

MULTITASKING, FRIEND OR FOE? THE IMPACT OF COGNITIVE LOAD  
ON ETHICAL DILEMMA FORECASTING

by

JORDAN LEE WATTS

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Texas Christian University  
Fort Worth, Texas

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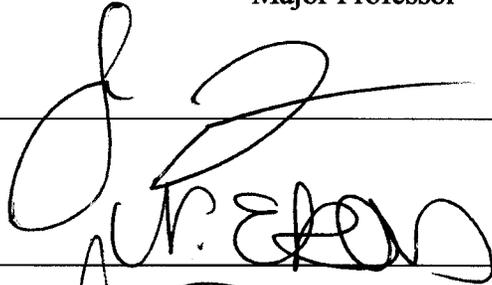
JORDAN LEE WATTS

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For The College of Science and Engineering

## COGNITIVE LOAD AND FORECASTING

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Multitasking, Friend or Foe? The Impact of Cognitive Load  
on Ethical Dilemma Forecasting

The term “multitasking” has its origin in the computer industry. The first definition for the term in the *Merriam-Webster Dictionary* describes it as the concurrent performance of several jobs by a computer. As computers have advanced they have become increasingly capable of handling multiple, complex operations simultaneously. Smartphones, highly advanced, compact computers which are carried on a daily basis by many, allow for complex tasks to be accomplished in the palm of one’s hand. A smartphone owner can listen to music, check their email, send a text message to a friend, and use GPS to locate a nearby restaurant, all within a matter of seconds. While the term multitasking was originally associated with computers use, it also has widespread usage outside this realm. This is reflected in the *Merriam-Webster Dictionary’s* second definition for multitasking, the performance of multiple tasks at one time. The term, based on its more general definition, has become one of the buzz-words often used in today’s society, particularly in the context of business and academia.

Common belief states that multitasking allows an individual to accomplish more in a smaller amount of time by overlapping activities within an allotted work interval to produce results more efficiently. After all, who doesn’t enjoy the thought of finishing all of their work in half the time and spending the remainder with family or partaking in leisure activities? However, as enticing as this notion may be, it is often as the old adage proclaims, too good to be true. While an individual may not have any problems completing basic tasks such as walking and talking at the same time, research suggests that people have difficulty completing multiple cognitive processes at the same time, even if they are relatively

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straightforward. Tasks ranging from the simple, such as a reaction time challenge where the individual must press a button in response to a tone, to the more complex, such as taking dictation while responding to conversation, can be impacted (Pashler, 1994). Multitasking, an activity that involves concurrent cognitive processes, becomes a more significant issue when the individual completing the activities must produce results of high quality from these simultaneous actions. The concurrent activation of multiple thought processes takes a toll on cognitive resources. The expenditure of cognitive resources on focus and analysis induces a state of cognitive load, placing strain on working memory and executive function. The process of multitasking therefore places an individual in a state of cognitive load and this becomes a critical variable in our ability to produce optimal results from our labor because it drains cognitive resources. What happens then if an individual faces a cognitively demanding task, such as an ethical dilemma, while in such a state? How might their ability to assess such a situation be affected by cognitive load?

The idea of multitasking is not a concept that readily comes to mind when thinking about ethics. Ethical dilemmas are high pressure situations that require multiple, complex thought processes to analyze and comprehend (Mumford et al., 2008). They are cognitively taxing challenges and require time and effort to understand fully. When facing a dilemma the first step is to identify it as such, a daunting task when attempted in a real-world scenario. Suppose a man named Tom starts a new job as an accountant. While completing expense reports Tom notices that his boss is paying his wife to complete dictation work for him at home, an act that goes against company policy. Tom must decide whether or not to report his boss who has been with the company for much longer than him, an act which could also put Tom's employment at risk. It is made clear to Tom by his boss that if he should choose to

report this violation of company policy, upper-level management will not side with him as he is so new to the company. Tom must now decide what to do; he ultimately chooses not to report his boss. This scenario was adapted from Singhapakdi et al. (1996) and Frey (2000). Tom's situation may seem like an obvious ethical dilemma to you; however, you were given the context before reading the scenario. You were primed to think about ethical dilemmas, even if only by reading the title of this paper. External and internal factors can impact how we assess a difficult situation and ethical dilemmas in the real world are rarely black and white. Certain emotions, for example, play a strong role and can make the tasks of dilemma identification, assessment, and forecasting of the future implications much more difficult (Kligyte, Connelly, Thiel, & Devenport, 2013). The current research attempted to draw upon past findings concerning cognitive load, which describe the phenomenon's largely negative impacts, and examine its effect on the identification and assessment of ethical dilemmas.

### **Ethical Decision Making**

Ethical dilemmas are convoluted and ill-defined problems which require the analysis of many variables. While some consider the resolution of ethical dilemmas to be a fluid, intuitive process, others clarify the activities by identifying stages or steps. Rest developed the moral reasoning model to represent the necessary processes that must occur for an appropriate ethical decision to be made (Rest, Bebeau, & Thoma, 1999). The first step in this process requires that an individual become aware of the existence of the ethical dilemma by reaching a state of moral awareness. This stage can be thought of as identification and requires the individual involved to be aware of how their own actions can impact themselves and others, or have moral awareness. Achieving this state means moving beyond excuses or the influence of others to focus on the most important aspects of a problem. Without

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identification of the ethical dilemma an individual cannot move on to the later steps and will therefore fail to engage the necessary processes for effective decision making. Step two, moral judgment, requires that the individual consider internal and external factors and reach a conclusion. These factors include such things as personal beliefs and potential rewards. The individual must consider possible courses of action as either right or wrong and make a decision based on the information produced in step one. They must consider the costs and benefits to each option when making their decision, weighing the potential consequence of every possible solution. Then the individual must develop the intent to follow through on their judgment. Forming intent to make a morally appropriate decision is step three. For this stage to be successful the individual must place the ethicality of their decision in higher priority than other competing motivations. These other competing motivations can often make less ethical courses of action appear rational and reasonable. An ethical decision can only be reached if these other motivations are deemed less important and the individual follows through with the decision made in step two. The fourth and final stage is execution of the selected decision (Rest, Bebeau, & Thoma, 1999).

Once intent exists to make an ethical decision, as in the third stage of Rest's model, an individual must be able to consider possible resolution paths and forecast the impact or results of each path. Forecasting in this context includes the development and analysis of each potential outcome of a plan in response to the dilemma. An individual must engage in creative thought processes to develop multiple potential courses of action and account for critical variables, including agents involved, environmental influences, and social or cultural factors, such as others' reactions and how they are currently or may eventually impact the decision. Individuals faced with making an ethical decision must also consider the rationale

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behind each possible plan, what it is they hope to accomplish with each, and the practicality of implementation. This process includes the prediction and assessment of potential consequences to each available action pathway. These consequences are often extreme and far-reaching, making their consideration critical. Ethical dilemmas frequently have long-term consequences not only for those directly involved but those around them as well (Stenmark, Antes, Wang, Caughron, Thiel, & Mumford, 2010). For example, a researcher who chooses to falsify research assumes great personal risk. They may consider the potential consequences for themselves such as loss of credibility and loss of employment. They may even compare these potential consequences with the potential gains and decide to take the risk. However, a complete analysis of this decision would also need to include the prediction and evaluation of potential consequences to others. A scandal such as falsified results places a stigma on a research lab and the sponsoring institution. Other members of the lab may face suspicion about the validity of their work, regardless of their individual virtues. A university that incurs the negative press that comes from one of their students or faculty being caught in such a scandal would also be faced with a potential loss of appeal to new students, and might even risk losing the benevolence of donors and alumni. When an unethical path is chosen these otherwise uninvolved parties suffer collateral damage, victims of one person's decision. In this example, these types of consequences should have been considered and could have been avoided if the fictional researcher had used proper forecasting. The identification of critical personal consequences and consequences for others is directly linked with forecasting ability and higher quality forecasting with improved ethical decisions (Stenmark, 2013).

Successful forecasting allows an individual to predict potential harm from their actions and make a choice with this in mind. Stenmark et al. (2010) proposed that higher

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forecasting abilities would be associated with more effective ethical decision making ability and demonstrated the importance of forecasting in complex cognitive processes, specifically in ethical decision making. Study results supported this hypothesis, as well as showing that the ability to identify the critical causes of an ethical dilemma was associated with better forecasting and ethical decision making ability. Unfortunately, forecasting is an inherently difficult and tiring task which requires a high amount of cognitive resources, and one that most people are not naturally proficient. Stenmark et al. (2010) concluded that due to the significance of forecasting in the successful navigation of ethical decisions, the development of forecasting skills should be a focus in ethics training. Emphasis within this training should be placed on identifying the significant causes of the ethical dilemma, as this is vital to proper forecasting. By considering the causes of a problem the individual can better predict what the outcomes may be and determine a goal for which to strive. For instance, the fictional researcher referenced previously who faces a dilemma about falsifying data, must be aware of the causes of his dilemma. Researchers need to consistently produce results in order to remain relevant in their field and to their department. However, they must also weigh the short-term benefits of falsification against the long-term costs. Ultimately, such a choice may lead to termination or expulsion from the university and complete irrelevance in their field.

The importance of forecasting potential consequences in ethics training was also examined by Harkrider, Thiel, Bagdasarov, Mumford, Johnson, Connelly, and Devenport (2012). The authors highlight the importance of creating “content-rich cases.” That is, utilizing forecasting, as well as training in codes of conduct, to maximize the amount of information one considers when faced with an ethical dilemma. Higher levels of information support cognitive processing and may lead to strengthened encoding of these experiences for

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future use. They found that better forecasting improved knowledge acquisition and increased use of sensemaking strategies, allowing the trainees to better consider the perspectives of and consequences for others. They also found that the implementation of forecasting methods led to greater decision ethicality and was particularly important for long-term decisions.

In order to better understand what ethical dilemmas are, and the impact they can have, it is crucial to understand what methods we use to make ethical decisions. The unique complexity of ethical decisions, involve many complex interacting variables, intersecting and contradicting values, and vague guidelines. Many models, like Rest's model of moral reasoning, have attempted to explain ethical decision making using a rational, sequential thought process. While these models have their place, it is also necessary to acknowledge that they do not account for the full range of factors which influence ethical thought. By neglecting affective influences these models fail to create a full, complete picture of how we reach ethical decisions (Rogerson, Gottlieb, Handelsman, Knapp, and Younggren, 2012). Immediate affective responses can be incredibly influential and are heavily involved in theories such as the dual-process model. These effects make consideration of multiple viewpoints critical when facing a dilemma in order to account for the variety of contributing factors. The studies described here attempted to examine how inducing a state of cognitive load through multitasking can affect an individual's ability to forecast when facing an ethical dilemma. If the ability to consider the full range of factors that make up an ethical dilemma is, in fact, inhibited then one would expect to see a decrease in the ability to forecast potential consequences.

### **Dual-Process Model**

To understand how a state of cognitive load could negatively impact ethical decision making ability one must first understand the dual-process model (Tversky and Kahneman, 1974; Kahneman, 2011). This model presents a theory detailing the systems through which we make decisions. The model consists of two systems, System 1 and System 2. These two systems collaborate to handle problems that we face on a daily basis, ranging from simple to complex, and work to process the constant load of information gathered from the environment.

System 1 is constantly working to handle the high amount of minute detail perceived in the environment. This system is quick and reactionary in nature, often relies on past experience and schemas to make snap judgments. It has a major emotional component, known in layman's terms as the "gut feeling", and is most often involved in completing simple tasks; it is beneficial because of the low amount of cognitive resources required for it to operate. While System 1 has its advantages, it is not particularly adept at reaching a solution to new, complex problems or understanding novel scenarios. It is also highly reliant on heuristics or experience based problem solving techniques. When facing a complex decision it is not uncommon for an individual to attempt to simplify it. The reliance on heuristics, simpler thought processes, allows for the conservation of cognitive resources. While efficient, this leaves System 1 vulnerable to a wide range of biases.

System 2, the analytical half of the dual-process model, is less affected by predetermined prejudices and works to handle less intuitive situations. It is a more conscious process, one that the individual is aware of, and is used to handle difficult problems that

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necessitate a higher expenditure of cognitive resources. It is the more analytical and rational system, but is slower and requires deliberate effort to complete its tasks. System 1 handles the familiar and System 2 becomes active when situations are encountered that require more detailed and specific processing or violate the rules which are understood by System 1. System 2 is where the “mental work” occurs; it is deliberate, requiring the exertion of significant cognitive effort. Based on its collected experiences System 2 monitors individual behavior and activates more fully when unusual or demanding situations are encountered (Kahneman, 2011). The emotional input that plays a large role in System 1 can sometimes be overcome by the rational nature of System 2 with sufficient application of cognitive resources. The majority of the time we rely on System 1 because it is relatively cheap in terms of resource expenditure, requiring little time or attention to function. This is a necessity because of the massive amount of information which is constantly presented to us. System 2 processing occurs when conscious effort is expended to better analyze all variables involved as opposed to relying on first instinct (Stanovich, 1999).

This framework for decision making has been directly applied to moral dilemmas as well (Greene, 2007). System 1 represents the emotional response to a moral dilemma. When a problem presents itself, an initial emotional reaction will arise in response to the personal moral violation, often inciting a person to act in one way or the other. For this emotional reaction to be overridden additional time is necessary. System 2, or conscious cognition, the counterpart to emotion in this model, does not act quickly. Neuroimaging studies have confirmed this delayed reaction time (Greene, Sommerville, Nystrom, Darley, & Cohen, 2001). Often times, once cognition has occurred and a cost benefit analysis has been completed, System 1 is overridden and participants responding to a moral dilemma will offer

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an opposing answer as compared to their purely emotional response. Take, for example, the crying baby dilemma discussed by Greene (2007). A woman is hiding in a basement as her village is raided above her head. In the basement with her is a group of her fellow villagers and her baby, which she holds. The baby begins to cry, threatening to alert the raiders above and putting the villagers' lives at risk. What does the mother do in this scenario? Instinctively she covers the baby's mouth to quiet it. Now she faces a dilemma. She can remove her hand and threaten the well being of everyone in the basement or keep her hand there, resulting in her baby's death. The immediate emotional reaction to such a hypothetical situation gives a clear answer; smothering one's own child is an aversive, personal violation of morals. However, a cold and rational cost-benefit analysis favors the other option. If the baby is allowed to cry then everyone dies. By choosing the more emotionally acceptable option a greater cost is incurred. Cases like this create a competition between the emotional and cognitive systems. The emotional reaction is powerful in its influence, but given enough time the cognitive system can outweigh it. Simply stated, the power of these systems can directly affect the way an individual approaches ethical dilemmas. This is particularly relevant when considering the effect that cognitive load had on System 2 in the work of Greene, Morelli, Lowenberg, Nystrom, and Cohen (2008). The application of cognitive load delays controlled cognitive processes which represent utilitarian judgment strategies, the systematic cost-benefit analysis conducted by System 2. This delay makes non-utilitarian, emotional reactions more prominent. The power of System 1 is increased as a side-effect of System 2's suppression. The results of this study strongly implicate the effect of utilitarian judgment strategies when facing moral judgments. The studies described here attempt to illuminate the relationship between System 2's suppression by cognitive load and the negative impact on

forecasting abilities as a result. They will attempt to demonstrate how ethical decision making ability can be affected by this interaction.

### **Cognitive Load**

Cognitive load is closely tied to the expenditure of cognitive resources. Under a state of cognitive load an individual is tasked with a high amount of cognitive processes which places strain on their working memory. The act of multitasking has been shown to have detrimental effects to performance in numerous areas because it induces a state of cognitive load. For instance, Fonseca, Brauer, Moiscu, and Nugier (2013) showed that induced cognitive load can impact the way an individual reacts to social norm transgressions, such as an unknown individual taking advantage of a busy mother to cut in line at the supermarket. This study demonstrated how effective forms of social control can be neglected for ineffective forms when a state of cognitive load exists, producing greater social consequences. Typically, the use of effective social control following a social norm transgression can inhibit a negative reaction. A direct-positive response to a transgression was found to yield the best results for limiting similar behavior in the future and provoked the lowest amount of hostility in the perpetrator. The study demonstrated that cognitive load promotes less effective response strategies which can have the opposite effects. The authors theorize that cognitive load reduces the use of effective direct social control strategies because the lack of cognitive resources makes dealing with the perpetrator's potential response undesirable. It was also found that participants under cognitive load exhibit more intense hostile emotions as a reaction to social norm transgressions than those not under cognitive load and are less able to consider and account for external factors that might be impacting the current situation and the decisions of others. They are therefore more inclined

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to make negative attributions to the person who is violating norms, resulting in increased hostile feelings. This more emotional reaction comes when cognitive load limits the availability of cognitive resources and rational thinking. Overall, when someone is put in a state of cognitive load they are less likely to deal with norm transgressions in an effective way.

The potential increase in negative emotions brought on by cognitive load can further impact social control and judgment indirectly. The importance of increased negative emotions is illuminated in the research of Kligyte et al. (2013). This study demonstrated that emotions, particularly anger, have an impact on ethical sensemaking strategies, the use of mental models to analyze possible courses of actions and forecast outcomes. The decision making ability of those in an angered state was found to be inhibited as compared to those in a control group with no negative emotion induced. The negative impact of anger is moderated and reduced by emotional regulation, or the control that allows us to react to a situation with emotions that are within social norms and with a level of flexibility to ensure appropriate timing of action or reaction. This work combined with previously described research supports the hypothesis that cognitive load can further reduce ethical decision making abilities due to reduced emotional regulation. As emotional regulation requires increased levels of cognitive resources, it may create a cycle of failure if the resources are overly taxed by the load of working memory activation as demonstrated by Fornesca et. al (2013).

Cognitive load was also shown to play a role in the attribution of knowledge during assessment of another individual's state of mind (Maehara and Saito, 2013). In this study, participants were put under varying degrees of cognitive load while reading and answering

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questions related to a story about an individual searching for an item; according to the story the item had been moved while the story character was away. Heavy cognitive load was induced by asking participants to remember a meaningless series of seven letters, while light cognitive load utilized two letter strings. The participants were asked to complete a mental-state reasoning task in which they declared the odds of the story subject looking in various places for the missing item. They had knowledge of the new location of the item while the story subject did not. It was found that light cognitive load during the story phase followed by high cognitive load during the mental-state reasoning task resulted in an over-attribution by the participants of their own knowledge about the object's location to the story protagonist. In a high load condition participants predicted higher odds of the story subject searching in the correct location, expecting them to act as if they had personal knowledge of the location of the item.

Just as cognitive load has been shown to impact people's ability to correctly isolate their own knowledge from situations involving others; it can also impact the successful utilization of personal wisdom to one's own situation. Our ability to successfully leverage our recollections plays a role in our future decisions. Improved judgment has been correlated with higher memory abilities (Weaver & Stewart, 2012) and suppressing excessive environmental input has been theorized to improve predictive and recollective memory (Glenberg, 1997). Research has found that cognitive load can negatively impact a person's ability to perform memory related tasks, and that performance can be improved by reducing the amount of cognitive load (Vredeveldt, Hitch, & Baddeley, 2011). This study found that visual and auditory distractions, inducing cognitive load, are detrimental to the memory of details. Recall became worse, with fewer details being remembered, and an increase in false

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memories was observed during higher cognitive load periods. Indeed, simultaneous tasks have been shown to disrupt the encoding process of memorization (Naveh-Benjamin, Craik, Perretta, and Tonev, 2000).

Research has also demonstrated that cognitive load can lead to the utilization of simpler, less-demanding judgment strategies, therefore impairing judgment abilities when more complex judgment strategies would be most effective (Hoffmann, von Helversen, & Rieskamp, 2013). These more complex judgment strategies become less common as working memory is taxed. Edwards, Snyder, Allen, Makinson, and Hamby (2012) found that those placed under cognitive load had trouble utilizing gained information to make behavioral choices. When participants were given data in graph form and then asked to explain this information they had no trouble interpreting the data. The act of reading data and applying meaning does not seem to require significant cognitive resources. However, when participants were told that certain actions should be taken in response to the value of specific variables meeting pre-established criterion the deliberative processing necessary to make a behavioral choice was impaired. This may be due to the fact that cognitive load can selectively interfere with utilitarian judgment processes, which are a commonly used strategy when dealing with moral dilemmas. Greene et. al (2008) equate these utilitarian judgment strategies with conscious cognitive processes. The authors cite the dual-process theory, claiming that these conscious cognitions are representative of System 2 and require cognitive control. When cognitive load is induced an individual's ability to actively engage in conscious System 2 analysis is impaired. The time necessary to make utilitarian judgments increases, while the time for non-utilitarian judgments does not. The authors theorize that these non-utilitarian judgments are made by System 1 of the dual-process model and

represent more innate, emotional decisions. This suggests that cognitive load interferes with System 2 but not System 1, and leads to decreased use of conscious cognition, which is vital for making ethical judgments.

The effects of cognitive load on judgment abilities have been examined across multiple contexts but its impact on forecasting in ethical decision making has not specifically been examined. Cognitive load has been shown to produce detrimental effects on ethical decisions as well as on other judgment tasks. The importance of forecasting to ethical decision making has also been demonstrated. However, there has been no conclusive research to demonstrate that cognitive load affects ethical decision making through this specific mechanism, forecasting. Clearly, ethical decision making is a complex cognitive process which requires numerous interacting systems to account for all variables, both present and future. Cognitive load's negative impact on emotion, the process of knowledge acquisition, memory, and mental-state reasoning all point to potentially impactful, often disastrous, results when burdening an individual facing a major ethical dilemma. For the purposes of these studies cognitive load will be induced by multitasking, engagement in individual and discrete tasks performed in succession (Dzubak, 2008).

### **Preliminary Studies**

Pilot data, collected during our preliminary studies, examined the effect of cognitive load using two different methodologies for induction, both validated in previous research studies. These data suggest that cognitive load interferes largely with forecasting.

Participants who were placed under cognitive load by completing a memorization task while simultaneously analyzing ethical dilemmas believed that the unethical actions of a fictional

character would cause less harm than those in the control condition. Marginal effects were observed for moral identification and moral judgment in some cases as well.

### **Study 1**

Our aforementioned preliminary studies attempted to measure the impact of cognitive load on ethical dilemma forecasting utilizing a simulated load which required short-term memorization of a sequence of letters. Specifically, the experimental group had to memorize a sequence of four letters that had to be reported after responding to questions related to ethical dilemma scenarios. The control condition reported the letters immediately after they were presented and prior to responding to any scenario related questions. For Study 1, two new conditions were added examine various levels of cognitive load and confirm assumptions made during preliminary studies. The first raised the difficulty of the cognitive load task by increasing the amount of letters had to be memorized. In preliminary studies very few participants made errors on this task, even in the experimental condition. Increasing the difficulty by requiring the memorization of more letters creates a new condition with an increased level of cognitive load. The addition of this condition allowed for a comparison of low and high cognitive load, an area that was unexplored in preliminary studies. The second additional condition was a true control. In preliminary studies those in the control group still received memorization tasks in order to produce a shared context for both conditions. The difference in the two groups' activities was the point at which they reproduced the memorized data. Those participating in the control condition were asked to reproduce the sequence of letters or numbers (varied depending on study goals) immediately, prior to responding to ethical dilemmas as opposed to those in the experimental group where the series were recreated after responding to the dilemmas. Placement of the reproduction step

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prior to the dilemma consideration was done to relieve the cognitive load, eliminating its effect on ethical dilemma identification, judgment, and forecasting abilities. The addition of a true control, in which the participants do not receive any memorization tasks, attempted to validate this assumption. It was hypothesized that those in the high cognitive load condition would show increased deficits over the no cognitive load condition when compared to the low cognitive load condition. Additionally, it was hypothesized that there would be no difference between the new, no-memorization control group and the control group used in preliminary studies.

### **Methods**

#### **Participants**

Sixty-nine college undergraduates (25 male, 44 female) were recruited using an online participant pool. Informed consent was obtained prior to participation in any study activities. Participants were given credit in a basic psychology course or extra credit points for one of their advanced psychology classes as compensation for their time.

#### **Design**

This study consisted of a four condition (control, four letter no cognitive load, four letter cognitive load, six letter cognitive load) within-participants design. This helped limit the possibility that perceived harm is influenced by individual differences and helped to ensure that the manipulation was consistent. These conditions will henceforth be referred to as C, 4NL, 4L, and 6L. Pairing of scenario and condition was completed randomly, and order of presentation was also randomized. Responses to ethical dilemmas regarding dilemma

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identification, judgments, social pressure identification, and forecasting following cognitive load induction were the dependent measure.

### **Materials**

Study 1 used Qualtrics, a digital survey system, for the administration of surveys and collection of data. Participants read and responded to three scenarios on the Perceived Moral Intensity Scales (PMIS) adapted from Singhapakdi et al. (1996) and Frey (2000), see Appendix B. All responses were recorded on a seven-point Likert-type scale (1 = Strongly disagree, 7 = Strongly agree). The survey included nine questions, which measure five factors. Item 1 of the PMIS measures ethical dilemma identification, item 2 measures ethical judgment, and item 3 measures ethical intentions. The remaining items combine to form two composite scores by averaging scores across associated items. Items 4, 6, 7, and 9 measure harm identification while items 5 and 8 measure social pressure identification. Survey materials were the same for each condition. They differed only in the cognitive load induction and order of presentation.

### **Procedure**

Random assignment determined the order in which the conditions were completed by each participant. Next, participants were presented with one randomly selected problem out of the four possible ethical dilemma scenarios. To ensure that the participants read each scenario thoroughly they were all presented for a set minimum amount of time, 30 seconds, before participants could continue to the next step. After presentation of the dilemma, the cognitive load phase began. The procedure was very similar to that used in pilot studies. Participants currently engaged in one of the experimental conditions were presented with a

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series of 4 or 6 consonants, depending on condition (4L and 6L), one at a time for approximately two seconds each and informed they must remember these and reproduce them later, in the correct order. They were then presented with a question from the PMIS regarding the ethical dilemma and asked to respond on a 7-point Likert-type scale (1 = Strongly disagree; 7 = Strongly agree). After answering one question they were asked to reproduce the sequence of letters presented earlier in the study section, thereby releasing the effect of cognitive load. This process of cognitive load induction, scenario response, and cognitive load release was repeated for all the questions related to the first scenario. Three additional scenarios randomly paired with one of the remaining conditions were presented until the participant has engaged in each experimental or control condition, with the induction of cognitive load and the release cycle repeated or skipped based on the group assignment. Participants active in the no cognitive load (4NL) condition were given the same letter sequences but reported them prior to responding to a scenario question so that the cognitive load was released before response. Finally, during the true control (C) condition, participants were not given a sequence of letters and instead simply respond to the scenarios. All participants completed one scenario under each condition. The order of conditions and scenarios was counterbalanced. Participants were then debriefed about the nature of the experiment and dismissed.

### **Results**

A within-subjects analysis of variance (ANOVA,  $p = .05$ ) was run to examine the relationship between the participants' condition and their responses on the perceived moral intensity scale. The results on this measure were compared using composite scores made up of multiple items. A significant effect was found on the composite score for predicted harm

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(items 4, 6, 7, and 9),  $F(3, 201) = 3.29, p < .05, \eta_p^2 = .05$ . Post hoc tests revealed that the 4L condition ( $M = 3.52, SD = 1.54$ ) was significantly more likely to predict small amount of harm from unethical decisions as compared to the 4NL condition ( $M = 3.04, SD = 1.29$ ) who predicted greater harm. The 4L condition was also significantly more likely to agree that small amounts of harm would result from the unethical actions as compared to the 6L condition ( $M = 2.88, SD = 1.27$ ). There were no significant differences in the C condition ( $M = 3.25, SD = 1.30$ ) and no other significant differences were observed.

In order to further examine the effect observed for predicted harm each individual item that makes up the composite score was also analyzed. The findings on the composite score for predicted harm were corroborated by the results found for the individual items which make up this composite score. A significant main effect was found for item 6 (“There is a very small likelihood that the Subject’s Action will actually cause any harm”),  $F(3, 204) = 2.78, p < .05, \eta_p^2 = .04$ . Post hoc comparisons with the Tukey HSD test indicated that the 4L group ( $M = 3.70, SD = 1.93$ ) were significantly more likely to agree that the unethical actions had a small likelihood of causing harm as compared to the 6L group ( $M = 2.93, SD = 1.59$ ). Additionally, there was a significant main effect on item 9 (“The Subject’s Action will harm very few people if any”),  $F(3, 201) = 5.53, p = .001, \eta_p^2 = .09$ . Follow-up comparisons using the Tukey HSD test indicated that there was a significant difference between the 4L condition ( $M = 3.56, SD = 1.77$ ) and the 4NL condition ( $M = 2.84, SD = 1.51$ ) with those in the 4L condition being more likely to agree that very few people would be harmed as a result of unethical actions. They were also significantly more likely to agree that few people would be harmed when compared to the 6L condition ( $M = 2.66, SD = 1.43$ ). Those in the 4NL

group ( $M = 3.28$ ,  $SD = 1.60$ ) were also significantly more likely to agree the few people would be harmed when compared to the 6L condition.

### **Discussion**

Study 1 attempted to examine the possibility that cognitive load could reduce forecasting ability in the context of an ethical dilemma. On the composite score for harm, as well as item 9 of the PMIS (“The Subject’s Action will harm very few people if any”), a significant difference was observed between the 4L group and the 4NL control group. This indicated that those in the 4L cognitive load group showed inhibited forecasting performance as compared to one of the control groups. As such, the first hypothesis is confirmed. Cognitive load induced through a memorization task can lead to reduced prediction of harm following an unethical choice. This difference was not observed with the C group.

The results from item 6 of the PMIS (“There is a very small likelihood that the Subject’s Action will actually cause any harm”) did not successfully show that the cognitive load groups would be significantly more likely to agree that small amounts of harm would result from unethical actions as predicted. Those in the 4L group displayed significantly lower forecasting, but only when compared to the 6L group. The composite score for harm also confirmed this difference, with the 6L group predicting less harm than the 4L group. The reasons for this difference most likely lie in the difficulty of each task. An inspection of the memorization task responses indicates that the six letter task may have been too difficult. A sizable portion of the participants in this group were unable to correctly remember the six letters. On the first sequence of six letters there were 41 correct and 28 incorrect responses. By comparison, the first sequence of letters during the 4L condition was correctly recreated

by 57 participants with only 12 failing to remember the sequence. During the 4NL condition, 62 participants were successful in recreating the sequence and only 7 were not. By the ninth sequence of the 6L condition the number wrong increased to 40, while only 29 were correct. The lack of success on this task may suggest that they felt obligated to complete some part of the study, as they were being compensated, so they may have chosen to give up on the memorization task and therefore given extra attention to the ethical dilemmas. This meant that they could use the time originally allocated to reporting the letters to further consider the dilemmas, resulting in increased performance. It is also possible that more importance was placed on the word problems, the more relatable and less arbitrary task, resulting in an effect opposite of that which was intended in the original study design. The participants' performance on the memorization task may have been hindered by the ethical dilemma task, as opposed to the other way around. Past research has found that switching attention to a secondary task from a primary task can reduce memory performance on the first and improve the second (Naveh-Benjamin et al., 2000). In this case, the more relatable tasks, the ethical dilemmas, were given greater importance and therefore allocated more attention.

The second aim of study 1 was to examine potential differences in the two control conditions. No significant differences were directly observed between the two controls, although they did occasionally differ on their relationship to the two experimental conditions. On item 9 as well as on the composite score for predicted harm, the 4L condition significantly differed from the 4NL condition but not the C condition. Those in the C condition were less likely to predict harm as a result of the unethical actions presented in the fictional scenarios when compared to the 4L group, but not significantly so. The two groups were similar, but because their individual relationships to the control conditions differed it is

not feasible to say that the results are identical. Thus, the second hypothesis is only partially supported. The reason for this difference is likely similar to the differences observed between the experimental conditions. The time given to report the letters from the memorization task was not limited and so this time may have been used to further consider the ethical dilemmas.

Ultimately, this study successfully advanced the knowledge base regarding the effects of cognitive load on ethical decision making, especially in the realm of methodology. We now know that when a cognitive load memorization task becomes too difficult it may no longer serve its intended purpose of inducing cognitive load, and therefore impacting System 2 of the dual-process model. Future studies should limit the difficulty of the memorization task or provide additional motivation for completing them successfully. We also confirmed previous findings that cognitive load induced through a simultaneous memorization task can negatively impact forecasting abilities.

### **Study 2**

Study 2 attempted to increase the generalizability of previous findings. It utilized a methodology for cognitive load induction which more closely resembles a real world scenario, and evaluated the impact when the participants were required to keep multiple dilemmas in mind at one time. It was hypothesized that, once again, increased levels of cognitive load would result in poorer performance on forecasting tasks. More specifically, it was hypothesized that those in the cognitive load condition would predict less harm as a result of unethical actions as compared to those in the mixed scenario condition and that those in the control condition would predict less harm as compared to both these groups.

## **Methods**

### **Participants**

One hundred and twelve college undergraduates (19 male, 93 female) were recruited using an online participant pool. Informed consent was obtained prior to participation in any study activities. Participants were given credit in a basic psychology course or extra credit points for one of their advanced psychology classes as compensation for their time.

### **Design**

This study consisted of a three condition (no cognitive load, mixed scenario, cognitive load) between-participants design. Response to ethical dilemmas regarding dilemma identification, judgments, social pressure identification, and forecasting following cognitive load induction was the dependent measure.

### **Materials**

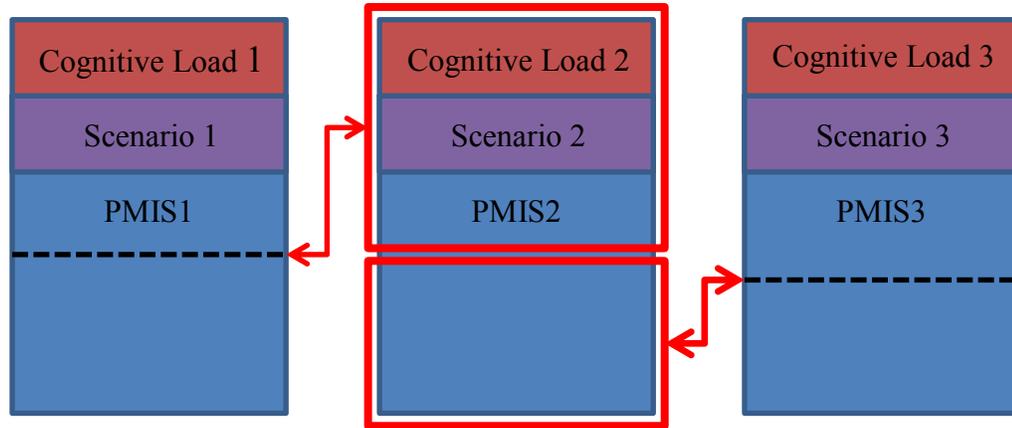
Similar to Study 1, Study 2 used Qualtrics for the administration of surveys and collection of data. All survey materials used for Study 2 were the same as in Study 1. Additionally, survey materials were the same for each condition. They differed only in the cognitive load induction and order of presentation.

### **Procedure**

Participants began by reading and accepting the consent document. Those in the cognitive load condition were then presented with the first cognitive load induction task. A 10 digit number series appeared on screen for 20 seconds and they were told that they had to remember this number and be able to reproduce it later. They were also told that receiving

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their credit was dependent on this “memorization task” to ensure that they did not ignore the task. Next, they were given the first ethical dilemma, Scenario 1. Once they had read the dilemma they proceeded to the PMIS section, PMIS 1. At the mid-point of this section the experimental groups (mixed scenario and cognitive load) broke away from the control condition. The cognitive load group was presented with the second cognitive load task and dilemma, Scenario 2, before they had reproduced the first number series or completed PMIS 1. This required them to keep two scenarios and cognitive load tasks in mind simultaneously, simulating the complexity of a real world situation. The mixed scenario group followed a similar procedure but was not required to memorize any number sequences. Once Scenario 2 had been read the participants completed the first half of the second PMIS, PMIS 2. Once this was completed they returned to the remainder of PMIS 1 and completed it in response to Scenario 1. At this point the first cognitive load task was ended. The participants were asked to reproduce the first number series they saw, prior to reading Scenario 1, and told that they no longer needed to remember it. At this point, the third section began. The third cognitive load task was presented and followed by Scenario 3. Participants then completed the first half of PMIS 3. Next, they returned to PMIS 2, completed the remainder, and reproduced the number series from second cognitive load task. Finally, they completed the second half of PMIS 3 and reproduced the final number series. This procedure is represented visually in Figure 1. Again, those in the mixed scenario condition followed a similar procedure, but were not given the number sequence to memorize. They are asked to multitask, by responding to two scenarios at once, but not complete a memorization task. The control condition read and responded to each scenario in order, with no overlapping of the dilemmas.



*Figure 1.* Visual representation of the procedure for cognitive load condition from Study 2. The mixed scenario condition followed the same procedure without the memorization task.

### Results

A one-way ANOVA ( $p = .05$ ) was run on the composite scores formed from the PMIS. First, there was a significant result for the composite measure of predicted harm, formed by averaging items 4, 6, 7, and 9,  $F(2, 106) = 4.50, p < .05, \eta^2 = 0.08$ . Follow-up comparisons using the Tukey HSD test found that those in the mixed scenario condition ( $M = 3.58, SD = 0.83$ ) were more likely to agree that a small amount of harm would result from the unethical actions as compared to the control condition ( $M = 2.94, SD = 1.02$ ) who predicted greater harm. There was no significant difference in the cognitive load condition ( $M = 3.35, SD = 0.88$ ).

In order to further investigate the relationship between condition and responses to the ethical dilemmas an independent samples t-test was run to compare the mixed scenario condition with the control condition, excluding the influence of the cognitive load group. The results showed a significant difference between the two groups on perceived harm,  $t(72) = 2.89, p < .01, d = 0.69$ .

Responses to the measure of perceived harm were the primary interest in this study. However, the other scores collected by the PMIS were also examined to further investigate what effects the new manipulation used in this study produced. A one-way ANOVA ( $p = .05$ ) was run on the composite measure of social pressure, formed by averaging items 5 and 8, which was also significant,  $F(2, 108) = 4.18, p < .05, \eta^2 = 0.07$ . Follow-up tests indicated that those in the mixed scenario condition ( $M = 4.41, SD = 0.80$ ) were significantly less likely than those in the control condition ( $M = 5.01, SD = 0.94$ ) to agree that others would identify the unethical actions as wrong.

Similar to the composite score for predicted harm an independent samples t-test was run to compare the mixed scenario condition with the control condition. There was a significant difference between the two groups and on social pressure,  $t(73) = -2.92, p < .01, d = -0.69$ . Means and standard deviations can be found in Table 1.

**Table 1**  
Group Means and Standard Deviations for T-Test Results, Composite Scores

Dependent Measure	Mixed Scenario	Control	<i>d</i>
Perceived Harm	3.58 (0.83)**	2.94 (1.02)	.69
Social Pressure	4.41 (0.80)**	5.01 (0.94)	-.69

Note:\*\*  $p < .01$

An identical independent samples t-test analysis was run to compare the differences between the cognitive load group and the control group on these composite scores. No significant results were found, yielding credence to the stronger effects observed for the mixed scenario group when examined using a t-test.

After analyses on composite scores were completed a one-way analysis of variance (ANOVA,  $p = .05$ ) was run to examine the main effect of condition on each item in the

perceived moral intensity scale. A significant main effect was observed for item 5 (“Most people would agree that the Subject’s Action is wrong”),  $F(2, 110) = 6.86, p < .01, \eta^2 = 0.11$ . Follow-up comparisons using the Tukey HSD test found that people in the mixed scenario condition ( $M = 4.77, SD = 0.97$ ) were significantly less likely to agree that most other people would find the unethical actions wrong when compared to the control condition ( $M = 5.54, SD = 0.93$ ). Participants in the cognitive load condition ( $M = 5.09, SD = 0.83$ ) were marginally less likely to agree with the statement when compared to the control condition and did not differ significantly from the mixed scenario condition. These results suggest that the mixed scenario condition presents a strong challenge when evaluating others’ opinions about an unethical decision. The addition of cognitive load through number memorization presented a moderate challenge, although it did not affect the participants as much as only mixing the scenarios.

The one-way ANOVA also found a marginal effect for item 1 (“The situation involves an ethical dilemma”),  $F(2, 110) = 2.62, p = .077, \eta^2 = 0.05$ . Follow-up tests showed that participants in the mixed scenario condition ( $M = 5.88, SD = 0.93$ ) were marginally less likely to agree that the situation involved an ethical dilemma as compared to the control group ( $M = 6.26, SD = 0.63$ ). Item 3 (“If I were the Subject, I would make the same decision”) was also marginally significant,  $F(2, 110) = 2.43, p = .093, \eta^2 = 0.04$ . Participants in the mixed scenario condition ( $M = 3.32, SD = 1.16$ ) were marginally more likely to agree with the statement when compared to the control condition ( $M = 2.77, SD = 1.10$ ). They reported more willingness to make the same, unethical decision as the subjects in the given scenarios. A marginal effect was also found for item 7 (“The Subject’s Action will not cause any harm in the immediate future”),  $F(2, 109) = 2.69, p = .072, \eta^2 = 0.05$ . Once again, based

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on post-hoc tests participants in the mixed scenario condition ( $M = 3.51$ ,  $SD = 0.91$ ) reported marginally more agreement with the statement than those in the control condition ( $M = 3.00$ ,  $SD = 1.11$ ). In this case, those in the mixed scenario condition were marginally less likely to forecast immediate harm as a result of the unethical action. Finally, a marginal effect was observed for item 9 (“The Subject’s Action will harm very few people if any”),  $F(2, 109) = 2.88$   $p = .061$ ,  $\eta^2 = 0.05$ . Once again those in the mixed scenario condition ( $M = 3.48$ ,  $SD = 1.08$ ) displayed less ability to forecast potential harm as they were marginally more likely to agree with the statement as compared to the control group ( $M = 2.93$ ,  $SD = 1.15$ ).

In the above cases, the mixed scenario group displayed a marginally reduced ability to identify an unethical choice, more willingness to make the same choice, and a diminished ability to forecast potential harm as compared to the control group. However, these differences were not observed in the cognitive load condition. This interaction was examined further using independent samples t-tests ( $p = .05$ ) to compare the relationship between responses on the PMIS. Each item on the scale was examined individually. The analyses confirmed the differences seen during the ANOVA and the exclusion of the cognitive load group produced even stronger relationships. All means and standard deviations listed below and in Table 2. The mixed scenario group and the control group showed a significant difference on item 1,  $t(62.85) = -2.05$ ,  $p = .044$ ,  $d = -.48$ , again showing that those in the mixed scenario group were less likely to agree that the scenarios provided constituted ethical dilemmas. Unlike the results collected from the one-way ANOVA, this difference was significant, not marginal. A significant difference was also observed on item 3,  $t(75) = 2.13$ ,  $p = .036$ ,  $d = .49$ , indicating that those in the mixed scenario condition were significantly more likely to indicate that they would make the same, unethical decision as the fictional

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subjects. Once again, there was a significant difference on item 5,  $t(75) = -3.54, p = .001, d = -.81$ , in which mixed scenario participants demonstrated lower belief that others would view the unethical action is wrong; this difference was even stronger than seen before. Similar to item 3, the t-test revealed a significant difference on item 7,  $t(75) = 2.20, p = .031, d = .50$ . Participants in the mixed scenario group were significantly less likely to predict immediate harm following the unethical action. A similar, significant result was found on item 9,  $t(74) = -2.08, p = .034, d = .49$ , showing that those in the mixed scenario group were more likely to believe that few would be harmed by the unethical action.

In addition to the marginal results from the ANOVA analyses being significant there was also a marginally significant difference on item 4 ("The overall harm done as a result of the Subject's Action would be very small"),  $t(75) = 1.68, p = .098, d = 0.38$ , found once examined using the independent samples t-test. Those in the mixed scenario condition ( $M = 3.31, SD = 1.16$ ) reported marginally more belief that the unethical actions of the subjects would cause a very small amount of harm compared to the control group ( $M = 2.88, SD = 1.10$ ). Additionally, there was a marginally significant difference on item 6 ("There is a very small likelihood that the Subject's Action will actually cause any harm"),  $t(75) = 1.83, p = .071, d = .44$ . Participants in the mixed scenario group ( $M = 3.45, SD = 0.97$ ) again displayed decreased forecasting of potential harm, reporting greater agreement with the statement regarding the unethical actions causing little harm, as compared to the control group ( $M = 2.97, SD = 1.19$ ). Finally, there was a marginally significant difference on item 8 ("If the Subject is a friend of the victim, the Action is wrong"),  $t(75) = -1.71, p = .091, d = -.39$ . The mixed scenario group ( $M = 3.91, SD = 1.39$ ) were less likely to agree that the unethical action was wrong when compared to the control group ( $M = 4.48, SD = 1.50$ ). Overall,

participants in the mixed scenario group displayed deficits in their ability to identify an unethical scenario, determine that an unethical choice was, in fact, unethical, and showed a reduced ability to predict future harm.

**Table 2**  
Group Means and Standard Deviations for T-Test Results, Individual Items

Dependent Measure	Mixed Scenario	Control	<i>d</i>
PMIS 1 (Identification)	5.88 (0.93)*	6.26 (0.63)	-.48
PMIS 2 (Judgment)	4.75 (1.05)	4.88 (1.32)	-.11
PMIS 3 (Intentions)	3.32 (1.16)*	2.78 (1.10)	.49
PMIS 4	3.31 (1.16)	2.88 (1.10)	.44
PMIS 5	4.77 (0.97)***	5.53 (0.93)	-.81
PMIS 6	3.45 (1.16)	2.98 (1.12)	.44
PMIS 7	3.51 (0.91)*	3.00 (1.11)	.50
PMIS 8	3.91 (1.39)	4.48 (1.50)	-.39
PMIS 9	3.48 (1.08)*	2.93 (1.15)	.49

Note: \*  $p < .05$  \*\*\*  $p = .001$

An independent samples t-test was run to compare the cognitive load group with the control group as well. This analysis confirmed suspicions that the results from the previous one-way ANOVA were being impacted by the cognitive load group. Significant differences were found on item 1,  $t(74) = -1.99$ ,  $p = .05$ ,  $d = -0.47$  with the cognitive load group ( $M = 5.94$ ,  $SD = 0.74$ ) demonstrating less agreement that the scenarios presented were, in fact, ethical dilemmas as compared to the control group ( $M = 6.26$   $SD = 0.63$ ). They were also significantly less likely to agree that others would find the unethical actions wrong ( $M = 5.09$   $SD = 0.83$ ) as compared to the control group ( $M = 5.54$   $SD = 0.93$ ),  $t(74) = -2.20$ ,  $p = .031$ ,  $d = -0.51$ . Item 6 was marginally significant,  $t(74) = 1.80$ ,  $p = .076$ ,  $d = 0.41$ , with those in the cognitive load group ( $M = 3.42$ ,  $SD = 1.01$ ) being more likely to agree that a smaller amount

of harm would come from the unethical actions as compared to the control group ( $M = 2.98$ ,  $SD = 1.12$ ). Finally, item 9 was marginally significant,  $t(74) = 1.83$ ,  $p = .072$ ,  $d = 0.42$ . Those in the cognitive load group ( $M = 3.38$ ,  $SD = 1.00$ ) were more likely than the control group ( $M = 2.93$ ,  $SD = 1.15$ ) to agree that the unethical actions would harm very few people. However, as stated previously, these results did not translate to a significant difference on the composite score for predicted harm.

### **Discussion**

The results of Study 2 provide important insight into the effect of multitasking on responses to ethical dilemmas. By mixing the scenarios so that participants are forced to keep multiple problems in mind there is a significant difference in their ability to identify, assess, and evaluate ethical dilemma scenarios. First and foremost, this study appears to confirm at least a portion of our hypothesis, the notion that cognitive load induced through multitasking can negatively impact forecasting ability. More directly, it appears that those who were asked to multitask by responding to two scenarios at once, as in the mixed scenario group, were less likely to agree that harm would result from unethical decisions. This was demonstrated by the significant differences observed on the composite score for harm. Additionally, significant differences on items 7 and 9 as well as the marginally significant differences on items 4 and 6 support this observation. In all cases those who were asked to multitask and respond to two scenarios at once predicted less harm. These results were not observed in the cognitive load group, marginal differences on items 6 and 9 notwithstanding; the reasons for this not observing the effect may be similar to those in Study 1.

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In addition to confirming that forecasting was negatively impacted by multitasking, this study also illuminated other deficits that can occur as a result of cognitive load. A significant difference was observed between the mixed scenario condition and the control condition on identification of social pressure (composite score, items 5 and 8). This further reinforces the notion that cognitive load as a result of multitasking, specifically attempting to analyze two complex problems at once, contributes to deficits in moral judgment by inhibiting an individual's ability to identify social pressures.

The significant results on item 1 of the PMIS elucidate the effect that multitasking induced cognitive load can have on ethical dilemma identification. Those in the mixed scenario and cognitive load conditions displayed less ability for identification of ethical dilemmas. This corresponds with the first stage of Rest's moral reasoning model, moral awareness. This inability to identify the ethical dilemma seems to indicate that cognitive load has the ability to lower the moral awareness when an individual is placed under strain.

A significant deficit in ethical intentions was also observed in the mixed scenario group, as evidence by differences on item 3 of the PMIS. Those participants who were placed under strain by considering multiple scenarios at once were more likely to indicate that they would complete the same unethical actions as the fictional protagonists. The cognitive load induced by multitasking resulted in lower moral judgment, the second stage of Rest's Moral Reasoning Model (Rest et al., 1999).

Results similar to those seen in the mixed scenario group were not observed for the cognitive load group on measures of ethical intentions or identification of social pressure. The task of remembering arbitrary numbers while attempting to assess ethical dilemmas may

simply be too difficult, causing those participants in the cognitive load group to give up.

Inspection of the results indicates that the majority of participants in the cognitive load group could not correctly remember all ten digits of each number series. In fact, of the 37

participants in this condition none of them remembered all three number sequences correctly.

Only two participants out of the 37 remembered more than one sequence. In total, the first sequence was remembered by four participants, as was the second sequence. None of these

were the same individuals. Finally, only three participants remembered the third sequence.

This lends credence to the notion that they were overloaded with information. It is also

possible that the simple memorization of numbers is not an effective method for disrupting forecasting ability when a more complex problem is also presented. The participants may

have placed higher importance on the word problems, viewing them as more relatable, and

were therefore more likely to ignore the numbers. As outlined in the discussion section of

Study 1, Delbridge (2000) showed that performance on one task is generally detrimental to the performance on a second, simultaneous task. In this case, their increased attention to the

ethical dilemmas may have inhibited their performance on the number memorization task as opposed to the other way around as intended in the original study design. Again, Naveh-

Benjamin et al. (2000) showed that switching attention to a secondary task from a primary

task can reduce memory performance on the first and improve the second. It is also possible that the participants may have used this time to rest and contemplate the ethical dilemmas at

hand, resulting in responses more similar to the control condition. Finally, the inclusion of

number sequences may have simply served a breaking point between scenarios, allowing for better differentiation between problems and lowered impact of cognitive load. Ultimately, the

cognitive load group did not display the same deficits as the mixed scenario group.

Despite the smaller differences observed between the cognitive load and control conditions, the results of this study are still extremely important. The mixed scenario condition was designed to most closely resemble a real world situation where the problems that an individual must often face are nebulous and multi-faceted. The significant inhibition of dilemma identification, ethical intentions, potential harm identification, and social pressure identification indicates dysfunction in the first three of the four stages of Rest's Moral Reasoning Model.

### **General Discussion**

A search of the literature related to the topics discussed here suggested that no previous study has attempted to examine the effects of cognitive load on ethical decision making. We hypothesized, based on the theoretical background and our own preliminary studies, that cognitive load would negatively impact multiple parts of ethical dilemma assessment as outlined in Rest's moral reasoning model and that this negative impact would be most acute in the area of forecasting. The results of Study 1 showed that the prediction of harm as measured by the Perceived Moral Intensity Scales was reduced when participants were required to memorize a combination of four letters before they responded to each item. This decrease in predicted harm was observed in comparison to the control group who also saw the letters but did not need to remember them while they were responding. This difference seems to confirm this hypothesis, that forecasting harm in response to an ethical dilemma is affected by cognitive load. Those who were put into a state of cognitive load by being required to keep the letter sequences in mind were less likely to predict harm as a result of unethical choices. As demonstrated by Greene et al. (2008) the cognitive load interfered with cognitive processes associated with system 2 of the dual-process model.

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The difference described above was not observed when the comparison group did not see the letters, although this does not harm the generalizability of this study. In a non-experimental setting, it would be reasonable to expect that an individual has other tasks or ideas that they are thinking about or processing while simultaneously considering an ethical dilemma. It would be rare that someone is not working on other tasks at some point in the day, similar to the group which saw the letters but did not need to remember them while answering. The group in which no letters were presented simulates an ideal environment. This controlled laboratory setting does not simulate the real world quite as well as the other control group, ultimately preserving the generalizability of this study. However, we also hypothesized that multiple different control conditions would serve the same purpose. In this case, we were not completely correct. While the two control groups did not differ from one another significantly on their ability to forecast potential consequences to an unethical choice, their relationship with the experimental group was not the same. This limitation must be recognized. Why then, did the group which was not required to ever change tasks forecast less harm? We believe the answer lies in the switching of tasks. The time spent on the relatively simple memorization task provided this group with a break from the complicated assessment of the ethical dilemmas. In this way the adverse, seemingly arbitrary, task of remembering letter sequences may have directly resulted in the increased prediction of harm. More directly, the inclusion of another task, even one that required their attention and was designed to induce cognitive load, may have given them a rest period between the complicated ethical dilemmas. Ultimately, this study still indicates that cognitive load may cause reduced prediction of harm when faced with an ethical dilemma and therefore make an unethical choice more likely. To best assess an ethical dilemma it is advisable that an

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individual attempt to limit the number of concurrent tasks, and focus only on the complex problem at hand. By controlling the amount of cognitive load they experience they can limit any negative effects on their forecasting abilities.

The results of Study 2 confirm and extend the findings of Study 1 by making them more generalizable and expanding their impact. In this study we found that individuals who were forced to consider multiple ethical scenarios at a given time were less likely to predict potential harm as a result of unethical decisions as compared to those who worked on them one at a time. Much like the group placed under cognitive load in study 1, this “multitasking” group, struggled with higher-level conscious cognitive processes involved in the prediction of future events. Their ability to forecast was limited by the cognitive load induced through multitasking. It’s probable that this deficit contributed to their inhibited ability to identify the moral dilemmas, make moral judgments, and identify social pressures. Stenmark et al. (2010) described how poorer forecasting abilities could limit an individual’s ability to make positive ethical decisions and the findings here serve to support this claim.

The implications of these findings extend to numerous professional realms. For example, anyone in a professional, managerial, or medical service position will deal with a multitude of complex problems over a normal day. These issues may often include a moral component and it is crucial that these individuals be able to make thoughtful and effective decisions. Their influence may extend to individuals they are serving, a group of employees who work directly under them, or an entire company or organization that they are responsible for managing. The findings of these studies suggest that these individuals may be at a disadvantage in certain situations because of the number of complex problems they face. Unless they are able to work through moral dilemmas one at a time, without multitasking and

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inadvertently inducing cognitive load, their ability to predict consequences of a given option may be hindered, resulting in less ethical decisions. This becomes especially relevant when one considers individuals who work in high demand fields such as medicine, emergency response, and human relations. Their positions require that they deal with complex dilemmas consistently. The responses executed to the types of problems faced in these and similar fields have impact across multiple individuals and groups and also directly to the individuals that make the decisions. If one of these individual's ability to predict potential consequences is limited by the circumstances of their job and they are ultimately unable to make the most ethical judgment then an individual, group, or an entire organization may be negatively impacted. Companies and other sponsoring organizations should keep the impacts of cognitive load, induced through multitasking, in mind when establishing a training system and practices for a working structure as this series of studies demonstrates the negative effects on individual's forecasting and ethical decision making ability.

**Appendix A: Demographics**

What is your age? \_\_\_\_\_

What is your gender? (Please Circle)      Male      Female

What is your racial/ethnic background? (Please Circle One)

- 1 = White/Caucasian
- 2 = Black/African American
- 3 = Hispanic/Latino(a)
- 4 = Asian/Asian American

- 5 = Native American/Alaskan Native
- 6 = Pacific Islander
- 7 = Other; Please explain \_\_\_\_\_

**Appendix B: Ethical Scenarios/PMIS**

Tom Waterman is a young management accountant at a large, diversified company. After some experience in accounting at headquarters, he has been transferred to one of the company’s recently acquired divisions run by its previous owner and president, Howard Heller. Howard has been retained as vice-president of this new division, and Tom is his accountant. With a marketing background and a practice of calling his own shots, Howard seems to play by a different set of rules than those to which Tom is accustomed. So far it is working, as earnings are up and sales projections are high. The main area of concern to Tom is Howard’s expense reports. Howard’s boss, the division president, approves the expense reports without review, and expects Tom to check the details and work out any discrepancies with Howard. After a series of large and questionable expense reports, Tom challenges Howard directly about charges to the company for typing that Howard’s wife did at home. Although company policy prohibits such charges, Howard’s boss again signed off the expense. Tom feels uncomfortable with this and tells Howard that he is considering taking the matter to the Board Audit Committee for review. Howard reacts sharply, reminding Tom that ‘the Board will back me anyway’ and that Tom’s position in the company would be in jeopardy.

**ACTION:** Tom decides not to report the expense charge to the Audit Committee.

Please evaluate this action of Tom by circling the extent of your agreement with each of the following statements:

1. Tom's situation involves an ethical dilemma

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

2. Tom should not do the proposed Action

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

3. If I were Tom, I would make the same decision

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

4. The overall harm (if any) done as a result of Tom’s Action would be very small

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

5. Most people would agree that Tom's Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

6. There is a very small likelihood that Tom's Action will actually cause any harm

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

7. Tom's Action will not cause any harm in the immediate future

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

8. If Tom is a personal friend of the 'Victim', the Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

9. Tom's Action will harm very few people (if any)

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

Anna and several other graduate students at State U are employed in a laboratory as research assistants to Professor Creasin while working on their degrees. Dr. Creasin's material science laboratory is involved in manufacturing and casting metals and composites. Since Anna is new to the lab, she is required to attend a day-long seminar on hazardous material handling given by Dr. Daniels, who heads the Materials Safety and Policy Department. During the seminar, safe uses of many chemicals are discussed, including one arsenic based compound that is being used by a fellow graduate student, Bryan. Bryan is employing several safe uses of the compound, but drilling into the solid form and heating above 400 F are specifically mentioned as unacceptable, because these procedures cause poisonous particles to become airborne. Anna knows that Bryan is drilling and heating the lead compound up in a conventional oven to about 405 F. Anna then discusses the situation with Dr. Creasin alone in his office. At first Dr. Creasin is very upset. He explains that he is aware of the situation and that 5 degrees is not a significant increase from the recommended level. Furthermore, drilling and using a temperature over the recommended limit is the only way to carry out this ground-breaking research. He also says that it would be too expensive to modify the lab and the additional expense would mean firing several graduate students, possibly Bryan. He suggests that they not discuss this matter further.

**ACTION:** Anna decides not to report the hazardous laboratory practices to Dr. Daniels and the Materials Safety and Policy Department.

Please evaluate this action of Anna by circling the extent of your agreement with each of the following statements:

1. Anna's situation involves an ethical dilemma

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

2. Anna should not do the proposed Action

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

3. If I were Anna, I would make the same decision

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

4. The overall harm (if any) done as a result of Anna's Action would be very small

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

5. Most people would agree that Anna's Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

6. There is a very small likelihood that Anna's Action will actually cause any harm

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

7. Anna's Action will not cause any harm in the immediate future

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

8. If Anna is a personal friend of the 'Victim', the Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

9. Anna's Action will harm very few people (if any)

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

Dr. Judy Brewster, long interested in the effects of exposure to maladaptive environments on development, plans to design a study to examine resilience. She wants to investigate why only some individuals are able to fend off the negative consequences associated with stressful environments and adverse circumstances, and which characteristics are associated with adaptation to such environments. To learn more about the characteristics associated with this resilience, Judy will study fourth, sixth, and eighth graders who have been exposed to violence within their communities. Youths will be assessed at six-month intervals for a period of four years. The amount and frequency of exposure to community violence will be measured, as well as short- and long-term psychological, behavioral and adaptational responses. Approximately two years into her study, Judy notices two distinct patterns of adaptation. Some of the children exhibit signs of distress, anxiety and depression, and report that they have begun to engage in substance use, delinquency, violence and sexual promiscuity. Other children show no signs of distress, or have outgrown and discontinued such behaviors. Judy is concerned about the acting-out youth. Although Judy is not clinically trained in diagnosing or treating distressed participants, she is competent enough to teach students adaptive skills such as anger management and conflict resolution. However, intervening in this way may invalidate her results. After deliberation, Judy decides to not intervene with the children, or inform outside authorities about their situation, in order to protect the results of her study.

**ACTION:** Judy decides not to intervene with the children in her study, keeping her findings so far for herself in order to protect the rest of her experiment and data.

Please evaluate this action of Judy by circling the extent of your agreement with each of the following statements:

1. Judy's situation involves an ethical dilemma

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

2. Judy should not do the proposed Action

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

3. If I were Judy, I would make the same decision

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

4. The overall harm (if any) done as a result of Judy's Action would be very small

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

5. Most people would agree that Judy's Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

6. There is a very small likelihood that Judy's Action will actually cause any harm

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

7. Judy's Action will not cause any harm in the immediate future

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

8. If Judy is a personal friend of the 'Victim', the Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

9. Judy's Action will harm very few people (if any)

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

Dr. Smith and Dr. Jones have collaborated on a study to identify determinants of preterm birth, and over five years, the project team recruited 10,000 women into the study. The study participants provided multiple cell samples, all of which were frozen and stored. All study forms and specimens were coded with identification numbers rather than the women's names. The links between the identification numbers and names were kept locked up and separate from all other study materials. It has now been five years since the end of data collection for the study, and Smith has become very interested in studying potential genetic causes of preterm delivery. She is eager to proceed with a genetic analysis using the participants' stored blood specimens. However, Jones is concerned, mentioning that the consent form the women signed did not mention the possibility that they might do this genetic analysis, and that they need to contact them again to ask for their permission. Smith thinks that contacting the women would be too difficult, and that the five year time lapse complicates the matter too much, so she decides to perform the genetic analysis without contacting the participants.

**ACTION:** Dr. Smith decides not to contact the women from the previous study to request new signed forms of consent, and runs her studies on the stored cellular samples.

Please evaluate this action of Dr. Smith by circling the extent of your agreement with each of the following statements:

1. Dr. Smith's situation involves an ethical dilemma

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

2. Dr. Smith should not do the proposed Action

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

3. If I were Dr. Smith, I would make the same decision

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

4. The overall harm (if any) done as a result of Dr. Smith's Action would be very small

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

## COGNITIVE LOAD AND FORECASTING

5. Most people would agree that Dr. Smith's Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

6. There is a very small likelihood that Dr. Smith's Action will actually cause any harm

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

7. Dr. Smith's Action will not cause any harm in the immediate future

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

8. If Dr. Smith is a personal friend of the 'Victim', the Action is wrong

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

9. Dr. Smith's Action will harm very few people (if any)

1	2	3	4	5	6	7
Strongly disagree	Disagree	Disagree slightly	Neither agree/disagree	Slightly agree	Agree	Strongly agree

**Appendix C: Cognitive Load Task - Study 1**

As part of this study your memory will be tested. You will need to memorize the following letter sequence and be able to reproduce it later. How well you perform on this memory task will impact the amount of credit you receive for this study.

No Cognitive Load Condition

JMZH

DLYM

TCVF

GBRC

SHLG

DCKB

VPTF

KRWJ

QNGC

Cognitive Load; 4 Letters

HFTR

YGDB

JLXT

NJPM

KSMD

CRTK

GSYP

THBQ

CXLN

COGNITIVE LOAD AND FORECASTING

Cognitive Load; 6 Letters

GRJVDM

CMPKRW

ZFPDBN

HYKVCX

BVNSPL

GTQLXF

DWCJHL

KHBMVT

PNXRSK

Please reproduce the previous letter set : \_\_\_\_\_

You will not be asked to remember this set again.

**Appendix D: Cognitive Load Task - Study 2**

As part of this study your memory will be tested. You will need to memorize the following letter sequence and be able to reproduce it later. How well you perform on this memory task will impact the amount of credit you receive for this study.

Number Series:

0472197865

7018645923

2871906581

Please reproduce the previous number sequence : \_\_\_\_\_

You will not be asked to remember this set again.

**Appendix E: Debriefing**

Thank you for your time and participation. This study was interested in examining how cognitive load can affect perceptions of the ethical behavior of others, particularly the amount of harm caused by unethical choices. The number sequence/letter set you memorized at the beginning of the study was included for the sole purpose of inducing cognitive load and your ability to remember it correctly will in no way influence the credit you receive. All given scenarios were fictitious. If you have further questions feel free to e-mail me (j.l.watts@tcu.edu). Thank you again for your participation.

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### VITA

Jordan Lee Watts was born August 2, 1990 in Dallas, Texas. He is the son of E. Michelle Watts and Lee A. Watts. He graduated with a Bachelor of Science degree in Psychology from Texas Christian University of Fort Worth, Texas in 2012.

ABSTRACT

MULTITASKING, FRIEND OR FOE? THE IMPACT OF COGNITIVE LOAD  
ON ETHICAL DILEMMA FORECASTING

by Jordan Lee Watts, 2014  
Department of Psychology  
Texas Christian University

Thesis Advisor: Dr. Timothy M. Barth, Professor and Graduate Faculty

Multitasking has become a characteristic of modern society. The desire or need to do more with less drives individuals to attempt to complete multiple tasks simultaneously in an effort to be more time and resource efficient. The demand of concurrent activities stresses our physical and cognitive resources resulting in hidden costs caused by the negative effects created when working memory is taxed. Previous research has shown that cognitive load can cause deficits in a variety of areas, including moral judgment tasks. The ethical decision making process is a complex one, requiring the utilization of mental resources to identify, assess, and resolve the dilemma at hand. The present studies examine the effect that cognitive load has on ethical dilemma assessment, particularly on the affected individual's ability to forecast potential harm caused.