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To Kill or Not to Kill: Exploring the Roles of Empathy and Working Memory in Moral Decision Making

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The Kill or Not to Kill:

Exploring the Roles of Empathy and Working Memory in Moral Decision Making

by

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TABLE OF CONTENTS

	Page
List of Tables _____	iii
Abstract _____	iv
Introduction _____	1
Working Memory and Moral Decision Making _____	2
Empathy and Moral Decision Making _____	3
Current Study _____	4
Study One _____	4
Method _____	4
Results _____	8
Discussion _____	9
Study Two _____	9
Method _____	9
Results _____	13
Discussion _____	14
General Discussion _____	14
References _____	17
Appendices _____	24
Vita _____	28

LIST OF TABLES

Table	Page
1. Descriptive Statistics of Working Memory, Moral Dilemmas, and Empathy_____	20
2. Zero-order Correlations_____	21

Abstract

Two studies were conducted to support the dual process model of moral decision making, which states that there are two pathways to moral decisions: one emotional and the other cognitive. Decisions made in *personal* dilemmas are driven by emotions and intuition, while decisions made in *impersonal* dilemmas are driven by cognitive factors. Intuitive, emotional reactions tend to lead to non-utilitarian decisions while deliberative reasoning tends to lead to utilitarian decisions. For the current studies, undergraduate students from the University of North Florida completed working memory tests, an empathy scale, and also responded to moral dilemma scenarios. In the second study, participants were asked to respond to the moral dilemma scenarios in the following conditions: baseline, working memory condition (counting task), cold water (cold pressor task), and warm water. In Study 1, participants in the high working memory group had slower reaction times while responding to self dilemmas. In Study 2, the empathy item “I feel other people’s joy” was the best predictor of participants’ utilitarian decisions. These results are framed in terms of the dual process model and possible directions for future research.

To Kill or Not to Kill:

Exploring the Roles of Empathy and Working Memory in Moral Decision Making

Haidt's (2001) social intuitionist model of moral decision making characterizes moral judgments as rapid, automatic evaluations of a particular situation. The initial evaluations are then followed by deliberative reasoning to provide specific evidence of the judgment's accuracy. This in contrast to more traditional conceptualizations of moral reasoning (rationalist models), which contend that moral judgments are based primarily on deliberative reasoning (Kohlberg, 1969, 1971; Piaget, 1965; Turiel, 1983; Williams, 1967). Moral emotions (e.g., sympathy) may play a role in decision making, but only through indirect means; these emotions are filtered through reasoning before judgment is made. An even more recent theory of moral decision making combines aspects the rationalist and social intuitionist models into a hybrid theory that suggests there are two possible pathways to moral judgment.

The dual-process theory accounts for how moral judgments are made: *personal* dilemmas are driven by emotions and intuition, while *impersonal* dilemmas are driven by cognitive factors (Greene, 2007). The well-known *Trolley Problem* best illustrates how this theory works. There are two versions of this philosophical puzzle. *Version 1* represents a personal dilemma (known as the footbridge dilemma), where the only way to stop a runaway trolley and save the workmen is to push a bystander on the tracks. The bystander dies. *Version 2* is the impersonal dilemma (known as the switch dilemma), where the actor can save the workmen by throwing a switch that will divert the trolley onto another track that only has one workman on it. The group of workmen is saved while the one workman is killed. What differentiates personal from impersonal dilemmas is the type of action taken: personal dilemmas require up close and direct acts of harm (pushing the bystander), while the impersonal dilemmas require indirect acts (throwing a switch).

In support of the dual-process theory, brain imaging research has demonstrated that brain regions linked with emotion (e.g., amygdala) are activated during the personal dilemmas, and brain regions associated with working memory (prefrontal cortex, parietal lobe) are activated during the impersonal dilemmas (Greene, 2007; Greene, Nystrom, Engell, Darley, & Cohen, 2004; Greene, Sommerville, Nystrom, Darley, & Cohen, 2001). The cognitive and emotional systems involved in moral judgments may at times come into conflict with each other. Thus, either enhanced cognitive ability and reasoning or decreased emotional responding may lead to utilitarian decisions.

Working Memory and Moral Decision Making

Working memory can be described as a cognitive skill that individuals use to keep a goal active in mind, inhibit distractors, and make decisions to achieve that goal (Baddeley & Hitch, 1974). To date, there are very few studies that investigate the role of working memory in moral decision making. Moore and colleagues (2008) investigated the role of emotional reasoning versus higher-order processing in moral decision-making. They sought to replicate previous findings supporting the dual-process model of moral decision-making, which posits that scenarios requiring direct “up close and personal” acts of harm (*personal dilemmas*) initiate emotional processing in the brain while indirect acts of harm (*impersonal dilemmas*) trigger deliberative reasoning and working memory. Researchers predicted that individuals with higher working memory capacities (WMC) would make more rational evaluations when faced with personal dilemmas because they are better able to override initial emotional responses to weigh the costs and benefits of action. The researchers also restructured dilemmas to include scenarios in which the subject’s own life was in harm’s way (*self dilemmas*) as well as scenarios in which only others were at risk (*other dilemmas*). Subjects completed three automated complex-span

measures to test WMC and responded to 24 critical scenarios. Results showed that subjects found it most appropriate to harm others in the *impersonal* dilemmas and *self* dilemmas. The possible reason underlying this finding is that indirect means of harming another individual is considered more acceptable than direct means, just as acting in self-preservation is considered a valid reason for harming another person. As predicted, those with higher WMC tended to make more utilitarian decisions across all types of scenarios. That is, they found it appropriate to harm one person in order to save a greater number of people regardless of the type of action it required. They were also more consistent in their answers across personal dilemmas but took longer to make these decisions. Overall, these results indicated that there are individual differences in responses based on subjects' ability to deliberatively reason.

Empathy and Moral Decision Making

Other lines of research have investigated emotional factors involved in moral decision making. Researchers have found that emotional deficits or emotional disruptions tend to lead to more utilitarian moral judgments (e.g., Ciaramelli, Muccioli, Làdavas, & di Pellegrino, 2007; Koenigs et al., 2007; Koven, 2011; Mendez & Shapira, 2009; Valdesolo & DeSteno, 2006). Glietcherricht and Young (2013) found that empathy was uniquely related to moral decisions, whereas other cultural and demographic variables (e.g., gender, age, religiosity, moral knowledge) were unrelated to participants' judgments. Within the context of empathy, only the *empathic concern* (compassion for the target) dimension differed between participants who made utilitarian versus non-utilitarian decisions. Those who consistently made utilitarian judgments in both personal and impersonal dilemmas exhibited lower levels of empathic concern than those who tended to make non-utilitarian decisions. In other words, those who made utilitarian decisions had diminished affective reactions to the target that would be sacrificed for the greater

good. However, participants who made non-utilitarian decisions did not have particularly high levels of empathic concern or score higher on other dimensions of empathy.

Current Study

Taken together, the aforementioned findings provide evidence for the dual-process model of moral decision making, wherein there are cognitive and emotional pathways that lead to moral judgments. As working memory and empathy have previously been implicated in the respective pathways of the dual-process model, the current study seeks to build on this research by investigating the influence of both working memory and empathy on moral decision making. We hypothesized that individuals with higher working memory would make more utilitarian decisions across all types of dilemmas scenarios and that empathy would be related to participants' number of utilitarian decisions.

Study 1

Method

Participants

There were 72 undergraduate students, ranging between 18 and 50 years (29% aged between 18-20; 55% aged between 21-26; female: 79%). Academic class standing was represented as follows: 20% freshman, 8% sophomores, 34% juniors, and 38% seniors. Regarding ethnicity, 67% described themselves as Caucasian/White, 13% as African American, 10% as Hispanic, and 7% as Asian.

Materials

Moral dilemmas. The dilemmas in this study are based on the two philosophical scenarios of the trolley (impersonal) and the footbridge (personal) (Greene et. al., 2001, 2004). In every scenario, subjects assumed the role of protagonist and decided the outcome of the dilemma

by indicating their agreement with the given solution (*yes/no*). All dilemmas involved killing at least one person in order to save an at-risk population. This decision making process concerned a choice between minimizing harm and maximizing desirable outcomes. An answer of “yes” indicated that the utilitarian solution was appropriate, while an answer of “no” indicated that the utilitarian solution was not appropriate.

The study included 11 scenarios. Each scenario had two possible moral dilemma conditions: personal and impersonal. The personal condition required participants to take an active role in deciding to kill a person (target) as a means of protecting himself and an at-risk population. The impersonal condition required participants to decide on a course of action that indirectly resulted in death of an individual (i.e. door closing, inaction, switch flipping) to save the larger endangered population.

Subjects received only one version of each moral dilemma condition (counterbalanced across participants). Five of the assigned scenarios posed threats to subjects’ lives in which the outcome of the decision to kill the target resulted in saving oneself as well as others (*self* dilemmas). In the remaining 6 scenarios, the outcome of subjects’ decision did not affect their life but only the lives of the target and the endangered population (*other* dilemmas). In total, there were 5 self dilemmas and 6 other dilemmas. A complete list of the dilemmas can be found at <http://www.uncg.edu/#njokane/memlab.html>.

Participant responses to the moral dilemma scenarios were coded as follows: 1 for “yes” and 2 for “no.” Thus, lower scores indicate more utilitarian decisions while higher scores indicate more non-utilitarian decisions. Additionally, participants’ reaction times were measured by the electronic survey technology so we could assess whether reaction times were related to working memory.

Working Memory. Working memory was measured using a standardized memory assessment, the Alloway Working Memory Assessment (AWMA-2; Alloway, 2012). All test trials began with two items, and increased by one item in each block, until the participant was unable to recall three correct trials at a particular block. There were four trials in each block and the number of correct trials was scored for each participant. The move-forward and discontinue rules, as well as the scoring, were automated by the program.

The Screener version was administered and this was comprised of one verbal and one visuospatial working memory test. In Processing Letter Recall (verbal working memory), the participant views a letter that stays on the computer screen for one second. Participants then hear an audio clip of a letter. They then verify whether the letter heard was the same as the letter they saw on the screen by clicking on a green tick mark for “Yes” or a red “X” for “No” on the screen. Next, participants click on the letters they saw in the correct sequence.

Visual working memory was tested using the Mr. X test. Participants are presented with a picture of two Mr. X figures. They identify whether the Mr. Blue figure is holding the ball in the same hand as the Mr. Red figure. The Mr. Blue figure may also be rotated. At the end of each trial, participants have to recall the location of each ball in Mr. Blue’s hand in sequence by selecting the correct locations on a picture with eight compass points. The compass points stay on the computer screen until a response was provided. Previously established test-reliability of the AWMA was established in a random selection of the normative sample tested on two separate occasions, four weeks apart. The reliability coefficient for the verbal working memory tests was .86 and for the visuospatial working memory test, it was .84 (Alloway, 2007). Raw scores were converted into standard scores based on a normative sample ($M = 100$; $SD = 15$).

Emotional Empathy. This was measured using the Multidimensional Emotional

Empathy Scale (MDEES; Caruso & Mayer, 1998). The 30-item scale measures the ability to recognize and understand emotions experienced by others. The scale consisted of six dimensions: *Suffering* (e.g., “The suffering of others deeply disturbs me”), *Positive Sharing* (e.g., “Seeing other people smile makes me smile”), *Responsive Crying* (e.g., “I don’t cry easily;” reversed scored), *Emotional Attention* (e.g., “I don’t give others’ feelings much thought”), *Feel for Others* (e.g., “I feel other people’s pain”), and *Emotional Contagion* (e.g., “When I’m with other people who are laughing I join in”). In order to reduce response bias and social desirability bias, six items were negatively worded and reversed scored. The empathy scale includes items dealing with positive emotional situations (e.g., “It makes me happy when I see people being nice to each other”), as well as negative emotional situations (e.g., “It makes me mad to see someone treated unjustly”). Responses for each item were measured on a five-point scale (1 = “Strongly Disagree”; 5 = “Strongly Agree”), with higher scores indicating a greater level of emotional empathy. The reliability of the MDEES in our sample was .86. Based on Caruso and Mayer’s (1998) findings, the seventh dimension (*Feel for animals*) was excluded because of low reliability.

Procedure

Volunteers were recruited over a three-month period. The study was advertised on the university research participation system. The criteria for participation was English as their first language and between 18 and 30 years of age. Individuals who chose to participate clicked on a link hosted by a third-party website, Qualtrics.

Participants first completed the working memory test, followed by the moral dilemmas. After responding to the moral dilemma scenarios, participants completed the MDEES items and a number of demographic questions.

Results

Tables 1 contains the descriptive statistics for working memory, moral dilemma scores, reaction times, and empathy scores. Correlation analyses were conducted between the empathy subscales, reaction times, and moral dilemma sum scores (see Table 2). As indicated, visuospatial working memory was positively associated with reaction times for the self and personal dilemmas. Additionally, scores in the *suffering* and *crying* empathy subscales were positively correlated with the reaction times for other dilemmas ($r = .26$ and $.24$, respectively). Several of the empathy subscales were also related to participants' moral dilemma sum scores. Similar patterns were found for the sum scores for self and personal dilemmas, which were both positively associated with all empathy subscales except *emotional contagion*. In the same manner, sum scores for other and impersonal dilemmas were both significantly linked to *positive sharing*, *responsive crying*, and *feel for others* subscales.

Based on the work of Moore et al. (2008), a median-split was conducted on working memory (WM) composite scores (median score: 105.5; $n=41$ in low WM; $n=28$ in high WM). Two multivariate analyses of variance (MANOVA) were conducted, the first on participants' utilitarian decision scores across dilemma types (personal, impersonal, self, other) and the second on their reaction times across dilemma types. The first MANOVA was not significant ($p = .60$), indicating that there was no difference in the number of utilitarian decisions across dilemma types based on participants' WM group (high vs. low).

The second MANOVA was carried out on the high WM and low WM groups to investigate any differences in their reaction times across the same four dilemma types. Post hoc analyses revealed a significant difference in reaction times for the self dilemmas based on WM group ($F(1,67) = 3.84$; $p = .05$, $\eta^2_p = .05$). The data suggest that participants with high working

memory tended to make slower decisions in the self dilemmas compared to individuals in the low working memory group.

To supplement the median split analyses, analogous regression analyses were conducted using the continuous WM scores. Results of the regressions and MANOVAs were similar.

Discussion

Although there was no difference in total number of utilitarian scores based on working group, there was a relationship between working memory and reaction times in the self dilemmas. Just as Moore and colleagues (2008) found, this particular result reinforces the notion that those with higher working memory are better able overcome salient emotional content, though it takes them slightly longer to do so. These results will be explored further in the general discussion.

Study 2

Study 2 was conducted to build upon Study 1 by expanding the scope of factors that could possibly influence moral decision making. While this study includes stress and pain data, the focus of this paper will remain on the working memory and empathy components.

Method

Participants

Participants were recruited over a nine-month period from the University of North Florida, and an incentive of undergraduate extra course credit was offered in exchange for volunteering. The criterion for participation was English as a first language. There were 133 total participants; however, 11 were excluded due to incompletes in the procedure leaving a total of 122 undergraduate students, ranging between 18 and 50 years (11% aged between 18-19; 79% aged between 20-29; 7% aged between 30-39; 3% aged between 40-49; and 2% aged between

50-59; female: 83.6%). Regarding ethnicity, 73% described themselves as Caucasian/White; 14% as African American; 10% as Hispanic; 8% as Asian; 3% as American Indian or Alaskan Native; and 3% as don't know / no response. Relationship status shows the majority as single with 84%; 12% as married; 3% as divorced; and 1% as separated. Religious affiliation shows the majority of 58% as Christian; 1% as Christian (non-mainstream); 9% as Jewish; 22% as no religious affiliation, and 10% as don't know /no response.

Materials

Moral Dilemmas. The study included eight moral dilemma scenarios with the same characteristics (personal/impersonal, self/other) as the scenarios used in Study 1. The eight scenarios used can be classified in the following manner: two self-personal, two other-impersonal, two self-impersonal, and two other-personal. The specific scenarios used in Study 2 can be found in Appendices A-D. After each moral dilemma, the participant was asked to respond to the moral dilemma aloud with either “1” for “Yes, it was appropriate to kill” or “2” for “No, it was not appropriate to kill.”

Participant responses to the moral dilemma scenarios were coded as follows: 1 for “yes” and 2 for “no.” Thus, lower scores indicate more utilitarian decisions while higher scores indicate more non-utilitarian decisions.

Working Memory. The AWMA screener test was also used in Study 2.

Empathy: The MDEES was also used in Study 2.

Cognitive Stress Task (*working memory*). In the cognitive stress task, participants were instructed to count backwards by 6's, starting from 100, while listening to a series of moral dilemmas.

Physical Pain Task (*cold-pressor*). In the physical pain task (*cold-pressor task*), participants placed their dominant hands in a two-gallon plastic bucket of ice water between 0° – 4° C (39° F) (Mitchell et al., 2004) while listening to a series of moral dilemmas. A physical control task (*warm water*) was used with water heated between 23° – 25° C (77° F). The warm water was heated by a small crock pot. For both the cold and warm water conditions, a digital thermometer was used to assess the ratio of ice water to room temperature water. The cold and warm water conditions were counterbalanced across participants.

Pain and Stress Scales. A Numerical Rating Scale (NRS) was used on an 11-point scale ranging from zero to 10. Participants' verbally rated their pain level on a scale of zero (no pain) to 10 (worst pain imaginable; Gedney & Logan, 2004). According to Bijur, Latimer, and Gallagher (2003) and Chien, Bagraith, Khan, Deen and Strong (2013) the NRS is a valid scale to use when verbally rating pain. After each condition, participants also rated their stress level in response to the specific task on a similar 11-point scale (0 = no stress) to (10 = high stress).

Procedure

The repeated-measures design included four levels: baseline, cognitive stress task (*working memory*), physical pain task (*cold-pressor task*), and physical control task (*warm water*). Each participant experienced all four of these conditions, with the order of the cold and warm water conditions counterbalanced across participants. The within-subjects factor was the moral dilemmas (*personal/impersonal* and *self/other*). Participants responded to each type of dilemma scenario, which were also counterbalanced across participants.

Participants were given a consent form upon entering the study, which informed them of the tasks they would be asked to do which included: a working memory test, answering scenarios, as well as “perform some number calculations (like counting backwards in 6’s from

100)” and “to place your hand in ice water and warm water for a short period of time” and would be indicating how they felt about statements. They were informed of a possible experience of slight pain or discomfort from the water task and could remove their hand from the water without penalty if needed.

After the participant read and signed the informed consent, they were instructed to complete the verbal and visuospatial working memory test on the computer. Once these tests were completed, the participants were given instructions for listening to moral dilemma scenarios before beginning the cognitive stress task (*working memory*), physical pain task (*cold-pressor task*) and physical control task (*warm water*).

The moral dilemma scenarios were administered via Qualtrics. All groups received the baseline and cognitive stress task before the counterbalanced physical pain task (*cold-pressor task*) or physical control task (*warm water*). In the baseline condition, the participant only listened and responded to the moral dilemma scenarios and pain question. In the cognitive stress task (*working memory*), the participant listened to the moral dilemma scenarios while counting backwards by 6's from 100 to zero. In the physical pain task (*cold-pressor task*) and physical control task (*warm water*), the participant listened to the moral dilemma scenarios while their dominant hand was submerged in the bucket of water. The water level covered their entire hand above the wrist.

After each condition, the researcher asked the participant to rate their pain on an 11-point scale (0 = no pain) to (10 = worst pain imaginable), as well as their stress level on a similar 11-point scale (0 = no stress) to (10 = high stress). The participant responded to the questions out loud and the researcher entered their responses into Qualtrics. Finally, each participant

completed the empathy measure and provided demographic information before reading and signing a debriefing form.

Results

A score of utilitarian responses was created for each condition (ranging from 0 to 2), with higher scores indicating a greater number of utilitarian decisions. Due to the ordinal nature of the utilitarian scores, non-parametric tests were used to analyze whether utilitarian responses differed as a function of experimental condition (baseline, working memory task, warm water, cold water). Friedman's test indicated that there was an overall difference in rank order among the four conditions ($\chi^2(3) = 45.50, p < .001$). According to Wilcoxon Signed Ranks Test, participants gave more utilitarian responses in the baseline condition than in the working memory condition ($z = -2.33, p = .02$), the cold water condition ($z = -5.73, p < .001$), and the warm water condition ($z = -4.68, p < .001$). Additionally, more utilitarian decisions were made in the working memory condition than in the warm water ($z = -2.87, p = .004$) and the cold water ($z = -3.17, p = .002$) conditions. The cold and warm water conditions were not significantly different from one another ($p = .457$). In summary, the most utilitarian responses were given in the baseline, followed by the working memory condition.

As a test of the extent to which empathy scores uniquely differentiate the upper and lower thresholds of utilitarian decisions, a discriminant function analysis (DFA) was conducted on those participants whose utilitarian response scores were 0 and 2 (score of 1 excluded; 0 being no utilitarian decisions and 2 being all utilitarian decisions). The stepwise regression method was used to identify the best empathy item to accurately classify participants as completely utilitarian or completely non-utilitarian. In this sample, the empathy item "I feel other people's joy" from the *positive sharing* subscale best discriminated between participants who were completely

utilitarian and completely non-utilitarian ($\lambda(1) = 9.00, p = .004$). Scores on this single empathy item was sufficient to correctly assign group membership for 59.6% of the sample (79.4% in the all utilitarian decisions group). This outcome establishes that empathy was effective at discriminating those who made all utilitarian decisions from those who made no utilitarian decisions, with lower scores typically characterizing those in the all utilitarian decisions group.

Discussion

The result of most interest in Study 2 is the fact that participants' level of empathy was related to their moral judgments. As Gleichgerrcht and Young (2013) found in their study, empathy is negatively related to utilitarian decisions. The implications of these findings will be discussed further in the following section.

General Discussion

The two main findings in this study include: 1) those with higher working memory tend to take longer to make utilitarian decisions in self dilemmas and 2) specific aspects of empathy can predict participants' moral judgments. In regard to the first major finding, longer reaction times for those in the high working memory group is in line with the findings of Moore et al. (2008), whose results indicated that individuals with higher working memory took longer to make utilitarian decisions under certain conditions (e.g., direct acts of harm that involve the self as an active agent). This supports one of the central ideas in the dual-process model: that higher working memory capability can aid in overcoming emotional content in moral dilemmas.

In the current study, there was no difference between the number of utilitarian decisions made by high versus low working memory participants, which is in contrast to Moore and colleagues' (2008) findings that participants with high working memory tended to make more utilitarian decisions across the four types of dilemmas. One possible contributor to these

disparate findings could be that the number of dilemmas used in the Study 1 (11) was slightly less than half than the amount used in Moore's study (24). With fewer scenarios, there was a restriction in possible variability in responses and thus less opportunity to tap into participants' decision making tendencies.

In Study 2, the major finding involved emotional factors involved in moral decision making. Like Gleichgerrcht and Young (2013), the current study found that levels of empathy can predict individuals' moral judgments. The empathy item "I feel other people's joy" from the MDEES *Positive Sharing* subscale was the most effective at discriminating between those who made all utilitarian decisions and those who made no utilitarian decisions. Those who scored lower on this particular item were more likely to be in the all-utilitarian group. Gleichgerrcht and Young's (2013) study used the Interpersonal Reactivity Index (IRI; Davis, 1980) to measure empathy; they found that lower scores on the *Empathic Concern* subscale predicted greater utilitarian judgments. An example item from this IRI subscale is "I am often quite touched by the things I see happen." While there is no one-to-one mapping of the MDEES and IRI items, both deal with "other-oriented" feelings.

The idea that empathy is negatively related to utilitarian decisions seems counterintuitive, but it is possible that higher levels of empathy cause individuals to identify too much with the single person who must be sacrificed in order to save the greater number. Because of this, solely increasing empathy in individuals may not be the best method to increase utilitarian reasoning. Instead, steps could be taken to also strengthen deliberative reasoning in these types of situations without necessarily decreasing or ignoring the importance of empathy in everyday life. Thus, a careful balance should be the goal.

One possible limitation in Study 2 was the restriction of range in the sum of participants' utilitarian decisions. As there were only two moral dilemma scenarios per condition (baseline, working memory, cold water, warm water; 8 scenarios total), the utilitarian score only ranged from 0 to 2. With such small variation in scores, non-parametric tests were used to assess potential differences. Though non-parametric tests are useful and robust in certain situations, it would be ideal to increase power by increasing the total number of scenarios per participant. Future research in this area would benefit from greater ranges of variability.

Though there is evidence supporting the dual-process model in the context of a more Western culture, future research in this area could focus on cross-cultural replication. Preliminary cross-cultural evidence for the dual process model has been found by Moore, Lee, Clark & Conway (2011). Moore and colleagues discovered that the personal/impersonal characteristic of dilemmas had similar effects on Chinese participants as they did on participants from the United States. Personal dilemmas caused greater conflict than impersonal ones, resulting in longer reaction times. Further research could be conducted in a number of cultures and tap into additional characteristics of moral dilemmas (e.g., self vs other dilemmas) and measure overall tendency for utilitarian judgments. It would be useful to determine whether conditions affecting moral decision making are consistent across different cultures or whether influential factors and pathways leading to judgment are dissimilar. Evidence from one culture could better inform the research process of another.

The current study provided partial support for the dual process model of moral decision making. Links were found between cognitive and emotional factors influencing judgments in moral dilemma scenarios, with working memory and empathy affecting reaction time and type of decision, respectively.

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Table 1
Descriptive Statistics of Working Memory, Moral Dilemma Scenarios, and Empathy

Working Memory Standard Scores	M	SD
Verbal	105.96	14.62
Visuospatial	106.96	21.57
Combined	106.46	15.11
Dilemma Reaction Times (in seconds)		
Self	42.13	17.19
Other	38.36	16.73
Personal	40.77	16.48
Impersonal	39.24	17.05
Dilemma Sum Scores		
Self	8.14	1.70
Other	15.32	1.46
Personal	1.57	0.31
Impersonal	3.65	0.26
Empathy Subscale Scores		
Suffering	4.32	0.49
Positive Sharing	4.26	0.51
Responsive Crying	3.39	1.07
Emotional Attention	3.94	0.69
Feel for Others	3.39	0.79
Emotional Contagion	3.63	0.71

Table 2
Zero-order Correlations

Working Memory and Reaction Times	1	2	3	4	5	6				
1. Verbal WM	-									
2. Visuospatial WM	.38**	-								
3. Self RT	.05	.27*	-							
4. Other RT	-.02	.22	.78**	-						
5. Personal RT	.04	.21	.99**	.83**	-					
6. Impersonal RT	-.02	.02	.78**	.99**	.82**	-				
Empathy Scores and Reaction Times	1	2	3	4	5	6	7	8	9	10
1. Suffering	-									
2. Positive Sharing	.57**	-								
3. Responsive Crying	.36**	.37**	-							
4. Emotional Attention	.43**	.45**	.33**	-						
5. Feel for Others	.52**	.49**	.59**	.32**	-					
6. Emotional Contagion	.13	.46**	.13	.13	.30**	-				
7. Self RT	.21	.18	.18	.14	.18	-.08	-			

8. Other RT	.26*	.09	.24*	.18	.18	-.03	.78**	-		
9. Personal RT	.23	.15	.15	.20	.18	-.06	.99**	.83**	-	
10. Impersonal RT	.26*	.09	.09	.24**	.18	-.03	.78**	.99**	.82**	-
<hr/>										
Working Memory and Sum Scores	1	2	3	4	5	6				
<hr/>										
1. Verbal WM										
2. Visuospatial WM										
3. Self Sum	-.19	.04								
4. Other Sum	-.23	-.06								
5. Personal Sum	-.22	.27*								
6. Impersonal Sum	-.19	.02								
<hr/>										
Empathy Scores and Sum Scores	1	2	3	4	5	6	7	8	9	10
<hr/>										
1. Suffering	-									
2. Positive Sharing		-								
3. Responsive Crying			-							
4. Emotional Attention				-						
5. Feel for Others					-					

6. Emotional Contagion							-			
7. Self Sum	.27*	.28*	.40**	.40**	.40**	.09	-			
8. Other Sum	.17	.34**	.24*	.24*	.35**	.12	.70**	-		
9. Personal Sum	.25*	.33**	.36**	.36**	.39**	.10	.97**	.77**	-	
10. Impersonal Sum	.21	.25*	.25*	.25*	.30**	.10	.69**	.86**	.69**	-

* indicates $p < .05$

** indicates $p < .01$

Appendix A

Self-Personal Dilemma

Cinderblock: You are the explosives expert for a company that has been hired to demolish a skyscraper. You are examining the last of the explosive charges when you notice a teenager below who is about to accidentally detonate one of the charges out of sequence. This explosion will result in the building's uncontrolled collapse onto you, the teenager, and the crowd of spectators.

The teenager is several floors below you and cannot hear you because of the loud demolition noise.

You realize that the only way to stop the teenager from detonating the charge is to drop a heavy cinderblock on his head.

This will crush his skull and kill him almost instantly but will prevent the out-of-sequence explosion.

Is it appropriate for you to kill the teenager in order to save yourself and the crowd of spectators?
(4, 75)

Nuclear Reactor: You are the inspector of a nuclear power plant that you suspect has not met its safety requirements. The plant foreman and you are touring the facility when one of the nuclear fuel rods overheats. The emergency coolant system fails to activate, and a chain reaction is about to begin which will result in a nuclear meltdown. This will release lethal radiation into the nearby town, killing thousands of people.

You realize that the only way to stop the meltdown is to push the foreman into the fuel rod assembly.

This will remove just enough heat energy from the rod assembly to prevent the nuclear chain reaction.

However, it will also incinerate the foreman instantly.

Is it appropriate for you to push and kill the foreman in order to save yourself and the nearby town? (4, 65)

Appendix B

Self-Impersonal Dilemma

Cliffhanger: You are a construction worker. You and your crew are high on a scaffold, working on a skyscraper. Suddenly, the scaffolding partially collapses. You and several others are hanging on to a dangling crossbar, but it cannot hold all of your weight.

The worker next to you slips off the crossbar and catches himself on another portion of the scaffolding; however, the entire structure is about to give way.

The only way to avoid you and everyone else falling to your deaths is to pull out a latch that will detach the section of scaffolding with your co-worker on it.

This will remove just enough weight that the rest of you can make it to safety before the scaffold collapses.

However, his fall will certainly kill him.

Is it appropriate for you to kill your co-worker in order to save yourself and the rest of the crew?
(5, 105)

Bus Plunge: You are a bus driver for a kindergarten field trip to the zoo. On the way, faulty tires cause the bus to overturn and plunge off of a bridge and into a roaring river. You and three of the children are still in the sinking bus, but the rest of the passengers have been swept away down the river to their deaths. You grab the two children nearest to you and begin to swim toward the exit door.

The two children you're holding onto cannot swim, nor can they hold their breath much longer.

Unfortunately, the exit door is blocked by some mangled seats.

You realize that the only way out is to pull the seats away from the exit, allowing you and the two children to escape the bus.

However, this will trap the third child at the other end of the bus, causing him to drown.

Is it appropriate for you to pull the seats away, trapping the third child, in order to save yourself and the two other children? (5, 94)

Appendix C

Other-Personal Dilemma

Enemy Spy: You are an officer in the military during a war. Your soldiers have found a high-ranking enemy spy trapped and injured inside of a partially collapsed building. You have been informed over the radio that a large group of enemy soldiers is planning a surprise attack on one of several nearby towns. These soldiers will kill all the civilians in the town if you and your soldiers do not stop them, but you do not know which town they plan to attack.

You have questioned the trapped spy who is high ranking and surely knows these plans, but he has refused to tell you which town is the target of the impending enemy attack.

He will die soon from his many injuries.

You could begin to beat, burn, cut, and otherwise painfully torture him in order to force him to reveal this information.

He would die from this painful torture, but you and your soldiers could then protect the town from the surprise attack, saving hundreds of innocent lives.

Is it appropriate for you to torture and kill this enemy spy in order to protect one of the nearby towns? (5, 108)

Tycoon: You are an electrician who has been hired to fix an electrical problem in the home of a very wealthy steel tycoon who is terminally ill with a very slow-growing cancer. Recently it had been publicly announced that when this man eventually dies, his enormous personal fortune is to be given to the local children's hospital. You know that there are many children at this hospital who could be saved with this money, but who cannot wait much longer before they die.

It occurs to you that while you're in the house, fixing the electrical problem, you could quietly slip into the tycoon's room while he is sleeping and suffocate him by covering his nose and mouth with your gloved hands.

This would look exactly like he had died from a heart attack.

Then his money would go to the children's hospital where it would save many lives.

Is it appropriate for you to kill this man so that the children's hospital will get the money that is needed? (4, 87)

Appendix D

Other-Impersonal Dilemma

Mine Shaft: You are a worker in a mine. The only way to exit the mine is to ride up in rock-buckets that can hold up to three people at a time. It is the end of the workday and miners from lower levels are riding up past you. As you are waiting for a bucket to ride in, you notice that the cable supporting the rock buckets is about to snap.

If the cable snaps, all of the miners in the buckets will fall to their deaths.

The only way to prevent this is to hit the emergency bucket release switch which will automatically detach the last bucket from the cable, lightening the load just enough to save the miner above.

There is one miner in this bucket who will be killed as a result.

Is it appropriate to detach the last miner's bucket, killing him, to save the other miner? (4, 80)

Modified Rowboat: You are in a rowboat with a tour guide while sight-seeing on a lake in Alaska. You notice that three children have overturned their boat nearby. They are now in danger of quickly freezing to death in the icy water. You begin to row over to rescue them when you realize that your boat will not hold you, the tour guide, and the three children.

Two of the children are closer to your boat than the third child.

As you and the tour guide pull in the first two it is obvious that they are too heavy and if you try to rescue the third child your boat will sink and all the children will die.

Neither you nor the guide can get out because you are rowing and the guide is performing CPR.

The only way to save the two children is to row quickly away from the third one, leaving him to die.

Is it appropriate to leave the one child behind to die in order to save the other way? (5, 111)

VITA

Andrea Frankenstein

Education

University of North Florida—Jacksonville, FL

- **Master of Science in General Psychology** **Expected 2016**
Current GPA: 4.0
- **Bachelor of Science in Psychology, Minor in Spanish** **Spring 2014**
Graduated *Summa Cum Laude*

Research Experience

Working Memory Research Lab with Dr. Tracy Alloway 2013–present

- **Working Memory, Empathy, and Moral Decision Making:** Investigating individual differences in the context of the dual-process model of moral decision making. More specifically, does high empathy lead to more deontological decisions, while high working memory leads to more utilitarian ones?
- **Stress, Morality, and Working Memory:** Exploring the impact of pain and stress moral decision making, and working memory using the cold pressor task and cognitive stressors. Trained in the use of physiological measures, including ECG, galvanic skin response, and skin temperature.
- **Working Memory, Intelligence, and Creativity:** Inspecting the role of executive processing in creative cognition. Is creativity solely an intuitive process? This project seeks to add support to recent research focusing on the contribution of top-down processes to creativity in contrast to the more traditional, intuitive view of creativity. A model comparison process was used to analyze the data, with a mediation model showing the best fit to the data.
- **Visuospatial Working Memory in Preschoolers:** As a part of a larger project, this study focuses on examining whether pre-school aged children have developed integrated visual and spatial working memory and how low SES, stress, and sleep predict working memory development, behavior, and learning outcomes.

Transformational Learning Lab with Dr. Dan Richard 2015–present

- **Service Learning Community Project:** Collaboration with Bonner Foundation to examine service learning program characteristics and civic mindedness. Analyzed outcomes using statistical techniques such as MANOVA and discriminant function analysis.

Publications

Alloway, T. P., Robinson, T., & **Frankenstein, A.** (due 2016). Educational application of working memory training. In T. Strobach & J. Karbach (Eds.), *Cognitive training: An overview of features and applications*. New York: Springer.

Frankenstein, A., Alloway, T. P., Nicholson, J. S., Barton, J. M., & Murphy-Powell, P. Exploring the role of environmental factors on working memory and behavior. (manuscript under review)

Southard, E., Alloway, T. P., **Frankenstein, A.**, & Güss, D. What makes people creative? Exploring the controlled-attention theory of creativity. (manuscript under review)

Teaching Experience

Graduate Teaching Assistantship

Fall 2015–Summer 2016

PSY 3213L Research Methods Lab: Instructor of Record for a total of five sections

- Addressed and explained relevant Research Methods topics (e.g., APA style, experimental design, and statistical analyses using SPSS)
- Guided students through in-class activities and moderated in-class discussions on the empirical research process
- Evaluated and critiqued students' research integration papers, literature reviews, and research proposals

Teaching Assistant

PSY 4302C Psychological Testing

Spring 2015

- Guest lectured on the topic moral decision making and the test validity of moral dilemmas
- Provided constructive feedback on students' literature reviews and other lab assignments
- Graded students' essays on psychological test design and evaluation

PSY 3021 Professional Opportunities in Psychology

Spring 2015

- Facilitated class discussions on personal statements, *curriculum vitae*, and interview techniques
- Provided feedback on students' personal statements and *curriculum vitae*

PSY 2012 Introduction to Psychology

Fall 2014

- Guest lectured on the Big Five personality traits to approximately 200 students
- Tallied students' class participation
- Led exam review sessions for groups of up to 30 students

Conferences

What Makes People Creative? Exploring the Controlled-Attention Theory of Creativity. 62nd Annual Southeastern Psychological Association Conference, New Orleans, LA (Poster Presentation, 2016)

Service Learning and Civic Identity Development. 62nd Annual Southeastern Psychological Association Conference, New Orleans, LA (Poster Presentation, 2016)

Investigating the Effects of Stress on Cognitive and Emotional Decision Making. 9th Annual Human Factors and Applied Psychology Conference, Embry Riddle University (Poster Presentation, 2015)

To Kill or Not to Kill, That is the Dilemma. Showcase of Osprey Advancements in Research and Scholarship (SOARS), University of North Florida. Chosen for Graduate Student Research Spotlight (Paper Presentation, 2015)

The Effect of Empathy and Working Memory on Moral Judgments. Showcase of Osprey Advancements in Research and Scholarship (SOARS), University of North Florida (Paper Presentation, 2014)

Honors and Experience

Vice President and Treasurer of PSI CHI, International Honor Society in Psychology Summer 2013–Spring 2014

- Supervised all chapter revenue and expenditures
- Reviewed candidate applications and determined membership
- Organized chapter meetings and events

Cross-Cultural Leadership Training, Global Next Research Group and Leadership Institute 2012 and 2013

- **“Jump Your Shadow” Conference at Oxford University (2012):** Attended leadership seminars along with several university students from Egypt. Received training in the area of leadership and conflict. Conducted local street interviews regarding current events. Received certificate of mastery in the course *Jump Your Shadow: Doing Brave Things in a Broken World*.
- **Internship in Cairo, Egypt (2013):** Participated in multiple leadership training conferences for Egyptian university students and young adults. Trained extensively in seminar subject matter. Facilitated break-out discussion groups. Collaborated with fellow Egyptian and American interns. Organized and transported conference materials. Received certificate of mastery in the course *Wired for Brilliance: Unleashing the Power of Personal Connections and Emotional Intelligence*.

Work Experience

Reservationist at Vacation Rental Pros, vacation rental management

- Sales Manager: Larry Jagunic,

May 2015 – August 2015

Server at Wasabi Japanese Steakhouse

- General Manager: Shawn Lim,

July 2013 – Dec 2014

References

- Dr. Tracy Alloway,
- Dr. Jennifer Wolff,
- Dr. Dan Richard,
- Dr. Lori Lange,