained that even knowing the look of their partners face made it more difficult for them to not sacrifice five victims. This could be due to participants creating family like bonds with each other due to playing with a single game object. For example, according to Wang [26] family’s members that frequently play videogames together report stronger closeness to each other. A similar thing could be happening in this study as well but this time between participants. This displays that participants may develop social connections between each other over time which can have influence to invoke a similar sense of value as many participants have for their “Loved Ones”. This value could then have a similar effect on participants decisions where one might not be able to cope with the emotional connection loss of their partner as suggested by Lieberman [11].

8.3 Presence and communication of participants

One of the most fascinating findings during this study was observing how communication between participants had affected their decision during multiplayer variations which had involved both participants. Unlike in previous variations which participants played separately, in these variations participants had started communication straight away upon entering these levels. For example, one of such occurrences often happened during the “Prisoners” variation where participants reassured each other that they will not turn their trains full of “Loved Ones” to the middle track. It’s important to note that participants were only told that they can communicate once they have

asked. This is interesting because during other variations participants did not communicate extensively until they had reached the “Discussion” level. This shows that the presence of other participants in dilemmas will often invoke people to seek for other involved individuals’ opinions or reassurance on the problem.

Additionally, it seemed that once the variations had involved both participants, many of them felt that they needed to cooperate when solving the problem. This was especially noticed amongst younger participants of the experience. According to McLeod [13] people at young adults age tend to uphold their social groups values. This is because participants who displayed such communication the most were mostly in the young adults age group. While this doesn’t display the exact reason why participant felt the need to cooperate it could show that the younger age group wanted to understand their partners values and decide their outcome based on them.

It was also noticed that during multiplayer variations which involved one observing and one choosing participant there were mainly two types of players. One of them were ones who clearly stated what outcome they will choose which was always one which either saved the “Loved One” characters of all participants or the study partner of the participant. It seemed that partners of these participants never challenged their point of view most likely due to their decision benefiting both participants rather than the unknown victims. The other type which was also more frequent were the participants who always asked their study partners opinion on the problem before making the choice. Perhaps the most interesting aspect about this type of participants was that they always took the advice of their partner and made their choice according to it. When this type of people explained why they made such choices there response often was that they needed to respect their partners ideas and that their partner was involved as much as they were. This is important because other researchs such as Schobel [17] explain that many people often ignore their own ideas and generally favour the ideas of other people which we also see happening in our study. Participants also could have tried to ask their partners opinion simply because they didn’t want to be blame for the action by themselves. Some participants had even stated that the person who pulls the lever usually gets most of the blame.

8.4 Time Pressure

Time pressure on itself was observed to not be a big factor that had influenced participants decision-making. In fact, every time participants didn't manage to make their desired choice in time, they had expressed themselves being too slow or confused during the discussions and that their intention was different from the outcome. Once participants progressed and got used to the mechanics of the game it seemed that thirty seconds to decide wasn't an issue for participants. Most of them were able to choose in seconds upon entering new variation. The only instance where time pressure seemed to have some impact was during the last variation "I Am A Philosopher". During this variation there was one instance where two participants clearly rushed to decide as seen in discussion bellow. This was because participants started a discussion in midst of the variation. This resulted them realising that they had little time to decide when the choosing participant was asking for the observing one to make a choice. This made the observing participant to quickly say their choice, however after the variation both participants hadn't mention anything about time influencing their choice. This displays that time pressure on itself may be hard to test because participants don't have to consider how much time each decision will take to make. Nevertheless, time pressure had played an important role in the recreation of each variation. If time pressure wasn't present in Embodied Trolley (VR) arguably the experience wouldn't as immersive due to the absence of it.

P7 - What decision should I make? Lever or no? P8 - Are you going to ask me? What If I don't answer you? What if I will tell you no? P7 - Well what are you going to tell me now? That is the better question! P8 - Okay Do it, I will die as a hero!

8.5 Cognitive Load with Time Pressure

It was noticed that during the second variation cognitive load and time pressure could have encouraged participants to save the five people instead of one. Evidence of this happening was a single case of a participant clearly changing their intention to save five victims unlike in the first variation where they chose a deontological outcome of saving one. There were also other participants who mentioned that the decision to save five people could have been induced by the math problem present in the variation, however it would be ill willed to take their words as facts as all other participants had intended

to save five people in the first dilemma. Nevertheless, our single case of one person clearly changing their decision to a utilitarian one due to the challenge provided by the mathematical cognitive load and time pressure provides a minor proof to the results of research carried out by Trémolière and Bonnefon [24]. Perhaps in the future with a bigger sample of participants it would be possible to observe more instances of participants shifting from a deontological decision to a utilitarian one when a significant conative load is applied. Now the size of the sample was too small to observe a significant number of participants choosing a deontological outcome in the first dilemma and then choosing the utilitarian outcome in the second one.

8.6 Limitations and recommendations for future study

Like every research this one had limitations which could be improved upon conducting further study.

Perhaps the clearest limitations were present in the design of the Embodied Trolley (VR). When looking at the discussions of the overall experience many participants had expressed that some approaches which would be possible in real life were missing from the experience. For example, participants noted that victims always ran alongside the track instead of going away from it when the train was approaching them. Participants also noted that victims always somehow ended up on track however there was no indication that they were trapped. This shows that simply the notion of victims being unaware of the train was just unrealistic for participants. This shows a serious immersion breaker which could have amplified the influence of moral disengagement in the experience. To rectify this issue for future studies all future levels should have a design which clearly indicates that victims present in each variation cannot escape the train.

Furthermore, few participants expressed that the graphics weren't realistic. This is another limitation which hinders virtual reality technology. To create VR experiences with photorealistic graphics vast graphical processing is required which current VR technology doesn't possess. To add, there are also ethical implications of using photorealistic graphics since high fidelity visuals such as blood could possibly traumatisise participants during such research.

Another interesting observation made by participants was the notion that they were eased into the more personal variations. For example, this was P4 said "**If the levels with the "Loved Ones" would have occurred**

first it would have been harder to make these decisions”. This is an interesting point since it was previously observed that connections between participants had formed due to them playing the experience together for some time. This could be an interesting area to study in future work. For example, if more personal variations would occur sooner, participants would have less time to familiarize with each other. Because of this it may be possible to see how participants react to each other’s ideas and decisions when social connection between them is not as strong as it would be by the end of the experience.

Fallowing this a final limitation was observed. It was noticed that participants could have gotten used to the premise of the experience by playing many variations of Embodied Trolley (VR) back-to-back. For example, this is what P7 said “**Because we know what’s going to happen just before we go into the level in a sense, we premeditate our decision, if this situation would happen randomly and someone asked for me to sacrifice for five random people, out of instinct we would probably say no**”. This shows that overtime participants may familiarise the experience. Hartmann and Vorderer [9] explains that familiarity with the virtual experience also has a chance of increasing moral designation for its participants. This means that perhaps in future studies it would be good practice to consider running many participants through single instances of random variations instead of letting them play an entire experience which has many variations lined up.

9 Conclusion

This research aimed to test and identify influences on people’s decision-making process in virtual environments. By conducting research through design, the study developed a virtual reality experience called Embodied Trolley (VR) which was able to provoke people’s decision-making process by recreating the famous “Trolley Dilemma” and its several other variations. To gain insight to people’s decision-making the study had carried out thematic analysis on participants experience and reflections during the Embodied Trolley (VR). Based on the qualitative data collected from the analysis it was concluded that factors of **emotional attachment, peer pressure and lives saved during the dilemmas** held most significance to people when facing a thought decision in a virtual environment. These results indicate

that while people do understand that they are in a virtual environment to an extent their decisions are still influenced by factors like the ones mentioned previously.

By conducting thematic analysis on participants discussions captured during the Embodied Trolley (VR) experience it was possible to better understand why and how the three mentioned factors had affected their decisions. However, this method also raised some questions such as how strong the influence of emotional attachment and peer pressure would be if the virtual recreations of the “Trolley Dilemma” would appear more random and sudden to participants providing them with less time and familiarity to create an emotional connection between one another.

Based on these conclusions future research could consider effects of time which participants spent together within the experience. This would help to better understand how emotional attachment may affect people if they are faced with personal decisions involving their partners early on in virtual environments. Additionally, the line-up of different “Trolley dilemma” variations in virtual environment could be randomized or could be tested on an individual bases to prevent participants from assuming what’s going to happen in the upcoming variations of the experience. This would help to create more unexpected virtual environments in which participants would have less time to think possibly resulting in more impulsive decisions.

Perhaps the biggest contribution of this research was that the study has directly enquired people to communicate and discuss reasons behind their decisions during Embodied Trolley (VR). By doing so this research provided a greater insight into how simulated factors and influences considered by people when they are faced with a dilemma within a virtual environment.

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