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Is the power of love more important than the power of responsibility? Moral decision-making in the context of obsessive-compulsive symptoms

By

Sera Kayla Pensoy

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Faculty Advisor: Gregory Chasson, PhD

Preceptor: Hannah Hamilton, PhD

Abstract

There is reason to believe that morality–beliefs of right and wrong–is linked to the manifestation of obsessive-compulsive symptoms (OCS) in individuals with Obsessive Compulsive Disorder (OCD), due to their heightened sense of responsibility. Previous literature shows that, when confronted with trolley problem scenarios, OCD patients differ in their responses to non-OCD participants, with OCD patients flipping the switch less than non-OCD counterparts in scenarios presented. Based on this, this study aims to examine how OCS interfere with moral decision-making, namely, whether moral decision-making preferences of those with high prevalence of OCS change based on whether potential victims in the scenario include someone familiar, and when the number of potential victims increases. Non-clinical participants recruited online (N = 158) were presented with a questionnaire containing trolley problems which varied in their parameters of whether a victim was close/familiar to the respondent ('familiarity'), and how many people were on each train track ('human loss'). Three generalized linear mixed models were fit to data. The first model included all of the predictors, the second included two-way interactions between familiarity, human loss, and OCS, and the third included a three-way interaction between all three. Contrary to expectations and past research, OCS was not significantly associated with trolley problem responses, though patients were 705.68 times significantly more likely to flip the switch in scenarios where familiarity and human loss were high. These results may suggest that concerns of saving those familiar to you, and saving as many people as possible, can have a stronger effect compared to OCS on moral decision-making. However, results of this study may not be generalizable due to a low sample size. Further research is needed to explore this dynamic more robustly.

Keywords: obsessive compulsive disorder, moral decision-making, trolley problem, excessive responsibility, guilt, moral psychology

Is the power of love more important than the power of responsibility? Moral decision-making in the context of obsessive-compulsive symptoms

Obsessive-compulsive disorder (OCD) is a disorder characterized by the presence of obsessions and/or compulsions (American Psychiatric Association, 2013). Obsessions are recurrent and persistent thoughts, urges, or images that are experienced as intrusive and unwanted, whereas compulsions are repetitive behaviors or mental acts that an individual feels driven to perform in response to an obsession or according to rules that must be applied rigidly. A common example of obsessions and compulsions are the obsession of fearing contamination, such as from dirt, germs, or bodily fluids or feces, and the associated compulsions of excessive washing and cleaning behaviors (Veale & Roberts, 2014). This example is characteristic of contamination OCD, one of the most common forms of OCD, with a purported 50% of OCD patients experiencing contamination obsessions, and 46% experiencing cleaning compulsions (Markarian et al., 2010; Abramowitz et al., 2003).

The global prevalence of OCD is approximately 2% of the general population (Sasson et al., 1997). However, research has shown that OCD is better characterized as a dimension, rather than as a category (Fineberg et al., 2020). This implies that all individuals fall somewhere on the spectrum of OCD characteristics. For that reason, we consider obsessive compulsive symptoms (OCS) in this study as a continuum, and as such, we will be discussing OCS and how they interfere with moral reasoning, and we will be sampling a healthy population rated for OCS prevalence in our study, rather than an OCD population.

Research has consistently found that responsibility beliefs are important in the experience of obsessional problems (Salkovskis et al., 2000; Ramezani et al., 2016). Responsibility beliefs can be characterized as a fear of causing bad, or harm, to others or to the self (Rhéaume et al.,

1995). Conceptually, taking responsibility is linked to the emotion of guilt, since one may feel guilty for being supposedly responsible for some harm or bad. This conceptual link is reflected in research that has shown how guilt and responsibility are linked to higher rates of OCS. For example, Shapiro and Stewart (2011) found that inciting guilt generated OCS in nonclinical samples, including excessive responsibility (Mancini & Gangemi, 2015). Furthermore, Arntz and colleagues (2007) found that fear of guilt yielded a greater increase in checking behavior across OCD subtypes than is observed in anxious and non-clinical samples (Mancini & Gangemi, 2015), linking checking—one of the most prevalent compulsions of OCD—with guilt. Lopatcka and Rachman (1995) found that obsessive patients' concern over a harmful event (e.g., a gas explosion) is substantially reduced if responsibility for the event is not theirs, but somebody else's, regardless of the actual probability of harm. Crucially, this suggests that their concern was not about the consequences of the event, so much as being responsible for that event (Mancini & Gangemi, 2015). However, it is important to note that responsibility, though a very common form of OCD, is not a universal component of OCD, as symptoms of OCD are highly heterogeneous.

Considering that responsibility is a common core belief in various forms of OCD, it stands to reason that one's moral framework—beliefs about morality, assessing good versus bad—plays a crucial role in how feelings of responsibility manifest and consequently influence the expression of OCS. In addition, one of the most common symptom dimensions of OCD is sexual/religious, also called 'taboo thoughts' (Rosario-Campos et al., 2006; Fineberg et al., 2020), which is conceptually tethered to morality and normative ideals of what is good and bad. The present research study therefore aims to examine how obsessive-compulsivity interferes with moral reasoning.

Moral Decision-Making and The Trolley Problem

In order to study moral decision-making and moral judgment in a population, the categorization of moral intuitions and judgments must be systematized, so judgments can be compared. To describe the ethics of different individuals, we will take inspiration from normative ethics. Thinking about what makes an action fundamentally correct or incorrect, two distinctions that one can intuit are (1) if the action itself was good or bad, and (2) if the consequences of that action were good or bad. Typically, in the case of (2), one will determine goodness or badness based upon whether joy/pleasure was brought about, or pain/harm, respectively. In the case of (1), determining how an action is good or bad is less clear. Kant famously theorized the universalizability principle as a criterion for distinguishing between good and bad actions: an action is deemed good if, and only if, one would "will that it become a universal law" (Kant, 1785/1997). Put simply, one can morally approve of an action only if they would approve of everyone else acting in the same manner in that particular context. Kant's universalizability principle is consistent with deontology, a theory of normative ethics that posits the moral correctness of an action is determined by the nature of the action itself. Conversely, the case of (2) corresponds with consequentialism (also known as utilitarianism), which contends that the moral value of an action hinges on its outcomes. These theories and their juxtaposition have endured over time.

Research on moral reasoning commonly operationalizes morality through the use of moral scenarios, where the options presented adhere to either deontology or utilitarianism. These frameworks represent two distinct approaches to ethical decision-making; deontology focuses on the adherence to moral rules or duties, whereas utilitarianism emphasizes the consequences of

actions, aiming to maximize overall happiness or well-being. The trolley problem (Foot, 1967; Thomson, 1976; Thomson, 1985) serves as a thought experiment that effectively illustrates this dichotomy of moral decisions. It poses a scenario where individuals must choose between diverting a runaway trolley onto a track where it will cause the death of one person or taking no action, leading to the death of five people on the main track. This ethical dilemma forces individuals to confront the conflict between deontological ethics (abstaining from 'bad' or wrongful actions) and utilitarian ethics (minimizing overall harm), making it an ideal tool for studying moral reasoning. The trolley problem (Foot, 1967; Thomson, 1976; Thomson, 1985) reads as follows:

You are standing beside a train track, which has 5 people on it. A train is hurtling down the track towards those 5 people. There is a lever beside you: if you pull it, the train is diverted onto a track that has 1 person on it. The train will kill whoever is hit, and no other interventions can stop the train. Do you pull the lever?

The trolley problem holds significant value for investigating moral reasoning by simplifying essential components of ethical decision-making into a controlled and easily comprehensible format. Its straightforward choices and high-stakes nature, where individuals must confront the imminent loss of life, provide a robust framework for examining how individuals prioritize different ethical principles. Furthermore, the extensive use of the trolley problem in moral psychology and philosophy has generated a substantial body of literature that supports comparative analysis. Research consistently demonstrates that individuals' responses to the trolley problem illuminate underlying intuitions and cognitive processes involved in moral judgment (Greene et al., 2001; Cushman et al., 2006). Therefore, the trolley problem was chosen

for this study based on its clarity, well-established research base, and capacity to evoke fundamental ethical intuitions.

Trolley Problem Responses Associated with OCS Prevalence

Previous research on the trolley problem in healthy populations has shown that a majority of people opt for commission, choosing to flip the switch. For example, Mancini and Gangemi (2015) found that 69% of participants made this choice, and Navarrete and colleagues (2012) reported an even higher rate of 90.5% in a virtual-reality setting. In contrast, previous research on moral reasoning and OCS or OCD has found that a majority of OC individuals opt for omission, refusing to flip the switch. Mancini and Gangemi (2015) found that only 22% of participants with OCD chose to flip the switch, and Franklin and colleagues (2009) found that the more strongly OCD patients endorsed responsibility attitudes, the less likely they were to choose the utilitarian choice (flip the switch) in the trolley problem binary. Though this relationship between strong responsibility attitudes and refusing to flip the switch was nonsignificant, a similar pattern was also evident in the control group. The researchers concluded that there may be a stronger association between moral reasoning patterns and responsibility attitudes than to OCD per se.

Heightened Sense of Responsibility Associated with OCS Prevalence

Despite their conclusion, analysis of various studies suggests that a heightened sense of responsibility, typical of OC individuals (though not universal), is a primary explanation for this difference in moral judgment. Wroe and Salkovskis (2000) explain how responsibility-based interpretations of intrusions form the bridge between the occurrence of the intrusion and the

compulsion to act. In turn, generally held assumptions drive the specific responsibility interpretations. Furthermore, the assumption that failing to (try to) prevent harm is the same as having caused the harm in the first place may be an important aspect of obsessional problems (Salkovskis, 1998; Wroe & Salkovskis, 2000). This relates to findings by Spranca and colleagues (1991) that non-clinical participants judge responsibility for negative consequences to be diminished when an omission is involved (i.e. not acting or the failure to act), as opposed to when some specific action (or commission) is involved in bringing about the negative consequence (Wroe & Salkovskis, 2000). We intend to explore this idea further in the current research: if individuals with high prevalence of OCS would rather let more people die than was necessary to avoid implicating themselves, then just how far does this preference go? What circumstances can one come up with to see when an individual with high rates of OCS will finally find it morally inexcusable to omit themselves, and change their response?

Designing Parameters to Test Priorities in the Trolley Problem

One can test this by manipulating parameters of the trolley problem dilemma to test moral reasoning variables (Thomson, 1976; Thomson, 1985): by altering subtle details, such as the number of individuals on each track or their relationship to the decision-maker, studies reveal shifts in moral judgments (Petrinovich et al., 1993). For instance, Petrinovich and colleagues explored variations where participants faced scenarios involving different numbers of individuals and varied relationships (e.g., strangers versus kin), influencing moral decisions.

Inspired by this approach, our study focused on two key dimensions. One was 'Familiarity,' examining how emotional closeness to a person on the spur track affects response (and therefore not necessarily from an evolutionary psychology framework, as was the case for

Petrinovich et al.) Previous studies suggest that familiarity significantly impacts moral decisions, as individuals may prioritize saving someone they know over utilitarian concerns (Petrinovich et al., 1993; Bleske-Rechek et al., 2020; Mehdizadeh et al., 2021). The other was 'Human Loss', exploring how different amounts of people on the spur or the main track, and therefore the number of deaths, affects response.

While research indicates that high rates of OCS is associated with prioritizing avoiding moral wrongs, little is known about whether familiarity or the severity of potential harm (human loss) overrides this concern in moral scenarios.

The Current Study

The current mixed design study investigated the association between OCS and moral reasoning in the trolley problem. Specifically, we tested a three-way interaction between predictors: Familiarity (within-subject; high/low, denoted by +/-), Human Loss (within-subject; high/low, +/-), and OCS (between-group; high/low, +/-). As the construction of each trolley problem entailed a main track and a spur track, human loss was high/low with respect to how many people were on the spur (commission) track; either five on the spur track and one on the main track (high human loss), or one on the spur track and five on the main track (low human loss). In the same way, familiarity was high/low with respect to whether the one lone individual (not the group of five) was the close person named by the respondent or not, regardless of which track they were on; either the one person was a stranger (low familiarity) or the one person was that named individual (high familiarity). As such, each participant responded to four trolley scenarios based on a 2x2 design: high familiarity with high human loss, high familiarity with low human loss, low familiarity with high human loss, and low familiarity with low human loss. For

further details surrounding the scenarios described, please read the four scenarios in Appendix B, and a visual aid for the dilemmas in Appendix C. For context, read the following scenario for 'Familiarity+, Human Loss-': high familiarity (meaning the individual is known), and low human loss (the sole individual is on the spur track, so flipping the switch and committing would result in the death of one, rather than five). The scenario reads as follows:

Familiarity+, Human Loss-

A trolley is hurtling down some train tracks. There are five innocent people on the track ahead of the trolley, and they will be killed if the trolley continues going straight ahead. There is a spur of track leading off to the side. There is one person, [NAME], on that spur of track. The brakes of the trolley have failed and there is a switch which can be activated to cause the trolley to go to the side track.

You are an innocent bystander (that is, not an employee of the railroad, etc.). You can throw the switch saving the five innocent people, which will result in the death of [NAME] on the side track. What would you do?

Hypotheses

We hypothesized, in line with existing literature (Mancini & Gangemi, 2015; Franklin et al., 2009), that OCS would be associated with trolley problem decisions (i.e., main effect). Specifically, we predicted that individuals high in OCS would opt for commission (i.e., pulling the lever) less than individuals low in OCS across all dilemmas. We also hypothesized that OCS would moderate the interaction between familiarity and human loss (i.e., three-way interaction). Specifically, low OCS would be associated with a higher commission rate compared to high OCS when familiarity is high and human loss is low (meaning there are five strangers on the

main track and their close relation on the spur track), and when familiarity is high and human loss is high (meaning their close relation is on the main track and five strangers are on the spur track), due to high OCS being associated with unwillingness to commit as observed in previous studies (Mancini & Gangemi, 2015; Franklin et al., 2009).

In addition, we hypothesized that there would be a significant interaction between familiarity and human loss (i.e., two-way interaction), as both factors influence participants' responses. Specifically, when familiarity is high and human loss is high (meaning their close relation is on the main track and five strangers are on the spur track), participants' preference for omission would be higher than when familiarity is high but human loss is low (meaning five strangers are on the main track and their close relation is on the spur track), due to having to engage in commission to save their close relation (putting themselves in a position of responsibility) as opposed to not having to respond/commit to save their close relation (evading responsibility). When familiarity is low and human loss is low (meaning five strangers are on the main track and one stranger is on the spur track), we hypothesized that the preference for commission would be higher than when familiarity is low and human loss is high (meaning one stranger is on the main track and five strangers are on the spur track), as participants align their response with whatever outcome reduces human loss.

Method

Participants

160 nonclinical participants volunteered through Prolific Academic; two participants were excluded from analyses as they did not complete the survey in its entirety. This resulted in a final sample of 158 participants, ranging in age from 21 to 72 ($M = 40.2$, $SD = 12.3$). We utilized

random sampling in order to represent the general population. Each participant was compensated $3.50. This research study obtained IRB approval before recruitment took place. Table 1 displays their other demographic information.

Table 1

Demographic Characteristics of Participants

Characteristic	*n*	%
Gender		
Female	82	51.9
Male	74	46.8
Other	1	0.6
Prefer not to say	1	0.6
Education Level		
Some High School	2	1.3
High School Diploma	39	24.7
Vocational or Technical Training	10	6.3
Associate's Degree	20	12.7
Bachelor's Degree	53	33.5
Some Graduate School	3	1.9
Graduate Degree	31	19.6
Household Income		
$0 - $25,000	21	13.3
$25,001 - $49,999	46	29.1
$50,000 - $74,999	31	19.6
$75,000 - $99,999	29	18.4
$100,000 - $124,999	11	7.0
$125,000 - $149,999	10	6.3
Greater than $150.000	10	6.3

Note. N = 158. Participants were on average 40.2 years old (SD = 12.3; Min 21.0, Max 72.0). The average age of the high OCS group was 37.3 (SD = 11.8), and for the low OCS group it was 43.1 (SD = 12.0).

Procedure

Participants completed a survey administered through Qualtrics, in which every participant was required to answer every question. They first entered their demographic information. At the end of the demographic section, there were questions which collected the necessary information for the familiarity predictor, including the name of an alive adult who is close to them. The following section presented the 4 dilemma scenarios, with their order randomized. The name of the close individual the participant entered earlier in the survey was carried forward (i.e., piped) into the two Familiarity+ permutations of the dilemmas, so the 'familiar' individual was tailored to each participant. Following the dilemmas, they filled in psychometric measures (some of which were not pertinent to the current study), one of which was the Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010) to measure OCS. Mental-health scales were arranged in a super-block (with each scale being its own block), interspersed with attention checks between scale-blocks, such that the order of the scales and attention checks were randomized. The final section was the debrief.

Measures

Obsessive-Compulsive Symptoms

The DOCS is a 20-item self-report questionnaire designed to measure OCS severity across four dimensions: contamination, responsibility for harm and mistakes, incompleteness/symmetry, and unacceptable taboo thoughts. Each dimension corresponds to a subscale within the DOCS. The subscales of the DOCS have demonstrated strong reliability, validity, diagnostic sensitivity, and responsiveness to treatment effects across diverse cultural

and linguistic contexts (Kim et al., 2013; Melli et al., 2014; López-Solà et al., 2014; Ólafsson et al., 2014). Each subscale prompts respondents to evaluate the severity of obsessions and compulsions they experienced in the past month. Ratings are based on a scale from 0 (no symptoms) to 4 (extreme symptoms) for (a) time spent on symptoms, (b) avoidance behavior, (c) distress, (d) functional interference, and (e) difficulty in disregarding obsessions and refraining from compulsions. Each subscale is scored by summing the ratings of five items (resulting in scores between 0-20). A total score is derived by summing the scores of all four subscales (0-80). A total score of 18 effectively distinguishes individuals with OCD from those without any psychiatric diagnosis, whereas a score of 21 effectively distinguishes individuals with OCD from those with other anxiety disorders. However, specific cutoffs for scores defining mild, moderate, or severe OCS are not yet empirically established. For our analyses, participants with scores above the median were sorted into the high OCS group (n = 78; 49.4%, with average age 37.3, SD = 11.8), and those with scores equal to and below the median were sorted into the low OCS group (n = 80; 50.6%, with average age 43.1, SD = 12.0).

Familiarity

Participants named an individual close to them. They then noted what type of relationship they have (i.e., mother, brother, cousin, friend, etc.), and their level of closeness. Level of closeness was standardized using the 'Inclusion of the Other in the Self' (IOS) Scale (Aron et al., 1992), which is considered a highly valid, reliable and psychologically meaningful measure of the subjective closeness of relationships and has also been shown to correlate significantly with six other commonly used scales designed to measure relationship closeness (Aron et al., 1992; Gächter et al., 2015). The scale entails one question asking participants to rate their closeness to this individual on a scale of 1-7 using visual aids of circles converging; at the lowest level, the

circles hardly overlap, and at the highest level, the circles are almost entirely overlapping. These circles are intended to represent the perceived closeness of the two individuals, which the participant reveals via their selection. This rating determined relationship closeness (see Appendix A).

Statistical Analysis

To determine the appropriate sample size, we conducted a power analysis in G*Power (Faul et al., 2009). Our goal was to obtain 0.80 power to detect an odds ratio of 0.53, reflecting a medium effect size as seen in Mancini & Gangemi (2015), at the standard 0.05 alpha error. G*Power recommended a sample size of 481 participants to meet this goal. Only 160 participants have been recruited to date, although additional data collection is underway for collecting a larger sample. This resulted in the current study being underpowered. For this reason, though we collected data for demographic variables (of which some are shown in Table 1), these were not included in our analysis, as each category would potentially have had too small of a sample size to visualize any effects. This may have led to results with large uncertainty being generated.

To analyze the interaction effects between the IVs—OCS group, familiarity, and human loss—we conducted a series of generalized linear mixed-effects models (GLMMs) in R (R Core Team, 2024) using the ‘lme4’ package (Bates et al., 2015). This analysis was conducted in three stages: a main effects model, a two-way interactions model, and a three-way interaction model. Each model's output was reviewed to identify significant effects.

In addition, to evaluate the overall significance of our GLMMs, we conducted omnibus tests using likelihood ratio tests (LRTs). This approach compared each full model (including the

predictors and their interactions) to a corresponding null model containing only the intercept and random effect, to determine whether the full model provided a significantly better fit to the data compared to the null model.

Results

DOCS scores had a mean of 12.66 (*SD* = 12.68), indicating a wide range of variability in the scores. Although the range of scores was from 0 to 57, the median score was 8, indicating a positively skewed distribution. The skewness was 1.29, and kurtosis was 1.12, meaning that only a few participants had high scores. The trimmed mean was 10.72, and the median absolute deviation (MAD) was 10.38. The standard error of the mean (SE) was 1.01.

Main Effects Model

To investigate the relationship between familiarity, human loss and OCS group on response (flipping the switch), a series of GLMMs were fitted to data. The first model tested for the main effects of OCS group, familiarity, and human loss on response (i.e., flipping the switch). As shown in Table 2, results of this model indicated that none of the tested predictors (OCS group, familiarity, and human loss) were significantly associated with participants' responses. Nonetheless, the pattern of choices suggested by the frequency table of main effects (Table 3) appears to imply that familiarity makes a difference in people's choices, despite a lack of statistically significant association apparent from the model.

The omnibus test revealed that the LRT yielded a chi-square value of 4.40 with 3 degrees of freedom, resulting in a non-significant p-value (0.22). This indicates that the inclusion of the main effects alone did not significantly improve the model's fit, suggesting that these

predictors, without their interactions, do not explain a significant amount of variability in the response variable.

Table 2

Results from the Main Effects GLMM

	b	*SE*	*z*	*p*	Odds Ratio (95% CI)
Intercept	-0.23	0.16	-1.44	0.15	0.79 (0.58, 1.09)
OCS	-0.17	0.16	-1.09	0.28	0.84 (0.61, 1.15)
F	0.26	0.16	1.61	0.11	1.29 (0.94, 1.78)
HL	-0.13	0.16	-0.80	0.42	0.89 (0.64, 1.20)

Note: N = 158. Reference category: OCS+, F-, HL-. OCS = obsessive-compulsive symptoms, F = familiarity, CI = confidence interval

Table 3

Frequency of Commission/Omission Responses as Influenced by Main Effects

	Do not flip the switch (Omission)	Flip the switch (Commission)	Total
OCS-	187 (58.44%)	133 (41.56%)	320
OCS+	169 (54.17%)	143 (45.83%)	312
F-	188 (59.49%)	128 (40.52%)	316
F+	168 (53.16%)	148 (46.84%)	316
HL-	173 (54.75%)	143 (45.25%)	316
HL+	183 (57.91%)	133 (42.09%)	316
Total	1068 (56.33%)	828 (43.67%)	1896

Note: OCS = obsessive-compulsive symptoms, F = familiarity, HL = human loss.

Two-way Interaction Model

Please see Table 4 for results of the model testing two-way interactions. Only the two-way interaction between familiarity and human loss is significant and has an odds ratio of 705.68 (290.50, 1840.63). To break down this interaction, Table 5 shows the frequency of responses–refusing to flip the switch or choosing to flip the switch–per moral dilemma, as defined by the levels of familiarity and human loss. The table shows that 74.05% respondents chose to flip the switch under F- and HL- (wherein the act of commission would entail one person dying, to save five people), but with the F+ and HL- condition (wherein the act of commission would entail your close relation dying, to save five people), choices to flip the switch decreased by 57.59%, meaning over half of participants changed their mind when a close relation was involved. Under F+ and HL+ (wherein the act of commission would entail five people dying, to save your close

relation) 77.22% of respondents chose to flip the switch, reflecting that same desire to save your close relation. These patterns imply that over 50% of participants were prioritizing the life of their close relation over utilitarian concerns or over a specific avoidance of engaging in commission.

The two-way interaction omnibus test revealed that the LRT yielded a chi-square value of 298.98 with 6 degrees of freedom, resulting in a highly significant p-value (<0.00). This indicates that the inclusion of the predictors and their two-way interactions significantly improved the model's fit, confirming the overall significance of the model in explaining the variability in the response variable.

Table 4

Results of the Two-Way Interactions GLMM

	b	*SE*	*z*	*p*	Odds Ratio (95% CI)
(Intercept)	1.43	0.27	5.24	0.00***	4.19 (2.51, 7.39)
OCS	-0.70	0.34	-2.05	0.04*	0.50 (0.25, 0.96)
F	-3.04	0.37	-8.12	0.00***	0.05 (0.02, 0.10)
HL	-3.75	0.42	-8.97	<0.00***	0.02 (0.01, 0.05)
OCSxF	0.70	0.45	1.48	0.14	1.95 (0.81, 4.81)
OCSxHL	0.07	0.45	0.15	0.88	1.07 (4.35, 2.60)
FxHL	6.56	0.47	13.98	<0.00***	705.68 (290.50, 1840.63)

Note. N = 158. Reference category: OCS+, F-, HL-. OCS = obsessive-compulsive symptoms, F = familiarity, HL = human loss, CI = confidence interval.

* p < .05, *** p < .001.

Table 5

Frequency Table of Responses by Human Loss (HL) Levels, Moderated by Familiarity (F)

HL	Do not flip switch	Flip switch
	F-	
-	41 (25.95%)	117 (74.05%)
+	147 (93.04%)	11 (6.96%)
	F+	
-	132 (83.54%)	26 (16.46%)
+	36 (22.78%)	122 (77.22%)

Three-way Interaction Model

Finally, the three-way interaction GLMM included all previous predictors, two-way interactions, and the three-way interaction between OCS group, familiarity, and human loss (see Table 6). Counter to expectations, the three-way interaction was non-significant. This suggests that OCS does not moderate the interaction between familiarity and human loss.

The results of the omnibus test revealed that the LRT yielded a chi-square value of 299.86 with 7 degrees of freedom, resulting in a highly significant p-value (<0.00). This indicates that the inclusion of the predictors and their interactions significantly improved the model's fit, confirming the overall significance of the model in explaining the variability in the response variable.

Table 7

Results of the Three-Way Interactions GLMM

	b	*SE*	*z*	*p*	Odds Ratio (95% CI)
(Intercept)	1.35	0.28	4.83	0.00***	3.88 (2.30, 6.94)
OCS	-0.57	0.37	-1.53	0.13	0.57 (0.27, 1.16)
F	-2.87	0.41	-7.06	0.00***	0.06 (0.02, 0.12)
HL	-3.52	0.47	-7.55	0.00***	0.03 (0.01, 0.07)
OCSxF	0.35	0.57	0.62	0.54	1.42 (0.47, 4.43)
OCSxHL	-0.51	0.79	-0.65	0.52	0.60 (0.11, 2.65)
FxHL	6.18	0.61	10.09	<0.00***	481.32 (151.17, 1678.54)
OCSxFxHL	0.90	0.98	0.92	0.36	2.46 (0.38, 18.32)

Note: N = 158. Reference category: OCS+, F-, HL-. OCS = obsessive-compulsive symptoms, F = familiarity, HL = human loss, CI = confidence interval.

*** p < .001.

Discussion

The purpose of this study was to examine how OCS interfere with moral decision-making when close relations are involved and when the number of potential victims is changed in the trolley problem. We hypothesized that individuals high in OCS would be less likely to commit than individuals low in OCS in all scenarios. We also hypothesized that OCS would moderate the interaction between familiarity and human loss to influence response; specifically, low OCS would have higher rates of commission when familiarity is high. Finally, we hypothesized that familiarity and human loss would have a significant interaction, as they influence participants' responses.

The lack of a significant main effect of OCS, coupled with the lack of OCS as a moderator of responses in all models, indicates that the rate of OCS might not significantly affect decision-making in the trolley problem when the parameters of familiarity and the number of lives lost are considered. The proportions of commission and omission according to OCS as shown in the main effects frequency table align with this lack of a significant effect, as the difference between proportions was only 4.27%. This invalidates our hypotheses and contradicts past research, which had found a link between high OCS and the likelihood of flipping the switch (engaging in commission) in the trolley problem (Mancini & Gangemi, 2015; Franklin et al., 2009).

As well as this, 77.22% of participants chose to engage in commission when familiarity was high and human loss was high, as shown by the frequency tables of response stratified by familiarity. This goes against our expectation, as it shows that most participants will commit even when this response results in higher human loss, implying that the safety of their loved one is a higher priority than reducing loss of life. This reinforces the implication that familiarity impacts responses heavily, since the proportion of times a commission resulted in higher human loss was increased when someone familiar was involved.

In the two-way interaction model, the interaction term between familiarity and human loss was significant, suggesting that familiarity is associated with human loss. The results showed that participants were 705.68 (290.50, 1840.63) times more likely to flip the switch under high familiarity and high human loss. This means that when familiarity is high, the decision of choosing to commit is more tightly linked with human loss being high. This validates our hypothesis, which predicted a significant interaction between familiarity and human loss, as suggested by previous research that found significant effects on response by familiarity

(Petrinovich et al., 1993; Bleske-Rechek et al., 2020; Mehdizadeh et al., 2021) and by severity (Lee & Holyoak, 2020).

However, these conclusions should be approached with caution due to limitations in our sample and data, which may affect the generalizability of our findings. Further research with more robust methodologies is necessary to substantiate these preliminary insights. First, our sample size was insufficient, leading to an underpowered study where effects could not be detected for certain variables included. Significant results do not necessarily imply that there is a true effect to detect, in the same way that nonsignificant results do not necessarily imply that there is not a true effect to detect, due to this study being severely underpowered. Future research could increase the sample size, thereby increasing the number of responses, to determine if the observed results hold with a larger sample. Additionally, our power estimation in G*Power did not account for random effects in the model, meaning that a sample size of 481 may not be sufficient for generating enough power when random effects are included. As random effects introduce additional variability and complexity, a larger sample size may be required to achieve the desired power. We will conduct a more detailed power analysis accounting for random effects to ensure adequate statistical power and collect an increased sample size according to this improved analysis, thereby helping us to address this limitation by providing more reliable and valid estimates of the effects in our model. Second, our sample's demographic representation was limited. Certain groups, such as those with specific levels of religious affiliation, race, or ethnicity, were underrepresented; future studies could consider different sampling techniques to ensure a more representative sample of individuals with OCD or a high prevalence of OCS. Additionally, expanding the study beyond a strictly American sample would provide the

opportunity to examine how different cultural values influence decision-making in moral dilemmas in the context of OCS.

As our study was underpowered, it was not sensitive enough to detect any effects from demographic covariates collected from our questionnaire, leading to their exclusion from our analysis. Future research with an adequate sample size could incorporate demographic variables, such as race and religion, to explore their effects on responses.

An additional consideration is that due to the spread of DOCS scores—few scores were very high, and most were low—our group of 'high OCS' was not necessarily truly constructed. Many of the participants in this group still scored low on the DOCS. However, we utilized grouping according to DOCS score instead of recruiting a non-OCD control group. Since OCS exists on a spectrum, we defined our groups in this manner, to capture the wide range of how OCS/OCD can manifest in different individuals. Thus, a strength of this study is that it may provide further insight into which variables truly have a larger influence on acts of commission, since all individuals in any given population possess some degree of OCS, which is captured by OCD. This also may explain why previous research studies saw effects from OCS/OCD, as they had an OCD group and a non-OCD control group.

An important consideration is whether participants would respond differently if they confronted such moral dilemmas in real life; these trolley problem scenarios are highly unlikely and artificial. However, neuroimaging research shows that reasoning about scenarios whose utilitarian option requires one to kill to save others does activate brain circuits involved in emotional decision-making (Greene & Haidt, 2014). Therefore, it stands to reason that our method would evoke the same complex thought processes described by Greene and Haidt (Franklin et al., 2009).

Furthermore, it may be useful to investigate moral decision-making in less dramatic moral dilemmas, as Foa and colleagues (2023) found that OCD patients, relative to control participants, took longer to make decisions about relatively low-risk scenarios, whereas no differences were apparent for high-risk scenarios. However, our study utilized the standard high-risk scenarios developed in previous research (Mancini & Gangemi, 2015; Franklin et al., 2009) as it allowed for more legitimate comparisons to be made and the ability to demonstrate that any reasoning biases that do exist in OCD (or with high rates of OCS) must be confined to other aspects, such as individual patient preferences (like specific moral or cultural beliefs) or only in lower-risk scenarios (Franklin et al., 2009).

Our study did not identify any main or moderator effects of OCS on response. However, our findings may still aid individuals suffering from morally relevant intrusions and their corresponding compulsions, including those with OCD. Cognitive-behavioral therapy with exposure response prevention, commonly used for OCD treatment, can leverage these insights to better understand these obsessions. Salkovskis (1985) and others (Freeston et al., 1996; Rachman, 1997; Rachman, 1998) suggest that the cognitive-behavioral conceptualization of obsessions hinges on the appraisal or interpretation of intrusive thoughts rather than the content of those thoughts. Our study's insight into the interpretation of moral intrusions can help clinicians better understand these appraisals. Reframing obsessional thoughts, such as considering them in the context of loved ones, may help patients move away from the corresponding compulsions. Advancements in this area of behavioral therapy could increase its effectiveness, potentially enabling further alleviation of patients' suffering.

In conclusion, our study found that under moral dilemma scenarios as represented by the trolley problem, there was no association between OCS and response. However, our study found

that there was a significant interaction between familiarity and human loss, suggesting that considerations of close relations and avoidance of causing harm (via number of lives lost) took precedence over OCS rates in whether to engage in commission by flipping the switch. These findings differ from previous research, wherein OCS (represented by OCD groups) was shown to influence likelihood of commission, as OCD is associated with a heightened sense of responsibility and guilt. OCD participants in these studies chose to commit less, as commission implicates them in the cause of harm, as opposed to omission, which separates them from being responsible for the harm caused. However, this study may further illuminate how close relationships affect moral decision-making preferences in participants with high OCS rates, which is an area of research that has not been fully explored. Therefore, with this study we intend to unlock further potential of enhancing understanding of the moral dimensions of OCD; clinicians, patients, and society as a whole stand to benefit from this area of research.

References

Abramowitz, J. S., Deacon, B. J., Olatunji, B. O., Wheaton, M. G., Berman, N. C., Losardo, D., ... & Hale, L. R. (2010). Assessment of obsessive-compulsive symptom dimensions: Development and evaluation of the Dimensional Obsessive-Compulsive Scale. *Psychological Assessment, 22*(1), 180-198. https://doi.org/10.1037/a0018260

Abramowitz, J. S., Franklin, M. E., Schwartz, S. A., & Furr, J. M. (2003). Symptom Presentation and Outcome of Cognitive-Behavioral Therapy for Obsessive-Compulsive Disorder. *Journal of Consulting and Clinical Psychology, 71*(6), 1049-1057. https://doi.org/10.1037/0022-006X.71.6.1049

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Arntz, A., Voncken, M., & Goosen, A. C. A. (2007). Responsibility and obsessive-compulsive disorder: An experimental test. *Behaviour Research and Therapy, 45*(3), 425–435. https://doi.org/10.1016/j.brat.2006.03.016

Aron, A., Aron, E. N., & Smollan, D. (1992). Inclusion of Other in the Self Scale and the structure of interpersonal closeness. *Journal of Personality and Social Psychology, 63*(4), 596-612. https://doi.org/10.1037/0022-3514.63.4.596

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software, 67*(1), 1-48. https://doi.org/10.18637/jss.v067.i014o

Bleske-Rechek, A., Nelson, L. A., Baker, J. P., Remiker, M. W., & Brandt, S. J. (2010). Evolution and the trolley problem: People save five over one unless the one is young,

genetically related, or a romantic partner. *Journal of Social, Evolutionary, and Cultural Psychology, 4*(3), 115-127. https://doi.org/10.1037/h0099295

Bloom, P. (2011) Family, community, trolley problems, and the crisis in moral psychology. *Yale Review, 99*(2), 26-43. https://doi.org/10.1111/j.1467-9736.2011.00701.x

Cushman, F., Young, L., & Hauser, M. (2006). The role of conscious reasoning and intuition in moral judgment: Testing three principles of harm. *Psychological Science, 17*(12), 1082-1089.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2009). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 41*(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Fineberg, N. A., Hollander, E., Pallanti, S., Walitza, S., Grünblatt, E., Dell'Osso, B. M., Albert, U., Geller, D. A., Brakoulias, V., Janardhan Reddy, Y. C., Arumugham, S. S., Shavitt, R. G., Drummond, L., Grancini, B., De Carlo, V., Cinosi, E., Chamberlain, S. R., Ioannidis, K., Rodriguez, C. I., ... Zohar, J. (2020). Clinical advances in obsessive-compulsive disorder: A position statement by the International College of Obsessive-Compulsive Spectrum Disorders. *International Clinical Psychopharmacology, 35*(4), 173–193. https://doi.org/10.1097/YIC.0000000000000314

Foot, P. (1967). The problem of abortion and the doctrine of double effect. Oxford Review, 5, 5-15.

Franklin, S. A., McNally, R. J., & Riemann, B. C. (2009). Moral reasoning in obsessive-compulsive disorder. *Journal of anxiety disorders, 23*(5), 575–577. https://doi.org/10.1016/j.janxdis.2008.11.005

Freeston, M. H., Rheaume, J., & Ladouceur, R. (1996). Correcting faulty appraisals of obsessional thoughts. *Behaviour Research and Therapy, 34*(5-6), 367-374. https://doi.org/10.1016/0005-7967(95)00076-3

Gächter, S., Starmer, C., & Tufano, F. (2015). Measuring the closeness of relationships: A comprehensive evaluation of the 'Inclusion of the Other in the Self' scale. PLOS ONE, 10(6), e0129478. https://doi.org/10.1371/journal.pone.0129478

Greene, J. D., & Haidt, J. (2014). How (and where) does moral judgment work? *Trends in Cognitive Sciences*, *6*(12), 517-523. https://doi.org/10.1016/j.tics.2014.08.006

Greene, J. D., Sommerville, R. B., Nystrom, L. E., Darley, J. M., & Cohen, J. D. (2001). An fMRI investigation of emotional engagement in moral judgment. *Science, 293*(5537), 2105-2108.

Kant, I. (1785). Groundwork for the Metaphysics of Morals (M. Gregor, Trans.). Cambridge University Press. (Original work published 1785).

Kim, H. W., Kang, J. I., Kim, S. J., Jhung, K., Kim, E. J., & Kim, S. J. (2013). A validation study of the Korean-version of the Dimensional Obsessive-Compulsive Scale. *Journal of Korean Neuropsychiatric Association*, *52*(3), 130. https://doi.org/10.4306/jknpa.2013.52.3.130

Lee, J., & Holyoak, K. J. (2020). “But he’s my brother”: The impact of family obligation on moral judgments and decisions. *Memory and Cognition, 48*(1), 158-170. https://doi.org/10.3758/s13421-019-00969-7

Lopatka, C., & Rachman, S. (1995). Perceived responsibility and compulsive checking: An experimental analysis. *Behaviour Research and Therapy, 33*(6), 673–684. https://doi.org/10.1016/0005-7967(94)00089-3

López-Solà, C., Gutiérrez, F., Alonso, P., Rosado, S., Taberner, J., Segalàs, C., Real, E., Menchón, J. M., & Fullana, M. A. (2014). Spanish version of the Dimensional Obsessive–Compulsive Scale (DOCS): Psychometric properties and relation to obsessive beliefs. Comprehensive Psychiatry, 55(1), 206–214. https://doi.org/10.1016/j.comppsych.2013.08.015

Mancini, F., & Gangemi, A. (2015). Deontological guilt and obsessive compulsive disorder. *Journal of Behavior Therapy and Experimental Psychiatry, 49*(Pt B), 157–163. https://doi.org/10.1016/j.jbtep.2015.05.003

Markarian, Y., Larson, M. J., Aldea, M. A., Baldwin, S. A., Good, D., Berkeljon, A., Murphy, T. K., Storch, E. A., & McKay, D. (2010). Multiple pathways to functional impairment in obsessive-compulsive disorder. *Clinical Psychology Review, 30*(1), 78–88. https://doi.org/10.1016/j.cpr.2009.09.005

McManus, R. M., Kleiman-Weiner, M., & Young, L. (2020). What we owe to family: The impact of special obligations on moral judgment. *Psychological Science, 31*(3), 227-242. https://doi.org/10.1177/0956797619900321

Mehdizadeh, M., Khosravi, Z., Noaparast, K. B., & Sabramiz, A. (2021). Moral judgment and decision-making based on interpersonal relationships with relatives and non-relatives: A systematic review. *Advances in Cognitive Science, 23*(1), 35-45. https://doi.org/10.30514/icss.23.1.35

Melli, G., Chiorri, C., Bulli, F., Carraresi, C., Stopani, E., & Abramowitz, J. (2014). Factor congruence and psychometric properties of the Italian version of the Dimensional Obsessive-Compulsive Scale (DOCS) across non-clinical and clinical samples. *Journal of*

Psychopathology and Behavioral Assessment, 37(2), 329–339. https://doi.org/10.1007/s10862-014-9450-1

Ólafsson, R. P., Arngrímsson, J. B., Árnason, P., Kolbeinsson, Þ., Emmelkamp, P. M. G., Kristjánsson, Á., & Ólason, D. Þ. (2013). The Icelandic version of the Dimensional Obsessive Compulsive Scale (DOCS) and its relationship with obsessive beliefs. *Journal of Obsessive-Compulsive and Related Disorders, 2*(2), 149–156. https://doi.org/10.1016/j.jocrd.2013.02.001

Petrinovich, L., O'Neill, P., & Jorgensen, M. (1993). An empirical study of moral intuitions: Toward an evolutionary ethics. *Journal of Personality and Social Psychology, 64*(3), 467–478. https://doi.org/10.1037/0022-3514.64.3.467

R Core Team (2024). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/

Rachman, S. (1997). A cognitive theory of obsessions. *Behaviour Research and Therapy, 35*(9), 793-802. https://doi.org/10.1016/S0005-7967(97)00040-5

Rachman, S. (1998). A cognitive theory of obsessions: Elaborations. *Behaviour Research and Therapy, 36*(4), 385-401. https://doi.org/10.1016/S0005-7967(97)10041-9

Ramezani, Z., Rahimi, C., & Mohammadi, N. (2016). Predicting obsessive compulsive disorder subtypes using cognitive factors. *Iranian Journal of Psychiatry, 11*(2), 75–81. PMID: 27437003

Rhéaume, J., Ladouceur, R., Freeston, M. H., & Letarte, H. (1995). Inflated responsibility in obsessive compulsive disorder: validation of an operational definition. *Behaviour Research and Therapy, 33*(2), 159–169. https://doi.org/10.1016/0005-7967(94)e0021-a

Salkovskis, P. M. (1985). Obsessional–compulsive problems: A cognitive–behavioural analysis. *Behaviour Research and Therapy, 23*(5), 571-583. https://doi.org/10.1016/0005-7967(85)90105-6

Salkovskis, P. M. (1998). Psychological approaches to the understanding of obsessional problems. In R. P. Swinson, M. M. Antony, S. Rachman, & M. A. Richter (Eds.), Obsessive-compulsive disorder: Theory, research, and treatment (pp. 33–50). *The Guilford Press.*

Salkovskis, P. M., Wroe, A. L., Gledhill, A., Morrison, N., Forrester, E., Richards, C., Reynolds, M., & Thorpe, S. (2000). Responsibility attitudes and interpretations are characteristic of obsessive compulsive disorder. *Behaviour Research and Therapy, 38*(4), 347-372. https://doi.org/10.1016/S0005-7967(99)00071-6

Sasson, Y., Zohar, J., Chopra, M., Lustig, M., Iancu, I., & Hendler, T. (1997). Epidemiology of obsessive-compulsive disorder: a world view. *The Journal of Clinical Psychiatry, 58* Suppl 12, 7–10. PMID: 9393390

Shapiro, L. J., & Stewart, E. S. (2011). Pathological guilt: a persistent yet overlooked treatment factor in obsessive-compulsive disorder. *Annals of Clinical Psychiatry*, *23*(1), 63–70. PMID: 21318197

Spranca, M., Minsk, E., & Baron, J. (1991). Omission and commission in judgment and choice. *Journal of Experimental Social Psychology*, *27*(1), 76-105. https://doi.org/10.1016/0022-1031(91)90011-T

Thomson, J. J. (1976). Killing, letting die, and the trolley problem. *The Monist, 59*(2), 204-217.

Thomson, J. J. (1985). The trolley problem. *Yale Law Journal, 94*, 1395-1415.

Veale, D., & Roberts, A. (2014). Obsessive-compulsive disorder. BMJ (Clinical research ed.), 348, g2183. https://doi.org/10.1136/bmj.g2183

Wroe, A. L., Salkovskis, P. M., & Richards, H. (2000). Now I know it could happen, I have to prevent it: A clinical study of the specificity of intrusive thoughts and the decision to prevent harm. *Behavioural and Cognitive Psychotherapy*, *28*(1), 63-70. https://doi.org/10.1016/S0005-7967(99)00145-X

Appendix A

Inclusion of the Other in the Self (IOS) Scale (Aron, Aron, & Smollan, 1992)

1. Please enter the name of somebody who is alive, an adult, and who is dear to you:

   _____

2. Please indicate the type of relationship you have with them:
   a. Mother
   b. Father
   c. Sibling
   d. Child (e.g., daughter, son)
   e. Extended family member
   f. Friend
   g. Significant other (e.g., spouse, partner)
   h. Other (please type response): _____
3. Which picture best describes your relationship with this person?

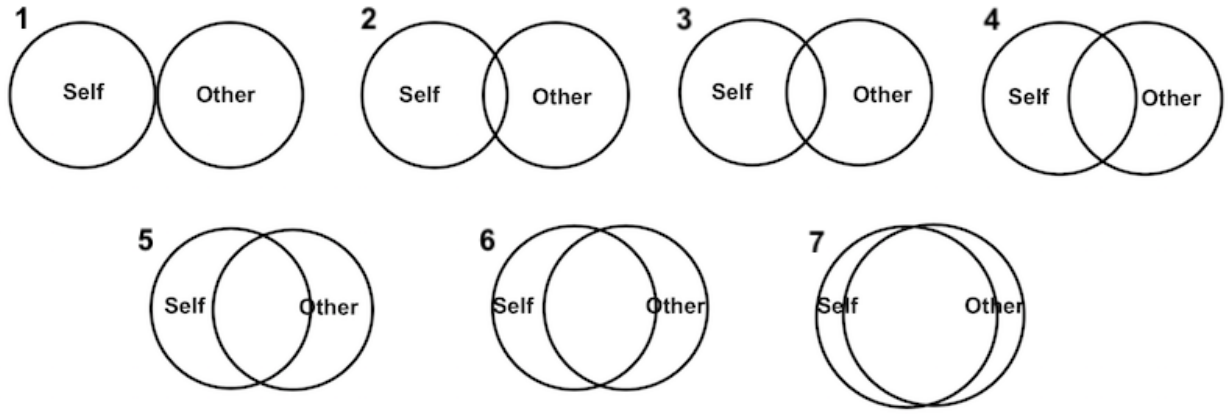


Figure A1. Diagrams 1 to 7 represent your ‘closeness’ based on the amount of convergence of circles.

Appendix B

Scenarios presented to the participants

Familiarity-, Human Loss-

A trolley is hurtling down some train tracks. There are five innocent people on the track ahead of the trolley, and they will be killed if the trolley continues going straight ahead. There is a spur of track leading off to the side. There is one innocent person, a stranger, on that spur of track. The brakes of the trolley have failed and there is a switch which can be activated to cause the trolley to go to the side track.

You are an innocent bystander (that is, not an employee of the railroad, etc.). You can throw the switch, saving the five innocent people, which will result in the death of the one innocent person on the side track. What would you do?

Familiarity+, Human Loss-

A trolley is hurtling down some train tracks. There are five innocent people on the track ahead of the trolley, and they will be killed if the trolley continues going straight ahead. There is a spur of track leading off to the side. There is one person, [NAME], on that spur of track. The brakes of the trolley have failed and there is a switch which can be activated to cause the trolley to go to the side track.

You are an innocent bystander (that is, not an employee of the railroad, etc.). You can throw the switch saving the five innocent people, which will result in the death of [NAME] on the side track. What would you do?

Familiarity-, Human Loss+

A trolley is hurtling down some train tracks. There is one innocent person on the track ahead of the trolley, and they will be killed if the trolley continues going straight ahead. There is

a spur of track leading off to the side. There are five innocent people on that spur of track. The brakes of the trolley have failed and there is a switch which can be activated to cause the trolley to go to the side track.

You are an innocent bystander (that is, not an employee of the railroad, etc.). You can throw the switch saving the one innocent person, which will result in the death of the five innocent people on the side track. What would you do?

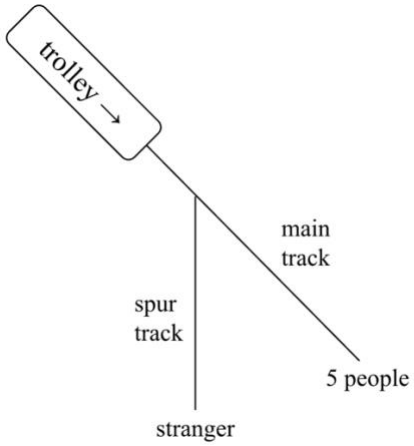
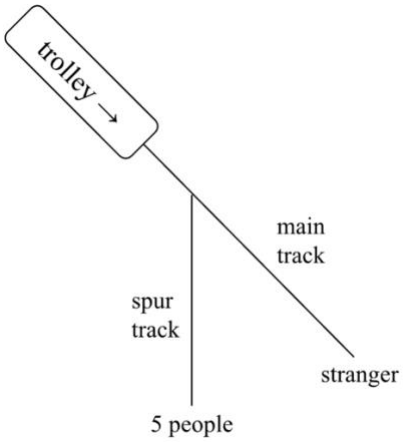
Familiarity+, Human Loss+

A trolley is hurtling down some train tracks. There is one person, [NAME], on the track ahead of the trolley, and they will be killed if the trolley continues going straight ahead. There is a spur of track leading off to the side. There are five innocent people on that spur of track. The brakes of the trolley have failed and there is a switch which can be activated to cause the trolley to go to the side track.

You are an innocent bystander (that is, not an employee of the railroad, etc.). You can throw the switch, saving [NAME], which will result in the death of the five innocent people on the side track. What would you do?

Appendix C

Visual aid for the 4 trolley problem dilemmas; HL-F-, HL+F-, HL-F+, HL+F+

Familiarity	Human Loss	
	Low (-)	High (+)
Low (-) (Unfamiliar)		
High (+) (Familiar)